

## SCREEN AND ROOM TECH GUIDE AND TIPS BY



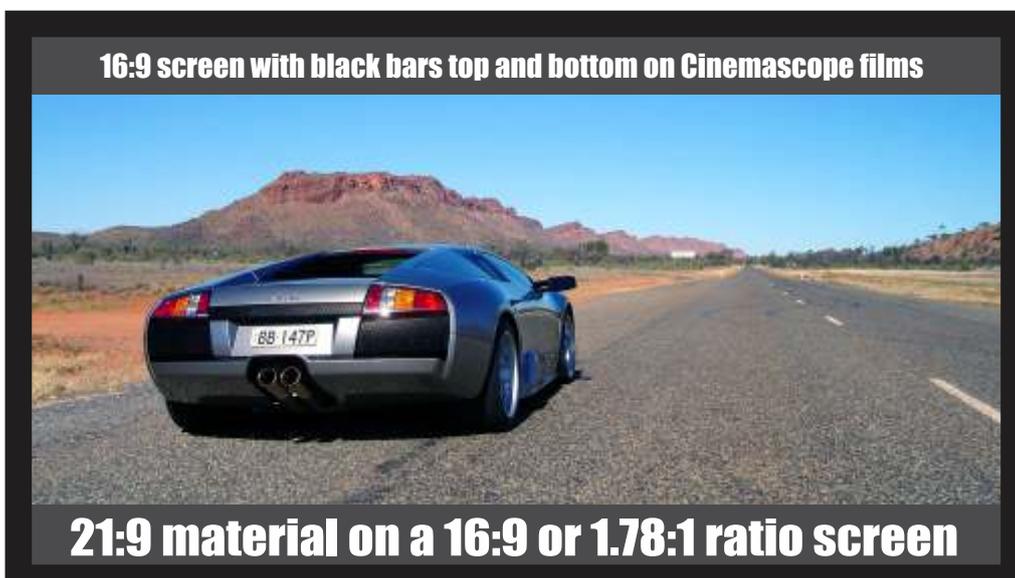
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### SCREEN FORMATS - SEATING POSITIONS - VIEWING ANGLES

The two main aspect ratios we watch today are HDTV (16:9) and Cinemascope (21:9). Broadcast TV is displayed in the 16:9 aspect ratio as are many films. Cinemascope films are one third wider again but because TV's and Projectors are fixed panel devices, black bars are added top and bottom to fill out the shape of the HDTV format and keep the image geometry correct. This is called 'letterboxed 16:9' format. With a TV you have no choice but to watch Cinemascope films with an image area smaller than the News with black bars top and bottom. But with projection we can emulate what is done at the cinema by using a zooming projector with a lens memory feature to expand the image to fill the 21:9 screen. Cinemascope screens are gaining in popularity and are seen as the future-proof projection format. This is also referred to as CIH or 'Constant Image Height' projection. By zooming, we push the black bars out off the top and bottom of the screen. See section on room colours and paint to see why this is important if using a scope screen.

The other not so popular format is the traditional 4:3 (1.33:1) format - MASH, Hogans Heroes, old Movies and computer presentations etc. 16:9 HDTV - current TV programming, Sporting events and many Movies.

21:9 Blockbuster Movies - Lord of the Rings, The Matrix, Marvel films etc.



**A 21:9 Screen is Constant Image Height or CIH projection  
with black bars left and right for 16:9 material.  
Cinemascope films are 78% larger than the same height 16:9 screen.**



**2.37:1 ratio or 21:9 format - Blockbuster films  
Also called 2.35 and 2.40:1**



**16:9 material on a 21:9 or 2.37:1 ratio screen**

**Choosing your screen size and format:** The correct size for your room will be dictated by the room length, width, height, speaker placement and seating position. If your room is width restricted you may choose 16:9 format over 21:9 as the 21:9 image will be the same size regardless. If your room is height restricted you may choose to use a 21:9 screen. There is no right or wrong format, it simply a logical decision based on those criteria. Always test out screen sizes whenever possible to determine the correct format and size for your room. Zoom out to a size that you're comfortable with and test out cinemascope material to make sure pixels are not going to be visible.

