Viewing Environments
Presentation and AV considerations
And creating Outstanding Viewer Experiences

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Overview

The purpose of this document is to assist those involved in the setting up of presentations to deliver such in a professional manner.

Creating a viewing environment is a challenging process. Those responsible for set-up (supervisor) must analyze a space, select the equipment that would best function in that space, adjust the equipment so that it displays an ideal image, place furniture to accommodate the audience, and be unobtrusive to the viewing environment.

To use a space successfully, an operator must:

- Analyze a room; identify both its benefits and drawbacks to the viewing environment.
- Select and position projection screens.
- Select and position projection equipment.
- Identify and set up meeting accessories

Analyzing the Room

Introduction

Those tasked with AV setup often lack the luxury of being able to change the infrastructure of a room to accommodate the AV equipment requirements. Equipment must be selected carefully to match the physical characteristics of the room where the event will take place. After observing the physical characteristics of a room, the setup should create the illusion that the space was designed specifically for that event.

The room characteristics that affect the viewing environment are:

- The size, width, depth, height, and shape of a room
- How the light in the room is controlled
- How the room areas are organized
- Proper placement of the audience

Room Space

how the floor and ceiling space affects the placement of the image.
Three things to determine when inspecting a room are:

- Ceiling height
- Useable floor space
- Shape of the room
- Occupancy load

Typically, representatives from the venue will provide you with the room information, including maximum occupancy (occupant load), ceiling height, and floor space. This information can be crucial when you are determining if and how all of your gear will fit into the room and still

accommodate the audience. Bring a measuring tape to the site visit to verify their measurements and determine the proper placement of the gear.

Ceiling Height

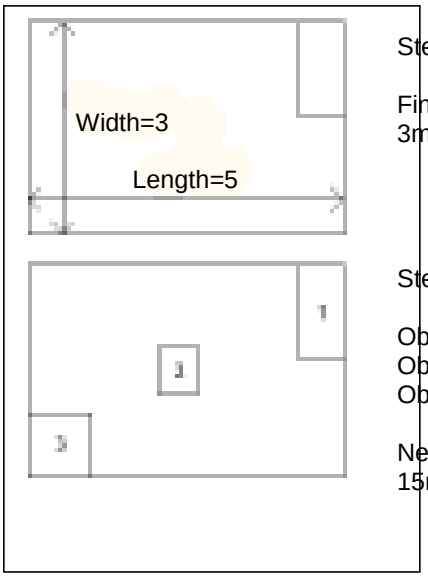
Not all ceilings are flat. When inspecting the venue, those supervising setup should look for anything protruding from the ceiling that may obstruct a projected image: chandlers, fire extinguishers, light fixtures, or balconies. Anything that may limit the height and placement of the stage equipment, screens, trusses, or lights, should be noted.

Floor Space

When inspecting the room, gather as many details as possible and note elements in the room that the drawings may not reflect. Record the size and shape of any objects that may obstruct the audience's view of the image. Also, note the placement of the stage, pillars, alcoves, doors, and folding wall storage that may obstruct the view of the audience. If the room has many obstructions that are not described on the venue's drawings, you may need to sketch a diagram of the room on your own. Begin by determining the net floor area.

Net Floor Area:

1. Measure the floor's maximum length and width at its widest points. Multiply the length times the width to find the total floor area.
2. Measure all objects that will or do occupy the floor space. Multiply their length times their width to find the floor area they occupy.
3. Subtract the area the objects occupy from the total floor space. This will give you the total usable floor area.



Step One:

Find the total usable floor space
3m x 5m = 15m^2

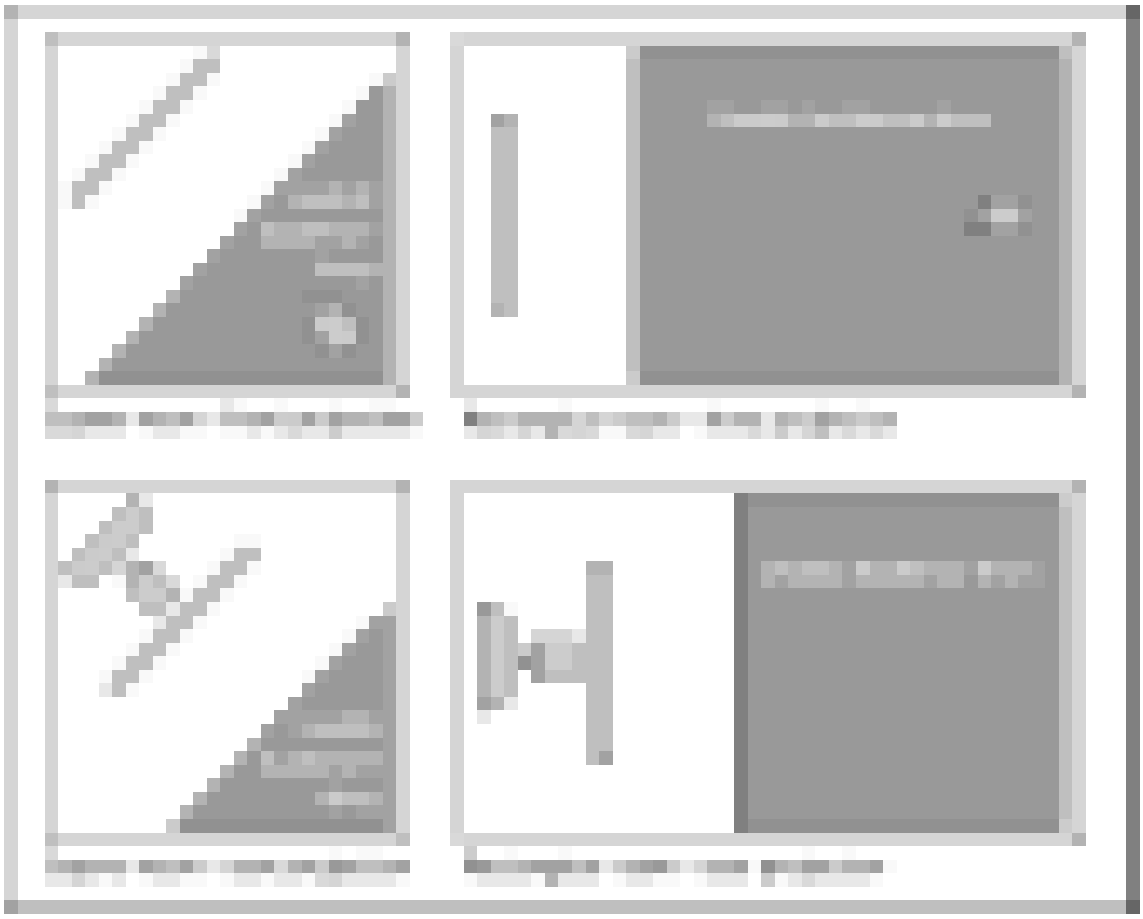
Step Two:

Object 1 0.6m x 1.5m = 0.9m^2
Object 2 0.6m x 0.6m = 0.36m^2
Object 3 1.0m x 1.0m = 1.0m^2

Net floor space =
15m^2 – 2.26m^2 = 12.74m^2

Floor Shape

When measuring floor area, pay attention to its shape; it will affect how you place the audience. By efficiently utilizing the shape of the room, you can increase the number of audience members who can see the image or stage. The graphic below illustrates how placing an image in the corner of a square room can increase the number of audience members who can comfortably view the image. The graphics illustrate how room shape and screen type can enhance the audience's seating area and ability to view the image.



Room Capacity or Occupant Load

Representatives from the venue should provide you with the estimated occupant load for the room. Don't be confused by the term "load". This refers to the amount of floor space that people and objects occupy, not their weight. The occupant load calculation reflects the maximum number of people allowed to occupy the room at a given time, as stated per fire code. Do not exceed occupant load limits. When the fire marshal determines the occupant load, he or she must consider what the room is being used for and how many people the egress system can accommodate. Maximum occupancy of a room can be reduced by the introduction of equipment or fixed seating. This is reflected in the following table where the measurements change based on the anticipated use for the space.

Occupant Load Factors	
Use	**m^2/person**
Concentrated use without fixed seating	0.65 net
Less concentrated use without fixed seating	1.4 net
Stages	1.4 net

(Coté, p.192)

To stay within fire code:

- Do not exceed the occupant load limits of the room.
- Do not hold an event in a venue that was not designed to accommodate events or large groups of people without inspection and approval by the local authorities.
- Do not obstruct or block any paths of egress including doors, stairs, or hallways.

As always, observe local building and fire codes on this subject.
Check to see if the venue is categorised as a Public Hall under BCA Class 6 or 9b, especially in NSW the BCA Section H requirements specify seat spacings, numbers, corridor widths etc.
Not withstanding this - Do not make the site unsafe or untenable under these codes etc. as you may be prosecuted under the Environmental Planning & Assessment Act & Regulations (NSW) *Other States have similar requirements & penalties.*

Controlling the Lights

methods used to control environmental lighting.

When using a space, the house lighting often needs to be adjusted. During a video presentation, lights may need to be dimmed to accomplish proper image contrast. There are various methods of adjusting light levels.

Common Types of Lighting Controls:

- Switches
- Dimmers
- Centralized lighting controls, typically a web based computer program
- Lighting control console

A switch is the standard method of lighting control. Switches give you the option of two conditions: on and off. Switches can control a single light fixture or a zone. If the facility has dimming controls on the lights, they will provide greater flexibility in the light level within the space. Dimmers control the amount of voltage (or current) to the fixtures or zones to provide various lower light levels.

A typical lighting configuration for a small room would be two zones of switched lights. Ideally, the lights in front of the projection screen would be able to be turned off separately from the rest of the room.

When setting up a presenter area in a small room, put the screen under one

lighting zone and the audience in a different zone. This will allow you to control the light on the screen without leaving the audience in the dark.

Many large venues have secure lighting controls. Ask the building manager for access to these controls. Older lighting systems or small events may require that an operator manually dim the lights using wall switches. This can be a complicated process if you don't know how the lights are controlled or what type of lights the venue is using.

Many venues have ceilings higher than 4.5 metres. To illuminate the floor area they may use high bay lighting fixtures, which use metal halide high-intensity discharge (HID) lamps, high-pressure sodium HID lamps, high-output linear fluorescent T5 (HO T5) lamps, or electrode-less induction fluorescent lamps, to increase the lumen output and illuminate objects at further distances. Metal halide high-intensity discharge (HID) lamps are often found in venues, but have many drawbacks such as:

- HIDs require several minutes to warm up.
- Dimming systems for HIDs are not typically installed in venues, are expensive, and are not as efficient as those for fluorescent lights (Inform, 2003).
- They contain mercury so be very careful when working around them.

It is a **best practice** test the house lights prior to the event.
This is done to determine:

- The location of the lighting controls.
- The functions of the lights, including dimming and the time between turning on the lights and actual full illumination of the lamp.
- If the lights are functioning properly.

There are many different large venue lighting controls. During the site visit:

- Find out if the house lighting controls will meet your events needs.
- Ask where the controls are and how they operate.
- Always test the lights before you need to use them during the event. This will help you avoid embarrassing mistakes and time consuming repairs.

Areas of a Room

Identify the room areas to consider while planning the event.
When analyzing a room, it's often difficult to visualize how much space the audience will need and how much space the stage and equipment will need. To avoid cramped and dangerous conditions, measure the space before the event and decide what space requirements for the controllers, equipment, and audience. If you are working at the venue for the first time, ask the venue and/or the meeting planner for a room layout or seating diagram.

A typical room layout can be broken down into the following areas:

- Audience area
- Presenter area or stage
- Control and projection area

Audience area refers to the area of the room where the audience will be located.

When measuring an audience area, consider requirements other than those for just seats and bodies. Here are some other audience needs that should be taken into consideration when measuring the audience area:

- **Visuals** – Is everyone able to see the stage and visual elements? Consider screen size, image resolution, sight lines, etc. If everyone cannot see the image, rearrange the areas until the majority of people can see. Then repurpose the areas that have an obstructed view of the image.
- **Sound** – Is everyone able to hear? Consider the ambient noise and acoustics of the room, and determine the appropriate configuration of microphones and loudspeakers.
- **Ease of movement throughout the room –** If your job responsibilities include setting chairs and tables, ask yourself, "Can everyone in the audience enter and exit with ease?" Determine what seating arrangement will allow everyone to exit safely and view the stage area, while creating as many places for people to sit as possible. Leave space for the audience to reach all emergency exits and have security monitor these exits so they do not become obstructed.
- **Audience comfort –** Will people be comfortable in their seats? Ensure that there is sufficient room between the seats and in the aisles for the audience to write, eat or complete any of the activities required of them.

Presenter, performer, or stage area refers to the area where the stage, displays, actors, or presenters will be positioned to be viewed by the audience.

When measuring the space for the stage area, think about how much space the performer will need. The stage should have room for their equipment and the AV equipment. They should have space to walk around, and stairs that allow them to safely exit the stage area without traversing obstructions.

- **Presenter and equipment –** Is there enough room for the presenter and the presenter's equipment? Also keep in mind that the presenter may want to move around during the presentation and not be anchored to the lectern.
- **Power/voice/data –** Are there adequate power, data and phone connections in the front of the room to meet the needs of the presenter?
- **Sightlines –** Can the audience see both the stage and the projected images? For example, if the presenter is too close to the screen, it may be necessary to limit the amount of the lighting on the presenter since it may interfere with the projected image making it difficult to see the presenter. Or the presenter may be positioned too far off axis to enable the audience to view the presenter and the projected images at the same time.
- **Versatility –** Have all the specific needs of the client been met? As with the other room elements, the planning phase is an opportunity for the AV technician to determine what is required to meet the client's specific needs. For example, the client may want to change the arrangement of the stage area during the event. If the client wants to move the equipment, what can you do to make it go smoothly?

Control or operations area refers to the space around the controls for the AV equipment. This space can be located behind the stage, next to the stage, or a portioned space within the audience area. Place the control area in the centre and rear of the room so that the operators can:

- Monitor audio levels and equalization to assure quality audio for the entire audience.
- Clearly identify microphone cues when using multiple microphones.
- Have a clear view of the entire show to facilitate lighting cues, light levels, and off script camera shots.
- Have a workspace without interrupting the event.

When measuring the control area, don't just think about how much space the equipment will need. Remember to leave room for safe egress for the operators, room to operate the equipment, airflow, and if their duties require it, clear access to the presentation area.

- **Equipment space –** Is there enough room for both the projection equipment and any AV operators? AV operators will spend long periods of time in the control areas. These areas need to be spacious enough for their comfort and for them to effectively operate the equipment.

Will you be able to leave empty cases on location or will you need to remove them during the show? Some cases may be stored behind screens or backstage, but large shows may require that they be removed.

- **Heating and cooling –** AV equipment produces heat making control areas very uncomfortable very quickly. Provide fans to cool the AV operators and the AV equipment without adversely affecting the event's audio.
- **Power requirements –** Is there sufficient power for the required equipment? If there isn't enough power, consult with the in-house electrician. Obtain his or her phone number and make certain that they will be available during your set up.
- **Voice/data –** Does the projection area include appropriate telephone and data communication? For example, a network cable may be required to control the equipment or to connect the presenter's computer to the Internet.
- **Lighting –** Sufficient lighting must be provided to ensure that the operators can see the system controls without adversely affecting the quality of the projected image.
- **Sound isolation –** Noise from equipment, such as cooling fans, must be controlled and minimized so that it does not distract the audience
- **Monitoring –** Operators must be able to hear what is going on in the stage area. Note that the operator should not be "tucked away in a closet," since the operator must be able to see and hear what is going on during the presentation. If it is not possible for the operator to be positioned in front of the stage, appropriate monitoring devices will need to be provided.
- **Exits –** Operators need to safely exit these areas in emergency situations. Make sure that nothing is obstructing exits and entrances to the operations area. Refer to the BCA-2007 for required widths.

