



CINEMA SCREEN SURFACES

Harkness cinema screen surfaces are used in more cinemas worldwide than any others



Harkness screen surfaces are all specially designed to give the best possible viewing experience in cinemas. They give excellent colour rendition and contrast. The screens have no visible seams under normal projection conditions.



Perlux™ gain screens reduce lamp power requirements, which can save on operating costs.



A range of foldable screens is available for economic air freight and easy access to buildings.



Specific screen surfaces are available for 3D projection and also for use in screening rooms.



The screen surface is one of the lowest cost items in fitting out a cinema, but it can have a major impact on the viewing experience.



Don't compromise - fit Harkness cinema screens!

Screen types

Matt Plus

- Made from optically brightened PVC.
- Colour temperature is very close to Xenon lamps and gives excellent colour rendition.
- The surface has a wide viewing angle.

Perlux™

- A PVC screen with a specially formulated pearlescent coating to enhance brightness without hot spotting.
- Available in three reflectance (gain) levels - 1.4 (Perlux 140), 1.8 (Perlux 180) and 2.2 (Perlux 220).
- Enables required brightness levels to be achieved whilst optimising lamp power output.

Spectral

- A PVC screen with a specially formulated aluminium coating, designed specifically for 3D systems using polarised light.
- A gain of 2.4 and an extinction ratio of 130:1 gives high quality 3D images.
- Also gives excellent 2D performance so can be used satisfactorily in theatres showing both 2D and 3D content.

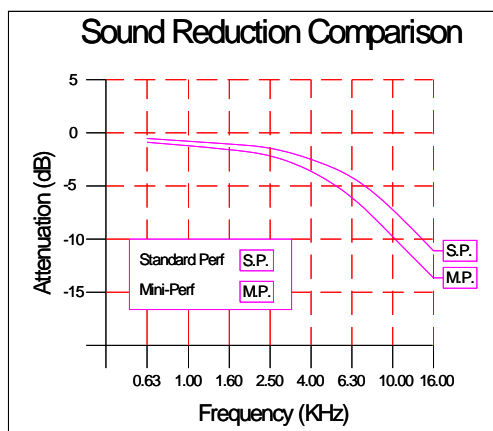
Matt Preview

- A coated screen designed for superb colours, uniform light levels and close viewing.
- Particularly suitable for preview theatres, screening rooms and film laboratories.

Acoustic Performance

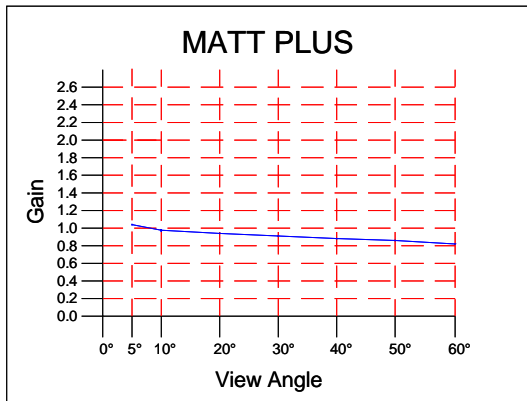
Screens are perforated to facilitate the acoustic performance of behind screen speakers. For most cinema auditoria, standard perf pattern is used. For close viewing (less than 5m/16ft), mini-perf pattern is recommended.

Non-perforated screens are available for use when there are no speakers situated behind the screen.



Perforated Form	Hole Size	Open Area
Standard Perf	1.2mm (0.047")	4.5%
Mini-Perf	0.5mm (0.020")	1.7%

