P O L I T E C N I C O   D I   M I L A N O

POLO REGIONALE DI LECCO

MSC. ARCHITECTURAL ENGINEERING

Theatre in the Last 50 Years

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Section 1: Evolution of Theatre Types

A successful theater is a space in which a performance takes place and comes to life. It is very important that an auditorium have the potential to come to life when there is a performance. This performance could be the arts of opera, ballet, musicals, drama, and dance, classical or popular music with the active involvement of the audience. The stage and backstage are the means with which to organize and present a performance; the lobbies are places of social gathering; but the auditorium, the heart of the theater, is a place of communication designed to enhance the important interaction that creates the whole experience of going to the theatre.

1.1 Energy Flow and Dynamic Sharing

The whole idea of a theatre is about communicating of ideas, emotions, and energy. This communication has to be in different ways; not just between the performer and the viewer but also among the audience members as well. There should be a sense of closeness and togetherness among the people, a feeling of sharing and unity, during a performance.

A flow of energy should exist between the performer and the stage and every spectator present in the theatre, which is also amplified by relation between them like laughter, applause, tears, and etc which results in an even greater performance. Therefore, to support this flow of energy the architect of a well-designed theatre brings in the audience together as close and dynamic relationship as possible.

1.2 Heritage

Historically and traditionally gathered audience has been often represented in all of the most successful historic theater types. In the theaters of ancient Greece and Rome they gathered huge number of people into semicircular amphitheaters.

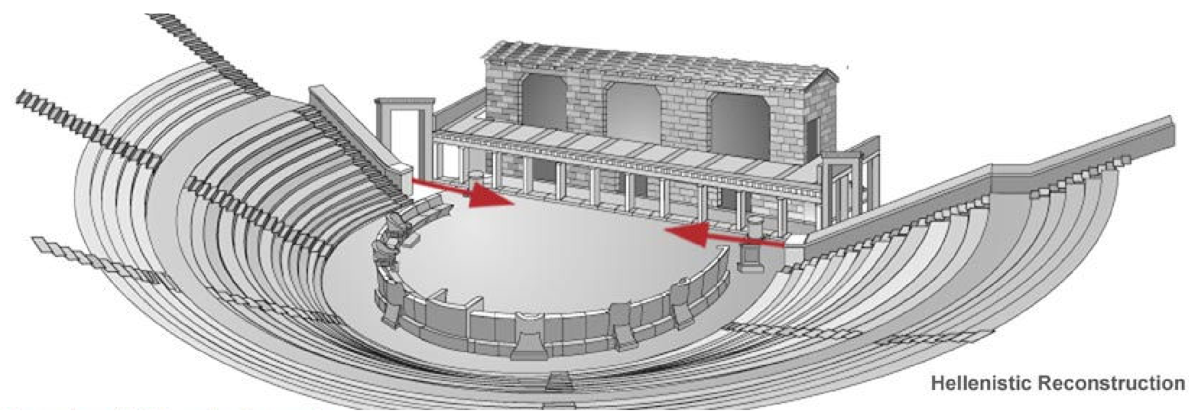


Figure 1 - Semicircular ancient Greek amphitheatre with side entrances in the front

In the period of the Elizabethan courtyard theaters (such as Shakespeares Globe Theatre) to the early 20th century, almost all theaters brought their audiences into an energetic three-dimensional relationship with the stage by using multiple vertically stacked balconies and surrounding boxes.

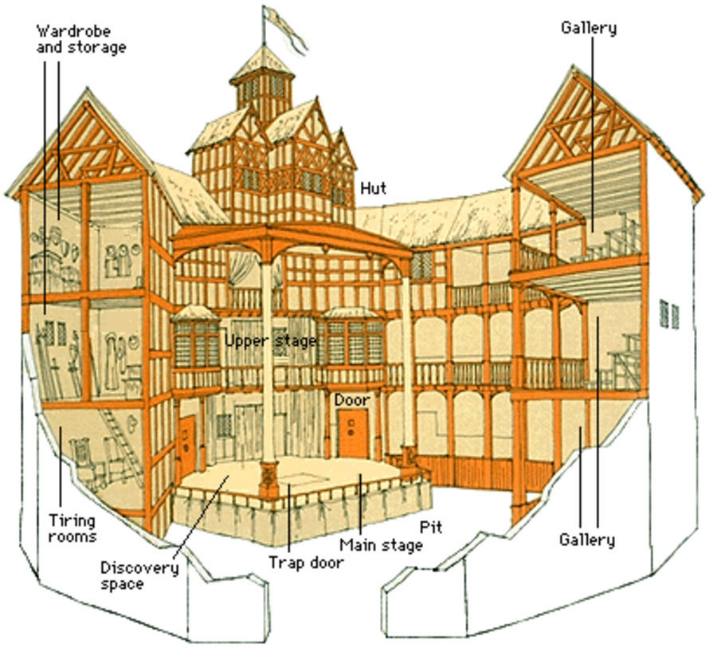


Figure 2 - Typical shape of an Elizabethan courtyard theatre

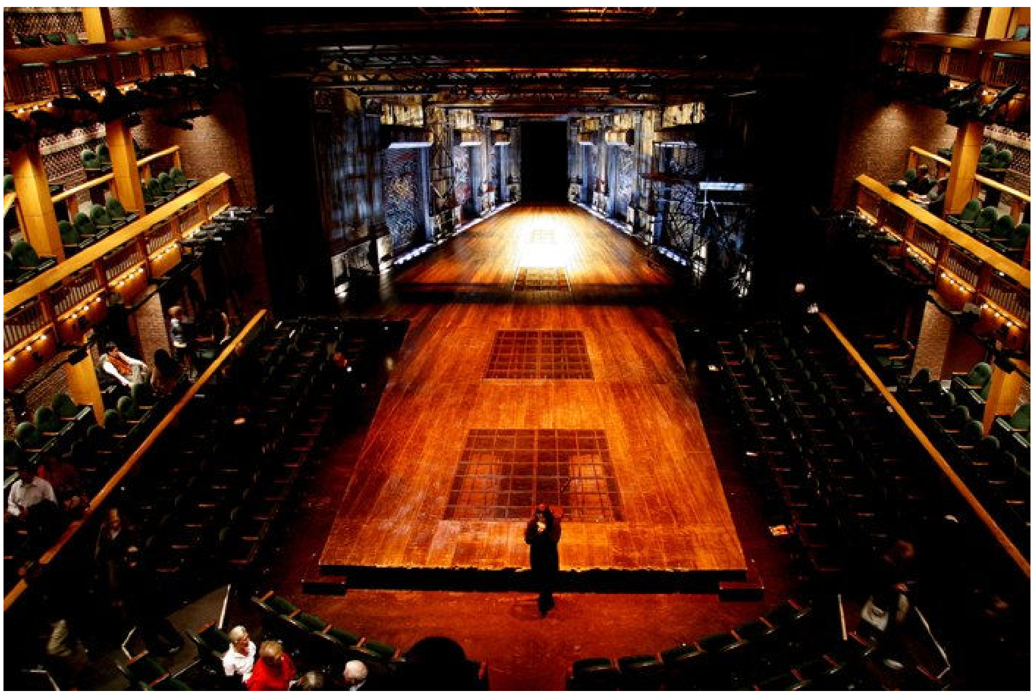


Figure 3 - Interior of the Chicago Shakespeare Globe Theatre

1.3 Arrangement

Audience's active role was ignored during a large part of the 20th century. From the 1920s to the 1970s theater artists, directors, and architects were obsessed with rules of sight lines, acoustics, and technology, while the modern movement in architecture took away traditional decorations from theaters. The outcome was cold, distant fan-shaped configuration theatres with audiences seated in seemingly endless rows facing an often isolated and far-away stage. Such arrangements took away the instinct to gather and worked against the energy and ease of communication that theaters had created in previous ages.