Keep in mind also, the screen size itself is just a number. The actual size of the image will change depending on your seating position. A much larger screen has to spread the light from the projector over a bigger area so the image by nature has to dim in brightness. In other words, 7 metres from a 160 inch screen will be dimmer than a 120 inch screen sitting at 4 metres. And the 120 will appear just as large as you're seated closer.

**Seating positions in your room is based on our visual acuity and image resolution.**

1080p – 1.7x width (equivalent to 33 degrees viewing angle with a 2.37:1 screen)

4k – 0.8x width (over 60 degrees viewing angle with a 2.37:1 screen)



4K is where we are at today so choose your screen size and format based on today's resolution. 0.8x screen width means you can sit as close as 2.6 metres from a 140 inch scope screen as long as pixel gap is not an issue. For LCD based projection you will need to sit about 20-25% further back or reduce screen size. Generally speaking, the most popular seating positions for a 140 inch screen are between 3 and 4.5 metres which is 1.1 to 1.4x image width. In the red zone of the image below and within industry recommendations. 1.54 screen widths puts you at 5 metres which is the THX furthest position, which is ideally where the back row should be if you have multiple rows of seats. You should leave enough space at the back of your room for your rear and side surround speakers to work effectively too.

**The height or position of the screen** on the wall will depend on a the following criteria:

- If you have enough room under your screen for the speakers to sit - room height.
- If you have enough room on the sides of the screen for your speakers - room width.
- Will front row heads be in the way of the back row viewers?
- Your angle of vision in your relaxed seating position will also help you decide how high or low the screen will be positioned. Generally, your eyes will be in line with the bottom third of the screen as per SMPTE recommendations. This will keep your vertical viewing angle within about 15 degrees.

