

Seating

► Foreword

This module, **Seating**, is part of the **Architecture** chapter of the document, **A Best Practices Guide** published by the **European Digital Cinema Forum**. It should be read in conjunction with other modules and chapters of the complete guide and in particular the modules on **Image** and **Accessibility** and also in compliance with all valid regulations, especially aspects regarding security, emergency, and accessibility. The aim of this module is, however, to give architects, cinema owners/managers and other people who are involved in the process of planning and designing cinemas some help in the design process. Very special thanks are owed to Rolv Gjestland who has kindly donated much of his text to this guide from his book, **How to design a Cinema auditorium**, for which we are eternally grateful.

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Thanks to

Film and Kino, Julian Pinn Ltd, and the Technology Committee of the International Union of Cinemas (UNIC).

► Why this is important

There are laws of nature that cannot be changed like rules of optics, anthropometry etc; not all seats can be perfect; and a complete black room might not look so nice. Designing a cinema auditorium always includes a lot of compromises and this module—and the wider chapter on Architecture—aims to help the reader optimise their investment towards making the best compromises and, therefore, making good cinema auditoriums where the audience can get many good movie experiences.

► Compliance

Be sure to comply with current rules regarding security, fire safety, accessibility etc. when making the seating layout.

► Row distance

► General considerations

The seating row distance must cover the seats and enough clearance for access and escape but should be larger for more leg space and better sitting comfort.

Seating

The row distance is measured from back of one seat to back of the seat in the next row.

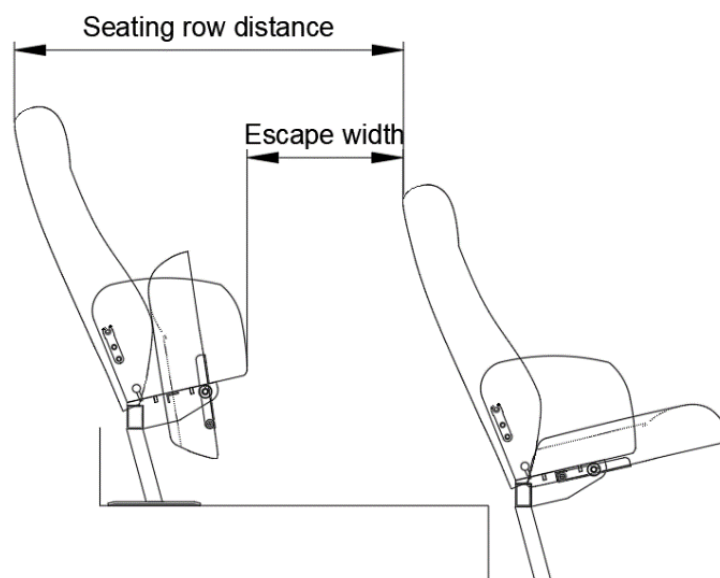
Before designing the seating area with rows and risers, the type of seating should be decided (see **Seating Types** section below). Take also into account that the trends are changing, and that other type of seating, demanding another seating layout might be selected later, for example, when new seats will be installed.

For regular seating, the row distance should be 1200mm or more for good leg space and seating comfort, given that the escape width is large enough.

► Escape width

There are different rules for minimum clearance between seating rows, depending on valid regulations and the seating layout.

- Maximum number of seats between two aisles is usually in the range of 30-50.
- If there is access to the seats only from one side, the acceptable number of seats between the aisle and the wall is usually half of what is accepted with aisles on both sides.
- The minimum escape width might be fixed (usually 400-450mm) or increasing with number of seats (or distance) to the closest aisle (usually 350-500 mm).
- There might be restrictions for maximum distance from any seat to the closest exit door. This maximum distance may also be dependent on number of exits in the auditorium.
- Special rules apply for rows accessible for wheelchairs (see **Accessibility** chapter of this guide).



Seating

▶ Last row depth

On the last row, the depth ("row distance") must be bigger, to compensate for depth of the seat back. Usually in the range of 150-200mm. With reclining seat backs it must be increased to 3-400mm. Special seating models might require even more depth on the last step.