NSW D1.10 Discharge from exits

(f) In a Class 9b building used as a *place of public hall*, at least half of the *required* number of *exits* from each *storey* or *mezzanine*, and at least half of the aggregate width of such
exits must discharge otherwise than through the main entrance, or the area immediately adjacent to the main entrance of the building.

NSW Table D1.13 AREA PER PERSON ACCORDING TO USE

Type of use		m^2 per person
Delete "Theatres and public halls" and insert the following:		
Places of public entertainment—		
other than *auditorium*		1.2
Auditorium—	standing area	0.5
	removable seating	1.0
	fixed seating	count seats bench seating 450 mm/person

When estimating the areas of the room, you must go beyond bodies, chairs, and equipment. A truly effective design intelligently utilizes all of the space provided and meets the needs of all the people occupying each area.

Don't forget to ensure acceptable access for those with mobility and visual impairment with reference to AS 1428: Access Design as well as BCA.

Access for Mobility Impaired

It is required that

- all buildings used for public entertainment and auditoriums are accessible and permit independent use for all persons.
- there should be the provision for persons who use wheelchairs provided at an overall rate of not less than 1 space for each 100-auditorium seats and the accessible seating is appropriately and evenly spaced across the auditorium seating area.
- that the accessible seating positions allow patrons to sit in individual, paired or group position, and adjacent to flip back seats allowing for extra people in wheelchairs to slot in as/when needed (AS1428.1 Figures 9.12.13 & 9.12.14)
- some fixed seats with an extra leg room provided in front of and to one side of the accessible seats for those with ambulant mobility impairment who are not in wheelchairs.
- the comparable sightlines provided in the accessible seating positions for a person seated in a wheelchair when a person in front stands up (the same sightlines as the person in front has when standing).
- the wheelchair space with a flat floor surface has a gradient not steeper than 1 in 40.
- a system of hearing augmentation may be required by the BCA, this is a listening system to aid hearing impaired persons

Viewing Area

Introduction

Temporary AV systems are a unique environment and many times neither the audience nor the screens are permanently positioned in the room. When you discuss where to place a projection screen, you are also thinking about where to place the audience. This mobile relationship allows you to freely adjust the spaces until you have achieved the best position for screen, projector, and viewer.

Preparing to provide this unique temporary AV system requires you to know:

- The terminology used when discussing image quality.
- The relationship between the audience and the screen.
- Angles from which a screen can be viewed.
- How to find the optimal viewing area in a room.
- The distance between the audience and stage.
- How to properly set up portable seating.

Image Quality

Describe some of the terminology used when discussing image quality.

Live event companies have many different procedures for determining screen size for an event. Often it is decided once the room and audience size can be estimated. To determine appropriate screen size, several factors need to be taken into consideration.

Visual resolution must be appropriate for the image size, view task, and viewer distance from the screen.

Task defines what the viewer will do with the image. For example, will the viewer need to read large bullet points, or inspect a detailed engineering drawing of a machine?

Image resolution is determined by the number of lines/pixels of the image. Higher resolution results in a more detailed image.

Viewing distance is the distance of the viewer from the screen.

Image height describes the vertical dimension of the image (and screen).

Aspect ratio considers the ratio of the width and height of the image. For example, a standard video monitor has an aspect ratio of 4 to 3 (4:3) - four units wide and three units high. A "wide screen" has an aspect ratio of 16 to 9 (16:9). An alternate way to represent an aspect ratio is by dividing the first number by the second number; for example, 4:3 is also stated as 1.33:1.

Image size defines how large the image is displayed.

Gain is the ability of a screen to redirect projected light to make the image appear brighter, within the viewer axis. The higher the gain number of a screen, the brighter the picture when viewed on axis.

Unity gain means that a screen should provide uniform brightness over the entire image area, with no dim areas or hot spots.

Hot spotting is caused by properties of the screen surface. It manifests itself as a brighter area on the screen.

"If the image is very bright relative to its environment, the perceived visibility of hotspots can be less than if the image is not bright – or even dim – relative to its environment. However where the image is not relatively bright, the hotspot can be painfully apparent!" (Jeffreys, 2005).

Uniformity -The image uniformity is a combined product of both the projector and screen uniformity. If the projector has poor uniformity, the screen cannot correct it. A screen with poor uniformity will produce an image of poor uniformity, no matter how good the projector uniformity is. Using wide angle lenses is often where the issue of uniformity becomes a problem, particularly if combined with high gain (transmissive) diffusion screens. Wide angle lenses used for rear projection should be combined with optical (i.e. Fresnel-lensed) screens – or low gain diffusion screens if budget forces their use. Wide angle lenses used for front projection should be combined with low gain screens (Jeffreys, 2005).

Brightness - The brightness control is sometimes called black level control because it determines the black level of the image.

- If the brightness level is too high, the intended black areas of the image will appear grey.
- If it is too low, then areas with subtle differences in levels of black will all be represented as one shade.

At best, the screen can only do as well as the projected light it receives (remember the old computer programming expression GIGO, 'garbage in, garbage out'?). This applies particularly to brightness uniformity.

Contrast - The contrast control sets the range of difference between the lightest and darkest areas of the picture.

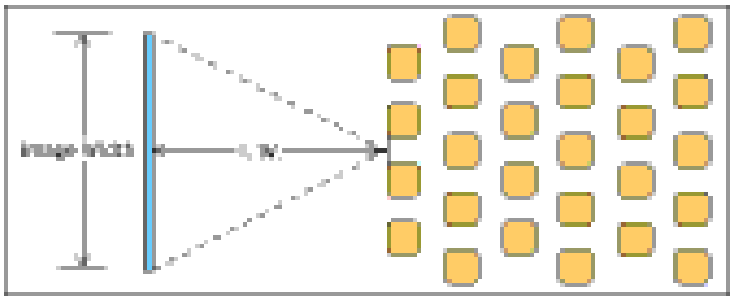
- If the contrast control is too low, the white details will appear grey.
- If it is set too high, areas with subtle differences in levels of white will all be represented as one shade.

Audience to Screen Relationship

Describe the criteria for determining the distance to the viewer closest to the image.

Finding the placement of the first row of views will affect the entire seating area. Notice how much space is between the audience and the screen, this can affect the estimate audience size in the room.

It is a best practice to place the first row of viewers no closer to the image than the width of the image. This position will allow the user to view the entire screen without moving his/her head.



In some instances, when scrutinizing a detailed image is necessary, the nearest viewer may need to be closer to the screen. Do not place a viewer too close, or scan lines, pixels or other artefacts of the projection process may be visible and fewer people in a large audience will be able to view the image.

(Please note that, currently, there are industry discussions about how this guideline differs, if at all, when using a 16:9 aspect ratio display versus a 4:3 aspect ratio.)

The use of even wider screens in 3:1 or 4:1 aspects is becoming more common. In these cases, the audience is supposed to move their head to cover the field. The screen height becomes the determining factor for positioning the first row.

It is also important to consider the height of the image, and ensure that the viewer can comfortably see the top of the screen. It may be necessary to adjust the seating, image size, and bottom of the image simultaneously until an acceptable image is displayed.

Distance to nearest viewer =1 x Screen Width

While most agree on the "1 x screen width" **best practice**, here are some other ways industry professionals determine how close a viewer can be seated to a screen:

- 1 x the diagonal (i.e., 3 metres from a 3 metre diagonal screen)
- 4 x the diagonal i.e., 12 metres from a 3 metre diagonal screen)
- 2 x the image height (i.e., 3 metres from a 1.5 metre high screen)
- Image is within the individual's field of view (60 degree viewing cone).
- At a point where the display process is not yet visible (i.e., no visible scan lines or pixelization)

Best Practice

As a general rule, it is a best practice when determining if an image will be viewable, to remember that image height equals the distance to the farthest viewer divided by:

- 8 for general viewing
- 6 for detailed viewing
- 4 for inspection viewing

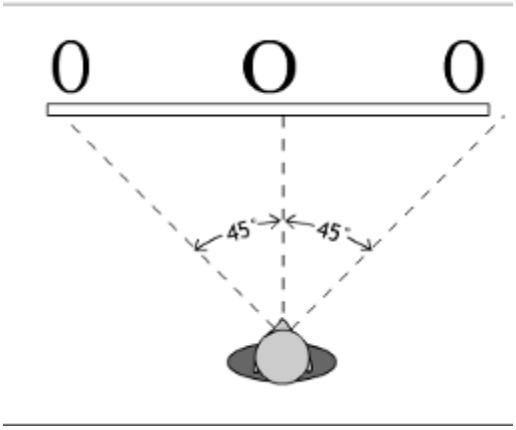
For example, the farthest viewer within a room that you are setting up will be 7.2 metres away from the screen. The required image height to ensure that an image will be viewable for performing the following tasks is:

- 900 mm high for viewing general images
- 1200mm feet high for viewing detailed images
- 1800mm high for inspecting images

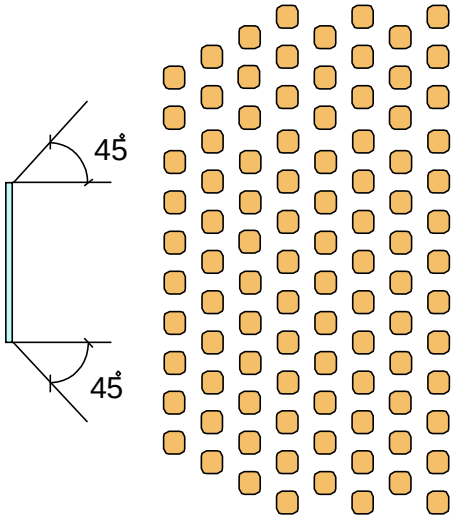
Viewing from an Angle

the relationship of display screen characteristics with respect to the lateral location of the viewer.

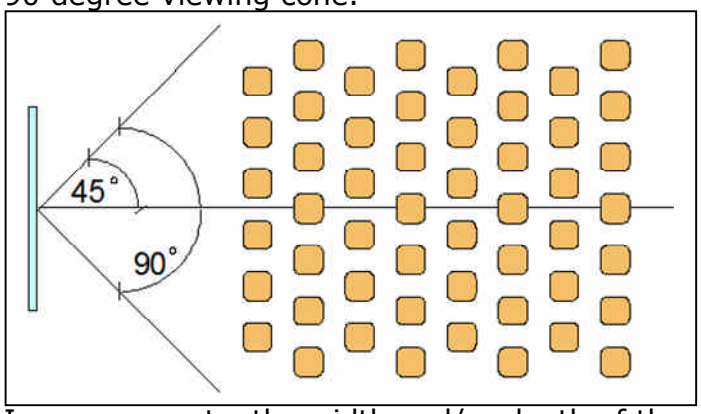
Projection screens and displays must be matched to the audience seating area. Place the viewers within the area where the image is not angularly distorted (i.e., where the screen appears to be rectangular and not trapezoidal). Projection screens and displays also have different characteristics regarding the acceptable angle at which they can be viewed with uniformity of brightness across the image, and off-axis. Both conditions must be met for optimal viewing: lack of distortion and uniformity of brightness.



To determine viewing angles, it is a **best practice** to consider the least favoured viewer as being no further off-axis than 45 degrees from the farthest outside edges of the screen.



The **good** viewing area is within 45 degrees of the projection axis or within a 90 degree viewing cone.



In many events, the width and/or depth of the audience will exceed the ideal viewing area of the image. One obvious solution is to get a larger screen, but often factors such as ceiling height prevent you from increasing the image size. In these situations, placing repeater screens along the parameters of the event space will help the entire audience view the image.

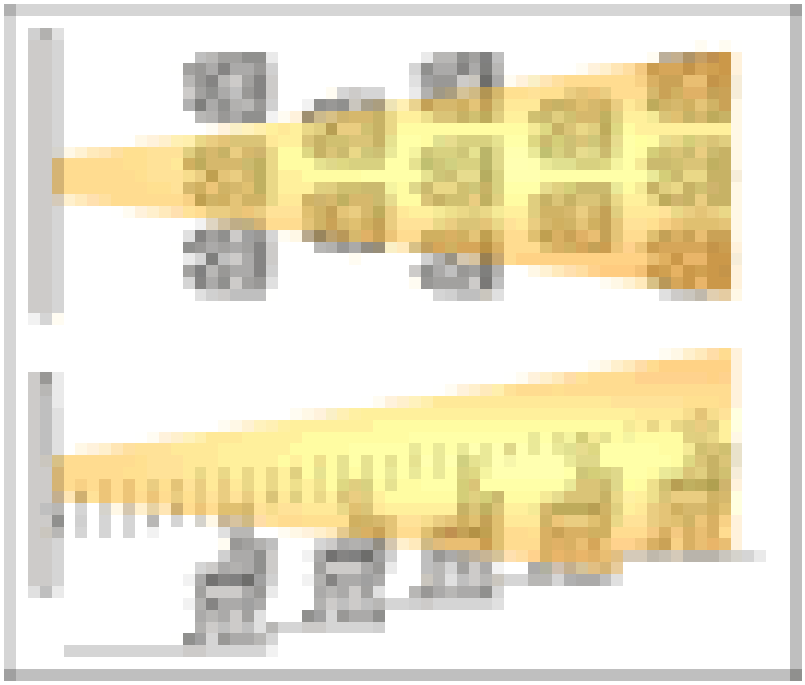
Optimal Viewing Area

the three-dimensional nature of the optimal display viewing area.

The best viewing area for the audience is referred to as the "viewing cone." The audience can most comfortably view the image produced by the projector in this area. The viewing cone is defined by the how the screen interacts with the projector's positioning and the screen reflectivity. Generally, the viewing cone limits are defined by the points, both horizontally and vertically, where the image begins to appear distorted. The term cone is used because there is width, height, and depth to the best viewing area. Positioning the audience within this viewing cone will assure that audience members will be able to see a picture of adequate brightness, provided that the line of sight is not obstructed, and the ambient lighting is correct.

The centre of the viewing cone is the most desirable area for viewing the image. In this position, the light from the projector is reflected directly back to the viewer. The ideal area will vary depending on the type and placement of the projector and screen. In some environments, this spot can be smaller than the size of a human head.

When determining screen sizes and seating layout, it is common to consider the horizontal and vertical axes:



Horizontal axis: considered as the "Viewing Area," and represented as a plan view of the room that includes the seating area and display area

Vertical axis: considered for sightlines, and represented as a section of the room through the middle of the audience

Placing Portable Seating

Describe how to place portable seating properly.

Now that you know where the audience should be in the room, you can learn how to set up the audience seating area. Even if your job tasks don't include seating setup, you may need to make minor adjustments to the seating to allow for the placement of equipment or to create an ideal viewing environment for the audience. Knowing safety guidelines will help you make these adjustments without endangering the audience.

There are two main categories of seating arrangements:
portable and fixed position. Primarily, the portable arrangement allows for some chair position flexibility whereas the fixed seat does not.

When working in theatres that have fixed seating, you may notice that the fixed chairs are placed much closer together then the portable chairs. When portable seating is used chairs may get moved around, this creates dangerous obstacles for the audience to compensate for this portable seating should be spaced further apart.

Portable seats come in various sizes; most will measure between 559-660mm wide.
Reference should be made to Section H of the Building Code of Australia in particular the NSW provisions associated with theatre & hall seating.