Only since the late 1970s has theater architecture rediscovered the values of intimacy that were essential to the theaters in older times.

Figure 4 - Fan-shaped Sony centre for the performing arts Toronto, Canada

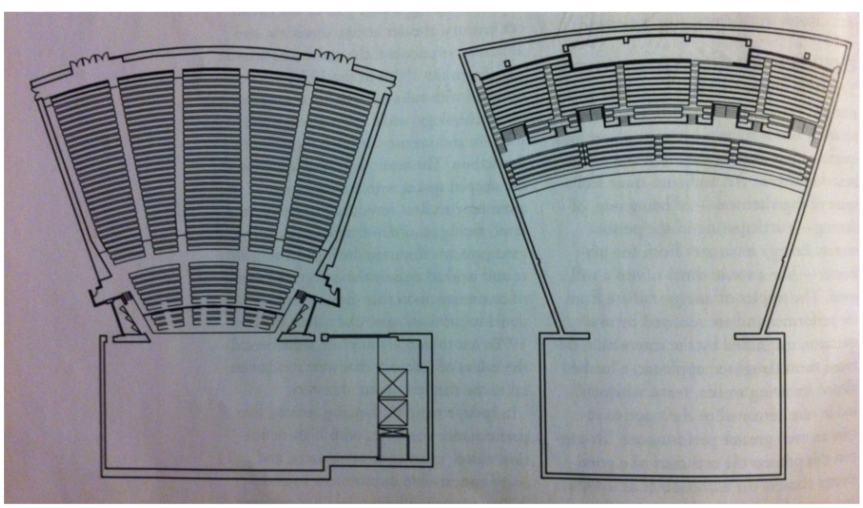


Figure 5 - Typical seating plan of a fan-shaped auditorium

1.4 Evolution of Different Theatre Functions and Shapes

As mentioned previously a theater may include many types of activities: opera, ballet, musicals, drama, dance, and classical or popular music. What all of them require in common is the need for a place where people can gather, while each has its own different requirements, both in the auditorium and on the stage.

There are various theatre types such as arena, thrust, courtyard, proscenium, traverse and etc, each of which may have different relationships between performer and the audience.

Nearly all kinds of the actor-audience relationship have been explored in the 20th century, and they all have their own different values and needs. As a tradition and for many practical and economic reasons, some art forms are linked with a specific theater shape. For example, opera and ballet are usually performed in a proscenium theater, with an orchestra pit between the stage and audience.

Figure 6 - Kay Theatre an example of modern proscenium theatre

The phrase "proscenium" is often misunderstood to mean a theater with stage divided from auditorium by a frame separating actor and audience. Only in the last 150 years has this been true. In prior to that period, the acting area was the forestage in front of the proscenium. The performer was in front of the stage and within the audience space. The proscenium was a link between the audience, the actor, and the scenic world, not a barrier. Through the 19th century, population growth brought greater audience demand for seats, orchestras grew in size, and scenic and lighting demands changed. The actor was pushed upstage and finally behind a proscenium frame. In the early years of the 20th, in reaction to the classic proscenium theatre shape and in an attempt to bring actor and audience into a more vibrant and intimate relationship, experiments with thrust, arena, and other forms of "open' stage began. But only in the late 1970s was the realization to occur that all theaters can be improved by seating the audience in a three-dimensional relationship to the actor rather than on a single level.

1.5 Courtyard Theater

The Elizabethan, Restoration, and Georgian theaters of England (16th through 18th centuries) inspired the modern courtyard theater. This is a rectangular auditorium of average size surrounded by two or three balconies. The central area, with seating and stage, may be completely flexible, to provide end-stage, thrust, arena, multistage, or flat-floor "promenade" capability. The balconies create intimacy; the sight lines afforded by the room's limited width (usually 10-14 m) allow the acting to take place along the central axis, from one end of the room to the other, while preserving the audience's view. Within one space, intimacy combines with flexibility while the balconies provide verticality, allowing the theatrical experience to range from the most intimate to the epic.

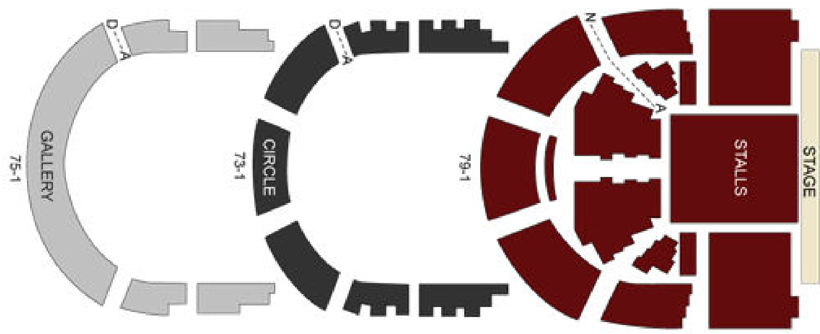


Figure 7 - Typical seating chart of a courtyard theatre

1.6 Thrust Stage

In a thrust stage theater the audience surrounds three sides of the stage. Usually raised two or three steps above the front row of the audience, the stage is often about 6 - 9 meters wide and is often surrounded by a lower "moat" between stage and audience, with access from two entrances. The center of the thrust should be at the "crossroads" of the stage, and the path from the entrances should be at a 45-degree angle in plan from the front and from the upstage corners as well as from the main stage behind. Lighting and sound requirements for the thrust are similar to those for the arena.

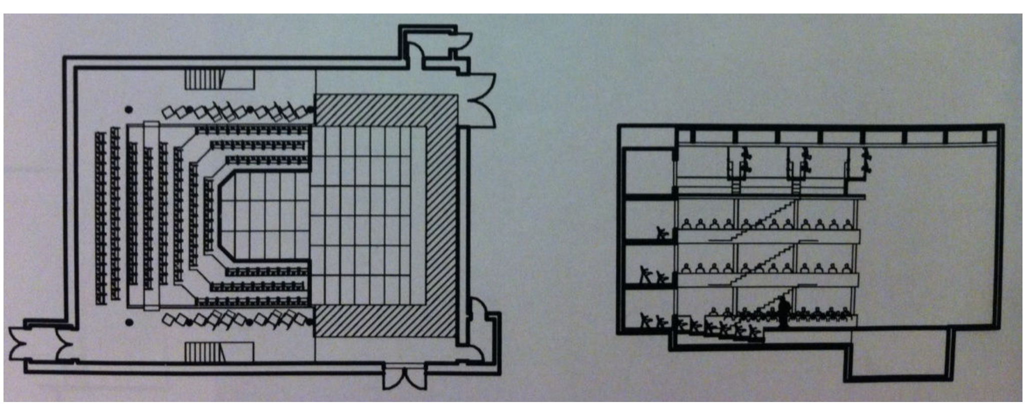


Figure 8 - Plan and section of a typical thrust stage auditorium

1.7 Arena Stage

In an arena theater the audience sits on all four sides of the stage. In this form there must be a sufficient playing area in the correct relationship to its encircling audience. Generally the stage is about 6-9 ft across and has access at each corner for actors, scenery, furniture, and props. Overhead suspension and a trap room below are often required. Lighting the actor on the open stage must be done from all sides and every angle, and a carefully conceived layout of overhead positions is required to provide a coherent angle of light from every direction. Surround sound effects may be elaborate, and provision for multiple loudspeakers may be required.