▶ Seating types

▶ Depth

Cinema seating comes in very many different models from many different manufacturers and many different qualities. Each of them can have a lot of options, like upholstery, armrests, height, cupholders etc.

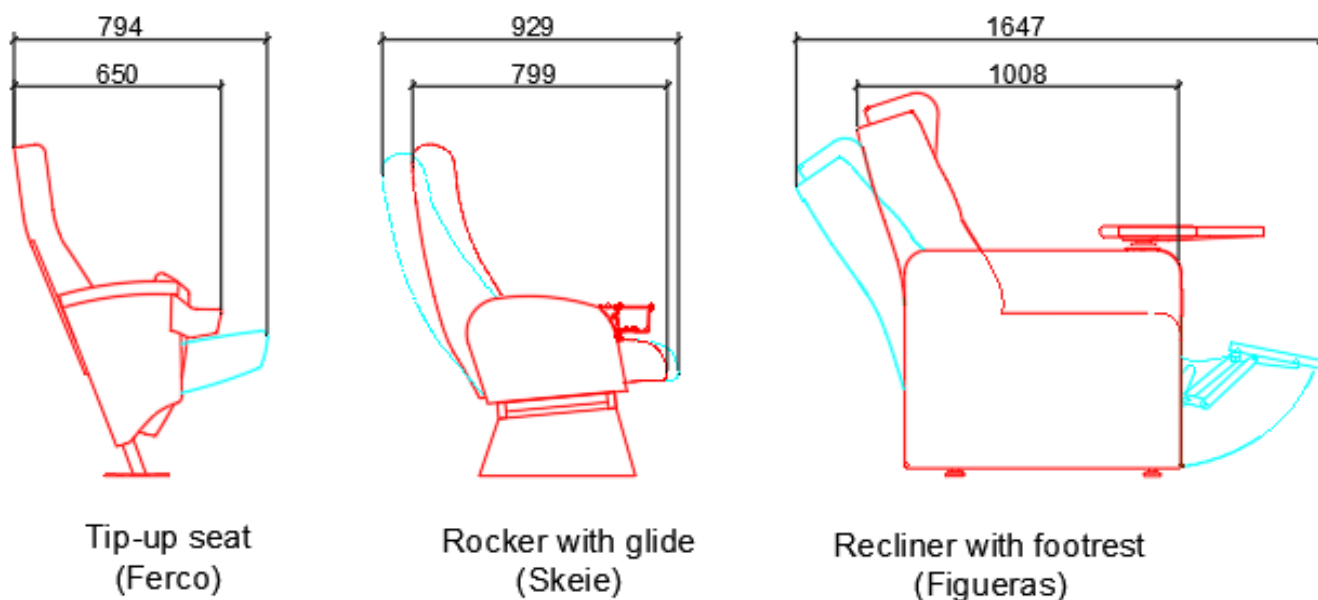
Most auditoriums have regular seats, meaning chairs to sit in. In some auditorium there might be special "seating" like cushions in the front (for children), bed-type "seating" (for laying down) etc. This type of seating is not discussed in this book. Regular seating can be divided into 5 main categories:

- ▶ Tip-Up seating, with seats that tip up when not in use, increasing the space for passing. To allow people to pass, the seated person must stand, tip up the seat and take one step back if the row distance is less than approximately 1200mm. Seat depth: 500-800mm with seat tipped up (empty).
- ▶ Fixed seating, with seats that cannot be folded up. With such seats, one should be seated when people pass, and requires larger row distance than tip-up seats. Seat depth: 800-1000mm.
- ▶ Twin seats (Sofas, "Loveseats"), is like fixed seating, but without armrest or with removable armrest (like in airplanes) between the two seats. Seat depth 800-1000mm
- ▶ Rockers, where the backrest can be reclined, often combined with seat gliding forward. The glide function can usually not be combined with tip-up seats, but there are exceptions. Seat depth: 700-1100mm (fixed, empty), 700-800mm (tip-up, empty). Both for security and for making the room look nice when people enter the auditorium, the seats should return to the rest position when they are empty.
- ▶ Recliners with footrest, where both the backrests and the footrests are motorized for very high comfort. Separate motors for backrest and footrest give better adaptation to individual preferences. Some seats have an additional separate motor for the neckrest. When a person leaves the seat, the free space in front of the seat must comply