Table H101.12 SPACING OF AUDITORIUM SEATING

Number of seats in *Rows*	Depth of *Rows* (mm)	Clearance between *Rows* (mm)
Not exceeding 16	950	300
17 - 30	975	325
31 - 45	1000	350
46 - 60	1025	375
61 - 75	1050	400
76 - 90	1075	425
91 - 105	1100	450
106 - 120	1125	475

NSW H101.11.6 Aisles and cross-overs

Where *aisles* and *cross-overs* are provided—

(a) each *aisle* must have a width of at least 1000 mm and each *cross-over* must have a width of at least 1500 mm; and

(b) the floor of each *aisle* must not have a grade of more than 1 in 8 at any part; and

(c) if there is a step from a *row* to an *aisle* or from a landing to an *aisle*, the step must not project into the *aisle*.

NSW H101.11.7 Platforms and steps

Where an *aisle* contains platforms or steps—

(a) the platforms and steps must extend for the full width of the *aisle*; and

(b) if there are no intervening steps between levels of platforms, the height of the platform riser must not be more than 200 mm; and

(c) if there are one or more intervening steps between levels of platforms—

(i) each riser must be at least 100 mm but not more than 200 mm high; and

(ii) each going must be at least 250 mm deep; and

(iii) risers and goings must be uniform; and

(d) goings which are more than 450 mm deep at platform level must not have a grade of more than 1 in 50; and

(e) at the entrance from the *aisle* to each *row* there must be a clear level floor space, extending the full width of the *aisle*, of at least 300 mm, measured from the back of the *row* in front; and

(f) any going projecting in front of a seat adjacent to an *aisle* must be protected by a guardrail.

NSW H101.11.3 Chairs in auditoriums—Level floors

Chairs in an *auditorium* that has a level floor must be—

(a) securely fastened to the floor; or

(b) secured together in groups of not less than 4 and not more than 16.

our local area authority may be stricter than these general guidelines.

National Fire Protection Association. (1999).*NFPA 101B Code for Means of Egress for Buildings and Structures* (1999 ed.). Massachusetts: Quincy

Audience to Stage Relationship

Describe the criteria for determining the distance between the closest viewer and the stage.

You know how to setup temporary seating so that it meets NSW fire codes and you know where to place viewers in relationship to a screen. You will need this knowledge to place an audience properly around a stage. Before you can successfully place the seats, you must first understand how the stage changes the dynamics of seating placement and the viewing code.

Different rules apply to temporary seating and permanent seating. You may notice that the space between the first row of chairs and the stage is very narrow in theatres with mounted seating. This design allows the theatre to accommodate as many people as possible. In these situations emergency egress is taken care of by the aisles perpendicular to the stage.

When placing temporary seating around the stage, the space between the stage and the first row of seating may be considered an aisle depending on local fire codes. If the space between the stage and first row of seats is considered an aisle or egress path, it may need to be as much as 1500mm. In this situation find out if the venue is categorized as a Public Hall and determine

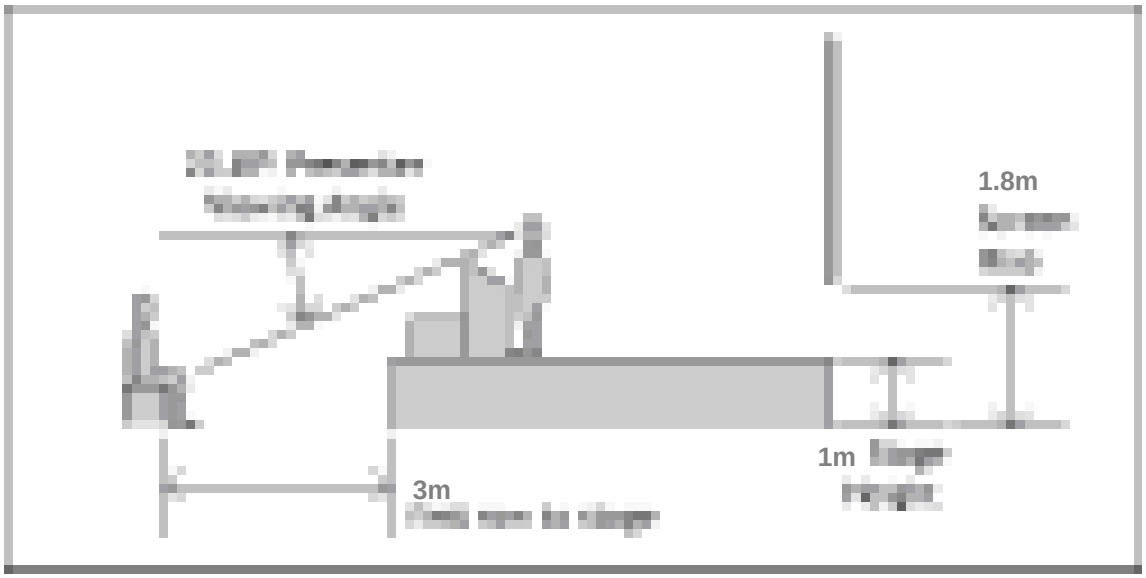
the fire codes that shall apply, making sure that everything is covered *including placement and performance capability of portable fire extinguishers (AS 2444, fir suppression (AS 2118.1 if required)*.

Adding a stage to the room design can alter the room's viewing areas. Depending on the size of the stage, the chairs will have to be placed further back and the screens will need to be raised to allow the audience to view all the visual elements and if a PoPE, a safety curtain and loading capacity sign wil l be needed.

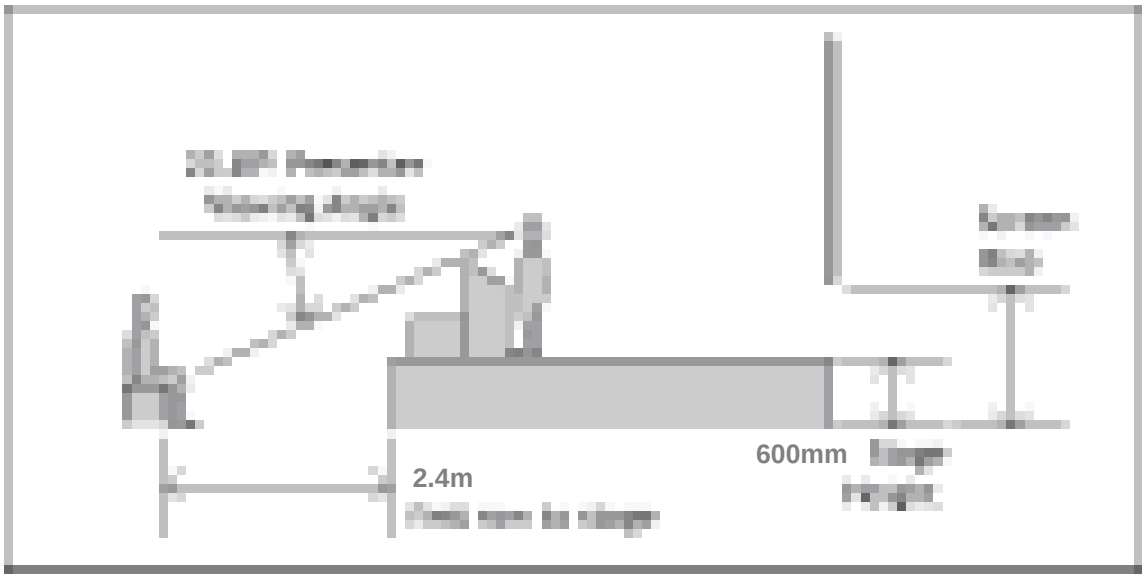
When placing seating around the stage, it is a best practice to:

- Begin the first row of seats in front of the stage at a distance of three to four times the height of the stage.
- Be aware of the fact that the **good** viewing area is within 45 degrees of the projection axis or within a 90 degree viewing cone.
- Remember that the talent on the stage should be able to view the first row without moving their head more than ten degrees.
- Place the first row viewers no closer to the image than the width of the image. This position will allow the user to view the entire screen without moving his/her head.

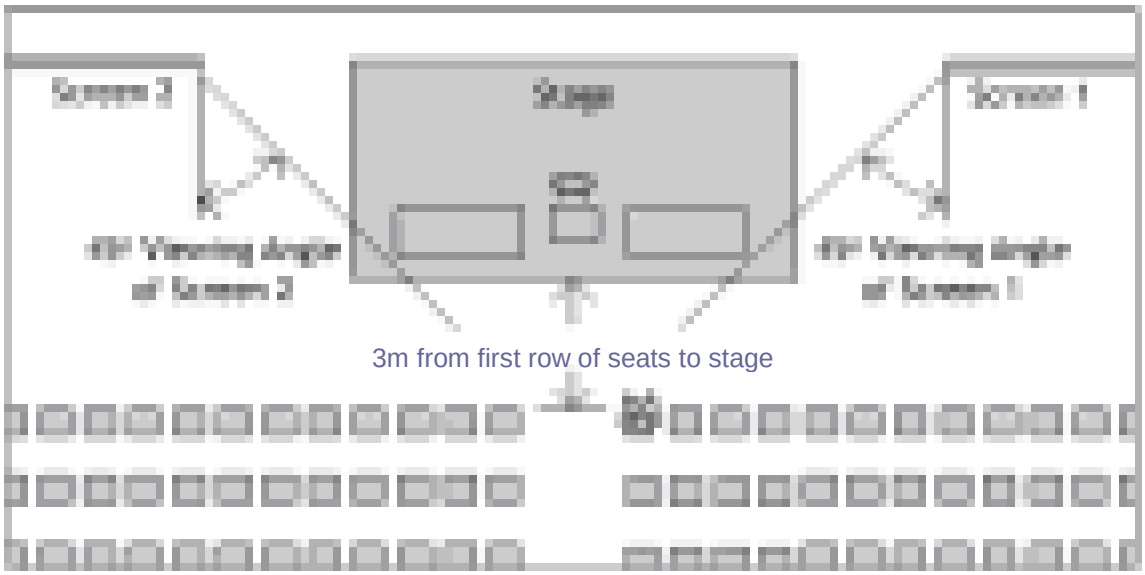
Examples of properly placing the stage:



The diagram above depicts a room setup with a stage height of 1 metre. The distance between the first row and stage is not dictated solely by the height of the stage but it also allows for the talent to be able to view the audience at a comfortable angle.



The diagram above shows the placement of the first row of seating when the stage is two feet high.



The diagram above shows the first row of seats placed within the good viewing area of the screen(s).

Selecting Projection Screens

Introduction

Once you know the audience size, room size, and type of media that will be projected on a screen you can begin thinking about projection screens. Projection screens come in many different designs to fill the viewing needs of both the audience and the environment. It can be challenging to select a screen that meets the needs of both the audience and the viewing environment. To make an informed choice you must learn about the goals the event has for the audience. Your choice of screen will be influenced by what the audience will view; a video or a detailed diagram, for example. Once you know what the audience's tasks are, you can select an appropriate screen type based on its attributes and limitations.

When selecting a screen, it is necessary to be able to:

- Identify types of projection screens
- Identify physical types of projection

Front Projection Screens

Identify two front screen surface types.

A front projection screen is a passive reflector of light. Reflected light can be manipulated to improve the perceived brightness. This is achieved by using surface treatments that focus the projected light back at the viewer.

Screens are sold in three delivery variations:

- Fabric Type and Surface Treatment
- Construction Type – Wall, Ceiling, Frame
- Electric or Manual

There are hundreds of types of projections surfaces developed by screen manufacturers. Each surface is designed to reflect or disperse the light of the projector for a certain application. These surface treatments can be adhered to a fabric surface.

Here are two examples of front projection screen surface treatments:

Matte White is "magnesium carbonate, a chalky white substance painted on the screen material" (Da-Lite, 1997). When light strikes the matte white surface of the screen, it is not absorbed but reflected in all directions making it a unity gain surface. Its ability to reflect and disperse light allows for a wide viewing angle of about 60°. This surface treatment is selected when projecting to a large audience, in an environment where the ambient light level is low.

Of Interest:
There is a significant phenomenon connected to viewing screens with poor uniformity. Screens with poor uniformity can actually look acceptable when viewed in isolation. However when positioned hard up against other screens (e.g. in an array or video-wall), the eye goes into a more critical mode and poor uniformity is much more evident. This usually leads to the use of low gain screens for front projection, and optical (Fresnel lensed) screens with rear projection together with projectors and lenses that have been rigorously selected. (Jeffreys, 2005).

High Gain or Angularly Reflective screen surfaces provide performance similar to that of a mirror. The light is reflected back at the same angle that it strikes the screen, but on the other side of the screen's axis. If a projector is mounted at a height equal to the top centre of the screen, the viewing cone's axis would be directed back at the audience in a downward direction. Most high gain screens (with a gain of greater than five) are of this type. These screens are typically selected to view video.

Portable Rear Projection Screens

Describe the materials used to construct portable rear projection screens.

Portable rear screens are flexible like a fabric and can be folded for easy transportation. In general, rear screens have a narrow viewing cone and are very bright, or the opposite - a wide viewing cone and a less bright image.

If you are using high contrast projectors, it makes sense to use low gain, high contrast screens with the wide viewing angle. The low gain reduces the hotspot and increases the contrast which is particularly important in blended images. This means the audience can see better from any angle, and the high contrast improves the image quality in any application.

Diffusion screens

- The portable rear projection screen's substructure is typically comprised of a vinyl or acrylic fabric.
- The surface is coated with a material on which the image is focused.
- The formula of the coating can provide a wide viewing angle both horizontally and vertically but with little or no gain.
- There may be some hot spotting due to the transparency of the screen fabric, depending on the vertical placement of the projector with relationship to the audience.
- The light from the projector is transmitted through the screen with relatively little bending.
- The ambient light rejection is based on the viewer-side material's reflectivity or sheen.

Flexible PVC

- This screen type is very popular in live event applications; it can be permanently installed.
- The PVC material must be stretched firmly during installation.
- The surface can attract dirt easily and should not be placed on the floor during assembly.
- Flexible rear projection screens can be easily punctured by sharp objects such as tools and ladders.

Front Projection Screens	Rear Projection Screens
Front projection doesn't require an additional space behind the screen, leaving more floor space for the audience.	"By definition, rear projection has to have space behind the screen for the one or more projection devices, which are to be aimed at it. And, needless to say, the bigger the screen, the bigger the booth area" (Da-lite, 1997).
"Front projection screens are also available in numerous configurations, but all of them to a greater or lesser extent are constrained by their sensitivity to extraneous light sources and their utility, therefore, is generally confined to darkened interiors" (Da-lite, 1997).	Generally, better contrast and colour saturation are possible in environments of high ambient light when you use rear projection.
In general, rear projection screens provide a brighter image than front projection screens.	In general, rear screens have a narrow cone of viewing and are very bright, or the opposite a wide viewing cone and a less bright image.
In general, rear projection screen surfaces offer narrower angles of view and more "hot spotting."(Butler, 2000)	When diffusion screen material is used, there may be some hot spotting due to the transparency of the screen fabric, depending on the vertical placement of the projector with relationship to the audience.
"Front projection contrast is, in practice, entirely a function of ambient light. Only in true blackout conditions does the projector's contrast (particularly black levels) have any relevant impact" (Jeffreys, 2005).	"All competing light sources in a rear projection system travel in directions essentially opposite to the projection beam. And since a rear screen is transmissive in both directions, only a small fraction of whatever light may strike its front surface is reflected; the major portion passes harmlessly through the screen to be absorbed by the *[space]* behind it" (Da-lite, 1997).

Rolled and Folded Screens

Identify rolled and folded screens.

In display screens, there are two considerations: the frame that holds the screen and the surface used to display the image.

The AV industry, works with two types of screen construction types: rolled and folded screens.

