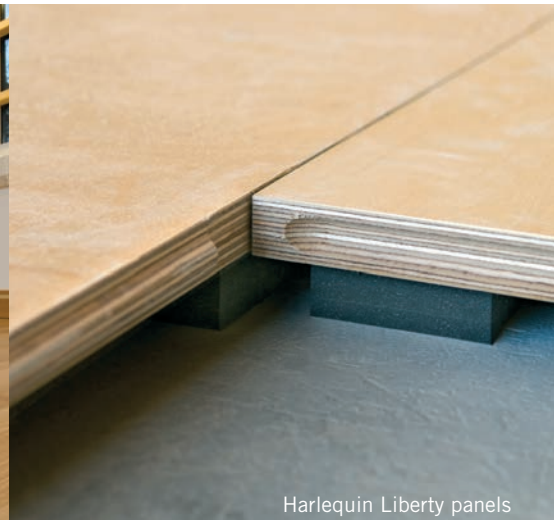


Stage floor construction and technical solutions



Shakespeare's Globe



Harlequin Liberty panels



Bolshoi Theater, Moscow

Building Stage Floors - refurbishment, rebuild and new construction

Backed by an engineering team and independent research, Harlequin Floors bring more than 35 years' experience specializing in stages and floors for the performing arts. Harlequin works on major stage refurbishments from installing a new top surface to constructing a complete new stage.



Birmingham Hippodrome

Harlequin combines traditional floor construction skills using natural materials and advances in engineered floor products and engineered plastics components to meet the most demanding stage specifications. Whether working to designs by architects or a venue's in-house technical crew, Harlequin's skilled teams, experienced in stage and floor construction, deliver the finished stage efficiently, on time and on budget.

Stage floors are integral to performance spaces and today venue owners and theater planners are demanding more than a safe and versatile performance surface. Integration with stage engineering, aesthetically sympathetic to the architecture, even contributing to the acoustic environment of the space can be factors that set high specification standards.

Stages not only need to be load-bearing for performers, scenery, props and trucks, but to be hardwearing, throughout fit-ups, get-outs and rigging - show after show. The floor surface should provide a safe working environment not just for performers but for the technical teams too. Then there is an expectation of the stage having a long working life with little need for maintenance.



Birmingham Hippodrome

After 30 years and more than a thousand performances, Birmingham Hippodrome's main stage was in need of replacement, and being the UK's busiest theater outside of London, a world-class stage floor was needed.

Rebuilding the stage

Harlequin removed the existing plywood stage and rebuilt the understructure fitting new dip traps and two layers of 25mm ply. The stage was finished with Harlequin Standfast vinyl, hot-welded at the joins to produce a seamless, continuous surface suitable for a mixed program of drama, opera and ballet.

- 630m² of black Harlequin Standfast vinyl flooring was installed
- The heavy-duty vinyl was designed to be used either as a finished surface, or beneath a portable sprung floor.

United Nations International School of Hanoi

A specially constructed Harlequin semi-sprung batten floor system, with a Harlequin Standfast performance surface was installed at the United Nations International School of Hanoi in Vietnam.

The stage floor specification called for a robust solution that could take the wear and tear of school productions, stage props, trucks and scenery construction and yet offer a cushioned floor and non-slip surface for dance. Hong Kong based Harlequin Asia took responsibility for the supply and installation of a specially constructed Harlequin semi-sprung batten floor system, with a Harlequin Standfast performance surface. A combination that provides durability as well as slip-resistance for performers. Dave Porter, Director of Operations at the United Nations International School of Hanoi explained: "Harlequin provided us not only with a durable Harlequin Standfast floor but also a professional stage sub-floor build-up, customized to suit our school's needs. Our stage floor is being put to the test daily by our students and can withstand the harsh climate conditions here in Vietnam."

Harlequin Standfast is an extremely hard-wearing performance floor intended for permanent installation, suitable for heavy-duty use and ideal for stages, percussive dance, multi-purpose use and ballet.

