

API CODE OF PRACTICE

Provision of Impact Attenuating Surfaces



THE ASSOCIATION OF PLAY INDUSTRIES (API)

What is the Association of Play Industries (API)?

- The UK Trade Association representing manufacturers, suppliers and installers of playground equipment and playground surfacing
- API members collectively represent over 85% of the industry sales within the UK
- The API was founded in 1984

What are the API's aims?

- To promote good play space design, installation and workmanship within the industry
- To promote an understanding of play and risk
- To maintain and assist the development of British, European and other Standards for play
- To liaise closely with governing bodies of play, nationally and internationally
- To ensure members comply with standards and good practice
- To provide a united voice for the play industry

The API's role in British and European Standards

- The API strongly supports the concept of British and European standards for playground equipment and playground surfacing
- The API is well represented on all committees discussing standards
- The API can provide practical information and advice on the interpretation of all relevant play standards

INDEX TO ABBREVIATIONS AND GLOSSARY OF TERMS:

API	-	Association of Play Industries
BSI	-	British Standards Institution
CEN	-	Committee for European Normalization
CFH	-	Critical Fall Height represents the greatest height of head first fall, from which a child, landing on a surface, could be expected to avoid 'sustaining a critical' head injury
COSHH	-	Control of Substances Hazardous to Health
DISPLACEMENT	-	The movement of loose particles on impact by children's feet or body
DOT	-	Department of Transport
EPDM	-	Ethylene Propylene Diene Modified
FREE FALL HEIGHT	-	Is the greatest vertical distance between any accessible parts of the equipment intended for play and the surface beneath
H&SAWA	-	Health & Safety at Work Act
HIC	-	Head Injury Criterion
IAS	-	Impact Absorbing Surfaces
ISSS	-	International Association of Sport Surface Sciences
LIAS	-	Loose Impact Absorbing Surfaces
MINIMUM SPACE	-	Sum of Equipment Space, Falling Space, Free Space (if any) and any allocation required under risk assessment
NAMAS	-	National Measurement Accreditation Service
RA	-	Risk assessment
SETTLEMENT	-	Depth reduction of a LIAS after consolidation or natural settlement (usually expected within 30 days of installation)
SBR	-	Styrene Butadiene Rubber
TPV	-	Thermoplastic Vulcanised

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1. Introduction to the Code of Practice

The Association of Play Industries (API) has produced this Code of Practice for the provision of impact attenuating surfaces to promote best practice in the installation and maintenance of playground surfacing. The document has drawn on the wealth of experience of its members, who have designed and installed a wide range of play surfaces over many years. Also, the document references the current British and European Standards where appropriate.

This Code of Practice provide a handy reference to the relevant guidelines set-out in the British and European Standards documents and is written in easy to understand English incorporating a jargon-busting glossary of technical terms, it is designed to assist potential clients and 'specifiers' with information relating to specification, maintenance and basic construction requirements in the provision of impact attenuating surfaces within a play space. The Code of Practice is written with the aim of helping the reader choose an appropriate system and surface to enhance their play space. It is not intended this Code of Practice should form part of any contract.

Who will find this document useful?

- Play professionals (installers, designers and manufacturers)
- Schools, nurseries and other early years settings
- Parish councils and resident's associations
- Local authorities and parks staff

API members are committed to meet the minimum guideline specifications within the Code of Practice. This guidance document represents the minimum guideline specification and is not intended to supersede any reasonable specification and terms of contract which may apply within site specific contracts.

The API Code of Practice: Provision of Impact Attenuating Surfaces was accurate at the time of publication and maybe subject to change. The document will be reviewed when appropriate. Any suggestions or amendments for consideration should be addressed to: Association of Play Industries, Rural Innovation Centre, Stoneleigh Park, Kenilworth, Warwickshire, CV8 2LG

NB: Clients and 'specifiers' inexperienced in this type of procurement should seek advice from qualified contractors and/or consultants. This is a guidance document only; the Association of Play Industries does not accept any liability in relation to use or application of the information supplied therein.

2. Standards and Specifications

2.1. British and European Standards

The British and European Standards that currently apply to impact absorbing surfacing are as follows:

2.1.1. BSEN 1176 Playground equipment and surfacing (Parts 1-11)

BSEN 1176-01:2017	General safety requirements and test methods
BSEN 1176-02:2017	Additional specific safety requirements and test methods for swings
BSEN 1176-03:2017	Additional specific safety requirements and test methods for slides
BSEN 1176-04:2017	Additional specific safety requirements and test methods for cableways
BSEN 1176-05:2008	Additional specific safety requirements and test methods for carousels
BSEN 1176-06:2017	Additional specific safety requirements and test methods for rocking equipment
BSEN 1176-07:2008	Guidance on installation, inspection, maintenance and operation
BSEN 1176-10:2008	Additional specific safety requirement and test methods for fully enclosed play equipment
BSEN 1176-11:2014	Additional specific safety requirements and test methods for spatial network
BSEN 1177:2017	Impact attenuating playground surfacing – Determination of critical fall height
BS 7188:1998+A2 2009	Impact Absorbing Playground Surfacing: Performance Requirements and Test Methods

2.2. Base Definitions for Impact Absorbing Surfaces

These two definitions form an important part of the surfacing guide and need to be considered for all surface types that are described in the following sections. Laboratory testing of surfaces (BSEN 1177:2017) states that the underlying base for the surface should not offer any benefits to the Critical Fall Height of the surface being tested.

Whilst it is possible to test surfaces on site in accordance with the requirements set out in BSEN 1177:2017 these results must always be viewed as indicative and not necessarily repeatable as the ground conditions may change. For example, if surfacing is installed and tested on a clay-based soil it is almost certain that a greater critical fall height will be achieved under test when the base is wet as opposed to when the base has been subjected to a dry period.

For the purposes of this document we have defined two types of bases below; specifiers and purchasers of surfacing products should be clear on which type of base the certified Critical Fall Height was obtained.

2.2.1. Engineered Base

An engineered base is a constructed sub surface to the impact attenuating surface that offers no additional benefit in terms of CFH (Critical Fall Height) to the surface it supports. Bases falling into this category would be concrete, bitmac, compacted type 1 stone ¹

¹ It is recognised that compacted Type 1 stone can offer some short-term benefits in terms of improving the CFH of the impact attenuating materials under which it is installed; the benefits are generally short lived and results given for products on test certificates with this type of stone base should be viewed with the recognition that the results are not necessarily reproducible.