Rolled screens, or roll down screens are typically contained in a metal or wooden tube and rolled on spring-loaded or motorized rollers. They can be front or rear projection. These screens can be custom made for the event and used for blends and widescreen format applications. The advantage is the visual effect of the screen being revealed and if the screen is retracted, the space can be used for something else.

Folding screens have a flexible fabric surface that is snapped or laced to a rigid, four-sided frame. The frame of the screen is a single, jointed piece made of lightweight metal that unfolds to form a rectangle of a fixed size. A flexible fabric sheet is then snapped to the frame, and the frame is mounted on collapsible folding legs. The stretched fabric that comprises the screen makes the surface extremely flat, allowing for precision focus of the projected image. These screens are commonly used with a black skirt and side curtains, making it look like a portable theatre environment. Events will place folding screens inside scenic treatments or fly them by themselves with no masking. Take care when using folding screens in some set designs. If the screen becomes too camouflaged or flown where people enter and exit the staging area you may leave the material vulnerable to dirt, punctures, and tears.

Screen Support and Mounting Construction Types

Identify advantages and disadvantages of screen construction types

There are many screen construction types, each designed to fit a particular application. Many are designed for installations, while others are created for portable uses. In the AV industry, the main construction types used are tripod mount, self- supporting frames, and wall or ceiling mount.

The most common small venue screen is the tripod screen. This type of screen is essentially a roller screen on a collapsible stand. The screen is drawn up from the roller tube and attached to a hook at the top. These screens are designed for small venues.

Large rolled screens such as 5.5 x 18.3 meter screens can be mounted to truss work and flown in ballrooms. Specifically designed for the requirements of the rental and staging markets, truss hung screens are portable and can be front or rear projection. These screens are typically motorized and controlled from a switch.

Some rolled screens are designed with a tab tension system. Nylon cords are run on either side of the screen material. These cords are kept tight by the frame of the screen and a spring system. A series of tabs are adhered to the edge of the screen material and wrapped around the nylon cords. This draws the screen material flat and helps prevent creases and warping.

Self supporting frames allow screens to be displayed without being mounted to a pre-existing structure. These frames can be custom ordered and designed to fit the exact projection specifications of an environment. **The unique design will allow the screen to fit any aspect ratio**. Depending on what material is used, the frames allow for rear or front projection. Screen material can be laced on, snapped on, or permanently mounted to a frame.

Folding frames come in several different designs. The frames unfold to provide a portable structure on which to snap or lace a folding screen. Front or rear projection screens can be used with these frames. There is a variety of folding frame designs. Some frames are thin to minimize the total weight of the screen. Small frame size can be anywhere from 13mm aluminium tubing to 38mm aluminium tubing.

The folding truss frame functions the same way rigging trusses do. The long straight members are connected by a series of angled members. The designs of the screen's angles prevent the structure from bending when a load is applied. Instead, the weight is distributed through all the members. Truss frames are often used when the screen's frame is in danger of becoming damaged due to environmental factors. Outdoor events with large screens and potential winds will use the truss style frame.

Image Size and Shape

Summarize how image size and shape affect viewability.

You already know that it's not enough to "make an image on the wall." To accommodate, the audience's needs, a wide variety of display equipment has been developed. This display equipment can display images on many different surfaces, such as glass, water, rock, smoke, and cloth. Considering the variety of mediums used to display an image, it may be more appropriate to discuss image size rather than screen size.

Many factors influence the choice of an appropriate image size for any application. Some of these factors are image type, projection surface, ambient light rejection, and projector orientation (front or rear, ceiling or table). Other factors are the audience, the media format, the room size, and the content of the presentation.

The shape of the screen is just as important as the size. The screen should be the same aspect ratio as the projected content. If multiple sources of varying aspect ratios are being used, be sure the screen's aspect ratio accommodates them all.

> **Of Interest:** When positioning screens in rooms with short ceilings, try using a 16:9 ratio screen instead of a 4:3 can help you effectively use the space.

Custom screens are screens that are made to exact specifications for an event. Curved screens are an example of custom screens. These screens are typically mounted on a rigid frame and the screen is laced to the frame work. The screen will be curved to the degree necessary to accommodate both the audience and the room. Screens can be curved in one direction or in two directions. Depending on which surface will serve as the projection surface the curved screens can be coated on either side. The screen manufacturers will coat the screen with the material that best suites the viewing environment.

Custom Curved Screens:

- Allow for 2.35:1 aspect ratio
- Projectors can use anamorphic lenses
- Direct all reflected light at the viewer
- Can be used for front or rear projection
- Are suitable for edge blending applications

If a custom screen is not appropriate for the event due to costs or project scope, many folding screens come with a Velcro® masking system that can match the aspect ratio of your image, giving the screen image a professional look.

Choose the screen surface treatment that is best suited for the projection environment and helps the audience clearly view the image. The projection environment considerations include matching the surface treatment to the type of projector being used, the ambient light, and the audience placement.

As for placement within the room, generally, you want to put the screen in front of or on a wall, known as an unbroken wall– one that doesn't have any partitions or doors. You also want to keep ambient light from reflecting off the screen by positioning the screen to minimize the amount of light it could reflect from windows.

Screen Placement

List what factors can influence the placement of the screen.

In the live events industry you may not have the luxury of changing the infrastructure of a room to suit the needs of your event. Given the physical realities of the event, you must take what you know about viewer placement, the characteristics of the screens, and the realities of the event to place the screens in the best possible locations.

Factors that may influence your screen placement decision:

- Table configuration
- Audience size
- Screen size D
- Type of projector – digital, film, overhead, or slide
- Room's physical construction
- Stage construction
- Visual barriers – podium, stage, centrepieces, chandeliers, pillars, or the fire suppression system

Projectors

Introduction

There are many types of projectors designed to function in a variety of environments. To create an optimal image using these specialized projectors, you need to understand how to properly place them and adjust the image to enhance rather than distract from an event.

The following topics are presented in this section:

- Physically positioning a projector
- Electronically adjusting a projector's image
- Choosing a type of lens
- Setting up a projector
- Understanding advanced projection applications
- Setting up multiple projectors

Selecting Projection Equipment

how to select the appropriate projection equipment for an application.

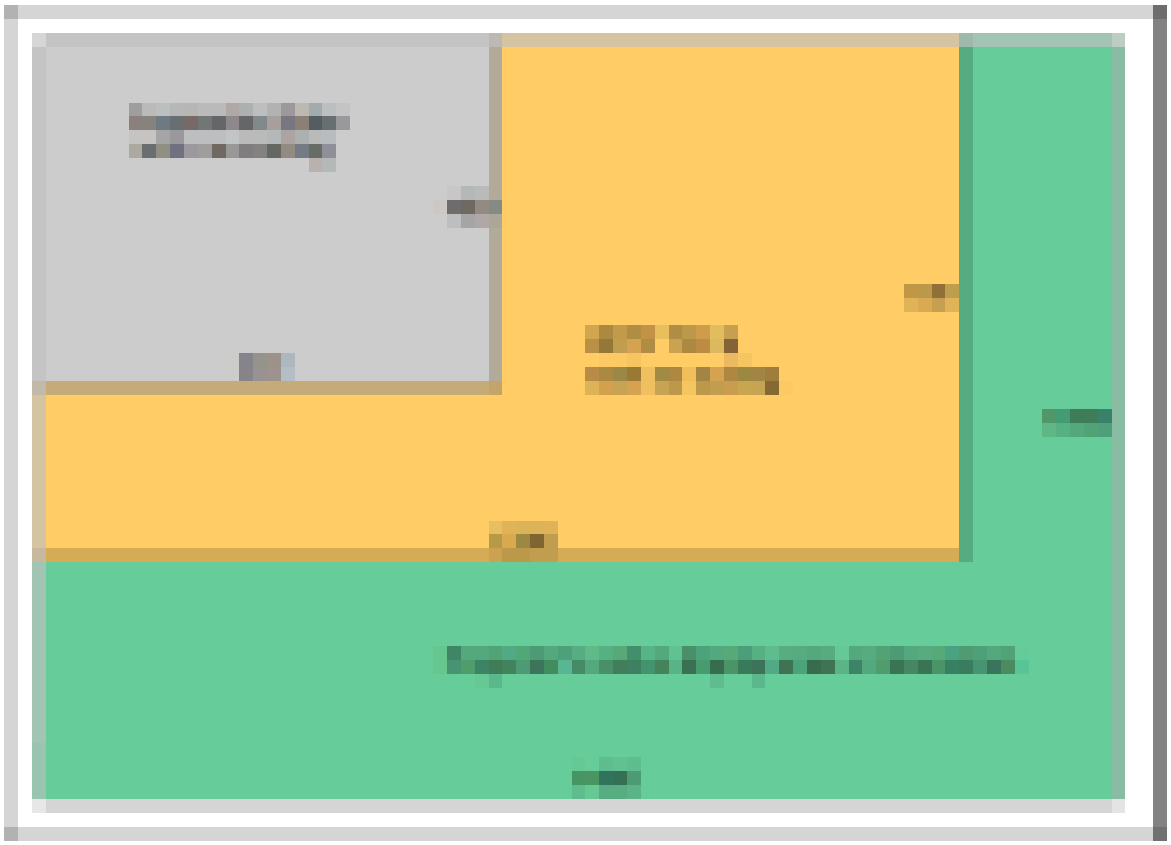
Selecting the appropriate projectors for an event is critical to its success. The projectors and display devices are usually among the most expensive components within the AV system and often must support a wide range of specifications and requirements.

Non-Projection Equipment – Many types of non-projection equipment, such as plasma and LED displays, can display a bright image even in rooms with high ambient light levels.

Resolution – Resolution measures the quality of a displayed image's detail. The higher the resolution, the more detailed the image. Select the projector with the same native resolution as that of the output display device, thus preventing the introduction of noise into your display and to avoid unnecessary processing.

In the example below, the native resolution is much larger than that of NTSC or HDTV 720. Without signal processing, the image may appear in a portion of the total image area. A signal processing device would adjust the signal from the input source so that it matches the native resolution of the projector.

There is an interesting phenomenon that happens when people compare images on a small display to images on a large projected display. The images appear to decrease in resolution the larger the image gets. This happens to occurs even when HD images are displayed. Of course the images are the same resolution as they are on smaller displays; it's just that each pixel gets larger and more apparent as the image gets larger.



Pricing – You must select the equipment that will meet the event convenor's needs while avoiding rental charges too high for their budget.

Projectors – Projectors can be a great source of revenue for the company if managed properly. The larger and brighter the projector, the more expensive the lamps tend to be. You must balance the cost of running the projector against your customer's needs.

Backups – Equipment failures do happen, and having a backup projector can save an event. When selecting a backup projector, choose a projector that meets or exceeds the specifications of the original projector. If your client has budget concerns, some people will accept a projector that has a lower resolution and less lumens as a back up projector.

Power requirements – Compare the power requirements of the entire setup to the over all quality and capacity of the venue's electrical system. Factors like lack of power, dirty power, old wiring, poor ground connections and international power requirements may influence your equipment choice.

> *Remember that all portable equipment and portable power chords used MUST have been tested to AS/NZS 3760 and display a tag declaring certification is current.*

Input signal types – There is a wide range of signals that can be produced by source devices, both digital and analogue. Note the types of signals that are going to run into the projector since not all projectors accept every input signal type. To help projectors adapt to the variety of signals used, manufacturers designed some projectors with cards that allow the user to change the types of signals it accepts. If the projector is not designed with cards, and doesn't accept the type of signal you are using, you may need to convert the signal.

Projector Placement

Name the four ways a projector can be oriented.

For a given screen size, the projector is designed to be placed in a specific spot. Precise projector placement is critical to the quality of the image.

There are several orientation settings for the projector. A projector can be placed in front of a screen or behind one; it may be set on a table, scaffolding, cart, or it could be on a mount in the ceiling area. Therefore, the four possibilities for orientation are:

- front-table
- front-ceiling
- rear-table
- rear-ceiling

On a typical projector this change of display configuration is done simply by a menu selection through the control panel on the projector.

Throw Distance

Describe how to reference a manufacturer's projector throw distance.

Throw distance is the physical length from the display surface to a reference point on the projector. There are numerous ways to determine the throw distance for a projector, and a desired image.

Examples of factors that may influence the throw distance of a projector are:

- lens specifications
- projector's resolution
- image size

Lens Ratios - In general, the lens ratio posted on the lens is multiplied by the screen width (SW) to achieve the projection distance (PD).

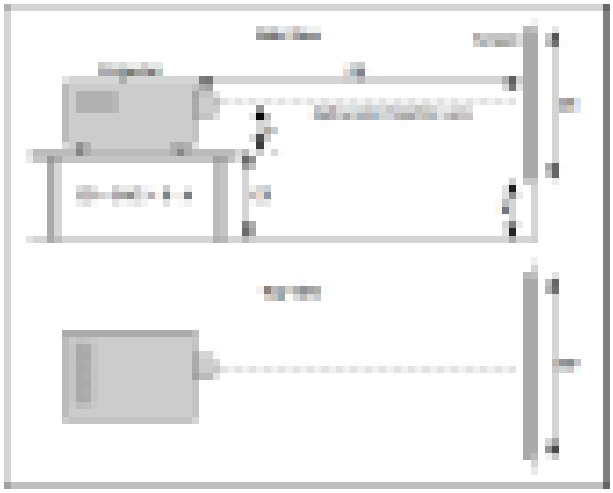
- PD= Lens Ratio x SW

For example, typically, a 10 ft (3.04 m) wide image will need a throw distance of about 12 ft (3.65 m). However, the ratio that is posted on the lens may vary when used on projectors with different sized optical chips.

Lens Through Ratio	Throw Distance Formula *(m) ±5%*	Diagonal Screen Size
0.8:1	0.79 x screen width (↔m) + 0.81	1.25-7.6 m
1.2:1	1.24 x screen width (↔m) + 0.82	1.25-9.15 m
1.5-2.2:1 zoom	Min: 1.52 x screen width (↔m) + 0.57 Max: 2.26 x screen width (↔m) + 0.44	1.25-12.2 m
2.2-4:1 zoom	Min: 2.23 x screen width (↔m) + 0.61 Max: 4.09 x screen width (↔m) + 0.36	1.25-12.2 m
2.5-4:1 zoom	Min: 2.44 x screen width (↔m) + 0.90 Max: 3.92 x screen width (↔m) + 0.72	1.25-12.2 m
4-7:1 zoom	Min: 4.03 x screen width (↔m) + 0.57 Max: 7.13 x screen width (↔m) + 0.27	2.5-12.2 m
4-7: zoom	Min: 3.93 x screen width (↔m) + 0.66 Max: 6.85 x screen width (↔m) + 0.51	3-12.2 m

Often the projector manufacturer will also provide a software solution or online calculator on their website. To use this calculator, simply plug the desired image size into the appropriate lens and projector combination and the software will give the throw distance result. The throw distance calculator on most manufacturers' websites will assume that the projector uses a standard lens. Most large venue projectors use various lenses. If you are not using a standard lens, the manual will instruct you to measure from a point on the front of the projector's body to the projection surface.

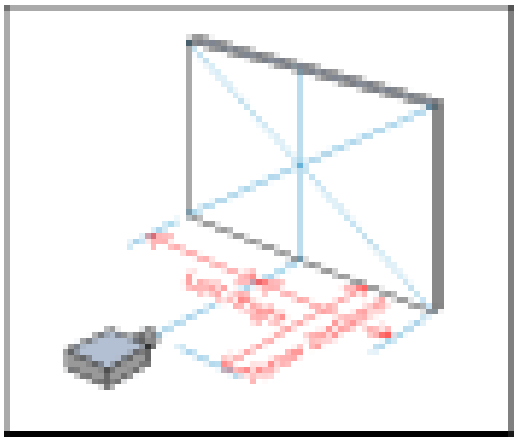
For example:



Don't rely exclusively on determining the throw distance based on lens size. Your 0.8 lens may throw a certain distance on a standard projector but if you put it on a high resolution projector (or a projector with a larger imaging chip) it is converted to a 0.7 lens.