Seating

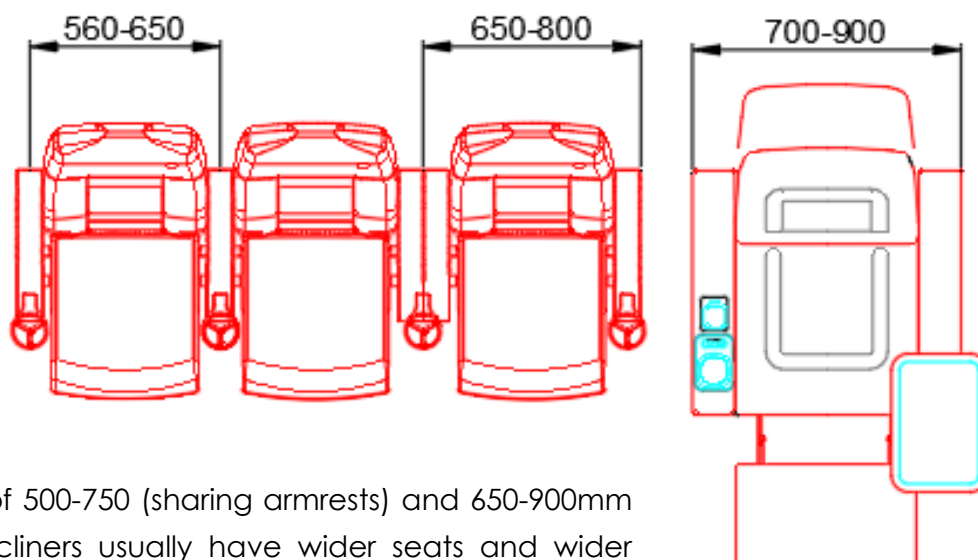
with the demanded escape width. If the seats do not automatically return to the neutral position, the seating row distance must be larger. Even if the row distance is large enough, the backrest and the footrest should return to the neutral position to make the room look tidy, before the next show.

Cupholders, tables and other accessories may increase the seating depth and require increased seating row distance.



► **Width**

Tip-up seats, fixed seat and rockers usually have similar seat widths that vary with the width of the armrest (50-150mm) and can be mounted with shared armrest or double armrests.



Consider seat widths of 500-750 (sharing armrests) and 650-900mm (double armrests). Recliners usually have wider seats and wider armrests, shared or double. Consider seat widths of 650-900mm (or more).

Seating

► Height

The height of a seat is given by the height from floor top of the seat back. The same seat model can often be delivered with different seat backs with different heights. A seat back is considered as high if it has support for the neck. As a rule of thumb, if the height is about 1050mm or higher it can be considered as high, and below 1000mm is low.

► Quality

Seating comes in a big variety of qualities. The differences apply to construction, cushion, upholstery and many other factors, and it can be difficult to evaluate the quality based on brochures with tech specs and even by testing a model for a short period. Price often reflects the quality, but not always. References from other installations might be useful, and seats should always be bought with extended warranty (5 years or more).

There is a European standard for testing seating quality: "**DIN EN 12727 Furniture - Ranked seating - Requirements for safety, strength and durability**". This is a testing of the seat construction and cushions, but does not include the upholstery (fabrics, imitation leather, real leather etc). The test results are ranged in four levels for different types of use and cinema seating should comply with Level 4 (severe use):

- Level 1: Light,
- Level 2: Moderate,
- Level 3: General, and
- Level 4: Severe.

Fabrics durability is often measured in Martindale, where minimum 70-80.000 Martindale for cinema seating is a common requirement.

Seating with fabrics can have a neck-rest or neck zone with imitation leather, to make it easier to clean this area, often soiled by hair chemicals etc.