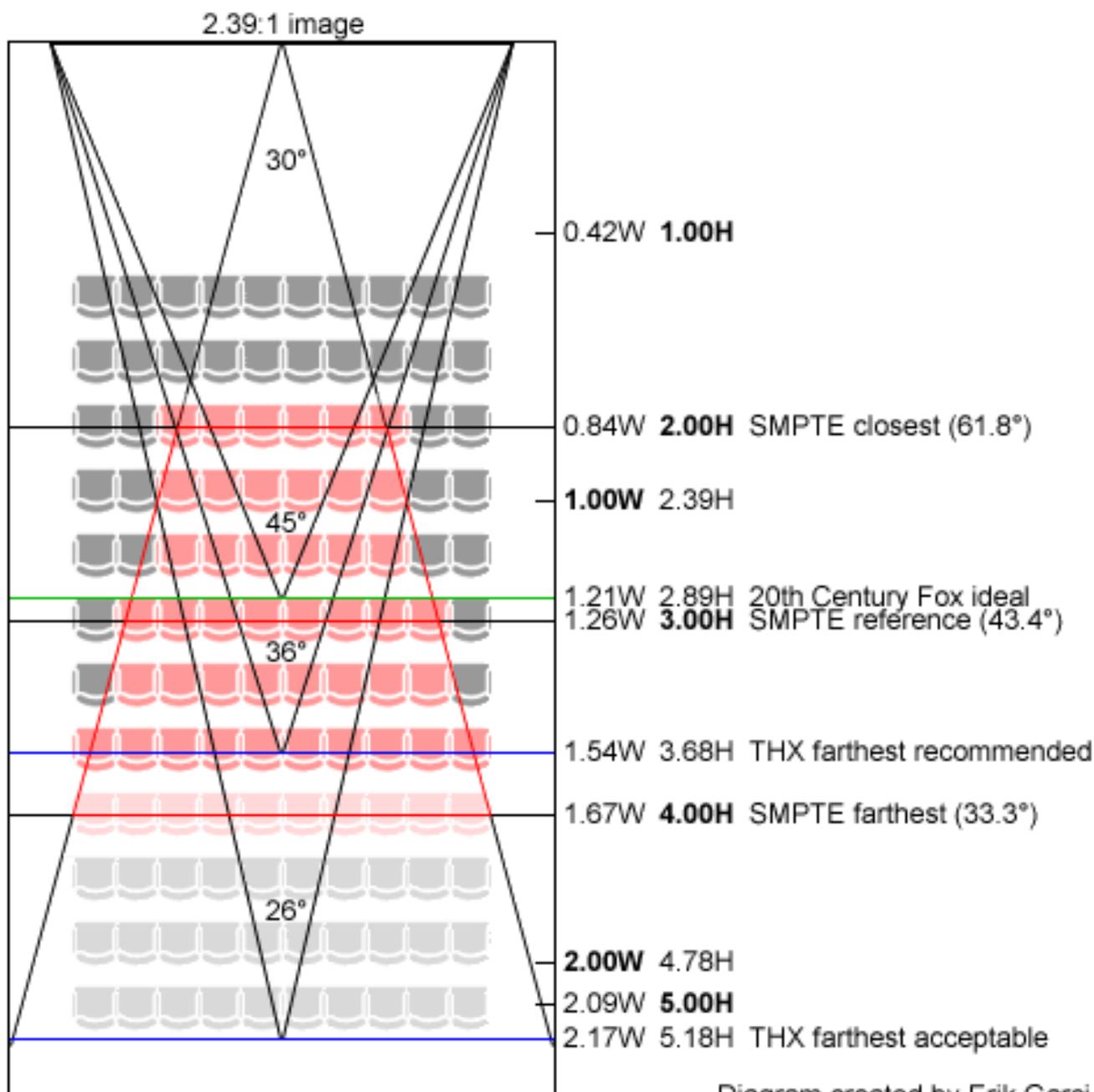


Diagram created by Erik Garci

# **SCREEN GAIN - FABRIC FINISHES - VELVET FRAMES**

Screen gain or 'gain' is a measurement of the screens reflectivity. It has a reference standard by which gain is measured against, that being magnesium oxide (plaster -without the paper). This is a zero gain diffuse material which measures 1.0, this means it has no gain at all. For Home Theatre applications, we have found the sweet zone for the gain of a material, being 1.1 to 1.3. Any higher than 1.3, the surface can glare or hot spot. See image simulation below to see what this means. Any lower than 1.1 means the image can appear quite dull and lifeless which can be likened to using a wall instead of a quality screen. Reflective screens materials are the most commonly used in home theatre applications.



Back in the day when projectors lacked lumens, high gain screens were all the rage. Today they are rarely used in home cinema because projectors are more than bright enough. We've exaggerated the image on the top left to show you how it can look.

The projected light cannot be reflected back evenly across the screen and since the projector cannot create more light, the viewing angle is reduced as a result. Avoid high gain screens. The image top right is a diffuse low gain screen which is the ultimate surface to project onto.



Be wary of the textured fabrics offered on 95% of motorised and most cheap fixed screens on ebay. This is old data screen material is used in Asia because it's cheap to manufacture. The market here in Australia has been flooded with these cheap imports. You cannot achieve image accuracy with this cheap out dated data screen fabric. The texture is called the 'orange peel effect' by painters. As the roller rolls around and lifts up it pulls up the wet paint creating a texture. You want your screen fabric dead smooth and nothing else.



Don't introduce artifacts into your image by using cheap textured screen materials. The problem with textured materials in today's world of 4K and beyond is seeing the texture during movies. The above photo shows such a textured material vs Evo 4K below left. With textured materials you can notice this annoying artifact, particularly in camera panning moments or times where the image on screen is a light colour, such as sky or snow etc. The image on the left is what you should expect when using a good quality screen surface such as our Evo 4K vinyls. **You wouldn't buy a 4K TV with a textured glass screen surface** so it shouldn't be done with projection either.

The idea of the screen disappearing when being used is really what it's all about. You don't want to see the screen material, the frame or have any other distractions. **An artifact-free floating image** is what you should be trying to achieve.

The Majestic screen's design and creation is based on this very idea. The combination of the smoothest 4K vinyl on the market and the blackest velvet frame achieves this.