2.2.2. Non-Engineered Base

A non-engineered base is a sub-surface that offers benefits in terms of improving the CFH properties of the impact attenuating surface under which it is installed. Bases falling into this category would be grass, soil, sand, gravel or other loose materials. Results given for products on test certificates naming these types of bases should be viewed with the recognition that the results are not necessarily reproducible. Please refer to BSEN 1177:2017.

2.3. Test Certificates and Reports

Every thickness of surfacing offered by a member should have a certificate of critical fall height test, carried out in accordance with the methods described in BSEN 1177 by a certified, accredited test house. Clients/specifiers are advised to ensure the surfacing contractor meets any specific CFH requirement of the site, which can be supported and detailed on each companies own test certification (see point minimum space).

BSEN 1177:2017 limits the tolerance level on impact with a surface to a Head Injury Criteria (HIC) of 1000. This limit is based on research aimed at reducing deaths and permanent injuries due to head impacts. These limits were never intended to prevent other forms of injury such as long bone fractures, which are common accidents in childhood.

For Loose-fill Impact Absorbing Surfaces (LIAS), a 100mm thickness of material shall be added to the test result to allow for compaction and displacement.

A certificate for each product tested will be issued by the test house, showing the product depths and the test results. A detailed report should also be available upon request.

Any surface being selected should carry a current test certificate confirming that the surface has been tested in accordance with the procedures set out in BSEN 1177:2017 and BS 7188: +A2 2009.

NB: Information on published amendments to British Standards is available from BSI Publications

API members, who do not have a valid certificate for the products being quoted, shall advise the client in writing, at the time of the quotation.

Indicative testing can be undertaken on site by suitably qualified persons using portable test equipment but any results achieved are not necessarily reproducible.

2.4. Impact Attenuation Properties

It is always advisable to obtain a certificate of test from the supplier of a surface as some surfaces will achieve different results under test simply because the construction is slightly different. For example, if company (a) has a 50mm thick rubber surface it may not achieve the same Critical Fall Height as a 50mm surface from company (b).

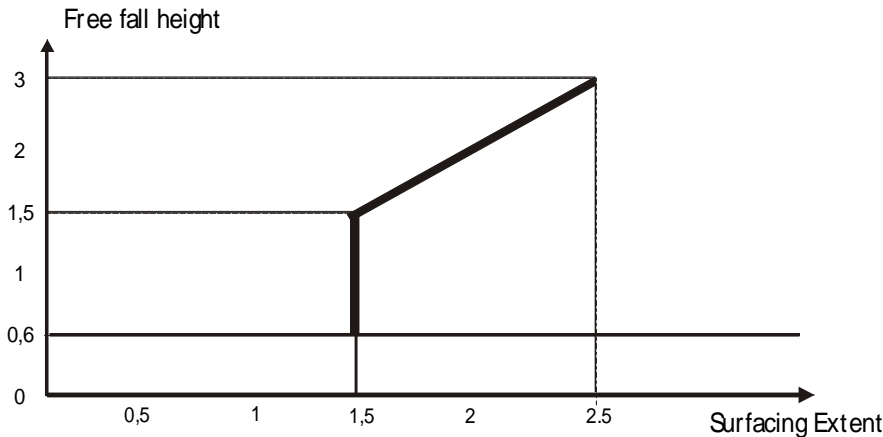
2.5. Trip Hazards

Changes in levels of surfaces should not present any hazard to the users of the area; for the purposes of this document 'trip hazard' is defined as 'an unexpected change in level'

2.6. Insufficient Surface Area

The higher an item of equipment, the further away from the equipment the child theoretically could fall. Special rules apply to swings, slides, runways and carousels where there is 'forced movement' on the user of the equipment. Reference should be made to BSEN 1176 Parts 1-11 for details of these specific requirements.

For static equipment the protected area should extend at least 1.5 metres around the equipment. This applies to fall heights from 0.6 to 1.5 metres and thereafter the extent rises to 2.5 metres around the equipment at the maximum permitted fall height of 3.0 metres.



The graph above shows the general surfacing extent relative to the play equipment free fall height. (See also 2.4 Edge Gradients for Non-Flush Fixed Wet-pour Surfacing)

NOTE: Free fall heights between 1.5 and 3m the surfacing extent is calculated by multiplying the FFH by 0.667 and adding 0.5m. The following table shows the calculated values in increments.

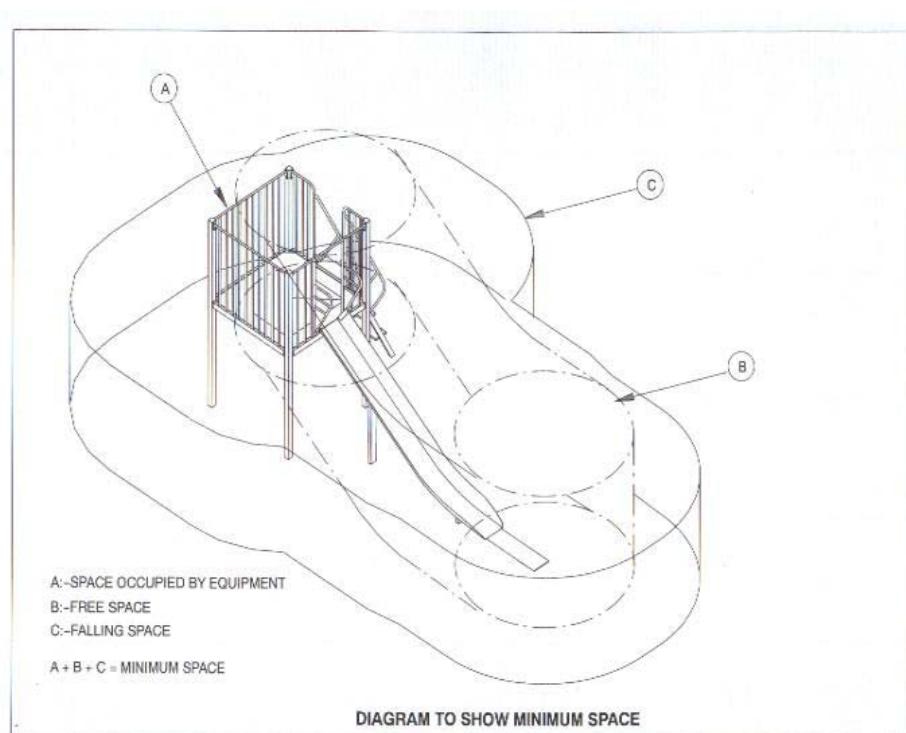
FFH	Surfacing Extent	FFH	Surfacing Extent
1.5m	1.50m	2.3m	2.03m
1.6m	1.56m	2.4m	2.10m
1.7m	1.63m	2.5m	2.16m
1.8m	1.70m	2.6m	2.23m
1.9m	1.76m	2.7m	2.30m
2.0m	1.83m	2.8m	2.37m
2.1m	1.90m	2.9m	2.43m
2.2m	1.96m	3.0m	2.50m