Centring the Projected Image

State the best reference for projector placement, and general guidelines that help in this task.

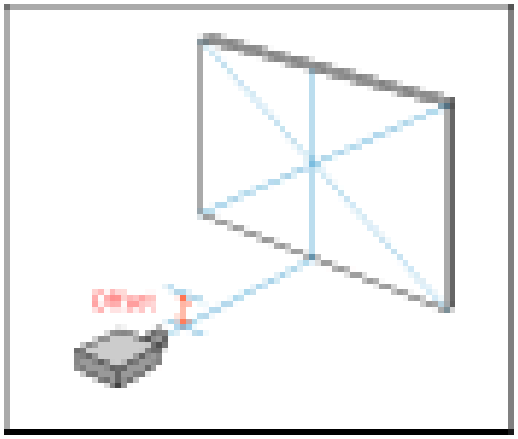


The location of the projector to the left or to the right of the projected image centre is also critical. The optical centre of a projector will vary based on its design. Some projectors are designed for table use and others are designed to be flown via rigging. The projector's internal optics will also affect the aspect ratio of the image. The best way to find your projector's optical centre is to consult the manual.

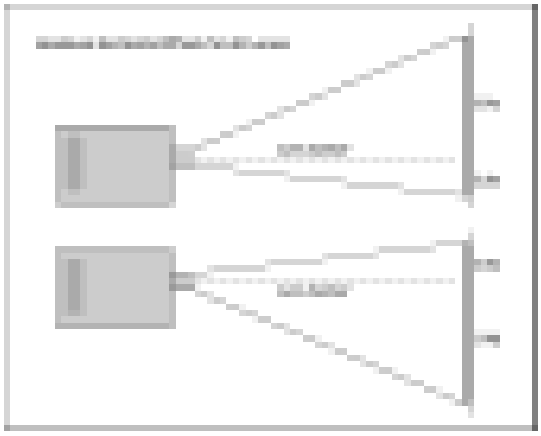
Projector Offset

Define projector offset.

Along with the minimum and maximum throw distance for a given projector/lens combination, there is a third dimension with which to work - the offset. The offset indicates the orientation of the projector on the vertical axis. If the projector is on a cart and the displacement of the projector from the screen is three meters, where does the projector go in the vertical plane? When placed on a cart, your reference point is typically the bottom centre point of the projected image area. In other words, the reference point is at the bottom of the screen but equal distance from the left and right (centred). The offset value tells you how high or low the projector should be moved in reference to this point on the projection screen.



Typically projectors don't have a horizontal offset, meaning the centre of the lens is oriented at the bottom of the screen, and an equal distance from the left and right. Some projectors do have a horizontal offset, which means the centre of the projector's lens should not be oriented an equal distance from the left and right of the screen. The offset allows the centre of the lens to be pointed slightly left or right of the screen centre. Read the projector's manual to discover where projector's offset should be.



AV professional projection systems will display an image that fills the screen to the borders. This is an industry **best practice**.

The projector needs to be located at the correct point in reference to three axes (left/right, distance from screen, and offset) or the result will be an image that does not appear square on the screen.

Image Correction

Summarize how to use three types of image correction.

If the projector is not properly placed, the result will be an improperly shaped projection image. Always attempt to physically position the projector correctly before you use electronic image correction. It is not the ideal solution; it can cause image problems and add noise to the image.

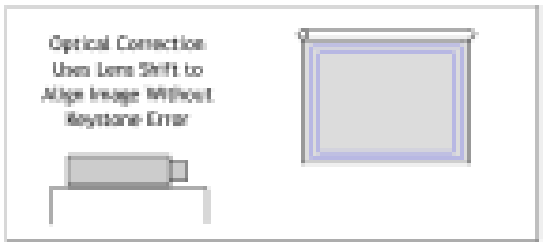
It is a best practice to reset the projector's display to the factory defaults before attempting to adjust the image electronically.

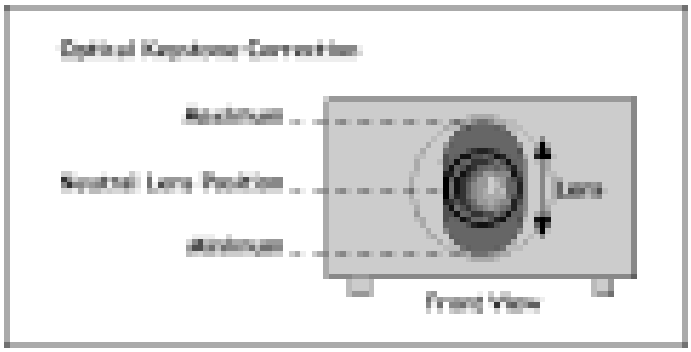
Overshooting is a practice that is used when an image has a slight keystone. The image is increased until the edge bleeds into the masking around the screen. This is not a recommended practice if the keystone is too severe you will lose parts of the image, the bleed into the masking may be noticed by the audience, and the entire image will be distorted. Take the time to properly orient the projector to the screen to avoid potential problems this shortcut can cause.

The two main types of electronic image correction are:

- Optical keystone correction
- Electronic vertical and horizontal keystone correction

Optical keystone correction, also referred to as lens shift, is preferred over electronic keystone correction. Some projectors can electronically shift the optics vertically, while a few others have vertical and horizontal shifts. The lens shift function is more expensive to manufacture and therefore will be found on higher-end projectors. This optical form of keystone correction allows you to move the image to correct for a misplacement of the projector. Only use this adjustment if it's impossible to position the projector correctly.





Electronic keystone correction attempts to square the horizontal edges of the displayed image by compressing and converting the image or removing offending edge pixels. Depending upon the critical nature of the displayed image, electronic keystone correction may not be an acceptable solution. When electronic keystone correction is used, the projector must eliminate some pixels from the display. If a detailed drawing is displayed, it is possible that critical detail will be lost as the electronic circuit in the projector attempts to correct for the projector's improper placement.

Electronic skew correction or vertical keystone correction is similar to the electronic keystone correction, except it eliminates pixels from the vertical edges of the image. Again this electronic skew correction should only be used as a last resort because it adds noise to the image.

Many projectors have memory chips that allow you to save electronic image adjustments. It is a **best practice** to save any electronic adjustments you have made if your projector is designed for this function. This will allow you to restore the settings if the projector loses power or gets turned off.

Configuring a Projected Image

Describe the procedure for using test patterns to configure the projected image.

Adjusting a projector's image can be far more complex than simply learning about the image adjustment menu on a projector.

You must think about where the signal can be adjusted within the entire system. Complex systems will require signal processing - devices that scale, route, mix, and switch a signal. These signal processors can be integrated into one package or come as separate units. All of them are capable of adjusting the signal sent to the display devices. When making image adjustments, these processors should be adjusted before the display devices.

The image should always be adjusted using the signal processors that you plan to use during the event. Some signal processors will have the capability of generating test patterns internally. Other times you may be required to plug a signal generator into the projector to produce the image needed for adjustments.

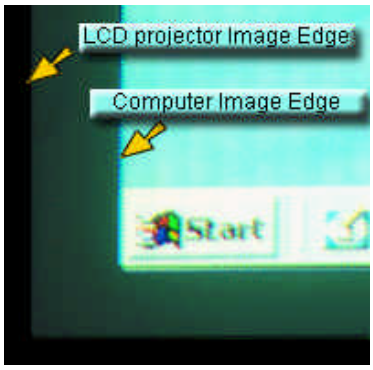
Some projectors provide a one-touch button that automatically sets up the image on the screen. Although this button may work well for the end-user, is not intended to be used for the final setup by an AV professional. These one-touch buttons are not infallible. The professional AV technician will not rely on this automatic alignment, but rather manually adjust the projector to the source.

When configuring a rear screen projector, it is a **best practice** to turn the lights out on both sides of the screen as to see the best possible image.

(For this hypothesis, assume that there is no keystone error and no keystone correction has been employed.)

While each projector has its own unique setup, here are some generic adjustments:

Picture Adjustment



This is a photograph of an image that needs the horizontal and vertical position adjusted.

The horizontal and vertical position adjustment:

- Sets the position of the display on the face of the LCD or DLP.
- When adjusting the horizontal and vertical position, use the test pattern that has lines around image with one vertical and one horizontal line in the middle.
- Adjust the image until all the lines around the image are visible.

The picture size adjustment:

- Increases or decreases the physical size of the display on the face of the imaging device (for example, LCD chip, DLP chip or plasma).
- When adjusting the picture size, use the test pattern that has lines around the image, with one vertical and one horizontal line in the middle.
- Adjust the image until all the lines around the image are visible.

Clock

This is a photograph of an image that needs the clock control adjusted.

The clock control:

- Is categorized as a timing control; it's also known as sizing or horizontal size control. The clock control defines the active pixel count for the display.
- Can interact with the image size controls. As a result, after adjusting one, you most likely will need to re-adjust the other.
- When adjusting, use the pixel-on pixel-off pattern. (Some techs prefer to use the extreme border pixel pattern.)
- Adjust until the moiré pattern (large vertical bands of black and white) is gone. Note the noise in the image will be evident across the entire screen. If the noise is only at one side, adjust slightly.

Phase

This is a photograph of an image that needs the phase control adjusted. Note the horizontal lines in the background of the image.

The phase control

- Phase control is also categorized as a timing control. Many projectors and display devices identify "phase" by other names. It is also called fine sync control, chroma phase, fine tracking, dot phase, or dot clock. The phase control sets where the picture actually starts to display. When misadjusted, vertical noise bars will appear on displays with fine detail.
- Set the pattern generator to the pixel-on pixel-off pattern, which looks like alternating vehicle lines.
- Adjust the phase setting until the fine lines of the pattern generator's image are visible and the image is bright and white.

Image Geometry

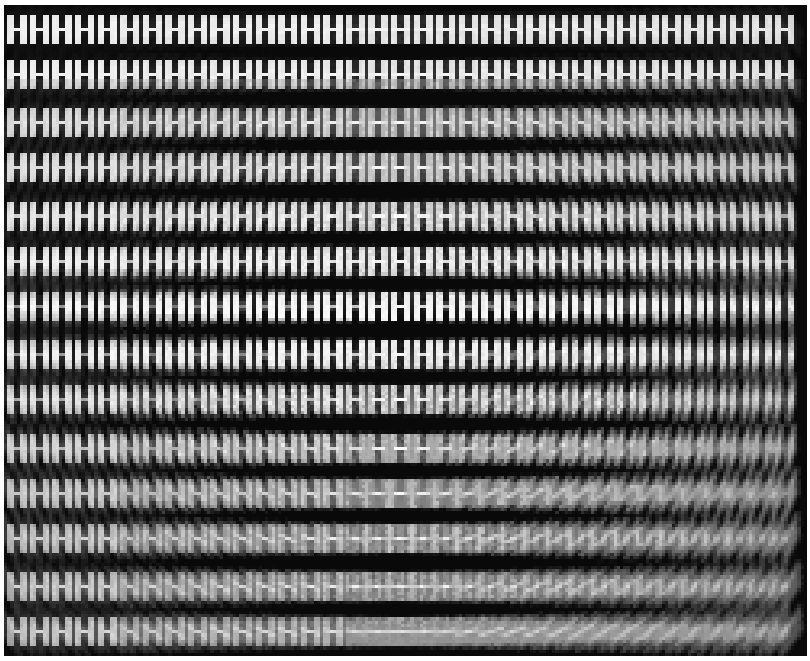
Describe the steps involved in checking the projector's geometry using a signal generator.

Many projectors come with internal images that allow you to display test images without the use of a signal generator.

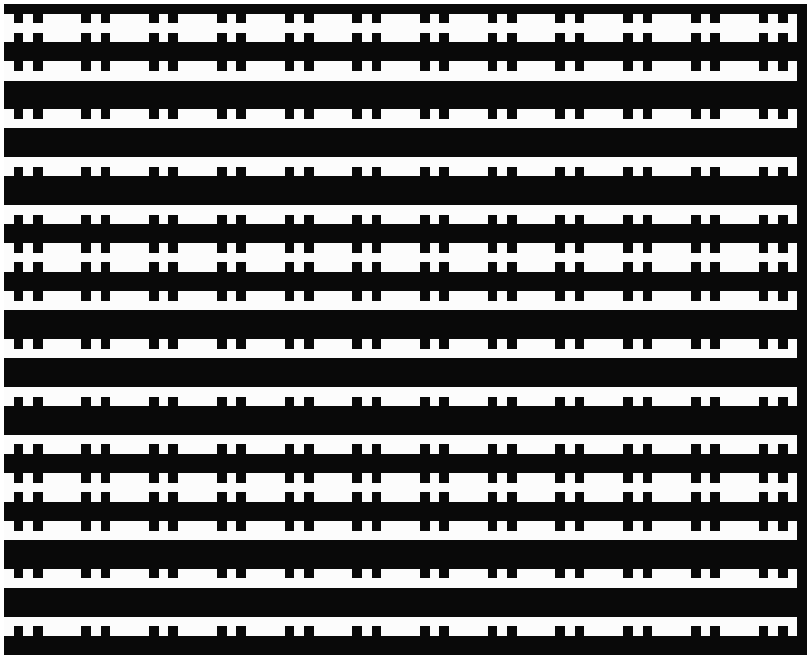
Internal imaging works well for setting projection alignment but does not inform the operator of problems existing in the feed. When adjusting the projector's image, try to use the signal generators as far back in the signal chain as possible. This way you are testing all of the possible systems that will process or carry the image.

To verify that the projector is square to the screen, check its geometry:

1. Calculate projector location according to manufacturer's manual. Determine optimal throw distance by averaging the minimum and maximum throw distance.
2. Determine the vertical position of the projector in relationship to the screen, and whether vertical offset is required for that lens.
3. Position projector at correct throw distance and vertical location and turn it on.
4. In the projector menu, find and turn off the KEYSTONE correction or set it so there is no active correction.
5. Connect a test pattern generator to the projector.



Malformed H pattern



Properly formed H pattern

6. Using an "H" pattern on a test pattern generator, zoom and focus the projector on the projection screen until it is square and filled. When the edges of the image are in focus and none of the letters are malformed, the projector is square on the screen. Remember that the physical position of the projector may not be the only cause of the poor image.

Adjusting Projected Image Colour

Summarize the procedure for adjusting a projected image.

Projectors need to be properly configured for video signals so that all of the signal information may be properly viewed. The adjustments that should be made include the brightness, contrast, and colour balance. This procedure is only for projectors, not monitors. Perform this process during multiple projector applications.

Connect all the signal processors you plan to use during the show to the projector before making any adjustments. If the signal processor doesn't have a built-in signal generator, connect an external signal generator to the input of the signal processor. This way you can adjust the display devices to the same type of signal you will be viewing during the show.

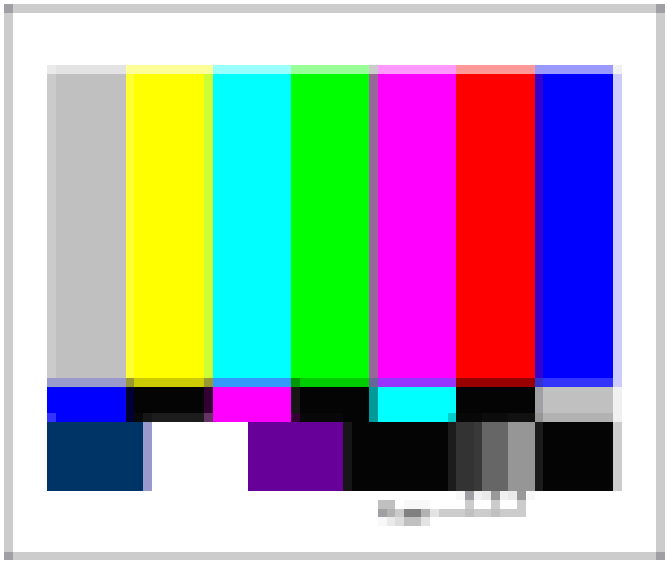
Turn on the projector to allow the lamp to warm up. Typically this takes 10~15 minutes for used projectors and up to 60 minutes for new ones.