**VELVET FRAMES AND OVER SCANNING:**

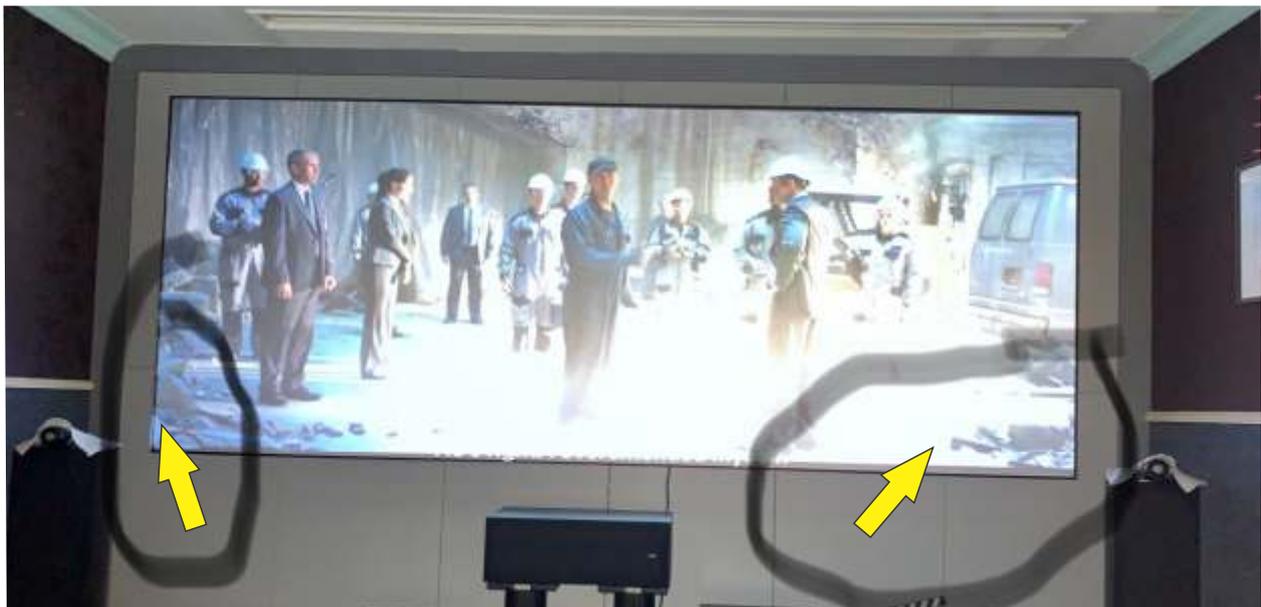
One of the integral parts of what makes an excellent cinema screen is the frame surround, something that's often overlooked. The blacker the frame, the crisper and neater the image will appear to sit on the screen. When using your projector, you will notice the edges of the image are quite undefined and soft, there will be some noise and grain on the edges, particularly with HDTV sources. Given the fact that you won't want any gap between the image edge and the frame, that soft edge is pushed onto the black velvet (the usual amount is 10-20mm). It also superbly helps the screen itself disappear when in use.



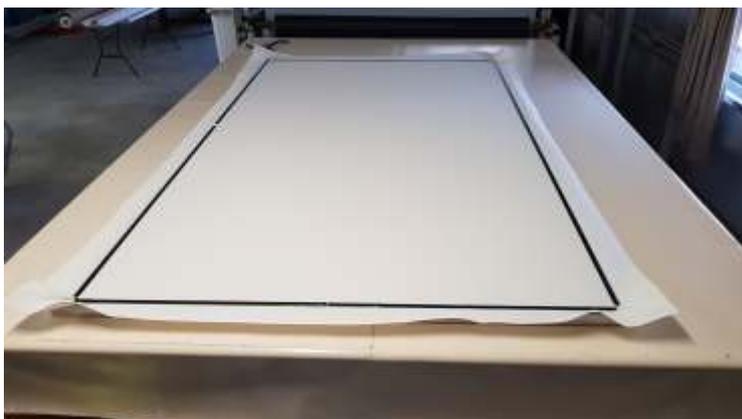
Other screen manufacturers use what is called 'economy flocking', this is a much cheaper dark grey imitation velvet, see image above comparing them and Fidelio velvet in broad daylight. We only use Black Fidelio velvet on our frames and you truly need to see this to appreciate how black it really is. Call for a sample and we'll happily post some to you. The black Fidelio velvet soaks up over-scan with ease. It is the blackest material on the planet bar none. It is a true velvet, a woven fabric with a 1.5-2mm pile. A truly luxurious material, made in the USA by JB Martin. Fidelio velvet is exclusive to Oz Theatre Screens and comes standard on all Majestic screens.

**SCREEN FRAMES:**

The industry standard is a 3 inch frame and for good reason. 3 inch frames are used for both strength and absorbing over scan from your projector. Frame less screens simply do not work or at best are very difficult to get the image to align properly, see below. This particular setup actually had the room for a 3 inch wide frame. Don't get caught up in thinking you need to max out the screen size when space is limited. If you had a 100" image with a frame less screen, you'd have a 94" image with a 3 inch wide frame. To compensate for this you would simply move forward 6% and now the image will appear to be the same size. Remember the screen size is only a number.