2.7. Rocking Equipment

In the 2017 version of the standard there is now a clear definition concerning Falling Space and Impact Attenuation for Rocking Equipment: For equipment Types 1, 2, 3 and 4, when measured from the perimeter of the equipment in its most extreme positions, the falling space should extend a minimum of 1 000 mm. When equipment is intended to be used in standing position, the falling space shall extend a minimum of 1 500 mm. For Rocking equipment types 2, 3 and 4 the impact area shall have a critical fall height of at least 600 mm. For types 5 and 6 the requirements for falling space and impact attenuation should be in accordance with the recommendations in BS EN 1176-1:2017

2.8. Minimum Space

Where a site inspection has been made by a member and the existing equipment is located within an insufficient minimum space to meet BSEN 1176, the member will advise the client in writing.



2.9. Equipment Unsuitable

The member, when having made a site inspection, will advise the client where an item of equipment is not in a fit condition to receive surfacing and will recommend an inspection by a competent person (RPII Annual Inspector (Outdoor)) to confirm their findings.

2.10. Assessment of Surface Areas and Thicknesses

Most equipment manufacturers will provide information concerning the critical fall height and surfacing area in their brochures. Where equipment is of a bespoke design and/or is not detailed in current brochures, the manufacturer shall provide information as before described.

It is recommended that guidelines in BSEN 1176 should be used as a basis to determine the necessary provision of impact absorbing surfaces for children's play equipment. Any such

surfaces being selected should carry a current test certificate to the test procedures of BSEN 1177:2017 and BS 7188:1998+A2 2009. Information on published amendments to British Standards is available from BSI Publications.

Particular care should be taken to ensure that the 'Critical Fall Height' of the surface, as stated on the test certificate, is equal to or greater than the 'free fall height' of the play equipment under which it is intended to be used.

Impact absorbing surfaces should be provided where the 'free fall height' is greater than 600mm even when guardrails and barriers are provided. It is not necessary to cover the rungs and treads of access routes. In the case of moving equipment, there are specific recommendations that should be followed.

For play equipment with a free fall height of less than 600mm, the application of a risk assessment process is essential (see API/RPII document Appendix 1). Well maintained grass can be used for Critical Fall Heights of up to 1.5m; the three main criteria are:

- That there be a minimum 150mm of good quality topsoil
- That there are no roots or rocks just below the surface (an assessment can be made using a 150mm long probe such as a screwdriver)
- That the grass remains throughout the year and does not become mud or bare earth

Reference: API January 2005 & API/RPII Statement January 2009

2.11. Health and Safety

The member will operate in conformity to all current Health & Safety legislation, including COSHH and The Duty of Care Directive, Environmental Protection 1990, relating to Waste Management. <http://www.healthandsafety.co.uk/envas.htm>

2.12. Guarantee

Members should clearly define the period and content of any guarantee offered and this should be detailed in the member companies Terms & Conditions.

2.13. Suitable Laying Conditions

The members will advise upon request, details as to recommended conditions for undertaking installation particularly relative to temperature restraints and wet/damp conditions.

2.14. Maintenance

Members will provide advice on methods of maintenance requirement.

2.15. Inspection

It is recommended that all play facilities and surfaces be inspected and maintained on a regular basis in accordance to BSEN 1176 Part 7 and by an appropriately qualified inspector.

2.16. Technical Mediation Service

The API maintains a Mediation Panel to assist in providing impartial assistance in resolving disputes between member companies and their customers. This service is restricted to technical rather than contractual aspects.

Parties requesting and agreeing to mediation are expected to be bound by the findings.

The Association does not act in any legal capacity in such events but will draw on the experience of the panel and relevant members to seek a satisfactory resolution.

Any reasonable costs incurred by the mediation service are to be met by the member company.

3. Wet-pour Impact Absorbing Surfacing (IAS)

Many different wet-pour systems exist in the UK market but all utilise the basic material content of polyurethane resin binder and rubber granulate. The granulate may be manufactured from recycled truck and tyres (i.e. SBR), TPV or from EPDM whilst the base colour for SBR rubber is black, it may also be colour coated. EPDM is generally available as either (1) Recycled EPDM, which is derived from Automotive components and is the best recycled grade of rubber and is normally what all Black EPDM offered is, or (2) Virgin EPDM which is purpose manufactured in a wide range of coloured options.

Note: Coated granules can wear and let the black base material show through in a fairly short period of time.



Examples of coloured wet-pour surfaces

3.1. Construction and Installation

3.1.1. Base Preparation

Members will always advise the client in writing, at the time of quotation, in respect of ground preparation and how arisings (spoil) are to be dealt with, where it forms part of their works.

It would be generally regarded as the equipment installer/ground preparation contractors' responsibility, to ensure that the ground works are prepared to the correct tolerances, less the thickness of wet-pour surface ordered.

It would be considered best practice, that members should highlight, at the earliest opportunity, any area which they believe, do not meet the specific/required tolerances.

3.1.2. Perimeter Edges

Where a play surface requires edging, it should be laid to an accurate line and level and to a tolerance compatible with the finished surface level. All edging used should be clean and durable so as to form a cohesive bond to play surfacing. Edgings should be set above the level of the substructure by the required thickness of surfacing and any structural layer. The type of edging used may be determined by the current substrate, adjacent surface structure and/or environment. In most cases where an engineered base is being constructed for the surfacing, hydraulically pressed pre-cast concrete edgings are most common; however treated timber edgings, block paving or engineered bricks may also be used. There are a number of products

available which may also be suitable for edging such as hard plastics or flexible steel. Other types of edging detail are available (e.g. rubber kerbs that adhere to the bitmac or concrete surface) and purchasers should satisfy themselves that whatever method is used will provide a permanent solution

Members will specify in writing as agreed at time of quotation if they have included for soft or hard landscaping, to external edges. Where it is not specified it should be assumed that this has not been allowed for. It is assumed that reinstatement of the surfaces immediately surrounding the area is included in the works.

3.1.3. Edge Details of Non-Flush Fixed Wet-pour Surfacing

Where no edge detail exists, it is good practice to provide a 'chase' or 'channel' for the wet-pour surface to finish and key into. The final specification of this should be checked with the specific surfacing contractor; however, it would typically be 50mm wide x a minimum 15mm deep, in the existing formation for wet-pour surfacing to finish to.