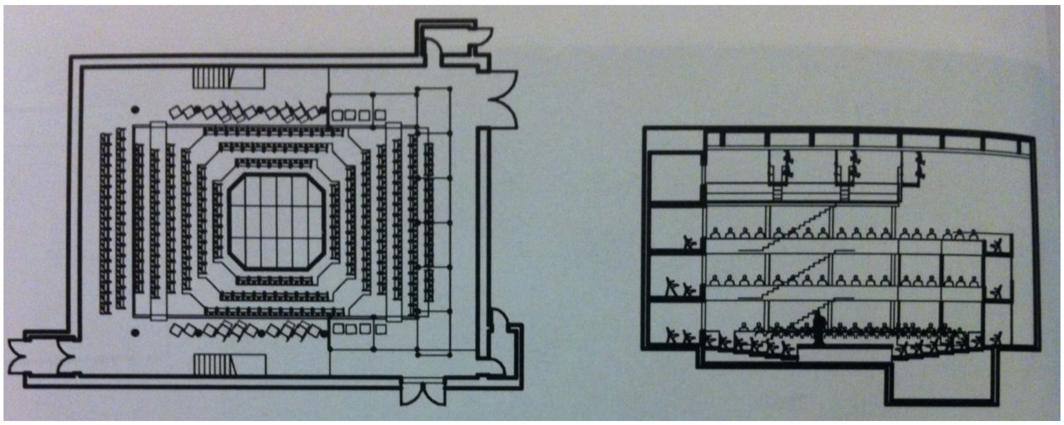


Figure 9 - Plan and section of a typical arena stage auditorium

1.8 Surround Stage

This is a stage whose apron extends around the front sides of the auditorium. Commonly found in university theaters in the 1960s, it created a very wide playing area that often lacked the necessary concentration of audience attention required in a good theater.

Figure 10 - Typical university theatre with an extended stage

1.9 Proscenium Theater

There is a wide variety of modern proscenium theaters. These range from the small drama theater to the largest opera house. They may, or may not, have an orchestra pit or a forestage, often of variable size. The width of proscenium drama theaters in the United States varies from about 12-14 m, while European widths are often 9-11 m. For opera, ballet, and musicals, prosceniums are generally wider, perhaps 14-17 m. Proscenium theaters in the Far East, which traditionally place musicians to the side of the acting area, are much wider again, 24-30 m.

Ideally, the width of the stage itself is two or three times the width of the proscenium, to allow scene changes to be prepared offstage. The absolute minimum is 6 m offstage on either side. An architectural drawing of the stage can be deceptive, because it almost never shows the scenery, lighting, actors, technicians, and supplies that will fill the backstage.

The height of the proscenium depends upon acoustic requirements and the auditorium's proportions, but may vary from 7-10 m. Opera and musical theaters' are higher, 9-14 m or more. The minimum stage depth for drama is 11 m, for musicals 14 m, and for opera or ballet 15 ft. An opera house, which has much heavier scenic demands, may have additional stages to the rear and at one or both sides capable of containing a complete setting ready to be rolled on stage for another act or scene or even another opera.

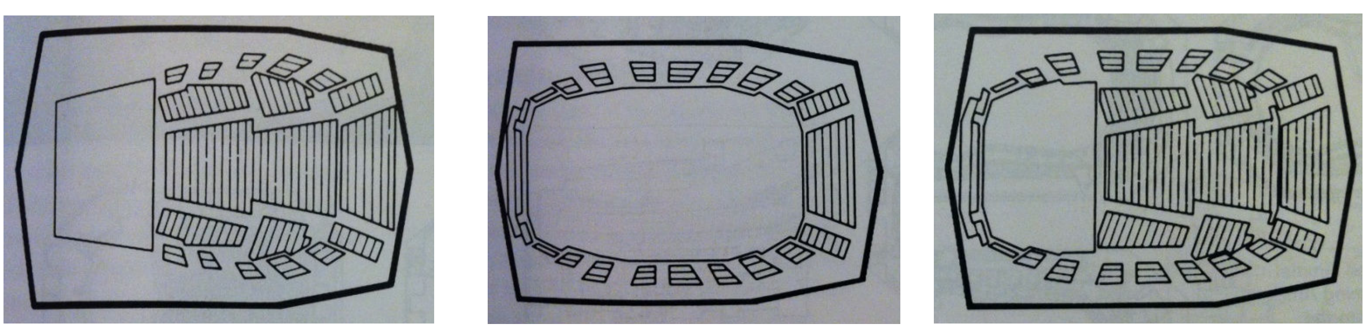
Across Europe almost all the historic opera houses are smaller than 2,000 seats. Rebuilt to modern standards of comfort, sight lines, and safety, they seat perhaps 40 percent fewer people, but their multilevel, horseshoe plan shape offers an ideal acoustic and visual environment for opera and ballet.

Figure 11 - Glyndebourne Opera House, UK with 1200 seats an amazing example of a classic proscenium opera house

1.10 The multipurpose Hall

The multipurpose hall emerged from the period of fan-shaped theater architecture, yet it has to combine the qualities of both the concert hall and the lyric theater. A good contemporary multipurpose hall is a blend inspired by the traditional opera house and the large theaters of Broadway and London's West End. These theatres, after the invention of the iron cantilever in the mid-19th century, allowed balconies to be built that brought audiences closer to the stage, with a greater overhang than in the traditional opera house. Excessive overhangs tend to force acoustic compromise, but today a balance can be achieved to create greater intimacy in large theaters, where amplified as well as natural acoustics are the goal.

Figure 12 - Example of multi-purpose theatre with its different configurations below



1.11 The multiform Theater

The multiform theater can be adapted from one configuration to another: thrust to proscenium, for example. Various experiments in the 1960s, such as the Vivian Beaumont Theater, at Lincoln Center, in New York City, failed to achieve a high-quality auditorium in either of its two layouts. In a small studio theater this variation is quite easily achieved. The courtyard style, with its limited width between balconies, helps to overcome side sight line problems and ensures theatrical quality in a variety of ways. But on a larger scale this transformation is a challenge: more seats to move requires more technology or labor But air-pallet technology does enable large sections of architecture and seating to be reconfigured.

1.12 Unconventional Theater

Theatrical performance can occur almost anywhere: in a converted warehouse, church, storefront, library, garage, or in the open air. Some of the most exciting theatrical experiences seem to happen in these informal surroundings. Productions in such venues require theatrical lighting and sound technology, and they benefit from an intimate and three-dimensional relationship between performer and audience.
These projects demonstrate different acoustic design approaches and different three-dimensional audience configuration but all require the flexibility of stage, backstage, and equipment to accommodate a range of performances.

1.13 Sight Lines

Sight lines vary for each form of theater. If every seat had a great view of the stage, the resulting theater would be imperfect and to attain intimacy some seats must be placed at the sides of the room. If the required seating arrangement was one that everyone could see, without interruptions, the whole width of the stage, the whole height of the proscenium, the forestage, and all the scenery onstage, the resultant theater would be the undesirable fan shaped auditorium built through much of the 20th century. Acceptable compromises are different for each discipline. For instance, dance theatres require optimum horizontal sight lines; opera usually needs a more vertical space than drama. Vertically, each seat should be able to see to a point near to the front of the stage. The exact aiming point varies with the intended discipline.