Floor dimensions

10.38m x 18.20m Total area: 188.92m²



Stage construction

The proscenium arch construction form has been an enduring feature of theatrical architecture for centuries in most western theatres, but each different, so the structure of the stage floor requires to be uniquely specified for each building.

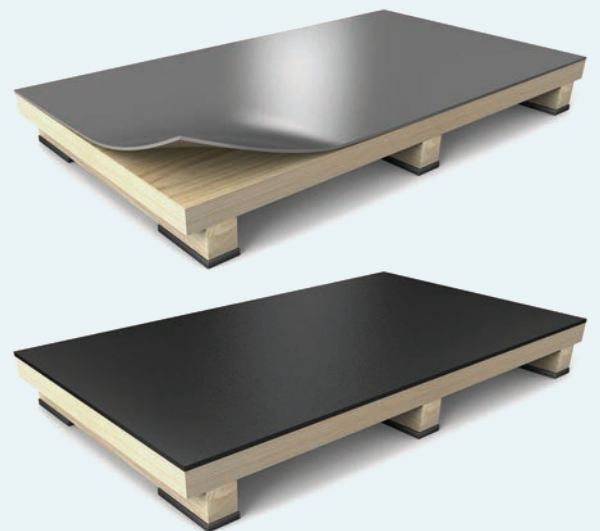
The actual stage structure may also include wings, an apron and incorporate traps, revolves and other features within the floor. Other theatrical spaces dispense with the common proscenium arch, some traditional like the thrust stage projecting into the auditorium. An arena theatre configuration with an island stage surrounded by the audience; or flexible stages in unconventional spaces originally built for other purposes; sometimes open air theatre - but all call for a bespoke solution to provide a suitable platform for the theatrical production. And this is where Harlequin Floors can bring their experience.

A typical stage construction

Harlequin works with architects and theater planners designing stages for all types of theatrical space. Bringing together traditional carpentry skills with the latest engineering developments and materials, Harlequin can also work in conjunction with main contractors to install the stages, frequently to demanding time schedules within the overall construction program.

Using well established and proven construction methods the stage is built to the plan which typically includes a semi-sprung floor (as shown). A desirable surface finish can be a hard wearing vinyl permanently installed onto the stage structure. Alternatively a 'sacrificial' wood surface may be specified.

Harlequin Floors has a wealth of experience in building stage floors around the world - as a total refurbishment and replacement of an old stage, or for a new theater.





Building a fully sprung floor onto a revolve

A fully sprung floor, including a revolve, was specified for a Les Rotondes theater in Luxembourg.

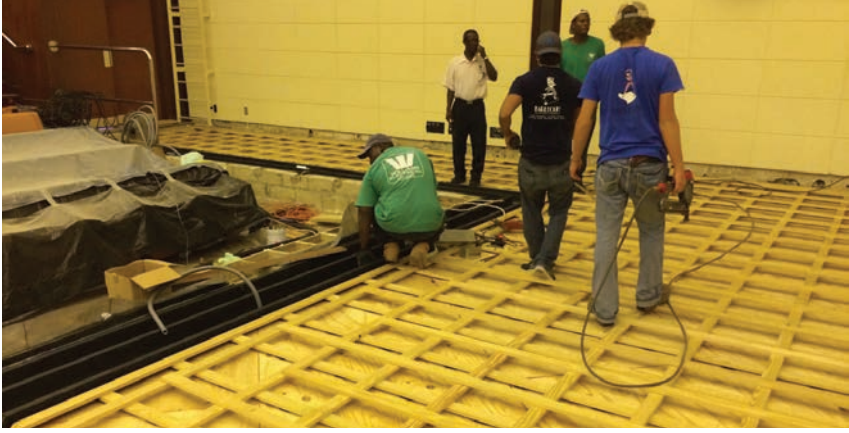
The importance of a sprung floor across the whole stage was recognized as essential for the benefits it brought in minimising stress injuries for the performers. Harlequin's knowledge and expertise in developing floors for dance was vital in ensuring a good user experience whilst uniquely integrating with the revolve.

Frank Collymore Hall, Barbados

This 2000 square foot stage project was built as a variation of our Harlequin WoodSpring, which itself is a modern update of the traditional 'basket weave' construction that originated in the 19th Century, but with 21st Century advancements.