This 'chase', 'channel', or precast/preformed ramp edge must be outside, or in addition to, the minimum full nominal depth of surfacing required to conform to BSEN 1176.

Bonding a surface to an asphalt surface can be problematic even with a chase or channel, as the oils in the surface prevent good adhesion. The forces imparted by the expansion and contraction of the surface under varying climatic conditions may also damage the asphalt surface.

3.1.4. Edge Gradients for Non-Flush Fixed Wet-pour Surfacing

The gradient from the top of full nominal depth surfacing to the external edge of surfacing shall be a maximum of 1 in 2 for thicknesses up to 50mm and a maximum of 1 in 2.5 for thicknesses over 50mm. It is recommended that clients and members should be encouraged to consider eliminating as far as possible any trip hazards, by reducing the gradient to a greater extent, than the foregoing.

3.1.5. Surface Level Tolerances and Joints/Seams

Where the surface is intended to be in a level plane, members will provide surfacing to a reasonable level of tolerance which is fit for the intended purpose/end use. The finished IAS shall finish flush with the top of the surrounding edging and provide no tripping hazard (Providing that the depth of IAS does not exceed the depth specified on the order).

Should the final surface be required to meet any specific tolerances, this should be highlighted to the wet-pour contractor in the original enquiry and/or documented well in advance of the installation date and the contractor should agree to meet these specific tolerances.

Where joining is necessary, the joint should not create a trip hazard. Members will advise clients where there is a potential for 'joints/seams' to fail and cause possible trip hazards at some future time, where a continuous wet-pour surfacing installation is interrupted. This may also be the case when attempting to join a wet pour surface to other types of surfaces without the installation of an edging detail.

If wet-pour is being installed onto an existing flat surface (tarmac/concrete) and different depths of wet-pour surface are required, the main contractor should advise their customer, or allow an

additional quantity of wet-pour to be costed for, to allow the wet-pour contractor to reduce the steps/ramps in the wet-pour to minimise any potential trip hazard.

3.1.6. Porosity

Wet-pour surfacing is a porous product and as such all drainage requirements should be considered at sub base level. Some older wet pour systems were non-porous but these are very rare today.

3.1.7. Layered Systems

Where wet-pour is installed as a two-layer system the base layer or shock pad, is installed at variable depths to meet the required CFH requirements. The wearing course is typically installed with a minimum thickness of 15mm. If a lesser thickness of wearing course is offered than 15mm, this should be clarified in writing to the client, by the member, at the time of the quotation.

3.1.8. Coloured Surfaces

Where through colour EPDM and TPV granules are not employed to achieve a colour finish other than black, the member shall provide in writing at the time of quotation, a description of how the coloured finish is to be achieved i.e.

- a) Colour coating by pre-site manufacturer
- b) Granule colour coating in situ
- c) Texture coating in situ by spray applicator
- d) Applying paint by sprayer brush or roller
- e) Any other method

The member shall provide in writing upon request, details of any additives, for colour or preservation, together with COSHH details.

3.1.9. Surface Protection

Member companies will make every reasonable provision to secure and protect newly laid surfaces to prevent damage occurring to them during the curing process. Members would normally take responsibility for the surface protection from the time of commencement of installation until such time as the surface is fully cured or an agreed handover to the customer has taken place. If surface protection is not provided then this must be clearly stated in writing to the customer.

3.2. Installation Methods

3.2.1. Mixing

The materials for wet-pour surfacing are mixed on site. The mixing process is such that only specially manufactured mechanical mixers will achieve the correct consistency of mixed material (forced action mixer). Conventional 'cement' type mixers are not suitable for this purpose. There are a number of critical elements in the preparation, mixing and laying of the surface that require knowledge and experience to ensure the finished surface is installed to a satisfactory standard.

3.2.2. Placing

The mixed material is transported to its final location and placed on the prepared base. The finished level is achieved by trowelling off the polymeric mixture and compacting by hand trowelling and/or rolling with a smooth wheeled roller. Minor surface blemishes may be visible on completion, but every effort should be made to ensure that roller marks are minimised.

It is important to ensure that construction joints or overnight joints are kept to a minimum within each individual area of IAS. Construction joints are, sometimes however, a necessary part of the installation process and may be required due to the overall dimensions of the area, weather problems, etc. All joints should be a straight or curved line and regular in appearance.

It is possible to inlay patterns of different shapes and colours within the wet-pour surface and by necessity this increases the number of joints in the surface; care should be taken when inserting graphics or different colours of surface to ensure that suitable bond is achieved between the different sections of the surface.

To aid adhesion it is advisable to prime edgings with a diluted binder solution prior to placing the surfacing.

3.2.3. Quality of Finished Installation

The finished installed Impact Absorbing Surface shall comply in respect with any reference sample submitted to the client. However, samples provided are an indicative illustration of the colour(s) and there may be some slight batch variation from samples provided. It should also be noted that dry granule samples (i.e. not mixed with resin) will have a slightly different finished surface colour once laid with resin, although the physical granule colour will not change.

The binders which are universally used are based on MDI-type isocyanides. These chemicals go yellow/brown on exposure to light. The chemistry is similar to the 'browning' of peeled apples. The rate of colour change depends directly on UV levels and humidity during the curing period. There is no evidence to show that this phenomenon causes any deterioration of the physical characteristics of the wearing surface. It is common for the original granule colour to be gradually restored due to wear on the surface binder.

Over the passage of time the effects of UV, natural ageing, weathering, light and shade, etc. will have an effect on the colours of granules used in IAS.

3.3. New Baseworks Specifications for Wet-pour Surfacing

3.3.1. For wet-pour surfacing less than 40mm thick

- a) Excavate to depth of between 100mm and 150mm plus depth of surfacing to be laid.
- b) Lay 150mm x 50mm pressed concrete flat top kerbs haunched with concrete on both sides. If timber is employed, this should be sturdy in profile and firmly fixed with suitable pegs to secure in place.

Where timber edges are used, they should be pressure treated to protect against rot unless otherwise specified.

- c) Lay and compact 50/70mm DOT Type 1.
- d) Lay and screed off 75mm of no-fines concrete using no bigger than a 15-20mm pea gravel or clean stone and to a level tolerance of ± 3 mm under a 3m straight edge.

The dimension from the top of the kerbs to the top level of the no-fines concrete should be equal to the depth of the surface to be laid.

Open textured macadam of the same sized stone may be used in place of the no-fines concrete but consideration must be given to the curing time of the asphalt to allow the oils in the material to evaporate.

3.3.2. For wet-pour surfacing more than 40mm thick

- a) Excavate to a minimum depth of 100mm plus depth of surfacing to be laid.
- b) Lay 150mm x 50mm pressed concrete kerbs haunched with concrete on both sides.
- c) Lay and compact 100mm of DOT Type 1 to a level tolerance of ± 10 mm under a 3m straight edge.