Armrests are often made with materials that look nice and are easy to clean, like lacquered wood, (imitation-) leather etc. Fabrics on armrests will often look dirty because people eat popcorn, chocolate and candy, giving greasy fingers.

Sitting down in a soft seat might be very comfortable, at least for the first minutes. But cinema seating must give good support for the back and legs to be comfortable, to not make the patron feel stiff and aching after 2-3 hours. Be careful when testing seats to not being cheated by the first impression.

Seating

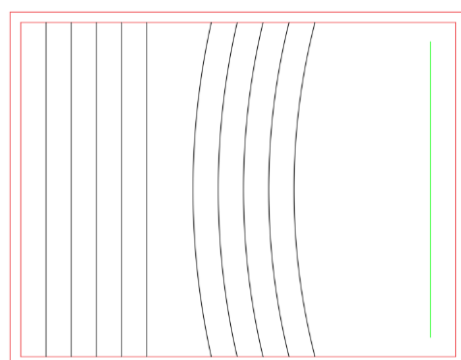
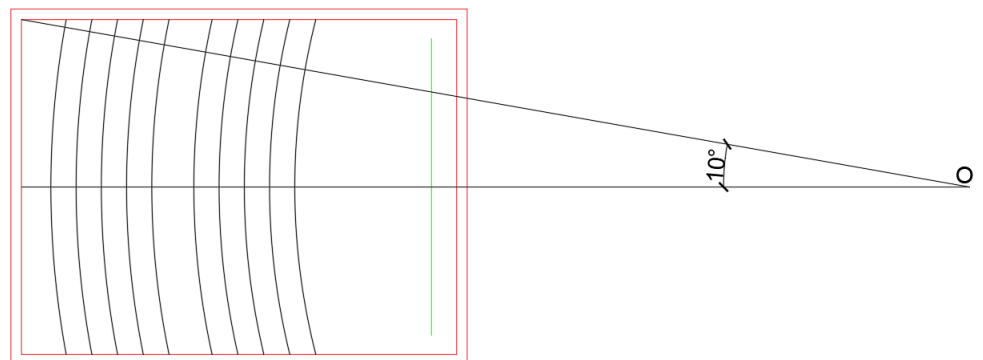
► **Curved seating rows**

The choice between straight or curved seating rows has only minor influence on the movie experience and may be more related to taste. By curving the seating rows, people in the auditorium will look more in the direction of the screen centre, which is good; many people consider curved seating rows to give the auditorium a touch of luxury; but it also raises some issues:

- The sides of the rows will be closer to the screen, and for the first row they may be too close. Can be solved by removing the extreme seats in Row 1, and maybe some seats on Row 2.
- With straight rows, the seating area will look well-arranged and it is easier to get an overview (preferred by many architects).
- The stadium construction will be more complicated and may be more expensive to build.

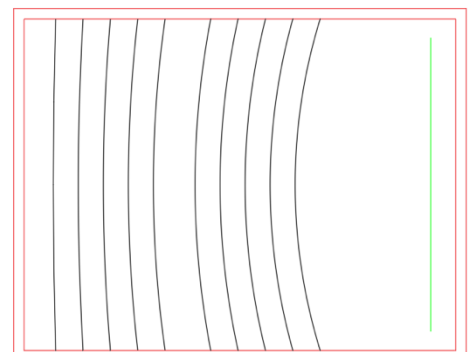
There are different principles for curving seats and some of them are shown in the illustrations here. For example, having a common centre for all row curves gives more curved rows in front.

The row distance on the sides will be larger than in the centre, reducing the sightline clearance. The same radius for all row curves gives parallel rows (same row distance on the sides as in the centre).



Alternatively, having just the front section curved, leaving the rear section with straight rows, gives wider entrance to the crossing aisle and better access for wheelchairs etc.