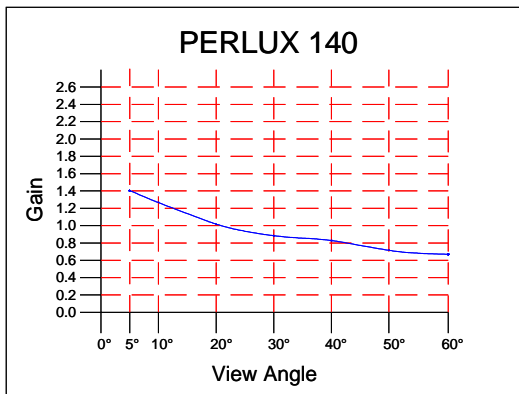
Technical Specifications



- Max gain 1.0
- Viewing angle 90° to axis

Matt Plus

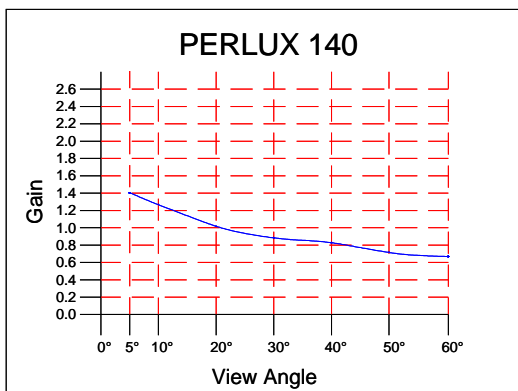
- Material PVC
- Colour white
- Fire classification
 - UK
 - USA NFPA 701
 - Canada
 - Germany B1
 - France M1
 - Italy Class 1
 - Spain M2
 - Japan
 - Australia
- Perforation standard or mini-perf
- Weight 0.43 kg/m² (0.09 lb/ft²)
- Thickness 0.3mm
- Maximum size no specific limit
- Packing Method folded; rolled as option



- Max gain 1.4
- Half-gain angle 50° to axis

Perlux 140

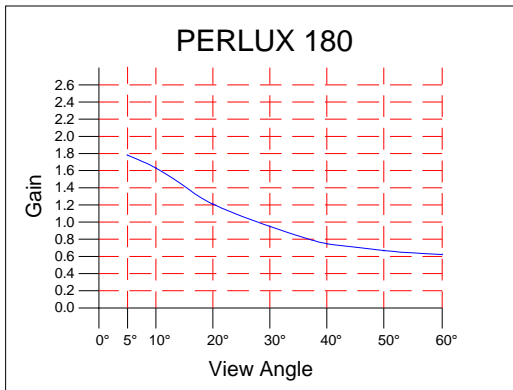
- Material PVC with pearlescent coating
- Colour white
- Fire classification
 - UK
 - USA NFPA 701
 - Canada
 - Japan
 - Korea
 - Australia
- Perforation standard or mini-perf
- Weight 0.43 kg/m² (0.09 lb/ft²)
- Thickness 0.3mm
- Maximum size USA plant: 23.5 x 11.8m (77'3" x 38'11")
- Packing Method folded



- Max gain 1.4
- Half-gain angle 50° to axis

Perlux 140+

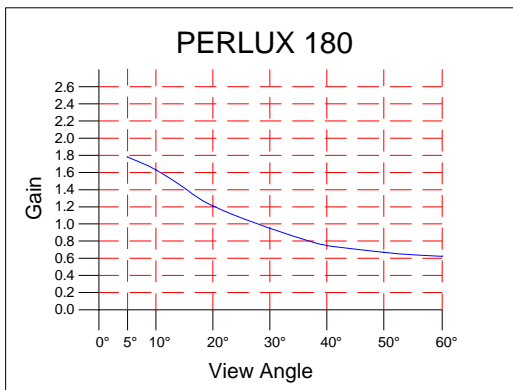
- Material PVC with pearlescent coating
- Colour white
- Fire classification
 - UK
 - USA NFPA 701
 - Germany B1
 - Italy Class 1
 - Spain M1
 - Japan
 - Korea
 - Australia
- Perforation standard or mini-perf
- Weight 0.50 kg/m² (0.10 lb/ft²)
- Thickness 0.3mm
- Maximum size USA plant: 24.1 x 12.4m (79'3" x 40'7")
Europe: 26.5 x 11.0m (87' x 36')
- Packing Method rolled