The dimension from the top of the kerbs to the top level of the DOT type 1 should be equal to the depth of the surface to be laid.

3.4. Aftercare

3.4.1. Repairs

Clients are advised to refer to competent supplier (API member).

Repair processes can include:

- Cutting out a damaged/out of tolerance area and re-laying with new.
- Skimming existing surfacing, by installation of a new wearing course. NB: The process of re-capping could increase and/or decrease the CFH capabilities of the surface.
- Other processes may be available and should be discussed with the supplier.

Repair kits are generally available and should be used on the appropriate advice from members where their use is considered appropriate.

4. Loose-fill Impact Absorbing Surface (LIAS)

These loose surfacing products include natural materials like bark, woodchips, sand, gravel, as well as granular and shredded rubber or other recycled products.



Bark



Woodchips



Sand

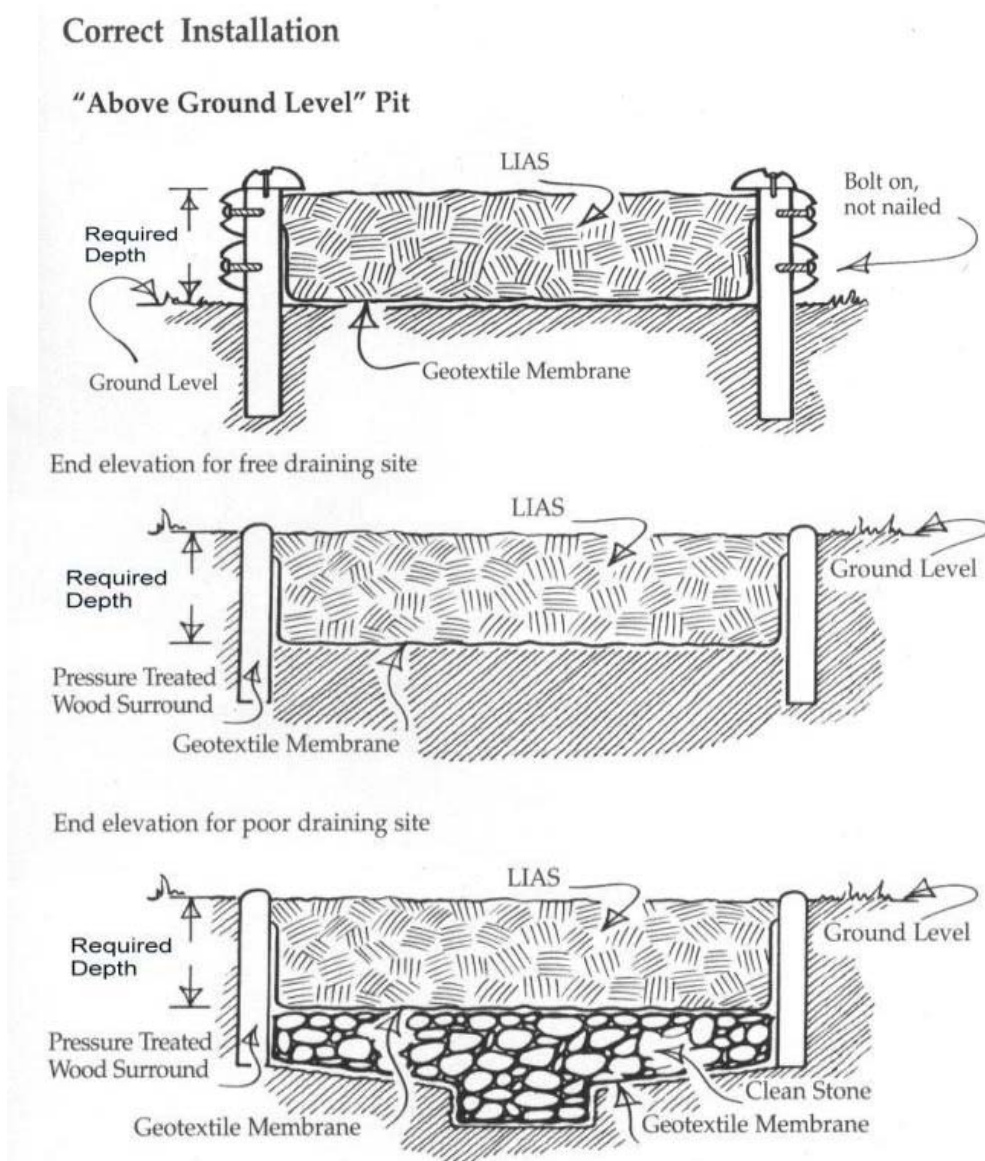


Shredded Rubber

Natural products have been successfully used in the UK for many years, are easy and low cost to install. Maintenance is simple and carried out using basic garden tools.

4.1. Construction and Installation

4.1.1. Installation options for LIAS



***NOTE:** Cladding should not be fixed with straight nails.

4.1.2. Excavation

Either excavate or prepare a raised retained edging to the depth required, creating a surface area in line with the relevant recommendations in BS 1176 appropriate for the equipment to be installed.

The depth of the excavation or retained edging should be not less the thickness of the product as defined in the test certificate supplied by the installer/supplier, when fully tested* in accordance with BSEN 1177:2017, with the addition of 100mm greater depth of material than that specified in the test certificate of the relevant material to allow for displacement in use. The base and sides of the excavation should be lined with a permeable geo-textile, unless laying onto a hard-impermeable surface. In which case, surface run-off provision should be made within the

design of the proposed edge retaining detail, or other means of drainage considered and provided.

4.1.3. Perimeter Edges

API members who intend to supply and install LIAS will advise what type and specification of perimeter edging they propose to use within their quotations.

If timber edging is used, it must be free of potentially hazardous sharp edges as far as practically possible, and is screwed or bolt fixed, not nailed.

Members will specify in writing as agreed at time of quotation if they have included for soft or hard landscaping, to external edges. Where it is not specified it should be assumed that this has not been allowed for. It is assumed that reinstatement of the surfaces immediately surrounding the area is included in the works.

4.1.4. LIAS Settlement

API members will advise their clients of the settlement factor for the LIAS product chosen, together with a sufficient displacement factor for the product to give the minimum CFH requirement.

API members will advise clients when using LIAS in conjunction with rubber tiles or wet-pour that trip hazards can arise as the LIAS settles and/or displaces.

Members will advise clients that the installation of loose fill impact absorbing surfaces under moving equipment is not recommended i.e. roundabouts etc.