'Woven' using a triple construction of custom machined timber laid at right angles, all wood was specially treated to avoid warping during the transport and installation due to the local humidity.

It was to this approach that Harlequin turned for the Frank Collymore Hall in Bridgetown. This 500 seat Hall is used for musical recitals, dance, dramatic presentations and conferences.



Stage floors for challenging environments



Marine environments - stages for cruise ships

The popularity of cruise vacations has led to the commissioning of larger and more lavish ships, including extensive entertainment facilities and well-equipped theaters. The marine environment and demands particular to ocean going stages are challenges met by Harlequin's experienced engineering and installation teams.

The range of specialized permanent flooring used on cruise liners includes Harlequin Marine, a hard-wearing, homogeneous PVC which conforms to marine standards and fire ratings. It is suitable for fitting within confined spaces on marine vessels and/or scenery docks on cruise ships. It is fire resistant, with a slightly marbled surface to resist scuffing. It can be laid on any hard, smooth sub-floor and is an excellent choice as the vinyl performance surface when used in conjunction with a Harlequin sprung floor.

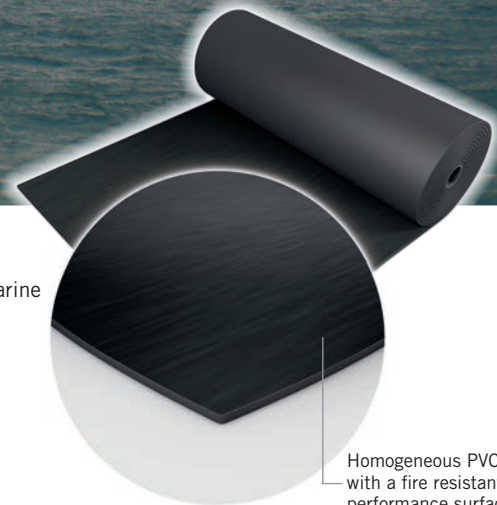
Working in the historic building environment

Many theaters and opera houses are historic buildings in their own right, which are subject to preservation orders to conserve the integrity of the structure. Materials and working practices may be regulated and inspected to ensure the building remains true to the original design and concept of its architect. In other cases the original purpose of the building may have become obsolete and conversion into a performing arts space allows the structure to be retained and given a new lease of life.

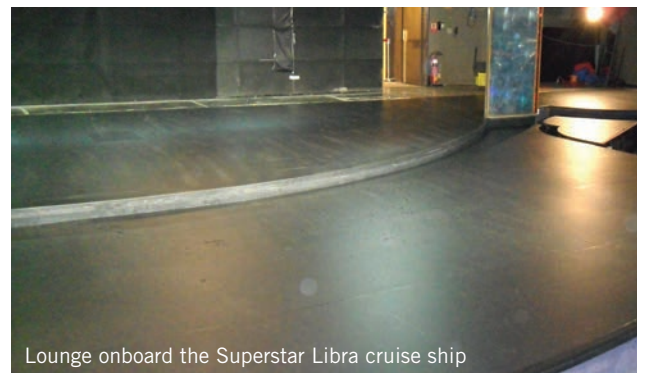
Harlequin Floors has years of experience, working sensitively to restore, refurbish or create new stages in buildings that are listed, preserved or subject to conservation orders. This may mean working around structural features, accommodating awkward spaces, complying with fire risk requirements and the selection of suitable materials.

Harlequin Liberty floor installation at the Royal Albert Hall. Panels had to be cut on-site to accommodate the iconic elliptic curve of the stage.

Harlequin Marine



Homogeneous PVC with a fire resistant performance surface



Lounge onboard the Superstar Libra cruise ship



Grand Théâtre De Bordeaux



A Harlequin Activity sprung floor with a Harlequin Studio surface was installed in a semi-circular shape in the Salle des Peintres, covering 255m² of the total 500m² space.