Gradually changing from curved rows at the front to a straight last row is another option that perhaps offers an



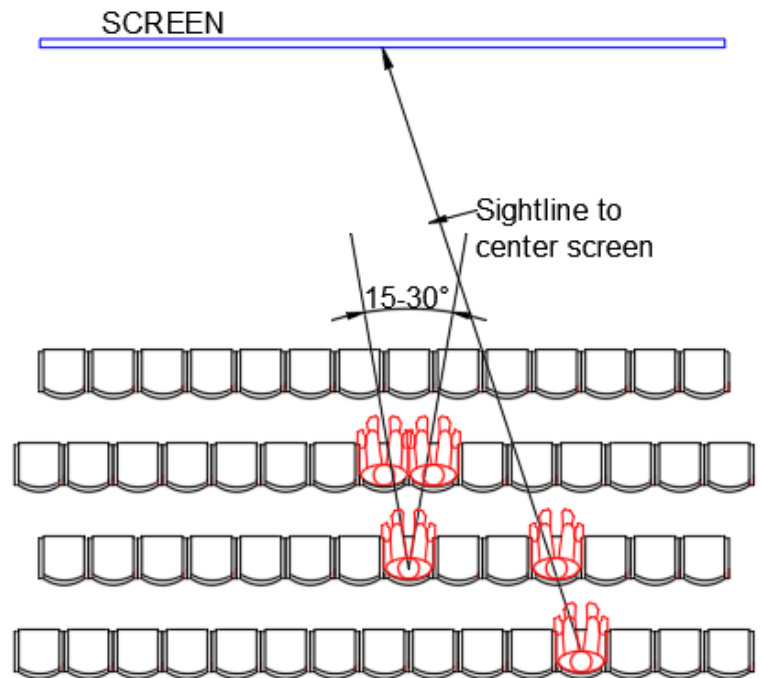
improved aesthetic to the sudden change from curved to straight of the previous example. Here, the row distance on the sides will be larger than in the centre and this reduces the sightline clearance.

Seating

► Offsetting seating rows

It is common to believe that the sightlines can be improved by offsetting each row half a seat width, as shown below. The field of view between the heads of two persons in front is only 15-30 degrees and is not enough to see the whole picture width. Besides, the persons might lean their heads together and make the clearance even smaller. For a person sitting on the side, the head in front can be on the sightline to the screen centre.

Offsetting seating rows will not improve viewing conditions and might reduce each or every second row by one seat.



► Aisles

► General considerations

Aisles are necessary to get access to the seating rows and are important for escaping in case of an emergency. The rules are different in different countries. Be sure to check current rules.

Usually there are rules for the total width of all aisles. It can for example be 1 cm per seat. In addition, an aisle must have a minimum width to be accepted as part of the escape system (for example 1200mm).

As described earlier in this module, the number of seats between two aisles is limited, and less (usually half) if there is only one aisle. For improved comfort, there should not be more than 10 seats between a wall and an aisle. Leaving a small corridor (400-500mm), not accepted as part of the escape system, from the wall to the seating row, will make those extreme seats more attractive and will improve the sound quality for people sitting there.

► Crossing aisles

A crossing aisle is either a separate aisle crossing the auditorium, or a row with seats having extended seating row distance to make an aisle in front of the seats. In both cases the aisle can fill different needs:

Seating

- ▶ It will be an additional possibility to cross the auditorium.
- ▶ It can be used for wheelchairs.
- ▶ If it is designed as a row with extended row distance, it can be equipped with extra comfortable seats (and higher ticket prices).
- ▶ It will give easy access to good seats, for important guests (celebrities filmmakers etc).
- ▶ It can give space for a mixing console (sound and/or light) for special events, like stage presentations/performances, conferences and debates, film festivals etc.