- Max gain 1.8
- Half-gain angle 34° to axis

Perlux 180

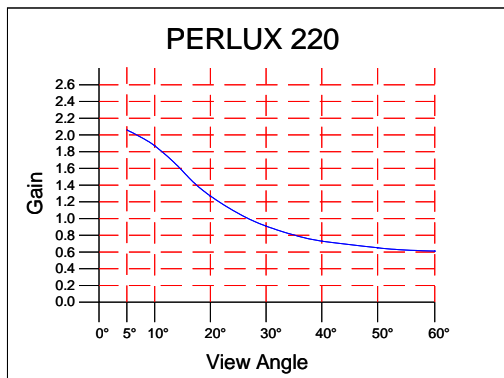
- Material PVC with pearlescent coating
- Colour white
- Fire classification
 - UK
 - USA NFPA 701
 - Canada
 - Japan
 - Korea
 - Australia
- Perforation standard or mini-perf
- Weight 0.43 kg/m² (0.09 lb/ft²)
- Thickness 0.3mm
- Maximum size USA plant: 23.5 x 11.8m (77'3" x 38'11")
- Packing Method folded



- Max gain 1.8
- Half-gain angle 34° to axis

Perlux 180+

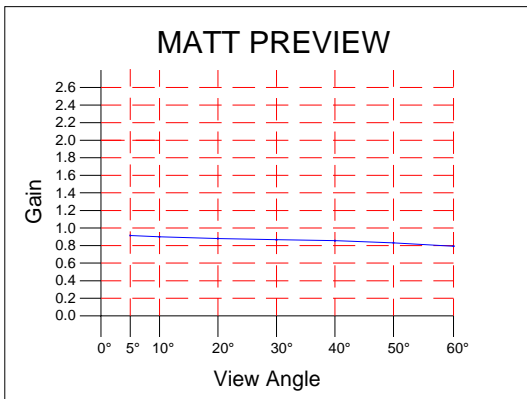
- Material PVC with pearlescent coating
- Colour white
- Fire classification
 - UK
 - USA NFPA 701
 - Germany B1
 - Italy Class 1
 - Spain M1
 - Japan
 - Korea
 - Australia
- Perforation standard or mini-perf
- Weight 0.50 kg/m² (0.10 lb/ft²) rolled
- Thickness 0.3mm
- Maximum size USA plant: 24.1 x 12.4m (79'3" x 40'7")
Europe: 26.5 x 11.0m (87' x 36')
- Packing Method rolled



- Max gain 2.2
- Viewing angle 25° to axis

Perlux 220+

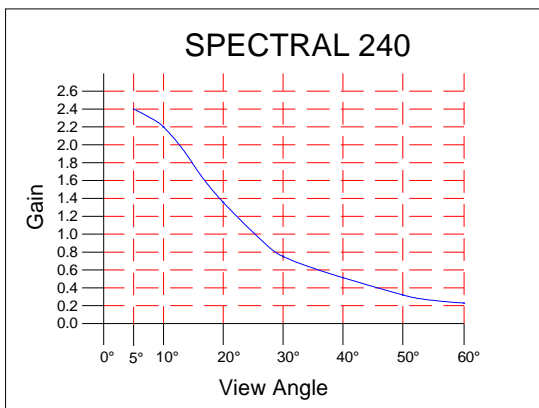
- Material PVC with pearlescent coating
- Colour white
- Fire classification
 - UK
 - USA NFPA 701
 - Germany B1
 - Italy Class 1
 - Spain M1
 - Japan
 - Korea
 - Australia
- Perforation standard or mini-perf
- Weight 0.50 kg/m² (0.10 lb/ft²) rolled
- Thickness 0.3mm
- Maximum size USA plant: 24.1 x 12.4m (79'3" x 40'7")
Europe: 26.5 x 11.0m (87' x 36')
- Packing Method rolled



- Max gain 0.95
- Viewing angle 90° to axis

Matt Preview

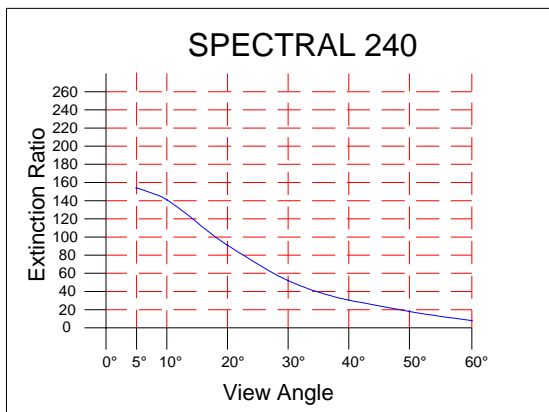
- Material PVC with matt white coating
- Colour white
- Fire classification Italy Class 1
- Perforation mini-perf recommended
- Weight 0.50 kg/m² (0.10 lb/ft²)
- Thickness 0.3mm
- Maximum size USA plant: 24.1 x 12.4m (79'3" x 40'7")
Europe: 26.5 x 11.0m (87' x 36')
- Packing Method rolled