4.2. Base works Specifications

4.2.1. Base Preparations

Prior to laying any materials the sub-base should be levelled and consolidated to avoid future settlement; levelling to accurate tolerances to create a consistent depth from proposed finished level of the surface.

Consideration should be given to the drainage qualities of the sub-strata on which the loose-fill material will be laid; and an appropriate drainage bed or network of drainage channels be installed prior to the laying of any loose fill materials.

The base and sides of the excavation should be lined with a permeable geo-textile, unless laying onto a hard-impermeable surface. In which case surface run-off provision should be made within the design of the proposed edge retaining detail.

4.3. Aftercare

4.3.1. Repairs

Clients are advised to refer to competent supplier (API member).

5. Grass Safety Matting

Matting products that allow the grass to grow through them are a popular choice as a safety surface because they can blend in quickly with the environment and can be a cost-effective option. The following provides some guidance on what to look out for when considering this for your safety surfacing.



Example of grass safety matting

5.1. Construction & Installation

5.1.1. Base Preparation

Members will always advise the client in writing at the time of quotation in respect of ground preparation.

It would be generally regarded as the equipment installer / ground preparation contractors' responsibility to ensure that the ground is prepared to the required tolerances unless otherwise agreed.

It would be considered best practice that members should highlight at the earliest opportunity any areas which they believe are unsuitable for good grass growth.

5.1.2. Specifications

The Grass Safety Matting should extend the correct distance from the equipment to ensure

the required falling space relative to critical fall height of the equipment is covered. It is important to note that the critical fall height achieved by a Grass Safety Matting installation may differ from time to time ⁽¹⁾. This is because soil conditions can change through the year due to the level of moisture in the soil and the extent of the grass root system at any one point in time. Good soil conditions that are conducive to good grass growth will help ensure the critical fall height of the Grass Safety Matting is maintained.

It should also be noted that any CFH certificates produced by suppliers will be showing indicative results because conditions from site to site may vary.

¹ See section referring to base definitions

5.2. Installation

API Members may have their own niche products and their installation methods may vary so it is important you discuss with your preferred supplier how your Grass Safety Matting is going to be installed. You should also take into account the following:

- Are the soil conditions suitable for Grass Safety Matting and is any additional ground preparation required?
- Ensure pot holes and local undulations will be removed.
- Ensure a stabilisation mesh is to be laid under the Grass Safety Matting.
- Ensure the Grass Safety Matting is going to be installed so there are no trip hazards at the perimeter, the edges should not be visibly exposed. This usually involves recessing the edges to ensure a consistent transition from the Grass Safety Matting to the adjoining surface, but other processes are available.
- Ensure any pegs used to secure the matting are not used inside the impact area.

With regard to the construction of the Grass Safety Matting we recommend you use a supplier that offers a minimum 5-year guarantee on its product, can provide a flammability test certificate and can supply spares and support if problems arise in the future.

5.3. Aftercare

5.3.1. Maintenance

The Grass Safety Matting should be inspected routinely and any rubbish or debris removed from the surface. The grass should be mowed on a regular basis using a conventional rotary petrol mower or similar, a strimmer may be required to reach into inaccessible places or around posts, but care should be taken to avoid damage to the structure

Monitor for signs of subsidence and areas where there is limited grass growth. This may occur in areas of heavy use resulting in compaction of the soil and may also indicate that the CFH may have been compromised. If this is the case then consult your supplier for further advice on how to rectify.

They may recommend the Grass Safety Matting is reinstated. This will involve the lifting or removal of the Matting in the critical areas and the ground being de compacted. The area can then be re soiled and levelled and fresh turf laid or the area seeded before the Grass Safety Matting is re-laid.

6. Artificial Grass/Carpet Surfacing

Synthetic artificial grass/carpet is a surface manufactured from synthetic fibres made to look like natural grass/carpet.

Artificial grass/carpet offers visual attractiveness, vibrant colours, low maintenance costs, resilience to vandalism and can be very cost effective.

The notes below will provide minimum guidelines as to what to expect when considering your safer surfacing in artificial grass/carpet.



Example colours of carpet surfacing



Example of artificial grass surface

6.1. Baseworks Specification

6.1.1. Excavation

Excavate proposed area to the specified system depth. Ensure that all vegetation and unstable material is removed in the process to provide a firm, level and even foundation.

Where the system does not have a stone foundation layer built in, the excavation depth should be increased by a minimum depth of 50mm.

6.1.2. Stone Sub-Base

Import, level and consolidate a minimum depth of 50mm 10-6mm clean angular stone to a level of tolerance of +/-6mm under a 3m straight edge.

Where the excavation depth is increased, the area should be backfilled, levelled and consolidated with DOT Type 1 granular sub base.

6.1.3. Edge Detail

Install and secure a suitable edge detail to contain the system and provide a secure fixing for the surface at the perimeter.

Where timber is used as a primary edge detail a minimum sized 50mm x 50mm should be used. Any timbers used to include pegs should be pressure treated tanalised-timber.

Where PCC edgings are used they should be 150mm x 50 mm flat tops, bedded and haunched in concrete to both sides.

Where alternative edge details are used they must provide a secure perimeter fixing of the system and/or surface.

6.1.4. Seams

When seaming together adjacent surfaces, joints should have a maximum gap of 2mm and infilling of greater gaps should not be allowed. All joints should have minimum seam strength of 25N/100mm when tested to BSEN 1228-2002 "Surfaces for Sports Areas – Determination of joint strength of synthetic surfaces". Method 2 – 'Peel Method' should be used, where a peel force is applied to the joint and the average and maximum peel strength values measured

6.2. Maintenance

The surface should be maintained as per the manufacturers guidelines and should include the following items:

- On filled surfaces the sand should be kept evenly distributed by brushing and topped up to the manufacturers levels, ensuring the correct sand is used.
- It is recommended to keep the surface clean by brushing/removing debris, leaves and rubbish.
- Keep any surrounding natural grass short at the perimeter.
- Ensure natural grass clippings are removed from the surface as soon as possible.

NB. The above information relates to areas requiring safer surfacing. It does not refer to general landscaping of mounds, walkways etc.

7. Bonded Rubber Mulch or Composite System Surface

Various different bonded rubber systems are available in the UK marketplace. All systems have a wearing course of rubber shred combined with polyurethane resin. The 'rubber mulch' is usually shredded forklift truck tyres and may contain chunks of granulated tyre. Systems can be a single layer of the bound mulch or a dual layer with a base layer to provide shock absorbency. Base layers vary in composition and include pre-formed shock pads, resin bound sbr and loose sbr.