The room was converted into a dance studio with the perimeter of the room designed as a warming-up area, since the height under the original beams was not sufficient for dance practice. The Salle des Peintres is situated immediately above the main opera room and Harlequin Activity was preferred for its acoustic properties. Floor traps were fitted for access to the opera chandelier.



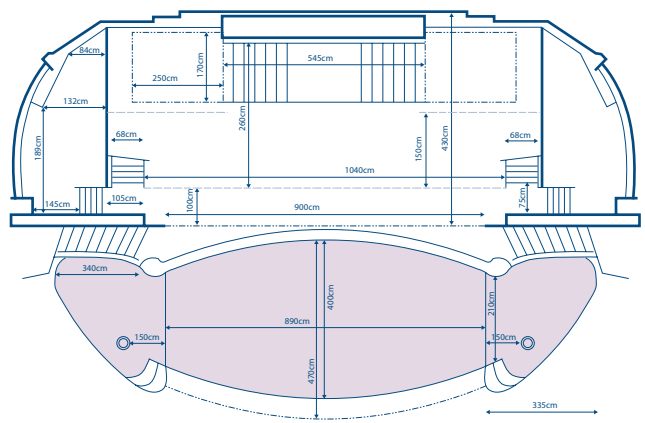
Emerald Princess and Grand Princess

The main stage refurbishment project was carried out in conjunction with Stage Technologies.

The existing floor covering was removed and any defects in the plywood sub-floor were repaired. A latex screed with flexible smoothing compound sand was used to give a suitable finish to install Harlequin vinyl. Harlequin Cascade was laid with welded seams and silicone applied to its perimeters, then PVC nosings were installed to the steps on each side of the stage into the audience area.



Superstar Pisces and Aquarius



Harlequin ripped out the existing stage to the understructure and replaced the plywood on the stage using two layers of Dricon treated 18mm timber onto Isorubber fixed with tech screws through the plywood and Isorubber.

The plywood joints were filled and sanded to a suitable finish to install a Harlequin vinyl top surface. Harlequin Cascade was then installed lengthways across the stage with welded seams and silicone sealant to the perimeter abutting walls.

The wooden plinth at the front of the stage was stripped of varnish, sanded and repaired then recoated with three coats of marine approved varnish.

Sprung floors for dance and ballet wagons

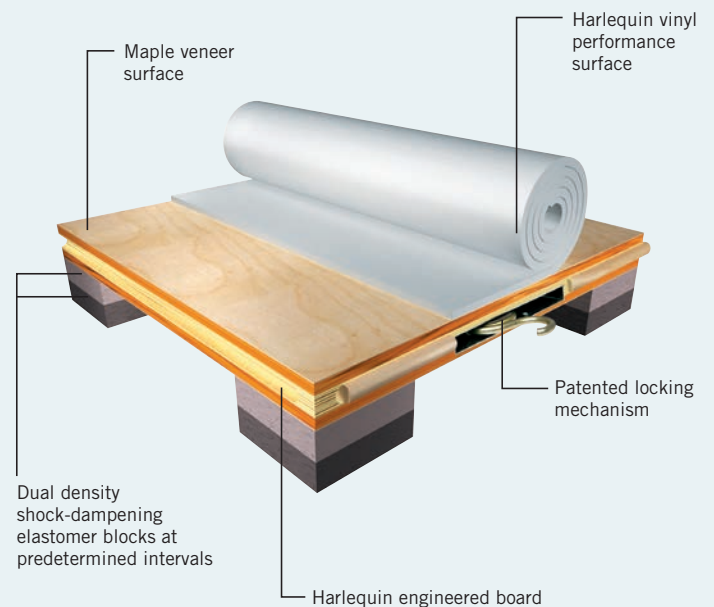
International venues with a large stage that is shared alternately between the resident ballet and opera companies are constantly presented with a problem: how to manage the regular transition of a stage floor designed for dance into a multi-purpose floor with scenery tracks and elevators required for opera productions.

A sprung floor designed for dance flexes under impact giving a softer feel and reduces the risk of injury to the performer. Harlequin Liberty is a sprung floor panel system with good area elasticity, originally designed for both permanent or portable installation due to a patented inter-locking feature. This flexibility means that the panels can be easily installed and removed by a theater's own technical team or permanently installed onto a ballet wagon.