Depending on the manufacturer, each projector's menu options are different. Even the way you change the colour settings differ, some must be done directly on the projector and others can be changed remotely by a computer. Familiarize yourself with the functions of the menus, and the options you can manipulate.

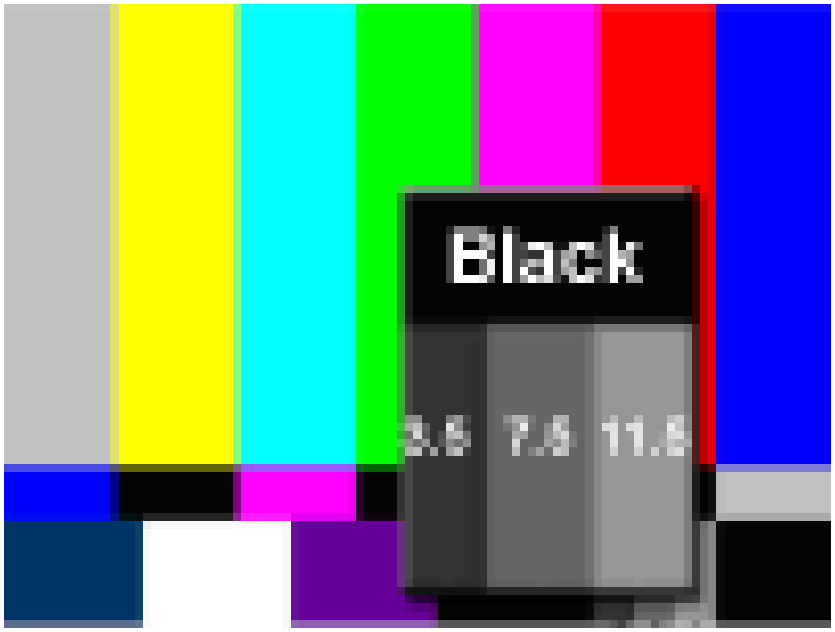
Adjusting Brightness and Contrast:

Using the PLUGE Pattern:

(The PLUGE pattern is recommended for setting the grey scale settings of analogue projectors, and the ANSI lumens method should be used for digital projectors.)



1. Use a test generator to feed an SMPTE colour bar pattern to the projector.
2. To set the **black** level, adjust the brightness control until the 3.5 and 7.5 bars are indistinguishable from one another. You should only see a division between 7.5 and 11.5. (7.5 is as dark as our picture is supposed to show.)



3. Set the **white** level by watching the white bar (100 units) as you turn the contrast control to maximum. Adjust the contrast control down until the white bar begins to respond. The projector will now show a proper greyscale.

Tech Notes:
"At the high end of the greyscale (100 percent white), the brightness adjustment should be set so that each grey rectangle on the right side of the PLUGE pattern is about half the brightness of the bar just above it. If the brightness control is set too high, the background black level will appear as a dark grey. If contrast is set too high, the top two steps on the right- side bar will blend together into a larger white rectangle. These incorrect adjustments also compress the visible greyscale and reduce image contrast.

With most projectors, it's difficult to show distinct steps among the black bar segments. Calibrate the projector for distinct separation between the high luminance steps first, and then make small adjustments to the projector's brightness control to achieve separation in the black bars. When in doubt, choose the brightness setting that holds the darkest background on the PLUGE test pattern, usually referred to as "projector black."

Also, choose the brightness setting that holds the darkest background on the PLUGE test pattern, usually referred to as "projector black" (Putman, 2006).

Adjusting Gray Scale on Video graphics Display Monitors

Adjusting brightness and contrast on a computer-graphics monitor or presentation monitor is slightly different than adjusting it on "video" monitors. This is partly because the PAL, NTSC, and SECAM monitors incorporate "decoder" circuitry that establishes the relationships of colours and their relative brightness. Graphics, or presentation, monitors are referred to as "RGB" displays although we may also connect to them with component video, DVI, or HDMI connectors.

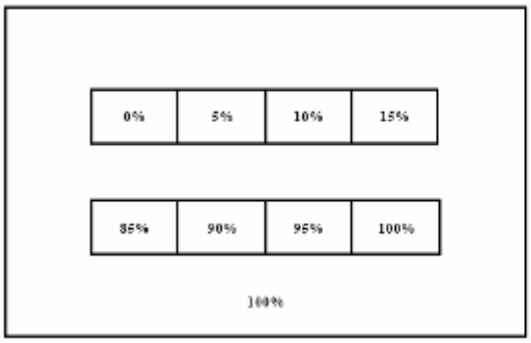
There are two ways of adjusting brightness and contrast, depending on what equipment is available: 1) "by eye", and 2) using a measuring device. .

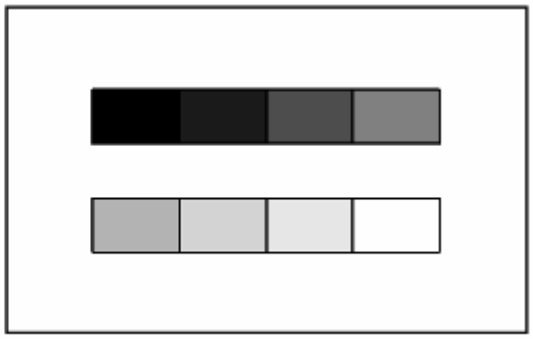
- "By eye" refers to adjustments that do not utilize a measurement instrument: we look directly at the image and judge its parameters.
- Measurement equipment for brightness and contrast uses a device that is placed in front of the image. This is calibrated to a reference scale, and allows the technician to "balance" the colours, which also balances brightness and contrast. The proper use of these devices varies with each manufacturer. This is the correct technique to use when balancing multiple monitors, such as with a video wall or with "edge blending." Refer to the measurement equipment operations manual for details.

We will concentrate on the first method here, as it is possible to execute without equipment, making it very convenient.

Adjustment of brightness and grey scale is an "iterative" process. This means that you will first adjust the brightness, then the contrast, then go back and check the brightness again. This is because the two are inter-related. We use the ANSI grey scale method, when inspecting the grey scale of a projector.

The test pattern looks similar to this: yours may have more gradations between the different greys:





1. The projector or display should be on until the lamp is warm and the brightness has stabilized. The manufacturer will specify the amount of time your projector must warm up.
2. Connect a pattern generator to the monitor or projector. This may be a stand-alone device or it may be a computer with the ANSI test pattern output. The signal sent to the projector or display from the generator device should match the native resolution of the device.
3. Darken the room as much as possible.
4. Input an all-black test screen. Set the contrast of the display or projector to the 50% point.
5. Turn down the brightness of the display or projector all the way.
6. Gradually turn up the brightness until the black display just becomes brighter, and then turn it back down to just below this point.
7. Input the ANSI grey scale test pattern to the display or projector.
8. Use the contrast control to adjust the grey levels to their 'clipping' point (i.e., the point at which the greys and their gradations are even, and easily distinguishable from one another). If the contrast is set too high, you will see the white steps blend together into one long band on the bottom bar.
9. Looking at the black square of the pattern, adjust the display or projector brightness back to the 'clipping' point (i.e., the point before which the black square begins to lighten as before).
10. You may need to repeat both steps a couple of times before you are happy with the result.

In the tests we carried them out as a committee, we agreed that when adjusted in this way, all sources we then displayed looked acceptable (computer, video, photos etc). Try it yourself and see what you think.

Remember that the grey scale will appear differently at different levels of ambient light – especially with front projection.

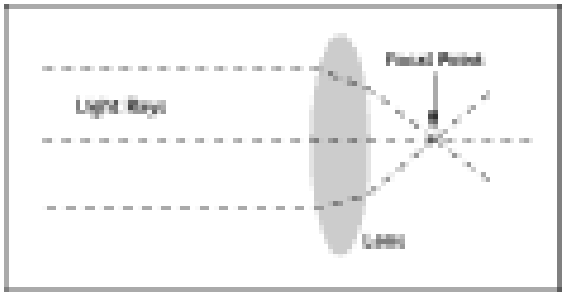
Note: Digital TV signals typically don't have a hue adjustment because they are transmitted as component video. These signals do allow you to colour saturation – but, assuming the material was encoded correctly, there should be no need to set the hue adjustment, unless the actual display has problems converting from digital back to analogue.

Types of Projection Lenses

Identify the types of projection lenses and their uses.

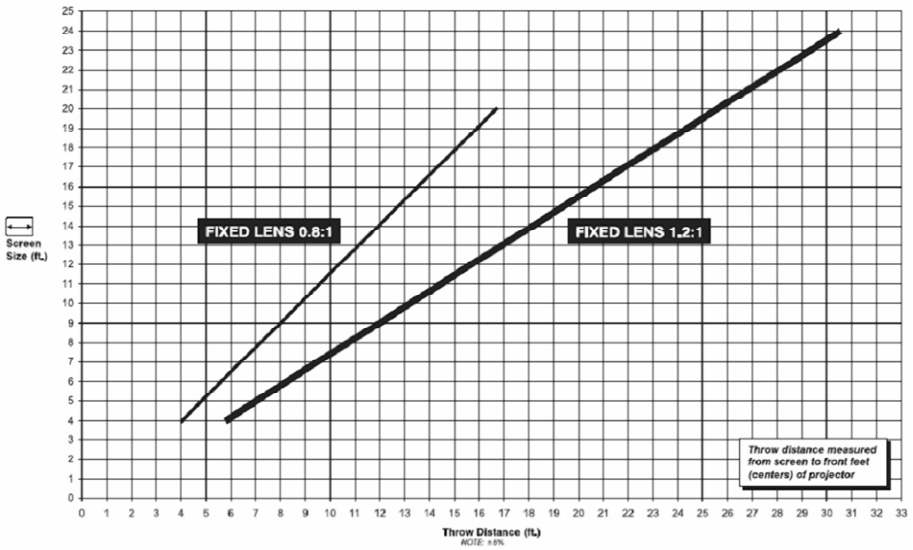
There are many types of projection lenses. Some are standard lenses and others are made to project an image from unusual throw distances. Lenses are tools that can help you display an ideal image in less than ideal situations.

Like a camera lens projector, lenses are categorized by their focal length or throw distance. This is the distance between the lens and the focal point. The higher the focal length, the greater the distance is between the screen and projector.



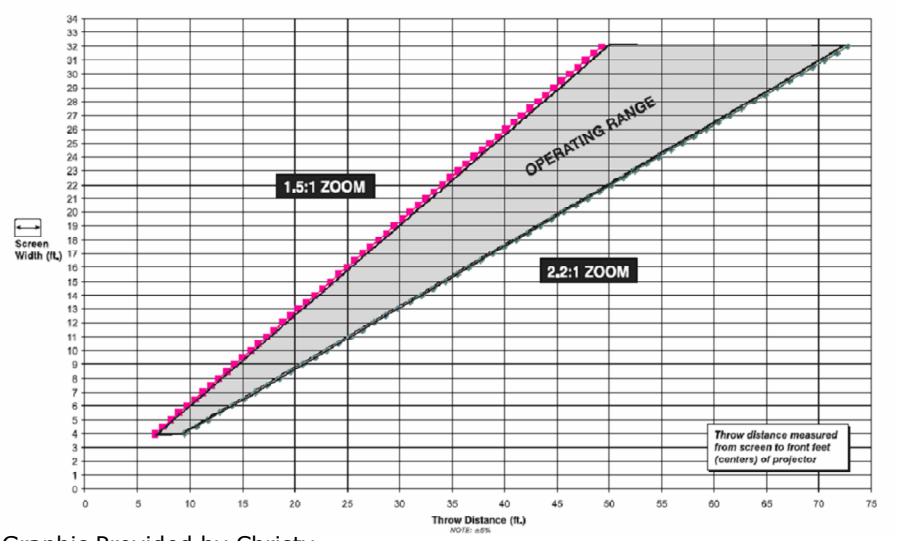
Fixed Lens – is a lens with a predetermined fixed focal length without a zoom function. There are long and short throw lenses that are fixed. You must place the projector according to the throw distance specified by the manufacturer, or the image will not focus or fill the screen.

Below is an example of a throw distance chart. This chart displays the specifications of two different lenses. In this example if you are using a 4.3m screen and a 0.8:1 lens you must place the projector 3.66 m from the screen. You cannot place it 5.5 m away because the image may not fit or may be blurry.



Graphic Provided by Christie Digital

Zoom Lens – A zoom lens will allow you to place a projector between a minimum and maximum distance and project an image that is in focus and fills the screen. Zoom lenses employ several lenses to achieve this operating range. This capability comes at a price. Zoom lenses are expensive and heavy. Avoid using a zoom lens if the room can be rearranged, allowing use of a less expensive lens type.



Graphic Provided by Christy

Wide Angle or Short Throw (Short Focal Length Lenses) – -If the room's space is limited, consider using a short throw lens. Short throw lenses are designed to allow an image to fill a screen from a very short distance. There are a few draw backs that should be considered before using a short throw lens. They have poor uniformity then standard lenses, and often create hot spots when used with rear projectors.

Long Throw (Long Focal Length Lenses) – If the distance between the screen and the projector is very large, consider using a long throw lens. Quality long throw lenses do not cause the image problems that short throw lenses tend to cause. Place the projector on a stable mount where it won't be bumped or vibrated by the building's HVAC system. The further away the projector, the more visible the projector movements are.

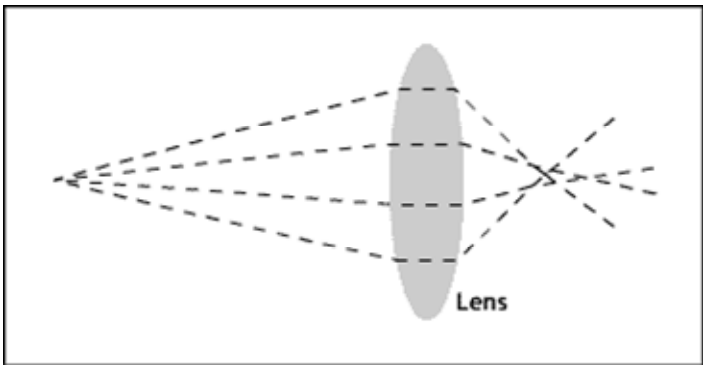
Contrast Ratio – Lenses can degrade the contrast ratio of an image. This degradation is increased when short or long throw lenses are used. To combat this effect consider using projectors with more ANSI lumen output and higher contrast ratios.

High Contrast – High contrast lenses are typically used when displaying HD video images. The darker darks and lighter lights give the image a more variant appearance. Some high contrast projectors utilize an iris to control the projector's contrast.

Optical Effects

Describe optical effects of lens shift.

The lens shift function can be used to compensate for an image that cannot be placed square on the screen; however this may decrease the quality of the image. The quality is compromised when the lens is moved relative to the internal optics of the projector, causing a misalignment of the lens to the projector optics. The further the lens is shifted, the more out of ideal alignment the optics become.