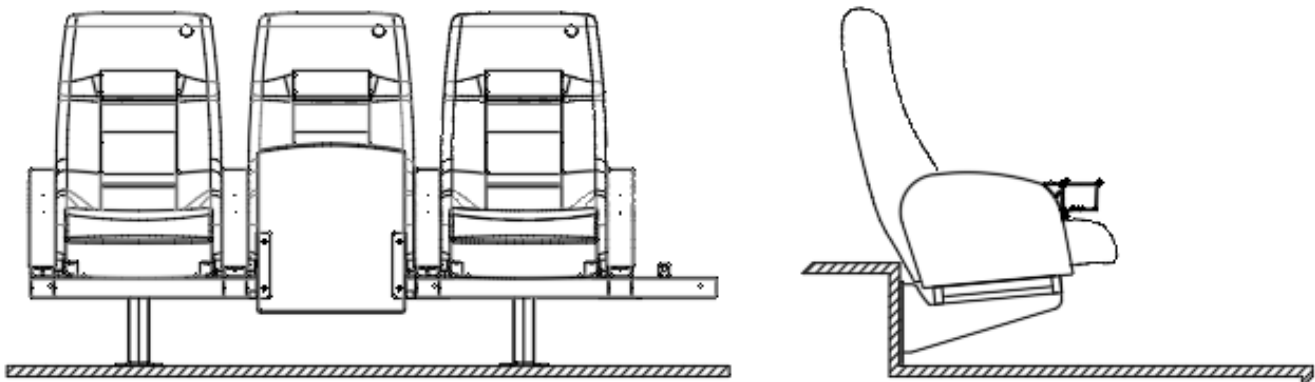
If the crossing aisle is on the same level as the entrance, it will give easy access for wheelchairs. It can also be more discrete than an entrance on the first row.

▶ Handrails

If the aisles are running along a wall, there must be a handrail to make it comfortable and safe to walk, especially when the room is dark. Handrails must be designed according to valid regulations. To make the handrails discrete, and prevent disturbing reflections during the show, they should have a dark, matt colour.

▶ Mounting seats

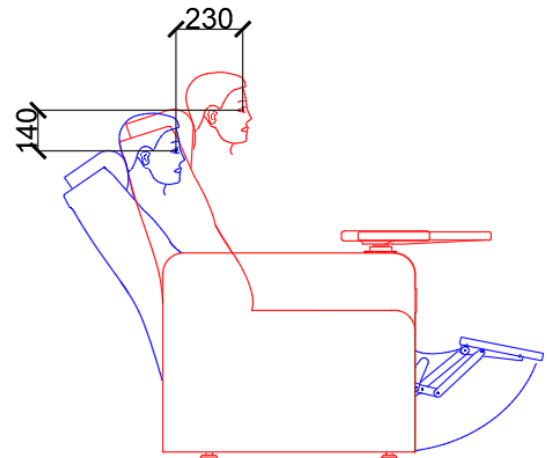
It is common to mount the seats on the floor with one leg for every one or two seats. For easier and faster cleaning, the seats in a stadium auditorium can be riser mounted. This requires a minimum riser height, in the range of about 200mm or more, and a riser construction that can carry this type of mounting. Consult the seating dealer to get specifications for the construction. Recliners often have four legs per seat and are mounted on the floor. Recliners have motors and will need power supply.



Seating

► Sightline issues with rising backs

If the seats have reclining backs, the eye height will be reduced 50-150mm when the back is reclined. It will also move the head backwards 50-250mm (see illustration). Especially if the person in the seat in front sits upright, this will affect the sightlines. When designing the auditorium profile, take this into account, to make sure that the sightline clearance is good for everyone, even if the person in front does not lean back.



► Stadium construction

A cinema auditorium is often designed as a "shoebox" with a stadium for the seating area. The stadium construction can be made of wood, steel, concrete or other materials. Often the room under the stadium is used as a chamber for air, with grids in the risers to let the fresh air in, close to where people are sitting.

If the seats are riser mounted, the grids in the risers must be designed in dialogue with the seating installers. The construction must also have extra strength needed for such mounting.

The room under the stadium must have acoustical dampening to avoid noise and resonances when people walk on the floor.

There may also be restrictions regarding fire safety for the chamber under the seating area.

To avoid step noise when people walk, carpets in the aisles should be used. Between the seating rows, it is common to use material on the floor that is easy to clean between shows. The floor between the first row and the screen should have dark carpets, both for the acoustics and to prevent disturbing reflexes of the light from the screen.

► Your notes