Harlequin Liberty LatchLoc™

Harlequin Liberty LatchLoc is a modular, sprung floor panel system manufactured from engineered boards with dual density elastomer blocks on the underside to give uniform and consistent shock damping. The panels are laid in a brickwork fashion onto the subfloor, so that cross-joins do not coincide. They are linked to each other by a hardwood dowel, which is secured into place using our 'one turn of the key' latch and lock mechanism.

Specification guide	
Permanent or portable:	Portable
Dimensions:	Full size panel 96" x 48". Half size panel 48" x 48"
Weight:	93 lbs
Thickness: (before inclusion of chosen finish)	1.5"/1.625" (Portable)
Maximum static load:	1200 lbs
Maximum dynamic load:	555 lbs



Harlequin Liberty portable panels for Staatstheater, Nürnberg

Het Muziektheater, Amsterdam

An ingenious solution was developed for Het Muziektheater in Amsterdam – their full-size ballet stage floor from Harlequin is flown vertically above the stage whenever the opera performs. The Harlequin Liberty sprung panels already in use at the Het Muziektheater were popular with the dancers, so the solution was to build them into a new mobile wagon that could be hung vertically in the fly tower, but without the need to remove the panels when not in use.

Seeing an aluminium system used by a visiting touring company prompted the design. Harlequin worked with the stage engineering company to develop a new type of mobile ballet wagon, which is 13.5m x 16.2m but just 180mm high including the dance surface.

The wagon comprises two main sections that subdivide to allow the floor to be raised or lowered from horizontal into the vertical storage position on a pair of 3-ton hoists without flexing. Sections are linked together with pin joints and a self-locking worm gear system.

The Liberty panels are installed onto the aluminium frame using unique linear driven bearing devices spaced at regular intervals which allow the floor to flex in the working position and secures the panels to the frame when in the flying position.

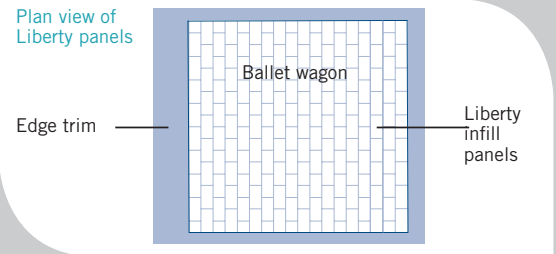
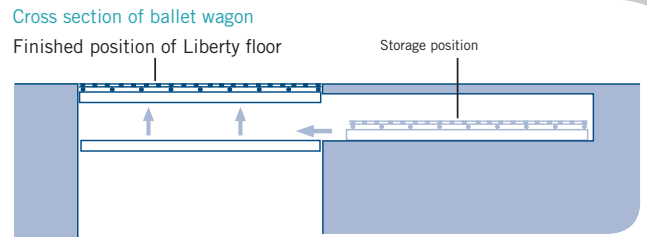


Esplanade Theater, Singapore

Harlequin Liberty portable sprung panels have been custom-sized to fit into the existing ballet wagon, which is stored horizontally below the stage and moved into place on a motorized track and elevator.

Six custom traps were manufactured on site and installed within the Harlequin Liberty panels on the wagon. Extra Harlequin Liberty panels were supplied for an infill area to extend the performance area downstage. Harlequin Cascade was supplied for use as a roll-out surface.

Additional reinforced Harlequin Liberty panels were supplied to be used as replacements in the ballet wagon, when required to withstand heavy scenery loadings.



Stages and studios with integral acoustic properties

Stage floors that are integral to acoustic design

Occasionally the choice of the appropriate stage floor construction can also contribute beneficially to the acoustic characteristics of the space. Sprung floor systems utilizing a multi-layer sandwich construction provide suitable noise damping and acoustic separation from other areas of the building.