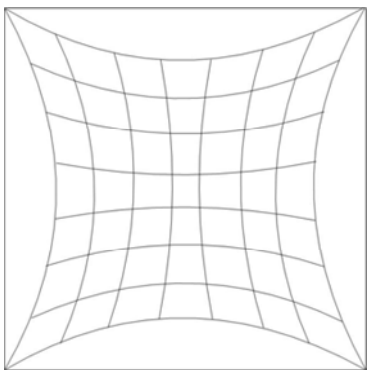


If the projector's image appears to be out of focus in some areas but in focus in others, and you are using the lens shift function, your image may be poor due to spherical aberration. To improve the image put the lens back in the neutral position so that it's lined up with the optics. Move the projector so that it's square to the screen and see if the image improves.

Curvature of Field

Lens shift also may cause curvature of field, which makes the image appear to be out of focus in the centre or exterior of the image. This can be caused by a malfunctioning lens, or it can be caused by the lens shift function. To improve the image put the lens back in the neutral position and reposition the projector to the screen.

Pin Cushioning



Lens shift may cause a pin cushioning effect, which the image appears to be concave around the edges. Of course, pin cushioning doesn't always appear equal on all sides of the image. If it is combined with a keystone effect, the image may be pin cushioned on only one side. The best solution these optical effects is to properly orient the projector to the screen.

An example of a pin cushioned image

Light Drop Off

An improperly installed lens or improperly aligned optics may cause the image to become dim in the corners, known as light drop off. When using DLP projectors, this may be caused by a misaligned Integrator Rod , a possible cold mirror condition, or alignment.

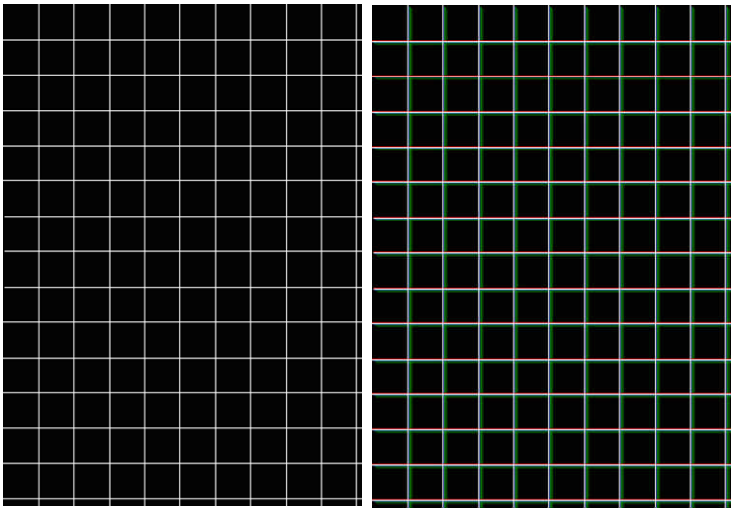
An example of light drop off

Compromised Focus

In the image above you can see that the center of the image is in focus while the sides and corners are fuzzy. A damaged or improperly installed lens may cause the corners of the image to appear fuzzy.

An example of an image with compromised focus

Poor Convergence



good convergence poor convergence

The focus of an image may be compromised due to the alignment of the internal optics of a projector. This can be caused by improper installation of the lens or poor convergence of the internal optics of the projector. When the image is poorly converged a red, green, and/or, blue colour will appear to bleed. The image shows a white test grid displayed by a projector. The projector on the left displays solid white lines, which shows its optics, are in good alignment. The projector on the right displays white lines in addition to fuzzy green, red, and blue lines bleeding off of the white lines. This indicates that the projector is not properly converged.

Causes of compromised focus due to internal optics are:

- Misalignment of the lens due to damage or improper installation.
- Misalignment of the optical cube due to damage.
- The panels of an LCD projector becoming misaligned due to damage.

Dirty Optics

Example of Dirty Optics

The internal optics of projectors can become dirty. To help keep the optics free of dirt, clean the projector's filters on a regular basis and operate them in clean environments. Depending upon the type of projector, several surfaces can collect dust and distort the image.

To look for dirty optics, use a signal generator, and project a white image onto a projection screen. You may see dust, speckles, and haze as you see in the image above. Adjust the focus of the projector until you can focus on some of the dust particles. The more you have to turn the focus knob the further back the dust is in the optics. Dust can collect on any flat surface in the projector such as the LCD plates, the mirrors, the lens, and the prism. Cleaning the exterior of the lens is often not enough to get rid of the spots in the image. Read the projector's manual before attempting to clean the internal optics of a projector.

Any of these optical effects can be displayed in combination with other image effects to make the diagnosis of the problem challenging. Many of these distortions can be avoided by keeping the equipment in good repair, and properly installing the projector's components.

Setting up Projectors

how to properly set up a projector.

You now know that setting up a projector properly requires more than simply pointing it at a wall and plugging it in. The procedures you follow to set up a projector will vary depending on the type of signal, type of projector, type of screen, size of the audience, and environment. Despite the wide range of variables there are some basics steps that you can follow when setting up a projector.

1. The live events industry will place projectors in a variety of places on a variety of structures. Check with your supervisor for specific installation instructions.
   ***Safety Note**: Check the load rating on carts, tables, scaffold, and hanging points. Utilize a qualified rigger whenever anything hangs overhead. Never choose an unsteady or compromised structure*.
2. Verify that there is adequate space around where the projector will need to be placed. This space should allow for the projector to have good air flow. Areas around the projector should have good ventilation and not trap heat. High ceiling and enclosures with little ventilation can cause a projector to overhead. If a projector overheats, it will automatically shut down until it cools off.
3. Construct the structure that the projector will be placed on or mounted/affixed to.
4. Verify that you have run all necessary cables to the projector's location (perhaps RGBHV, Y/C, control, or CAT 5, 5e, or 6).
5. Check for necessary power. Check the power with a meter, make sure there is enough power for your use, and that it is clean.
6. Verify that the structure can support the projector's weight.
7. If you are using a mount for the projector, keep in mind that each model projector requires a specific mounting bracket. This bracket system allows the bracket to be secured to the mounting surface and the projector subsequently hung from the bracket. Tilt adjustments are available on most brackets, and pan adjustments are available only on a few. Follow manufacturer instructions, and remember that safety comes first. Always connect the proper safety cables to the projector and check the rigging for any possible safety problems.
8. Connect the cables and turn on the projector. Let the projector's lamp warm up; this will allow you to calibrate the projector if needed. Projector calibration will be covered in more detail in this course.
9. Send a signal to the projector.
10. Place the projector at its optimal throw distance for the projector. If the projector has a zoom lens, place it in the middle of the zoom lens's range, leaving room to adjust the image's size.
11. Adjust the zoom lens so that the image fills the screen, but does not bleed over the edges of the screen.
12. Use the legs and feet of the projector to square the image to the screen. If the legs on the projector are not long enough to make the proper adjustments, check the structure and the screen to confirm that they are level.
13. If necessary, use the electronic image adjustments in the projector's menu to fine tune the image so it is perfectly square on the screen.
14. Test the controls for the projector.

15. Get close to the screen and check for pixel definition and image problems. Make the necessary adjustments to the image. Walk into the audience area see if the image appears to be focused and square from the audience's point of view.

Knowing how to properly configure a projector's image will help you when you begin setting up multiple projectors in the same space.

Remember that all portable equipment and portable power chords used MUST have been tested to AS/NZS 3760 and display a tag declaring certification is current.

Advanced Projection Applications

Demonstrate knowledge of advanced projection applications

Edge Blending

Edge blending is used when creating images wider or taller than standard projector formats. For instance, a 3:1 wide image might be created by overlapping the images and blending the overlapping areas of three 4:3 ratio projectors. Edge blending can be used to display information or part of the scenery. When the process is complete, the image should look seamless, as if it weren't comprised of several projector images. It is a complex process that requires experience to master. Edge blending is also referred to as optical blending.

Types of edge blending include:

- optical external
- optical internal
- electronic external
- electronic internal

Optical Blending or Edge Blending

- Use identical models of projectors.
- All the lamps in the projectors should have the same hours.
- All the image settings in the projectors should be reset, or set to the same specifications before attempting to optically blend (edge blend) the images.
- The projectors should be mounted on the same mounting truss, rigging point(s), or on the same surface, which will prevent the projectors from individually moving and becoming misaligned.
- Use low gain screens to prevent hot spotting and image overlap bands, which are very apparent on high gain screens (Wagnar, 2004).
- To align the images, use an external signal processing device or the projector's signal processor to feather the edges of the images giving you a blend region. This automatically adjusts the contrast in the area where the images overlap.
- Use graphic switchers and faders to manage the task of delivering the proper signal to the proper projector. If you are planning on importing live video, make sure the signal processors are capable of handling video.

- Many mounts are designed for edge blending applications. The mounts have fine adjustments allowing you to position each projector precisely with a turn of a knob.

Blending Procedure

1. Begin with the central projector. Depending on how many projectors are in use, choose the most central projector possible. Orient the projector on all four axis points and don't forget to compensate for the offset.
2. Each projector's image should be a fraction of the total image area. The amount of image area that is covered by each projector will vary depending on the amount of projectors and the image design.
3. Make all the necessary image adjustments such as colour, brightness, and contrast.
4. Once the central projector's image is adjusted properly, move to the projector adjacent to the central projector.
5. Orient the second projector to the screen, and then position its image next to the central projector's image.
6. Move the projector until you can't see any banding between the images. Dark bands between the images indicate that the images are too far apart and bright bands indicate that the images are too close together. Move each projector accordingly until all bands are gone.
7. Adjust the second image until it is consistent with the central image's colour, brightness, and contrast. The images must have consistent colour, size, brightness and contrast to create the illusion of a single large image.
8. Move on to the next projector and repeat the process.

The setup should minimize or prevent any image:

- Banding
- Mixed white/black levels
- Projector/lens raster spill
- Haloing (Wagner, 2004)

When complete, the entire image should be centred on the screen with no light spillage. The image should appear seamless with no visible bars or bands in the image. All the images that comprise the entire image should be the same contrast, brightness, tone, and hue. When all the elements of the image are adjusted properly, the viewer should believe that one single projector is creating the entire image.

Convergence and Dual Convergence

Convergence refers to the alignment or act of aligning the red, green, and blue internal optics of a projector, or the guns on a CRT display. When projectors are no longer in convergence, their images can appear to have impaired focus.

Dual convergence is the method of superimposing the images from many projectors to make a single composite image. Specially designed projector mounts allow projectors to be stacked and properly positioned. Adjust the image using the lens shift function, the mount's pan, and tilt adjustments. Each image should be projected pixel per pixel over the original image to produce a clear image. This is done to increase the brightness of the projector and it creates a redundant backup projector.

Multiple Screen and Projector Applications

Any time you are using multiple images in the same space, you must be aware of how all the images appear when they are compared to each other. The images must have consistent colour, size, brightness and contrast to appear uniform. Even if the images are not blended or projected next to each other, they must be consistent for a professional appearance.

For consistent images in an event space you should:

- Use the same make and model of projector.
- Use lamps with the same hours.
- Orient the images to the screen properly.
- Configure the image settings so that they are the exact same brightness, contrast, and hue. This requires more than simply setting all the projectors and signal processors to the same settings. They must appear the same from the audience's point of view during the event. This may require adjustments once the projectors are projecting the images on the surfaces that they will project on during the event.
- Pay attention to your signal types and make sure you are using signal processors to send the same signal to all the projectors.
- The projection surfaces you are using should be made of the same material.
- The projection surfaces should have the same ambient light levels on them.
- Familiarize yourself with the projector's display function menu. Many projectors offer a variety of settings and methods of inputting those settings.

Inserts
In some applications, a second projector is used inside a window or frame created by the first projector. This gives the appearance of an image within an image. The two images can be any size and positioned anywhere on the viewing surface, to create a variety of creative visual effects. This effect can be created with video mixing equipment.

Projecting on Irregular Surfaces
Images can be projected on irregular surfaces to create visual effect. This is often done to intentionally distortion of the image for a visual effect. If the client wishes to project on an irregular surface without image distortion, processing devices can correct the image.

Processing Devices

There are a wide variety of system components that can be used in an AV system. Each component is selected for the system based on its functionality and its ability to produce the type of display that the event requires. Below is an example of an AV system with several input devices, signal possessors, and output devices.

To select the proper components of an AV system you should:
1. Select the type and size of display based on the requirements of the event.
2. Select the input devices based on the requirements of the event.
3. Select an image processing device(s) that meets the requirements of the input devices and the display devices.

Of Interest
When switching between sources, use a signal processing system that sends a stable signal. It should not introduce "glitches" or noise into the system, even when switching between input sources. In a broadcast application, every device (from the cameras to the recorders) should be genlocked. A single device provides the timing for the whole system so that all components have a single timing reference.

To select a signal processing device you should know:
- The number and type of inputs it can process,
- The resolution(s) it can input, process, and output;
- The types of signals it can process;
- The types of switching effects it can produce; and
- It's ability to switch inputs without introducing noise into the signal.

Once you have selected the signal processing devices you should:

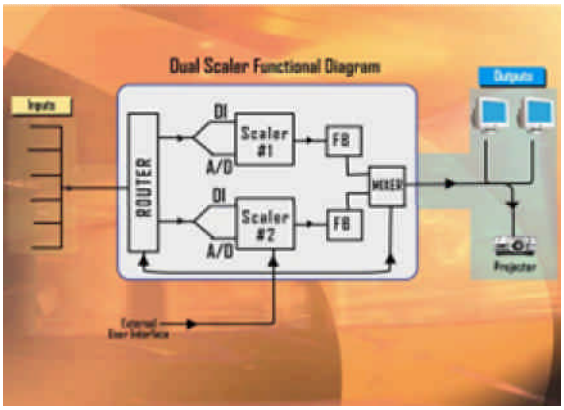
- Determine the switching resolution required for the event.
- Assess capability of the display devices to handle input source(s).
- Adjust projector components to work with source(s).
- Scale image(s).
- Convert signal(s).
- Make the necessary adjustments to the image(s).

Here is an example of selecting an image processing device for an AV system:

This event has six input devices, three computers, and three video cameras. Three outputs will be required, which are two monitors and a projector. The screen size has been determined based on the audience size and the projector has been selected based on its ability to display the input devices and fill the screen.

You select a seamless switcher with these capabilities:

- Switching signal from six inputs.
- Routing the selected video signals to the scalar.
- Scaling an image which uses a set of circuits that converts an input signal to the desired output signal's resolution.
- Mixing input signals by using a circuit to perform effects and transitions without introducing noise into the signal.
- The output of the switcher is the native resolution of the display device.



Control Systems

There are many methods of controlling and AV system. Your choice of control system should be based on the type of equipment the event requires and who needs to control the equipment.

AV equipment is designed to accept many different types of control signals from many different types of connectors. Some equipment can only be powered on and off, and others require a user interface to process the complex control signals. Familiarize yourself with the equipment and its capabilities before an event.

Depending on the size and complexity of the event, the number of operators

may be limited to a few if any. Small events with a single display may allow a presenter to advance PowerPoint® slides using a remote. Larger events may have people switching video, recording video, and routing video to many different displays. They will need to control every aspect of the display sources and signal processing.

Common Types of Control Devices:

- mouse
- IR remote
- RF remote
- RS 232/422
- networked
- proprietary
- mini-pin

- Hardwire controls such as networking, or RS232/422 work best when the event uses multiple projectors.
- Many projectors offer the option of internal or external networking cards for control. If you plan to network the projector(s), make sure the wireless or "wired" networking cards are compatible with the network you are using.
- Small events with one projector should use IR or RF remote for convenience. Remember that the IR has to have a direct line of site to work properly.
- If you anticipate needing to adjust the projector during the show, use a computer based control system. These typically work with RS232/422 or networked control systems.