- Max gain 2.4
- Half-gain angle 24°

Spectral 240

- Material PVC with aluminium coating
- Colour Silver
- Fire classification UK
USA NFPA 701
Japan
Korea
France M1
Germany B1
Australia
- Perforation standard or mini-perf
- Weight 0.50 kg/m² (0.10 lb/ft²)
- Thickness 0.3mm
- Maximum size USA plant: 24.1 x 12.4m (79'3" x 40'7")
Europe: 26.5 x 11.0m (87' x 36')



- Extinction ratio on axis >130:1

Screen selection

Screen size

Matt Plus and Perlux can be used for any size screens but Harkness' general recommendation is to use Matt Plus for screens up to 11m (36ft) wide; Perlux 140 for screens up to 14m (46ft) and Perlux 180 for screens above this. This enables required brightness levels to be achieved whilst optimising lamp power output. Normally, standard perforations are used in cinemas.

Close viewing

For close viewing, in preview theatres or film laboratories, Matt Preview is recommended. Where perforated screens are required, the mini-perf form should be used if the viewing distance is less than 5m (16ft).

Digital projection

Gain screens are particularly suitable for digital projection. Perlux 140 performs well with 2k and 4k projectors, giving a very uniform brightness level whilst optimising lamp power.

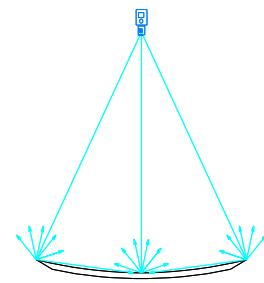
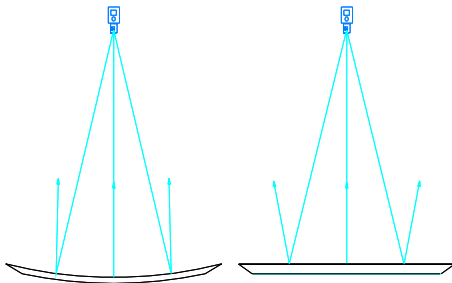
3D projection

All 3D systems suffer substantial light loss and gain screens are recommended with all "active" and "passive" systems. For passive systems using polarised light, use Spectral 240. For passive systems using colour filters and for systems using active eyewear (moving shutters), Perlux is recommended over 9m (30ft); Perlux 220 is recommended for larger screens (14-15m).

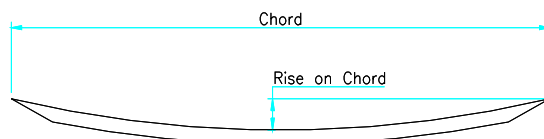
Screen shape

Matt white screens scatter light; gain screens reflect light more directionally. Light distribution to the auditorium is optimised if gain screens are fitted to curved frames.

It is not recommended to curve matt white screens, as cross scatter of reflected light can reduce contrast.



For most auditoria, the recommended curvature is to make the depth of curve (rise on chord) 5% of the screen width (chord). SMPTE recommend to curve all gain screens.