Most bonded rubber mulch systems are colour coated. Please note that the colour coating may wear off over time and the black base material will show through this is an inherent part of the surfacing.

A bonded rubber surface provides a natural looking safety surface in comparison to synthetic and other rubber safety surfaces. The surface is designed to follow the contours of the ground and unless an engineered sub-base is provided may continue to undulate following the natural movement of the ground upon which it is laid.



Example of a bonded rubber mulch

7.1. Baseworks Preparation

If the bonded rubber or composite system surface is to be surface mounted, it is recommended that surface vegetation is removed from the proposed area to minimise on future deviations in levels as a result of degradation of vegetable material. (This can be done by mowing to a minimum level and/or scarification. Shallow excavation/scabbing off the vegetation can be done but care must be taken to fully compacted the ground, as laying on softer subsoils can also lead to future deviations of levels. If appropriate weed-kill can be used; subject to the nature of the vegetation and location of the installation).

7.1.1. Excavation

Excavate as appropriate and/or prepare a raised retained edging to the depth required, creating a surface area in line with the relevant recommendations in EN 1176 appropriate for the equipment to be installed.

For an engineered sub-base please see New Basework Specifications for Wet-pour Safety Surfacing (Sections 3.1 and 3.2).

7.1.2. Sub Base

Prior to laying any materials the sub-base should be graded and consolidated to avoid future settlement; graded to 'mirror' the proposed contours of the new surface, to create a consistent depth from proposed finished levels of the surface.

Consideration should be given to the drainage qualities of the substrata on which the surface will be laid; and an appropriate drainage bed or network of drainage channels on larger areas, to be installed prior to the laying of any system, should they be deemed necessary.

It is recommended to always lay a fully permeable geo-textile over the top of any sub-grade, including surface mounted systems.

The depth of the surface and/or composite system should be not less than the thickness of the product tested as defined in the test certificate supplied by the installer/supplier, when fully tested* in accordance with BSEN 1177:2017

*Certificates should state clearly if the materials being supplied have been tested fully in accordance with the BSEN 1177:2017 test method, meaning on to a concrete sub-base or similar hard engineered surface that does not contribute to the HIC value, within the results obtained.

7.1.3. Perimeter Edges

Members will specify in writing as agreed at time of quotation if they have included for soft or hard landscaping, to external edges. Where it is not specified it should be assumed that this has not been allowed for. It is assumed that reinstatement of the surfaces immediately surrounding the area is included in the works.

7.1.4. Edge Details of Non-Flush Fixed Bonded Mulch Surfacing

Where no edge detail exists, it is good practice to provide a 'chase' or 'channel' for the surface to finish and key into. The final specification of this should be checked with the specific surfacing contractor; however, it would typically be 50mm wide x 50mm minimum deep to avoid the surfacing being lifted.

This 'chase', 'channel', or precast/preformed ramp edge must be outside, or in addition to, the minimum full nominal depth of surfacing required to conform to BSEN1176.

7.1.5. Edge Gradients for Non-Flush Fixed Wet-pour Surfacing

The gradient from the top of full nominal depth surfacing to the external edge of surfacing shall be a maximum of 1 in 2 for thicknesses up to 50mm and a maximum of 1 in 2.5 for thicknesses over 50mm. It is recommended that clients and members should be encouraged to consider eliminating as far as possible any trip hazards, by reducing the gradient to a greater extent, than the foregoing.

7.1.6. Surface Level Tolerances and Joints/Seams

Where the surface is intended to be on a level plane, members will provide surfacing to a reasonable level of tolerance which is fit for the intended purpose/end use. The finished IAS shall finish flush with the top of the surrounding edging and provide no tripping hazard (Providing that the depth of IAS does not exceed the depth specified on the order).

Should the final surface be required to meet any specific tolerances, this should be highlighted to surfacing contractor in the original enquiry and/or documented well in advance of the installation date and the contractor should agree to meet these specific tolerances.

Please note that without an engineered sub-base the surfacing may be subject to movement and become uneven due to displacement of the ground on which it is laid.

Where joining is necessary, the joint should not create a trip hazard. Members will advise clients where there is a potential for 'joints/seams' to fail and cause possible trip hazards at some future time, where a continuous surfacing installation is interrupted. This may also be the case when attempting to join a bonded mulch surface to other types of surfaces without the installation of an edging detail.

If the surfacing is being installed onto an existing flat surface (tarmac/concrete) and different depths of surface are required, the main contractor should advise their customer, or allow an additional quantity of bonded mulch to be costed for, to allow the contractor to reduce the steps/ramps in the bonded mulch to minimise any potential trip hazard.

7.1.7. Porosity

Bonded mulch surfacing is a porous product and as such all drainage requirements should be considered at sub-base level. (Punch drainage holes in a non-porous sub base at regular intervals if the sub-base is not laid to falls).

7.1.8. Layered Systems

Where bonded mulch is installed as a two-layer system the base layer or shock pad, is installed at variable depths to meet the required CFH requirements. The wearing course is typically installed with a minimum thickness of 40mm. If a lesser thickness of wearing course is offered than 40mm, this could be clarified in writing to the client, by the member, at the time of the quotation.

7.1.9. Surface Protection

Member companies will make every reasonable provision to secure and protect newly laid surfaces to prevent damage occurring to them during the curing process. Members would normally take responsibility for the surface protection from the time of commencement of installation until such time as the surface is fully cured or an agreed handover to the customer has taken place.

If surface protection is not provided then this must be clearly stated in writing to the customer.

7.2. Installation Methods

7.2.1. Mixing

The materials for bonded mulch surfacing are mixed on site. The mixing process is such that only specially manufactured mechanical mixers will achieve the correct consistency of mixed material (forced action mixer). Conventional 'cement' type mixers are not suitable for this purpose. There are a number of critical elements in the preparation, mixing and laying of the surface that require knowledge and experience to ensure the finished surface is installed to a satisfactory standard.

7.2.2. Placing

The mixed material is transported to its final location and placed on the prepared base. The finished level is achieved by trowelling off the polymeric mixture and compacting by hand trowelling and/or rolling with a smooth wheeled roller. Minor surface blemishes may be visible on completion, but every effort should be made to ensure that roller marks are minimised.

It is important to ensure that construction joints or overnight joints are kept to a minimum within each individual area of IAS. Construction joints are, sometimes however, a necessary part of the installation process and maybe required due to the overall dimensions of the area, weather problems, etc. All joints should be a straight or curved lined and regular in appearance. It is possible to inlay patterns of different shapes and colours within the bonded mulch surface and by necessity this increases the number of joints in the surface; care should be taken when inserting graphics or different colours of surface to ensure that a suitable bond is achieved between the different sections of the surface. To aid adhesion it is advisable to prime edgings with a diluted binder solution prior to placing the surfacing.