Our new Majestic frame profile was designed to handle larger Acoustic Screens up to 5+ metres wide without the requirement for rear bracing.



**SCREEN FRAMES Continued:**

Engineered based on the I-beam with thicker horizontal sections. Twin wall thicknesses of 2mm and 3mm makes this new design 55% stiffer than the previous Majestic frame. All inside a single hollow design.

Works flawlessly with all our screen fabrics.

Rear insert channel for black speaker cloth if required for Acoustic Screens.



Above our brilliant new fabric insert profile. This is a 100 series PVC extrusion with 4 sets of flexible wings. A breeze to insert, easy to remove yet hard to push out under tension. Based on the snap buttons used in the automotive industry.

Can be inserted with one hand! No more sore thumbs!



# AMBIENT LIGHT - ROOM COLOURS - PAINT

Any projection setup will always work best without any ambient light present. As a screen manufacturer, we realise this is not always possible. Many people will use a lounge room or a combined family room as the Home Theatre and often there will be ambient light problems. Luckily today, many projectors have high lamp mode settings such as 'daytime' and 'vivid' modes. These help deal with some of the ambient light but are not the 'best modes' the projector can display. You should try and get as much light out of the room as possible. Perhaps not so paramount for sporting events and TV, but for those blockbuster movies, night time viewing and the projectors best mode should take preference over daytime viewing where ambient light can be a problem.

**Grey screens** can help by boosting the perceived contrast level of the projector when using in less than ideal conditions compared to white screen in the same environment. Dark grey screen materials are less suited for Home Theatre applications because they can crush the colours. Sure they boost perceived black levels and contrast (which are the first things to be diminished by ambient light) but dark grey materials tend to darken all other colours also. Whites become grey, yellows push towards orange etc. So there is always going to be some kind of trade-off when trying to get a projector to work well in the presence of ambient light. A lighter grey material is better and why we have developed a light grey Evo Ultra Grey 4K vinyl for use in such conditions.

The ultimate projection room will always be void of ambient light and will have dark coloured walls and ceilings. All projectors used in Home Theatre applications will always work at their optimum when light is removed from the room. Think of your local Cinema, dark floors, dark walls, dark ceiling and lights out of course when movie begins.



Even some of the most expensive cinema rooms can have reflection problems.



Ceiling and side wall reflections. These reflections also bounce back onto your screen and wash out the picture.

**ROOM COLOURS AND PAINTING:**

As discussed above, the ideal room should be dark, with dark walls, ceiling and carpets. Matte black paint is easier to maintain than flat black which can become very messy not only when painting and getting a good finish but when trying to clean it. There are some very good flat black paints out there, but I've found just a straight matte black paint is a better option for the reasons stated. There is less than 3-5% difference between their sheen levels anyway. So go with a dulux or similar matte black and keep it simple. If you can't use black, any dark colour is good, burgundy, navy and dark greys are often used. Feature walls are also done in different colours.



**Make sure you undercoat with a grey primer if painting over a white or light coloured surface as you'll be doing 3+ coats of black otherwise.**



If you have a room with an alcove, paint the side walls and underside of the alcove matte black as the alcove essentially brings the walls closer to the screen where the light bounce is more pronounced. If you're screen is further away from walls, the light is diluted as it has to travel further. These alcoves were designed for TV's not cinema projection. If you're building from scratch, I recommend no alcove at all or only one that's as deep as the screen frame itself if you want a flush finish. And if you want to go better again, find a black velvet from a Spotlight or similar vendor and either pin it to the gyprock or attach to corflute panels and stick those in place. Black velvet will always do a better job at absorbing light bounce but matte black paint will also be good enough for many.



If you take a look at our gallery page you'll notice how rooms have changed over the years. The images at the top of the gallery, many of the them are darkened rooms and many of the images towards the bottom of the page, which must go back a good 15+ years, are white.

Big thread here over at the AVS forum on room darkening;

<https://www.avsforum.com/forum/24-digital-hi-end-projectors-3-000-usd-msrp/1465053-blacker-theater-better-image.html>

How it should be done. If you have a dedicated room then go matte black, black velvet etc for the best results.