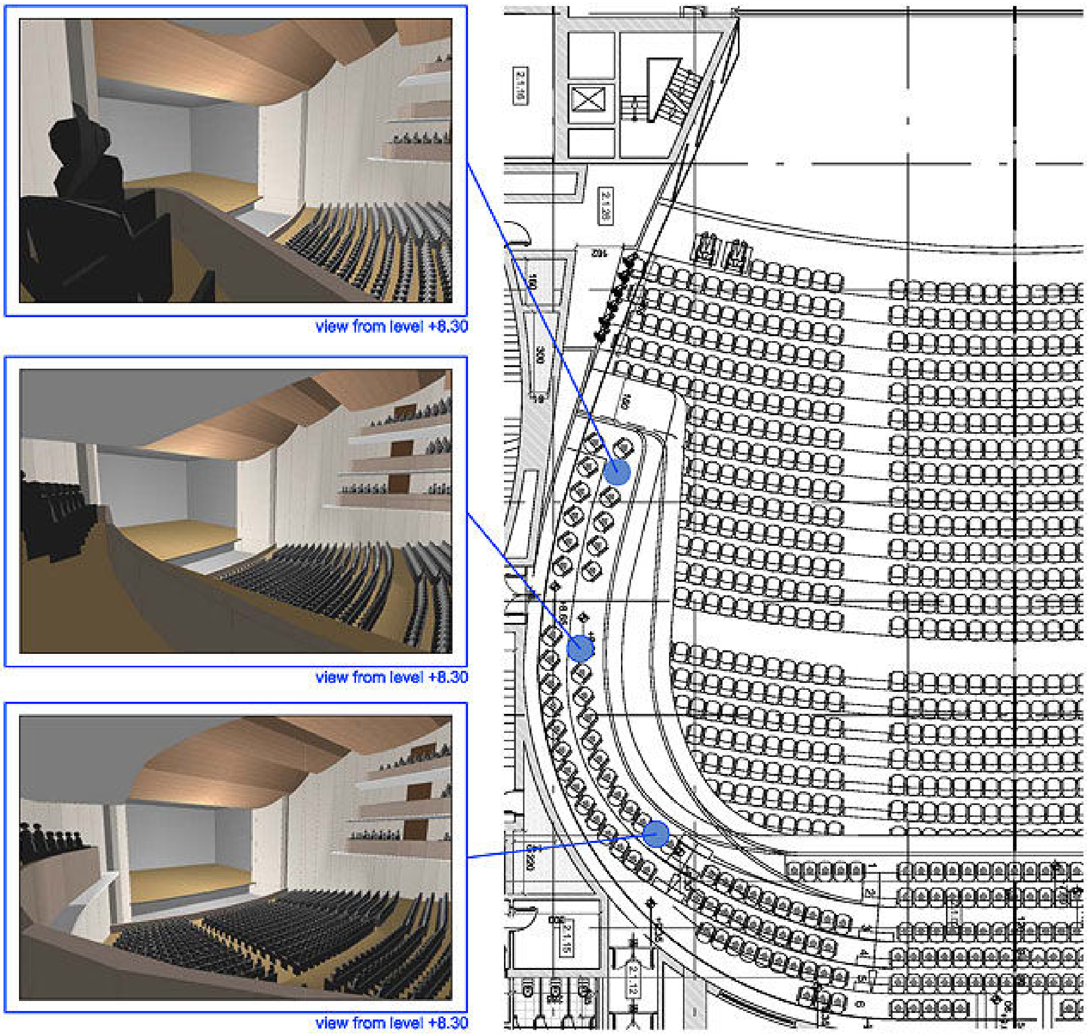


Figure 13 - Sight line simulation from balconies at different viewing angles

Section 2: Relationship between Theatre and City

2.1 Location and Economy

Location is extremely important when building a new theatre. A city central location is usually preferable to a rural location. Going to the theatre is mostly part of a night or free time activity and its vicinity to other facilities, such as commercial centers and restaurants, is therefore useful and crucial for both the theatre and the economy of the area as well. A theatre obviously needs to attract a large numbers of people. This will bring 'footfall' which as a result will bring more customers for close businesses and also create greater activity in an area.

The construction of a new theatre complex is usually seen as a means to set in motion the revival of a particular area as a 'cultural quarter'. Even when successful, revival is a process which often takes a long time to give results. On the other hand, there are many examples of small theatres starting up in old buildings in low-rent areas, which have been successful in attracting people only with their pure passion, the quality of their work and the different experience they provide for people, particularly younger age groups.

2.2 Transport and Access

The quality, quantity and closeness of public transport systems is a very crucial element when choosing a site for a theatre. It is projected that an audience going to a theatre spends almost the same amount of energy as the total used by the building itself. Usually, car travel should be discouraged, although for theatres with large rural catchment areas or where there is limited late night public transport, there may not be much option. In these cases, adequate parking spots are required to be provided within reasonable walking distance of the theatre. Public car parks in city centers can also be used by theatre goers as these are often under-used in at nights. Parking availability should be in such a way that theatre goers are not forced to park in residential parking areas which will without doubt generate conflict and should be avoided. Drop-off points for taxis and parking for people with disabilities must also be considered.

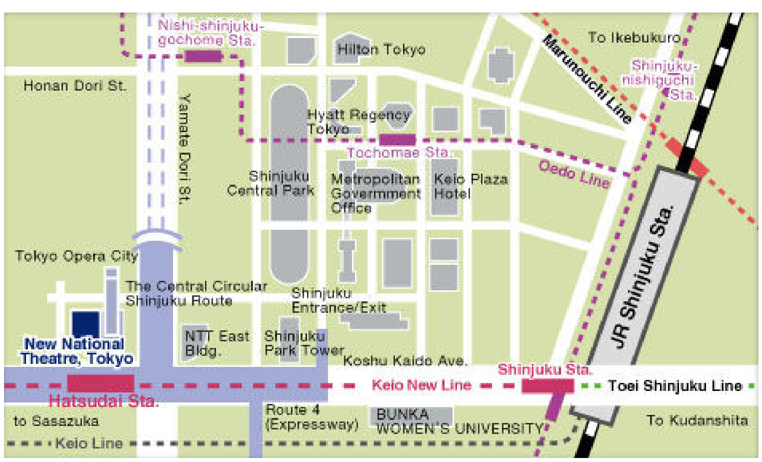


Figure 14 - Parking area and access routes designed for Tokyo National Theatre

2.3 Deliveries and Access for Equipments

The ability to deliver equipment and other supplies is very important. For larger theatres, this may include using several large vehicles, which need space to move around and park off-street at the delivery doors. It can be difficult to provide this especially in an urban environment. Loading and off-loading will often take place at night and needs to be organized in a way that it will not cause disturbance to nearby residents.

2.4 Recognition and Visibility

Theatres, particularly larger ones, are important public buildings and have to be situated in a well-known position within the town or city and to be easily recognizable. This may be achieved through location, the architecture of the building itself, and clear signage.

Every theatre needs signage both to say what it is and to advertise the current and forthcoming productions. This needs to be recognized as a design requirement at an early stage. If no provision is made it is likely to result in unplanned additions by the users at a later stage that could well detract from the appearance of the building. Views into the building from the street are also important in promoting a venue and encouraging the public to enter. Older theatres often have small doors and windows, with little opportunity for people to see in. If this is the case, it will be important to ensure that the building is highlighted with good external lighting and signage and made as welcoming as possible.