7.2.3. Quality of Finished Installation

The finished installed Impact Absorbing Surface shall comply in respect with any reference sample submitted to the client. However, samples provided are an indicative illustration of the colour(s) and there may be some slight batch variation from samples provided. It should also be noted that dry shred samples (i.e. not mixed with resin) will have a slightly different finished surface colour once laid with resin, although the physical granule colour will not change. The binders which are universally used are based on MDI type isocyanides.

These chemicals go yellow/brown on exposure to light. The chemistry is similar to the 'browning' of peeled apples. The rate of colour change depends directly on UV levels and humidity during the curing period. There is no evidence to show that this phenomenon causes any deterioration of the physical characteristics of the wearing surface. Over the passage of time the effects of UV, natural ageing, weather, light and shade, etc will have an effect on the colour of the finished surface. Colour coated granules will lose their colour and the underlying black material may be exposed.

7.3. Aftercare

7.3.1. Repairs

Clients are advised to refer to competent supplier (API member). Repair processes can include:

- Cutting out a damaged/out of tolerance area and re-laying with new.
- Skimming existing surfacing, by installation of a new wearing course.

NB: The process of re-capping could increase and/or decrease the CFH capabilities of the surface.

Other processes may be available and should be discussed with the supplier.

Repair kits are generally available and should be used on the appropriate advice from members where their use is considered appropriate.

7.3.2. Guarantees

Bonded Mulch guarantees vary from supplier to supplier. It is recommended to check any guarantee offered in terms of length and extent of warranty.

8. Rubber Tiles

Whilst not in common use across the UK there are still a number of rubber tile manufacturers producing impact attenuating surfaces. Rubber tiles are moulded in the factory and shipped to site for installation.

The basework for rubber tiles will almost certainly be an engineered construction such as no fines concrete or a bitmac surface. The main problems found with tiles in the past were related to size variation in different temperatures and humidity levels which caused the tiles to fail at the joints.

Clients should establish with any prospective supplier the level of warranty offered with the product with particular regard to the stability of the size and joint failure.

The benefit of using a rubber tile surface is that they are manufactured in controlled conditions and will have a consistent texture and level of performance for impact attenuation.

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9. Useful Contacts

<p>British Standards Institution 389 Chiswick High Road London W4 4AL Tel: 020 8996 9001 Fax: 020 8996 7001 Email: cservices@bsigroup.com Web: www.bsigroup.com</p>	<p>Health and Safety Executive Redgrave Court, Merton Road, Bootle, Merseyside L20 7HS Tel: 015 1951 4000 Web: www.hse.gov.uk</p>
<p>British Standards Institution Product Service Maylands Avenue, Hemel Hempstead Hertfordshire HP2 4SQ Tel: 01442 278607 Fax: 01442 278630 Email: cservices@bsi-global.com Web: www.bsigroup.com/en/productservices</p>	<p>Play Board Northern Ireland 7 Crescent Gardens, Belfast Northern Ireland BT7 1NS Tel: 028 9080 3380 Fax: 028 9080 3381 Email: lisa.oconnor@playboard.co.uk Web: www.playboard.org</p>
<p>Centre for Sports Technology Ltd Unit 3 Greenwich Centre Business Park 53 Norman Road, London SE10 9QF Tel: 020 8293 6655 Fax: 020 8269 0440 Email: londoncst@aol.com Web: www.cst-global.com</p>	<p>Play England c/o Homerton Grove Adventure Playground Wardle Street London E9 6BX Email: playengland@ncb.org.uk Web: www.playengland.org.uk</p>
<p>Fair Play for Children 32 Longford Road Bognor Regis PO21 1AG Tel: 084 3289 2578 Email: administration@fairplayforchildren.net Web: www.fairplayforchildren.org</p>	<p>Play Scotland Midlothian Innovation Centre, Pentlandfield, Roslin, Scotland EH25 9RE Tel: 0131 440 9070 Fax: 0131 440 9071 Email: info@playscotland.org Web: www.playscotland.org</p>
<p>Fields in Trust 2nd Floor, 15 Crinan Street London N1 9SQ Tel: 0207 427 2110 Email: info@fieldsintrust.org Web: www.fieldsintrust.org</p>	<p>Play Wales Baltic House, Mount Stuart Square Cardiff CF10 5FH Tel: 029 2048 6050 Fax: 029 2048 9359 Email: mail@playwales.org.uk Web: www.playwales.org.uk</p>

<p>Royal Society for the Prevention of Accidents RoSPA House, 28 Calthorpe Road, Edgbaston Birmingham B15 1RP Tel: 0121 248 2000 Fax: 0121 248 2001 Email: help@rospa.com Web: www.rospa.com</p>	<p>Health and Safety Executive Redgrave Court, Merton Road, Bootle, Merseyside L20 7HS Tel: 015 1951 4000 Web: www.hse.gov.uk</p>
<p>Register of Play Inspectors International Ltd 1b Bagshaw Close Ryton-On-Dunsmore Warwickshire, CV8 3EX Tel: 02476 693787 Email: rpii@playinspectors.com Web: www.playinspectors.com</p>	<p>Sport England 3rd Floor Victoria House, Bloomsbury Square London WC1B 4SE Tel: 08458 508 508 Fax: 020 7383 5740 Email: info@sportengland.org Web: www.sportengland.org</p>
<p>Sports and Play Construction Association The Hexangle, Stoneleigh Park Warwickshire, CV8 2LG Tel: 024 7641 6316 Fax: 024 7641 4773 Email: info@sapca.org.uk Web: www.sapca.org.uk</p>	<p>TÜV Product Service Octagon House, Concorde Way Segensworth North, Fareham Hampshire, PO15 5RL Tel: 01489 558100 Email: info@tuvps.co.uk Web: www.tuvps.co.uk</p>
<p>Smithers RAPRA Technology Limited Shawbury, Shrewsbury Shropshire SY4 4NR Tel: 0844 488 0505 Fax: 01939 251118 Email: info@smithers.com Web: www.rapra.net</p>	<p>WIRA Testing Centre WIRA House, West Park Ring Road, Leeds, West Yorkshire LS16 6QL Tel: 0113 259 1999 Fax: 0113 278 0306 Email: info@bttg.co.uk Web: www.bttg.co.uk</p>

Association of Play Industries

Rural Innovation Centre

Stoneleigh Park

Warwickshire

CV8 2LG

Telephone: 0247 641 4999

Email: api@api-play.org

Website: www.api-play.org