Projector Mounting

Select the mounting hardware for the application. Mounting hardware can be expanded into rigging, which is too complex for a projector section. There are two problems you must solve before safely mounting or rigging a projector to a structure. You must secure the projector to some type of mount, and then you must secure that mount to some type of structure.

Common design mounts that attach to the projector:

- Rigging cages – the projector is enclosed in a type of box
- Clamp Style Mounts – the mount is designed to wrap around the projector
- Bracket Style Mounts – using the projector's mounting holes the mount is attached using bolts

Mounting hardware gives you versatility when mounting a projector to many types of structures:

- Threaded Pipe Adaptor
- Wall Adaptor
- False Ceiling Adapter or Suspended Ceiling Mounts
- Projector Bracket
- Ceiling or Wall Bracket
- Adjustable mounts
- Fixed Mounts
- Extension Mounts

- Low Profile Mounts
- Clamps that are used to mount a projector to rigging


example of suspension clamp hardware

A C-Clamp attaches to a structural pipe or truss.

- Don't exceed its weight capacity typically 300 lbs.
- A clamp that allows cable to pass into the pole will be needed.
- It requires a threaded collar for a pole.

Mounting sources include:


A truss or rigging point


A drop ceiling or air wall track


Existing steel pipes or I-beams

When mounting equipment, ensure that no damage occurs to the structure. Always follow proper safety precautions when mounting equipment. Use caution when dismounting.

Input Cards

Describe the uses and types of projector input cards.

Input Cards or Modular Inputs

Some projectors are designed with removable input cards. Each input connector on these projectors is mounted to a removable circuit board. Much like computers, these boards can be removed and replaced to change the input connectors on the projector. Input cards are not interchangeable; each input card is designed for a specific make and model of projector.

Input cards shouldn't be confused with PCMIA (Personal Computer Memory Card International Association) cards, which are cards that store computer files. Many projectors come with PCMIA slots. These slots allow you to use PC cards with the projector. Some projectors have software installed that can read the cards and display files without the use of a computer. You can also use the slots to install wired or wireless LAN cards for control, and file transfer to the projector.

PCI (Peripheral Component Interconnect) cards and busses are found in PC's. They allow the computer to be customized and upgraded. Input cards are designed around the same concept. You can buy and install cards to upgrade your computer's functionality.

The types of input cards vary depending on the manufacturer of the projector. Some types of input cards available are:

- Projector control cards
- Wireless and wired LAN network cards
- Cards with a variety of input connectors and signal processors to convert the signal can include:
    - S-Video
    - Component video
    - RGBHV
    - Analogue HD
    - SDI
    - HD-SDI
    - DVI

Tips for working with input cards:

- Before installing an input card, verify that it is the correct input card for the application, make, and model of the projector.
- Some inputs look similar but actually transfer different signals, so always read labels and the manual before installing the cards.
- If the input card or projector is not functioning properly, report the problem immediately.
- Make sure the scan rates and resolutions of the input signals, input cards, and projector are compatible. Read manuals and specifications to discover this information. Be aware of varying scan rates and resolutions when working with analogue HD and RGBHV.

Tips for using input cards and adapting the signals:

- Sending signals to equipment is more complicated then just purchasing the proper input card and using adapters. You must process the signal so that it is compatible with the equipment.
- RGBHV to DVI converters only work if the projector or signal processor accepts analogue on a digital format.
- Use a pixel map processor (scalar) or other signal processor to convert the signal.
- Many events will require that you adapt a variety of signals to one shared format. This format should be the native format of the projector. Be aware that this process may cause you to convert a high resolution to a low resolution or video signal.
- If you are sending a VGA signal to an RGBHV input, you can use a VGA to RGBHV adaptor.
- If the DVI connector is carrying an analogue signal, you can adapt from a DVI to a VGA connector using a cable.
- A signal processor is required if you are adapting from an analogue to a digital signal.

Presentation Equipment

Introduction

It is easy to overlook other visual elements that may play minor roles in the event. Overlooking these details can make the event appear disorganized. Presenters may become frustrated when their tools are not easily accessible, and random placement of the equipment will give the presentation area a cluttered feel. It is important to be able to identify the presentation equipment, and set it up so that it is accessible when the presenter needs it.

This section discusses:

- Presentation Equipment
- Setting up Overhead Projectors

Types of Presentation Equipment

Identify and place presentation equipment.

Flip Charts or Presentation Easels – Flip charts come in many different shapes and sizes, making it difficult to anticipate specific needs for presenters. In addition to many designs, a variety of terminology follows the flip chart. The term "easel", for example, typically refers to the structure that supports a writing surface or poster, but the term has been used interchangeably with the word "flipchart". The most common use of the term flipchart usually refers to a structure with a writing surface and a large pad of paper. You can see how this terminology makes taking an event convenor's equipment order challenging.

Tips for Using Flip Charts:

- Don't use permanent markers; they may damage the writing surface. Instead use dry erase markers, which will not damage the white board even if they bleed through the paper pad.
- The paper must fit the support structure.
- Protect portable flip charts by using carrying cases.
- Be gentle when transporting and setting up flip charts; their plastic parts may make them light but it also makes them fragile.

Flip charts are relatively small when compared to a standard blackboard. They measure 1200mm wide by 2100mm tall and the paper held is about 680mm x 860mm. This size makes them ideal for displaying written information to small groups of people.

When positioning a flip chart, put yourself in the same spot as the least favoured viewer. The view of the flip chart should not be obstructed by other audience members, and the text on the flip chart should be legible to the entire audience. Note the proper position of the flip chart, and then remove it from the presentation area until it is needed. Unused equipment can clutter up the presentation area and cause tripping hazards.

Whiteboards – Today the versatile dry erase boards, or whiteboards, have, for the most part, replaced blackboards. These whiteboards are easy to read, practically dust free, and their multi-coloured writing pens make communication more colourful and detailed.

Whiteboards that are mounted on rolling stands should be placed in the presentation area facing the audience. Using a whiteboard at the same time as a projection system can cause the presentation area to become cluttered. Whiteboards that are specially designed to function as both screens and writing surfaces have been developed to decrease clutter. To increase efficiency, try to use equipment that is designed for multiple purposes, but don't sacrifice the visibility of the images.

Laser pointers – Laser pointers enable a presenter to point at details of an image without obstructing the projected image. When setting up a room, place the laser pointer on the podium or table where the presenter can easily pick it up. Show the presenter that the laser pointer is working and then show them how to use it. Remind them that not all people can see the red dot so it may be helpful to ask the audience if everyone can see it.

Clocks and timers –It's a detail easily forgotten, but to keep an event running on time clocks and timers are essential. Place the clock, or timer where the presenter can easily see it, but where it will not obstruct the view of the audience. Clocks mounted on the back wall of a room offer an easy solution, but stage lighting may obstruct the presenters view.

Pipe and drape – Pipe and drape may be used to dress the room area or stage. Pipe and drape can be very useful to direct the audience's attention to the stage; and controls both ambient light and sound.

When installing the pipe and drape, follow all the manufacturer's warnings and the event's floor plans. Remember to; always secure the bases of the framework with weights. Even if the framework seems stable, the environment can change, people may grab the curtains or a gust of wind from an open door may send the whole thing tumbling down. Improper assembly of the pipe and drape is not only a hazard it can be embarrassing during a chance mishap.

Don't forget that drapes used in any presentation event room must be treated with fire retardant and certified for to BCA C1.10/C1.10a by the manufacturer.

NSW H101.10 Safety curtains

A safety curtain *required* by NSW H101.5.3 *(between a stage and the audience)* must—

(a) be made of *non-combustible* material; and

(b) be so fitted that, when it is closed, it forms an efficient smoke seal between the *stage* and the *auditorium*; and

(c) be capable of withstanding a pressure differential of 0.5 kPa over its entire surface area; and

(d) be run on steel guides located on each side of the proscenium opening; and

(e) remain engaged in its guides if the guides, together with their fittings and attachments and that part of the curtain engaged in the guides, are subjected to a pressure differential of 1 kPa; and

(f) be of sufficiently robust construction to withstand damage by scenery, *stage* properties and falling debris; and

(g) be capable of closing the proscenium opening within 30 seconds, either by gravity slide or by motor assisted mechanisms; and

(h) have manual controls, located on each side of the *stage*, for the closing of the curtains; and

(i) have a notice displayed adjacent to the operating controls, in clear and legible letters and symbols of adequate size, indicating its use and operation; and

(j) when operated, actuate a distinctive warning alarm audible to persons on the *stage* and must not be reliant for its operation solely on the primary electricity supply; and

(k) have the words "Safety Curtain" exhibited on the curtain in clear and legible letters of adequate size to enable them to be read from all parts of the *auditorium*.

Banners and flags – Hang the banners and flags after all the pipe and drape has been installed. Wear gloves when handling banners and flags, and keep them off the floor to preserve them for as long as possible. Carefully follow the event's plans when hanging banners; it is difficult to adjust them once the tables and chairs have been set. Banners often have a special cut or design applied to one side of the fabric; orient the decorations toward the audience. If banners have been specially designed for the event, leave time to check the banner and make sure it has been assembled properly. Sending a banner back can cost you valuable time and leave a hole in the set design.

Screen dress kits – Screen dress kits will hide the framework of the screen and direct the viewer's eye toward the projected image. Install the screen dress kit after the screen has been setup and properly positioned for the viewing environment. Screen dress kits are not just for aesthetics they will also help control ambient light from sources behind the screen, hide the frame work of the screen, and direct the viewer's eye to the image.

Setting up an Overhead Projector

how to set up an overhead projector.

> *Remember that all portable equipment and portable power chords used MUST have been tested to AS/NZS 3760 and display a tag declaring certification is current.*

An overhead projector is typically placed on a table or a cart. You need to place the projector high enough so that the person using the overhead can easily write on its stage (the writing surface on an overhead projector). To accommodate the presenter's height, you need to know how tall the person is and if he or she will be standing or sitting. There are adjustable stands which you can use to adjust to the presenter's height exactly.

If the height at which the overhead is placed is determined by the user, then how do you adjust the size and shape of the image?

To adjust the size of the image, move the projector closer to the screen to make it smaller and further from the screen to make it larger.

Sometimes the shape of the image is a trapezoid, rather than a square. This is called a keystone error. It occurs when the projector is too low in relationship to the screen. To correct a keystone error your options are:

- Use the attachment at the top of the screen to move the top of the screen toward the audience.
- Pivot the projector's head.
- You may raise or lower the screen, but not so much that it sacrifices the audience's ability to see the screen.
- Use staging risers to raise and lower the presenter and the overhead safely.

Tips for using the overhead:

- Carry the overhead by the handle not the head - you may bend the arm the image to become blurred and out of focus.
- Clean the stage and the Fresnel lens regularly to keep the image clear.
- If you need to increase the size of the image, move the overhead projector farther away from the screen.
- Focus the image using the focus knob, which moves the entire head or a lens further or closer to the stage.
- If the projector has two lamps, do not switch to the spare lamp while the projector is on.
- Close all lamp access doors before turning on the projector.
- Replace the lamps on a regular schedule, based on their life expectancy.
- Replace lamps that are losing their reflective coating.
- Don't handle lamps with your bare hands.
- Position the overhead for the comfort of the presenter, and then consider the viewability of the image.

Summary

Showing everyone in the audience a beautiful, clear image in a safe and comfortable environment can be a challenging task. All of the equipment has specific distance requirements for optimal viewing. Too much equipment can clutter the presentation area and obstruct the view of the audience members. Organizing the schedule so the presenter may access their materials when necessary is the best way to avoid clutter; it eliminates unnecessary trips to the presentation area. You must weigh the cost against the benefits of each decision you make. Each conclusion should improve the viewing environment more than detract from it. Once the setup is complete you can use your experience to improve your skills for the next event.

References:

Brouke, Paul. (2004) Edge blending using commodity projectors. Downloaded November 3. 2006 from http://local.wasp.uwa.edu.au/~pbourke/colour/edgeblend/

Butler, T. J. and Meier J. (2000). Now I Can See The Light: Selecting A Multimedia Projector To Meet Your Congregation's Needs. Retrieved August 24, 2006, from http://www.digitalprojection.com/news/newsarchives/pdf_press releases/00_april.PDF

Coté, R., & Harrington G.E., (Eds.). (2003). *Life Safety Code Handbook.* Quincy, Massachusetts: National Fire Protection Association, Inc.

Building Code of Australia (BCA) 2007 with particular attention on Public Halls and NSW Appendices.

Da-Lite Screen Company. (1997). *Angles of View, 3(3).* Retrieved August 24,2006, from http://da-lite.com/education/angles_of_view.php?action=details&issueid=32

Da-Lite Screen Company. (1997). *Angles of View, 3(3).* Retrieved October 31, 2006, from http://da-lite.com/products/product.php?cID=20&pID=370

Draper Inc. (2006). Truss Style Cinefold. Retrieved October 31, 2006, from http://www.draperinc.com/Screen_Pages/truss_style_cinefold_projection_screen.htm

Inform, (2003). Purchasing for Pollution Prevention High-Bay Lighting: Opportunities for Mercury Reduction and Energy Efficiency. Retrieved October 27, 2006, http://www.informinc.org/fs_P3highbay.pdf

Jeffreys, G. and Christensen, J. (2005). Specifying and Assessing Projected Image Quality *Best practice paper* Retrieved August 24, 2006, from http://www.infocomm.org/Education/index.cfm?objectID=A5A5CEA7-A965-41AC-81E464DAC522CB3D

Putman, Pete (2006, March). Calibrating a Projector [Electronic Version]. *ProAV 23*(3), 67-70.

Stewart Film Screen Corporation. (2005) Engineering & Specification Sheets Product Spec sheets. Retrieved October 31, 2006 from: http://www.stewartfilmscreen.com/home_cinema_screens/cinec urve.html

Wagner, Joe. (2004) Cheat Sheet: Edge Blending *Pro AV Magazine*. June 2004. Down Loaded November 3, 2006 From http://proav.pubdyn.com/Cheat_Sheets/July207142005111526AM.htm

Some BCA Definitions which may apply:

Aisle means a walkway at the end of *rows* of seating, not being *continental seating*, leading to a cross-over or to an egress doorway.

Auditorium means such part of a place of public entertainment as is designed to accommodate the audience to an entertainment or public meeting.

Continental seating means *rows* of seating in which the *rows* extend the full width of an *auditorium* without intervening *aisles*.

Cross-over in relation to a public hall, place of *public entertainment* or *temporary structure*, means a walkway between *aisles* or between an *aisle* and an egress doorway.

Film means a cinematograph *film* of a size of 35 mm or greater.

Flying scenery means scenery of a kind that is lifted above the *stage* floor by means of lines run from a *grid*.

Grid means a framework from which lines are run for the purpose of lifting *flying scenery* above the *stage* floor.

Minimum lateral clearance means a permanently unobstructed space having a height above floor level of not less than 2000 mm and a width of not less than the specified measurement.

Place of public entertainment means—

(a) a drive-in theatre; or

(b) an open-air theatre; or

(c) a theatre or public hall; or

(d) licensed premises providing entertainment.

Projection suite means such part of a *place of public entertainment* as is designed to accommodate apparatus used for projecting *films*.

Public entertainment means entertainment to which admission may ordinarily be gained by members of the public on payment of money or other consideration.

Row means a *row* of seating—

(a) between a wall or other barrier and an aisle; or

(b) between 2 aisles.

Stage means such part of a public hall or *place of public entertainment* or other Class 9b building as is used by performers or speakers in an entertainment, public meeting or other such assembly.

Temporary structure means—

(a) a booth, tent or other temporary enclosure, whether or not a part of the booth, tent or enclosure is permanent; or

(b) a mobile structure.