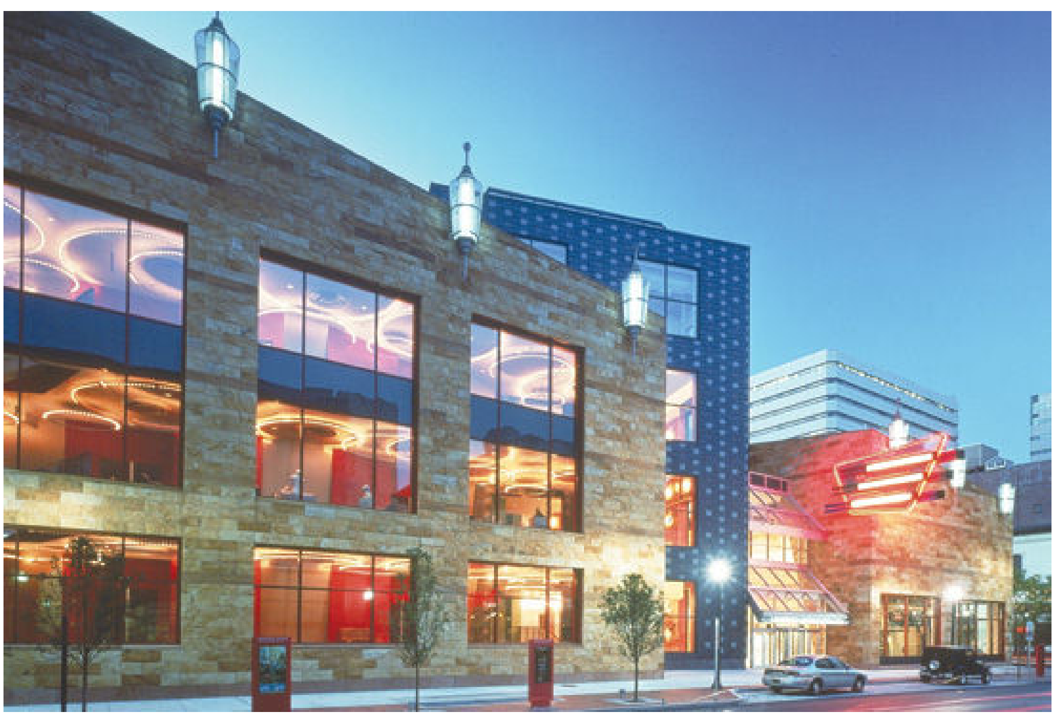


Figure 15 - Whitaker Centre, Pennsylvania, US - Lobbies are unpopulated during performances and when unused, so it is wise to design a second interior lighting feature that highlights the theatre's presence

Figure 16 - Egg Theatre in Bath, UK - Example of a theatre with smaller windows that has highlighted itself by an inviting reflection of red light to outside

With new buildings or new additions, a more transparent entrance and foyer area that allows the activity within the building to be seen from outside, particularly at night, will help to animate the theatre and make it appear more accessible for new audiences. The Egg theatre, described later, illustrates this approach.

2.5 Surrounding Sound and Acoustics

Another important element is the consideration of the acoustic environment when selecting a site for a new theatre which can have a major effect on the cost of the building. It is essential to be able to create a quiet environment within a theatre and this becomes much harder when the building is located close to external noise sources such as railway lines, airports or major roads.

It is always preferable to choose a less noisy location as it will be costly to implement construction techniques to exclude high external noise levels. However, this may conflict with the need for a city centre location.

Another import design element is the noise break-out from the theatre, especially for theatres that present shows with loud music as it may cause complaints by close-by residents, which in many instants may lead to restriction of the operating hours or even forced closure in extreme cases. It is possible to solve these issues through the use of heavy construction and of separated structures to prevent air-borne and structure-borne noise from leaving the building, but again this means higher construction costs. For this reason always an acoustic consultant firm must be involved during the design process.

2.6 Audience catchment area

In order to design a logical audience travel plan to the theatre, it is first very important to know where the clients will come from. For different kinds of theatre and locations, the catchment area is very different. A small community based theatre will attract most of its audience from a rather local and close area; on the other hand a larger central theatre requires attracting people from a larger area. The size of catchment area is designed based on the theatre's travel time. This means that a theatre in a provincial town will need to draw its audience from a larger geographical area than a theatre located in a major city centre. To analyze the probable catchment area and to forecast attendance for a particular theatre and location it is required to assign a specialist marketing consultant.

Section 3: Theatre Case Studies

3.1 Tenerife Auditorium, Santa Cruz Spain

Designed by the architect Santiago Calatrava, its construction began in 1997 and was finished in the year 2003. It is situated on the land between the winding ring roads of Santa Cruz of Canary islands, an industrial container port and the wild Atlantic Ocean; taking advantage of a stunning site and connecting the city to the ocean, creating a significant urban landmark.

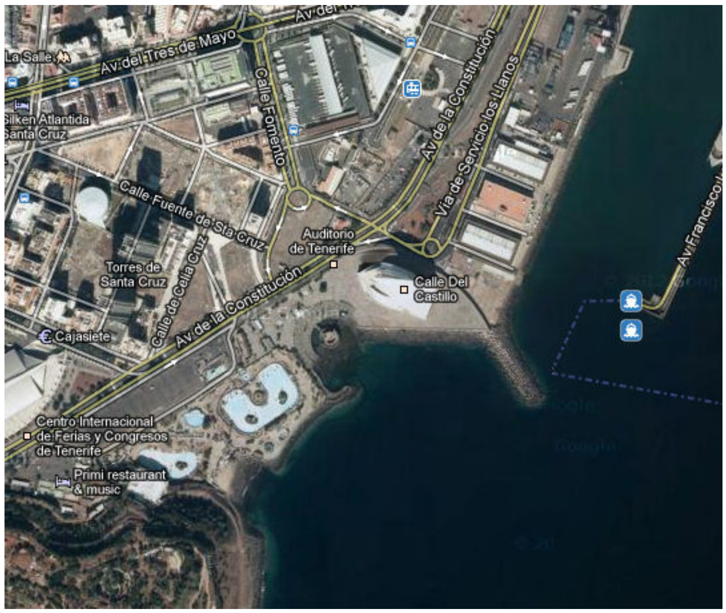


Figure 17 - Tenerife Auditorium - aerial view

In design concept similar to other Calatrava's works, the building describes architectural engineering with having "no façade" and it produces different resemblances and therefore always keeps fresh. To some it has the form of a wave about to crash against the rocks on the coast, for others moon with its reflection in the water at night, or as a giant sea bird trapped by the surrounding, furious mass of the city and industrial complexes.

Figure 18 - Tenerife auditorium resembling the moon at night

Another important characteristic of the Tenerife Auditorium is its opening to the outside, both at sea and the city, with spacious terraces and a pedestrian shopping mall which crosses the building from side to side.

Figure 19 - Huge welcoming curved entrances towards the sea and the city

Rising up from the harbor, Santa Cruz itself is bordered by the Anaga Hills. This natural topography combines with the city's high-rise structures to create a magnificent background and setting for the auditorium.

Figure 20 - Santa Cruz's natural topography and skyscrapers creating an amazing backdrop to the auditorium

Figure 21 - View of the Santa Cruz city and Tenerife auditorium from the surrounding Anaga hills

The visual effect of such structure in Tenerife's capital, Santa Cruz, cannot be overstated. The auditorium building can be seen from every turn in the city's streets and from the roads coming in from the surrounding hills, and its luminous white surfaces and stunning form attracts the eyes. The Tenerife Auditorium is making a statement; the city has established a strong cultural connection through architecture, and the union of such a dramatic building with the ocean, hills and city, like the site of an ancient amphitheatre, has a strong and exciting effect.

Figure 22 - View of the Auditorium from Calle Fuente De Sta Cruz

The glowing exterior walls are constructed from white concrete cast on site, and finished with broken ceramic tiles and granite basalt, the local volcanic stone, creating an unusual shine.