Theater and acoustic consultants have the option of evaluating stage and studio flooring as an acoustic sympathetic component, whether the surface is finished in hardwood or vinyl. Harlequin Activity's well-established 'triple sandwich' permanent sprung floor construction is designed to provide absorption of performer loads and sound. These fully floating floors have no fixings to the sub-floor and can be laid on any reasonably smooth and flat surface without prior preparation.

Correctly reinforced, Harlequin Activity can withstand heavy loading including retractable seating and the top surface can be chosen from a wide range of vinyl or wood options.



Carnival Cruises land-based facility in Southampton. Photo ©Maria Slough

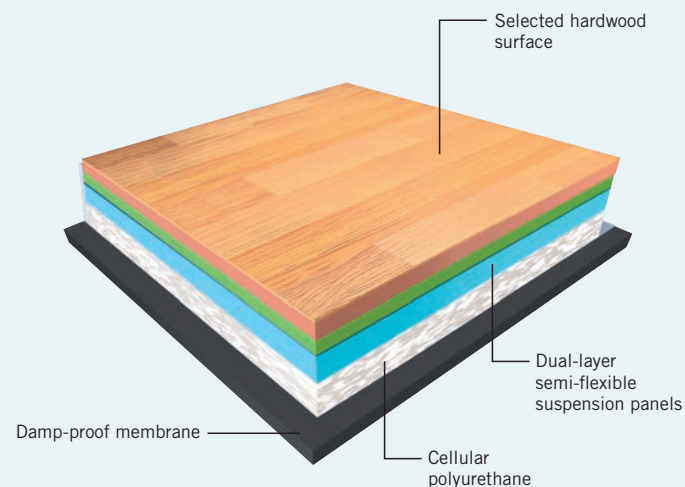
Harlequin Activity™ with hardwood surface

The construction is identical to Harlequin Activity with a vinyl surface, but the second layer of semi-flexible panels is replaced by a selected hardwood surface layer, normally an engineered board with a choice of hardwood wear layer. (However, if desired, this can be substituted with a solid hardwood layer). This is installed with the use of a modified elastic one-component silane adhesive and secretly secured through the tongues using lost-head nails. The hardwood surface may optionally be protected by impregnation with a multi-coat hardwearing polymer lacquer. The expansion gap around the perimeter of the room can be concealed by a scotia profile of matching hardwood to form a neat edging.

Specification guide

(Typical construction using engineered board)

Overall thickness:	2¼" nominal
Description of board:	¾" solid hardwood
Weight:	47-50lbs/yd ² depending on hardwood surface chosen
Maximum dynamic load:	645 lbs/yd ²
Maximum distributed load:	1380 lbs/yd ²



Shakespeare's Globe, Sackler Studios

"It's not just a dance surface it's also an acoustics surface." said Andy Scorgie, Head of Facilities Management at Shakespeare's Globe in London, talking about the floors recently installed by Harlequin at their education and rehearsal center.

The Globe's selection of a Harlequin Activity sprung floor with hardwood oak surface was chosen not just for its spring characteristics and aesthetics, but also for its acoustic properties. Located close to Shakespeare's Globe and reflecting the same architectural feel thanks to the use of oak and curved walls, the Sackler Studios comprise a rehearsal room for the theater company, four education workshop studios and a music room, as well as a café.



Harlequin Activity with hardwood surface
Sackler Studios, Shakespeare's Globe,
London

Central Saint Martins College of Arts and Design

The King's Cross Campus in London includes four multi-purpose performance and seven rehearsal spaces. The combination of specialized products, customization and innovation were employed to ensure individual floors matched the demands of performance styles including ballet and rock concerts.

Blending aesthetics and customization

The stylish KX Platform Theater was complemented with a Harlequin Activity sprung floor finished in Weitzer Parkett oak to match the interior. To create an optional orchestra pit economically, Harlequin designed a 351m² floor based on Steeldeck® platforms that could be removed in sections as required.

- Harlequin Cascade vinyl floors, one black and one white, were chosen for the multi-purpose monochrome workshop spaces
- The studio theater space has 177m² Harlequin Activity sprung floor finished in engineered maple
- Harlequin Activity fully-floating floors were also installed in seven additional rehearsal spaces and finished with engineered maple or Harlequin Standfast.





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