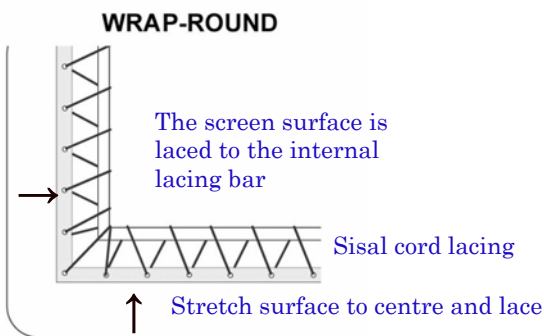


Edge finishing

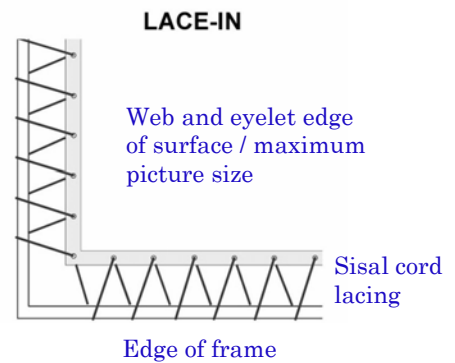
Harkness screen surfaces have a triple fold web. Eyelets (grommets) are spaced at 150mm (6") and have metal inserts for strength.

Cinema screen frames

Frames for attaching cinema screen surfaces are usually “lace-in” or “wrap-round” types.

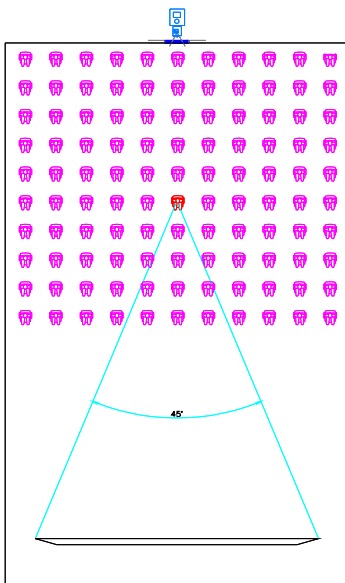


Wrap-round frames are often used when there is no masking. Wrap-round frame provides a full frame picture.



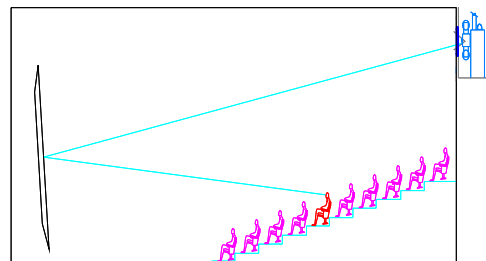
Lace-in frames are normally used when there is moving masking.

Screen dimensions



Screen size relative to auditorium size is important. A guideline is a screen width that gives a subtended angle of 45°-50° for a viewer situated two-thirds of the way back from the screen.

Screen rake



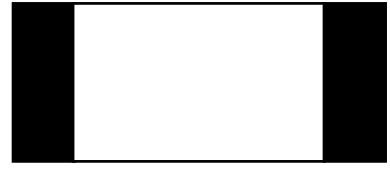
With stadium seating, raking the screen may be beneficial. Each 1° rake gives 2° improvement in reflected light angle. A rake of more than 5° is not recommended.

Format changes

Harkness recommends maintaining screen height constant when changing film formats.



Cinemascope
2.35:1



Widescreen
1.85:1

This gives optimum light levels with 35mm projection in both formats.

For smaller theatres, keeping the screen width constant may be more practical but measures will be needed to maintain consistent light levels.



Widescreen
1.85:1



Cinemascope
2.35:1

With digital projection different considerations may apply, depending on whether format changes are achieved electronically or with the use of anamorphic lenses.

Screen sizing

In order to determine the size of the screen to be ordered, various factors have to be taken into account:

- Curvature of the frame, if applicable.
- Allowance for web and grommet border beyond the image size.
- Screen stretch. Harkness surfaces typically stretch 3% on wrap-round frames and up to 5% on lace-in frames. This stretch is in the vertical, not the horizontal.

Screen installation

For both wrap-round and lace-in frames, the following is recommended:

- The auditorium should be clean and all building works completely finished.
- Install at ambient temperature and allow the screen to acclimatise in the auditorium before installation.
- Handle with care - cotton gloves are recommended and it is important to avoid snagging the screen on sharp objects. Spectral screens require particular care, as they are easily damaged. They should never be creased.
- Use sisal cord to lace the screen - this is preferable to using rubber ties or springs, as it enables the correct tension to be achieved.
- Start the installation with the top of the screen and then attach the bottom of the screen, stretching it in the vertical; finally, loosely tension the sides.
- It is important that sufficient tension is achieved. Screens should be stretched between 3%-5% of the height. Never stretch screens sideways, as this may cause 'belly'.