Figure 23 - The glowing facade is created with carefully installed broken ceramic tiles

Calatrava used concrete because according to him it allows to "mold forms and defy the laws of gravity, as the ridge that falls from the sky.", Allowing this 3500-Ton "wave" of concrete to be lifted from the ground, and to stay motionless in the air. The whiteness of concrete is achieved by using a high proportion of sand and titanium dioxide and is finished with “trecandis” broken ceramic tiles of less than eight centimeters thick that characterize the works of Gaudi. Some other advantages of using white concrete includes:

- Avoiding activities such as stucco, finishing and paint and therefore reduction in constructive activities and thus increased speed in the construction
- Higher levels of brightness and reflection of light, useful for common areas, stairwells, parking and etc. and therefore savings in energy
- Reduced maintenance and total cost

The Tenerife Auditorium is home to Tenerife Symphony Orchestra and consists of two main performing areas; a 1660-seat concert hall and a 428-seat hall for music chamber. The building was built on a parcel of 23,000 m², of which the auditorium occupies 6471 m² with gardens, plazas or entrances and a parking lot with 260 spaces. Calatrava explains that “the curved geometry of the concert hall is the generating element of both the form and structure of the building”. The hall for chamber music has a triangular footprint of 411 m² and a false ceiling with a dramatic palm leaf finish. Self-contained, with all the usual amenities – foyer, bar and cloakrooms – it is accessed through a passageway from the main foyer.

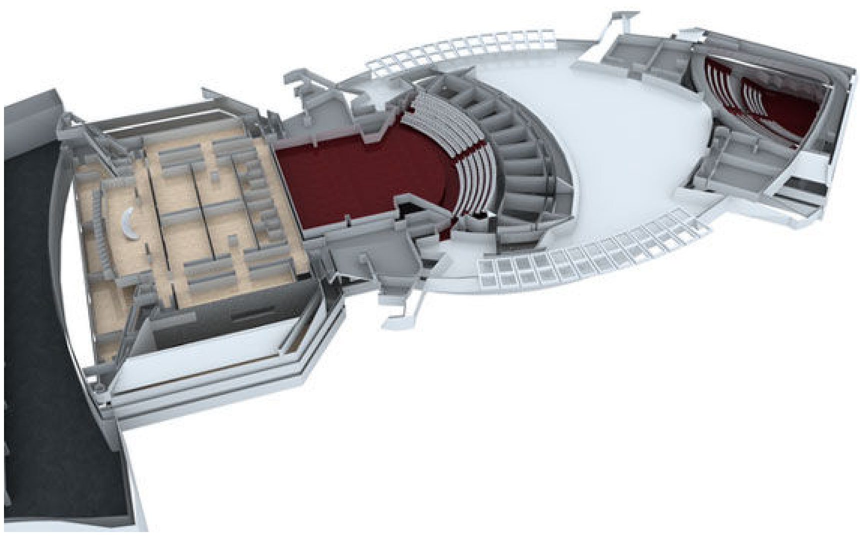


Figure 24 - General plan of the Tenerife auditorium

The auditorium’s series of structural elements are centered on the conical concert hall. Two outer casings surround the auditorium, creating a perimeter space which serves as a foyer and as a barrier from the hectic city outside. Concrete arches, spanning 50 meters, support glass entrances on each side of the auditorium, the glass creates a difference with the rest of the building. The arches also transfer the loads from the outer casings to the foundations.

Figure 25 - Positioning of the internal formwork for the curved and inclining sail-like walls, anchoring the supports in the suspended intermediate slab served to carry the high horizontal loads from the bracing

Figure 26 - Concrete arches with glass entrances, spanning 50 meters, transfer the loads to the foundations

The principal visual feature is the roof ‘wing’, which rises to a point 58 m above the base of its arc over the main auditorium before curving downward and narrowing to a point; similar to the gnomon of a giant sundial, the wing points north-east over the public plaza and out across the Atlantic Ocean towards Africa.

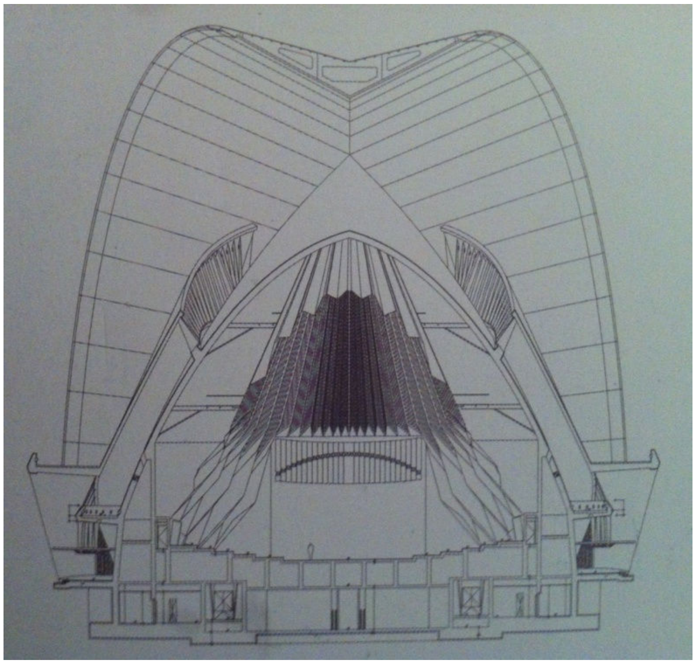


Figure 27 - Wing arches sitting over unusual conical roof of the concert hall

Figure 28 - Finished view of the 50 meters wing over the concert hall

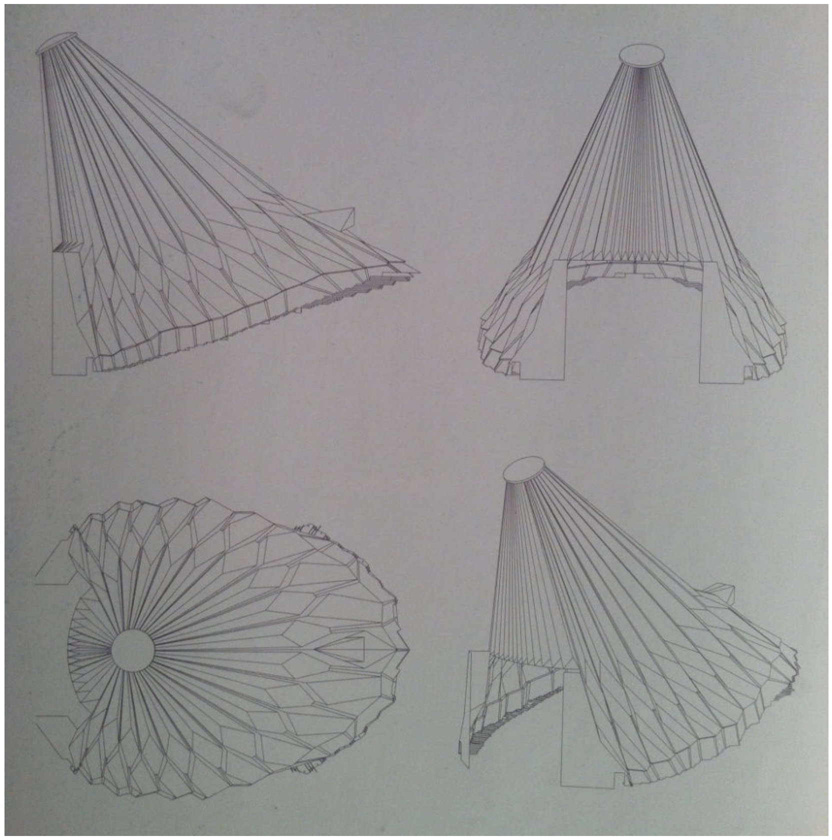


Figure 29 - The cone of the concert hall in development

As mentioned before due to the slender and unusual form, the use of concrete for the realization of the structure was unavoidable. A wide range of formwork skill was required: from simple TRIO panel formwork for the foundations, climbing formwork for symmetrically arranged round and curved sail-like walls, to an unusual special construction for the approximately 100 m long self-supporting roof assembly.

A steel construction with four longitudinal girders formed the basic structure of the massive "wing roof" and was braced with trussed frameworks. This steel skeleton was covered with reinforced concrete which presented construction teams with a difficult task: climbing formwork had to operate crane independently, and working platforms needed to be horizontally adjusted in every position. In addition, conversion work on the formwork elements was to be kept to a minimum and the maximum load-bearing capacity of the wings, including the loads from the steel and concrete, had to be taken into consideration.

Figure 30 - One of the two climbing units which hydraulically lifted the complete construction, including working platforms and formwork, from cycle to cycle

Figure 31 - Modular scaffolding served as shoring for the construction of the winged-shaped roof. Anchoring was carried out using a 1.50 x 1.50 m square grid formation on the “nut” roof shell. Base spindles were used to vertically adjust the prop lengths for the different contact area levels

Figure 32 - All carriage movements are carried out using three independently operated hydraulic circuits: moving forward and retracting, positioning as well as shuttering and striking.

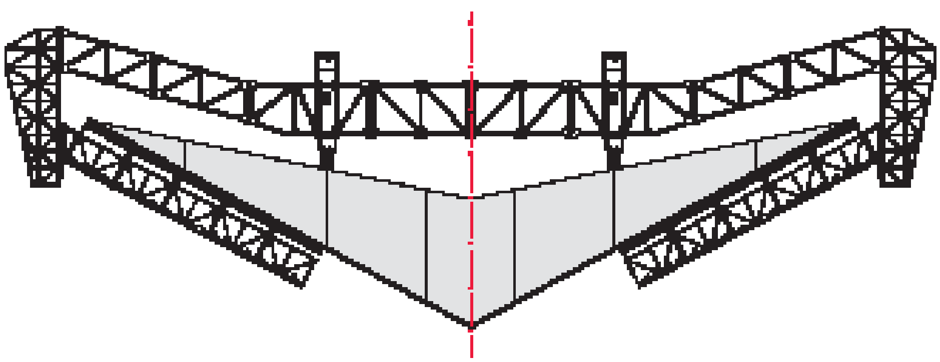


Figure 33 - Cross-section of formwork carriage with moving and adjustment equipment

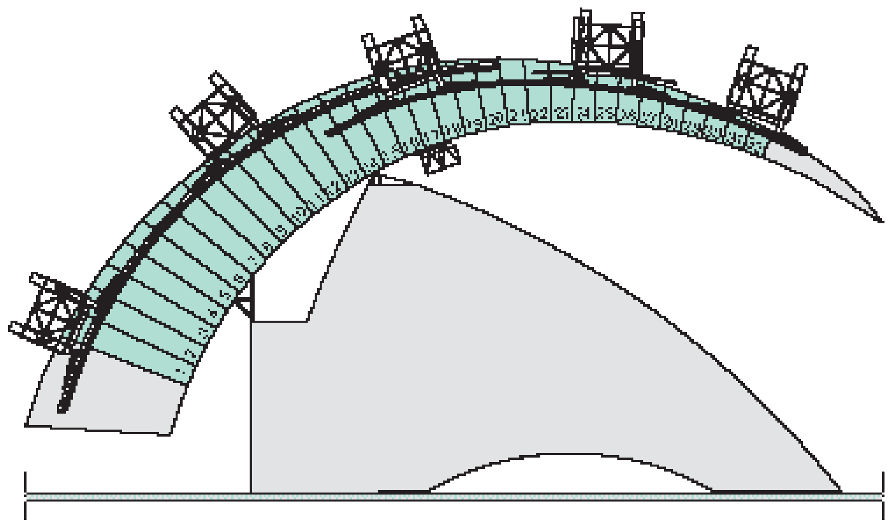


Figure 34 - The formwork was used continuously for 32 casting segments in regular weekly cycles – only two breaks were needed because of formwork element adjustment

The main public access to the auditorium is placed on the raised plaza to the northeast, beneath the curved and sculpted concrete shell of the roof. Although administrative and service areas and the central auditorium are air-conditioned, public foyers and circulation areas profit from the island's pleasant climate; as it is naturally ventilated airflow through the glazed areas beneath and between the building's concrete shells.

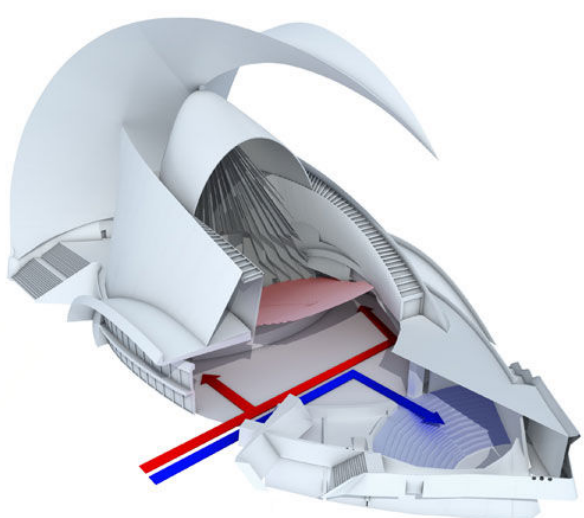


Figure 35 - Building's access and circulation to different areas

Finally, a public plaza brings the auditorium to the wider community and, with its magnificent sense of place, has proved to be a popular destination for tourists and locals alike. On the ocean side of the complex, a terrace café provides stunning views.

Figure 36 - Plaza Alisios open to the outside, with beautiful views of the Atlantic Ocean and the dynamic figure of the auditorium as decor

The Tenerife Auditorium has two parts sharing exceptional views: the magical Atlantic Ocean and the modern city of Tenerife.

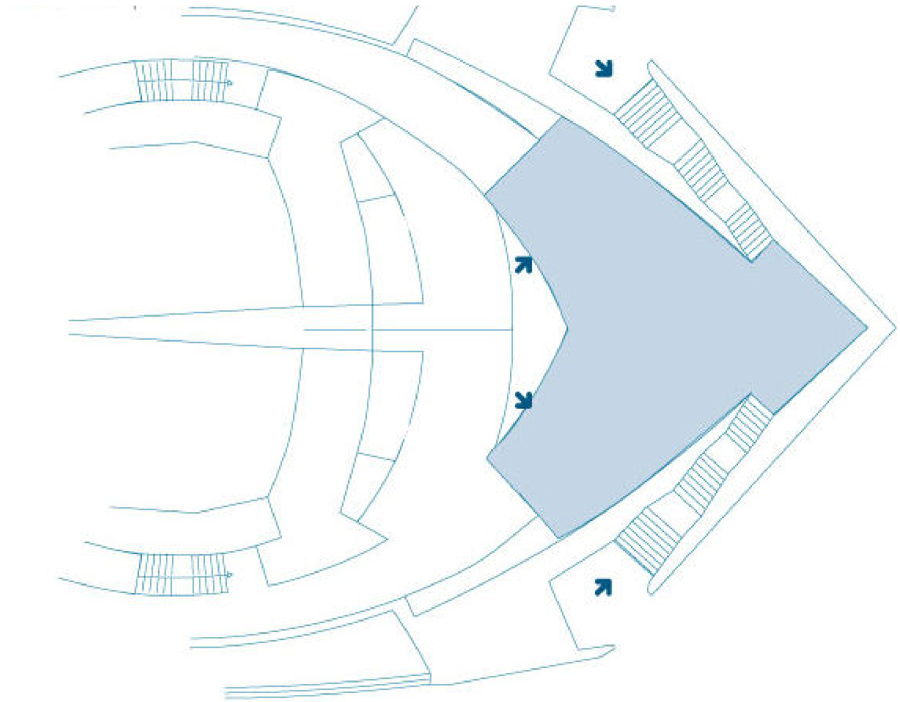


Figure 37 - City Terrace Surface – Area: 350 m² – Access: Direct access to the street