Care and maintenance

- Maintain a clean auditorium to minimise dust and dirt build-up on the screen.
- Screens can be periodically brushed by using a soft, long-handled brush. Do this vertically over the whole screen. A vacuum can be used with care.
- Wet cleaning of screens is not recommended.

Technical information

Screen brightness levels

SMPTE standard for screen luminance for film projection is 16 ft. lamberts in the centre of the screen and minimum of 75% at edges using white light (no film in the gate). For digital projection, the standard is 14 ft. lamberts for the screen centre. These standards are widely followed internationally. There is no standard for 3D projection but 6 ft. lamberts is recommended.

Image formats

Various film formats are used, which have different width to height ratios. The commonest film formats are “Cinemascope” (2.35:1) and “widescreen” also called “flat” (1.85:1). However, other formats are also used.

Flame retardancy

Screens contain additives so that they comply with fire retardant standards. The most important standards are: UK (BS 5867 Part 2); Germany (DIN 4102); USA (NFPA 701 or USA California Fire Marshall); France (NFP 92-503); Canada (CAN ULC S102-2); Spain (UNE 23-727-90); Australia (AS/NZS) 1530.3. The specific classification that the cinema screens have been tested to are shown against each individual product.

Fire certificates are available. In some countries, the importer is responsible for testing compliance.

Screen luminance factor (gain)

The gain of the screen is a measure of the ability of the screen to reflect projection light towards the audience. The screen luminance factor is measured with reference to a calibrated standard with a luminance factor of 1. The screen is brightest (has the highest luminance factor) when the source and the viewer are on axis (at 90° to screen). The viewing angle is the angle between the viewer and the axis. Gain diminishes with viewing angle. The half-gain angle is the viewing angle at which gain is half the peak on-axis level. Reference standard is British Standard: BS 5550.

Luminance diagram (gain curve)

This shows the luminance factor (gain) at each viewing angle. A flat curve shows a uniform light distribution on the screen. A curve with a strong peak on axis may be more likely to “hot spot”.

Extinction ratio (signal to noise ratio)

Relates to stereoscopic 3D systems using polarised light streams. It is the ability of the screen to maintain the polarisation of the light stream. The measure is the ratio of light passing through two filters that have aligned polarisation to light passing through two filters with opposed polarisation. It indicates the extent of light signal received by the right eye that is intended exclusively for the left eye and vice versa.

Moiré fringes

Interference between digital pixels and perforations may occasionally occur, particularly with smaller screens. This may show up as dark bands. It is recommended to use mini-perf screens in small digital theatres or screening rooms.

Screen manufacturing

All screens are made from PVC material to a Harkness specification. Screens are made up from panels seamed vertically using high-frequency welding. A web and grommet border is added. Perlux, Spectral and Matt Preview screens are coated using specially formulated paints. All Harkness cinema screen surfaces have seams that are invisible under normal projection conditions.

Packing, transportation and storage

Except for Matt Plus, all screens are normally rolled for packing and transport. Perlux screens are available in a folded version that is beneficial for air freight. Screens are packed in cardboard cartons, cardboard tubes or wood crates, according to size and method of transport.

It is recommended to install screens as soon as possible after arrival. Long-term storage can be detrimental, particularly to folded screens. Storage in excessively hot or cold conditions should be avoided.

References and data sheets

- SMPTE 196M-2003 standard for luminance using 35mm projection.
- SMPTE 431-1-2006 for luminance using digital projection.
- British Standard BS 5550-7.2.5: 1980 for gain measurement.
- Harkness data sheets:
 - Matt Plus/MP
 - Perlux 140/140+/MP
 - Perlux 180/180+/MP
 - Perlux 220+
 - Spectral 240/MP
 - Matt Preview/MP
 - Surface Sizing
 - Screen Surface Installation
 - Spectral 3D Installation (rolling)
 - Spectral 3D Installation (flying)
 - Measuring Screen Gain in Cinema

All data sheets are available on www.harkness-screens.com

Harkness Cinema Screen Surfaces - the world's most popular screen surfaces

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