Figure 38 - City terrace with the view of the city

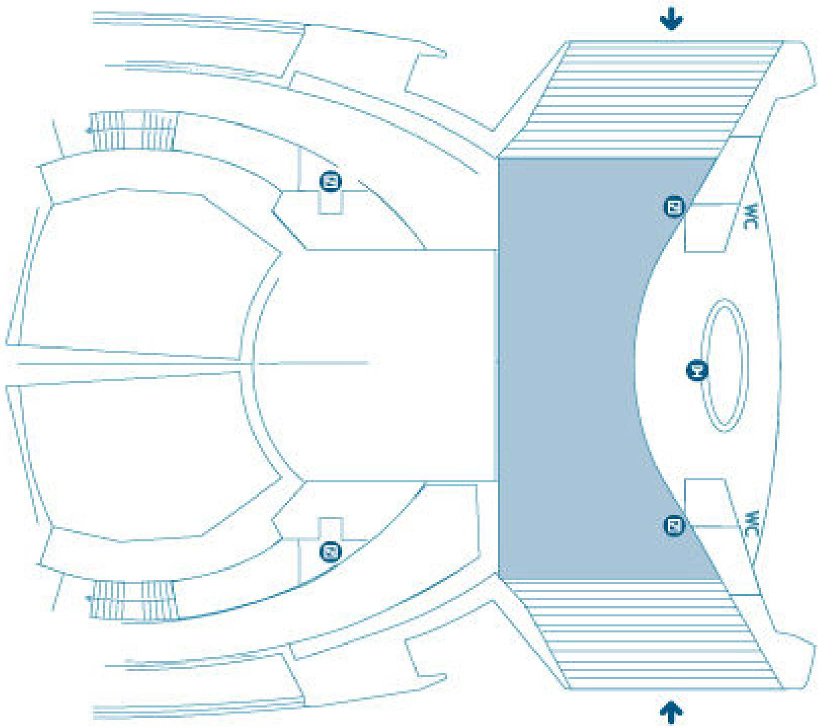


Figure 39 - Atlantic Terrace Surface: 400 m² Access: Direct access to the street

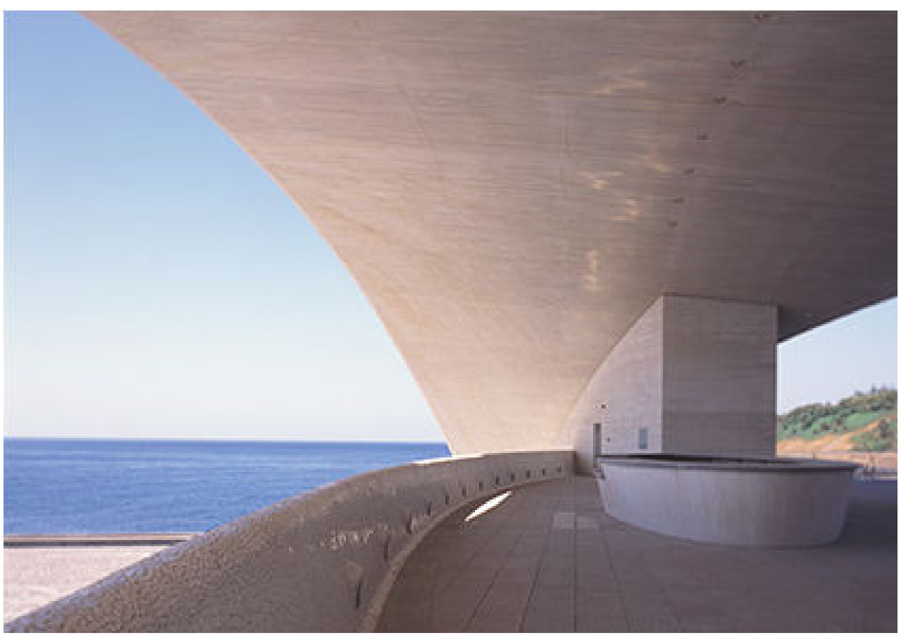


Figure 40 - Atlantic terrace with the view of the sea

The harbor and castle galleries on both sides of the building have an area of 300 m² and can be accessed from the Chamber Symphony, the Main Hall, and directly from the street. This area has breathtaking views of the sea and the Maritime Park of Cesar Manrique.

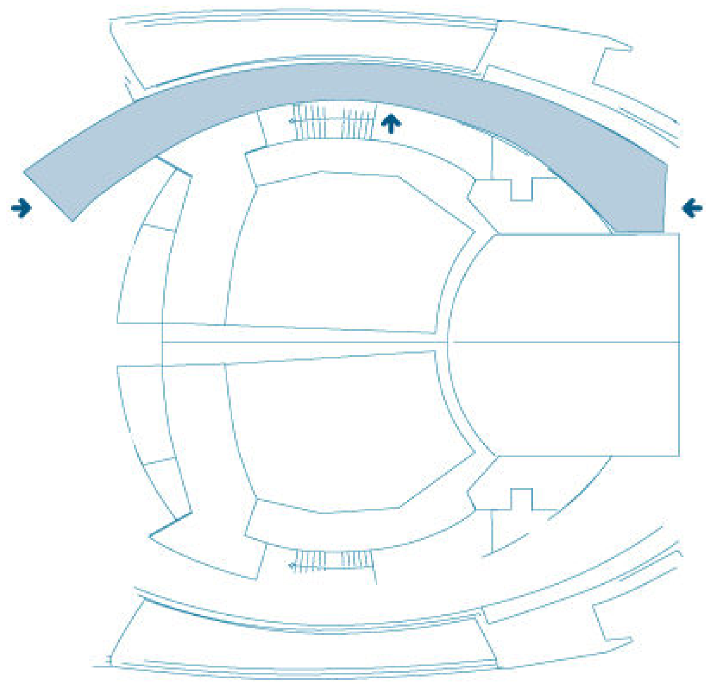


Figure 41 - Castle Gallery

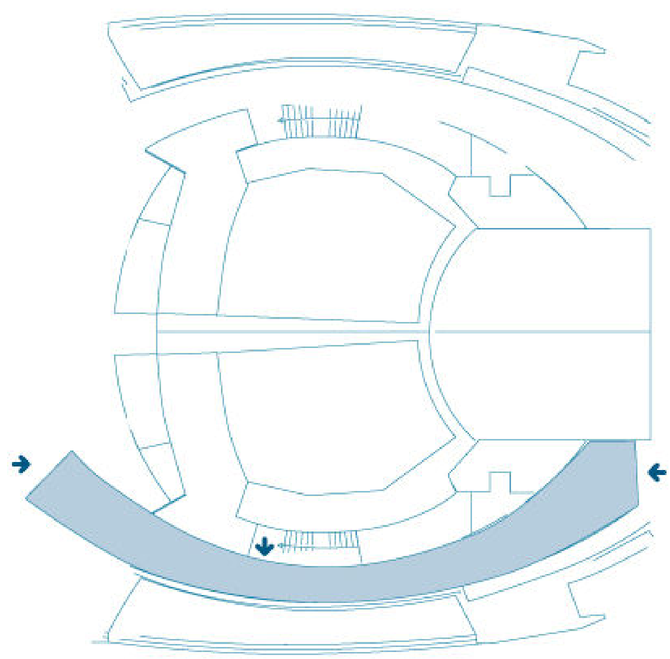
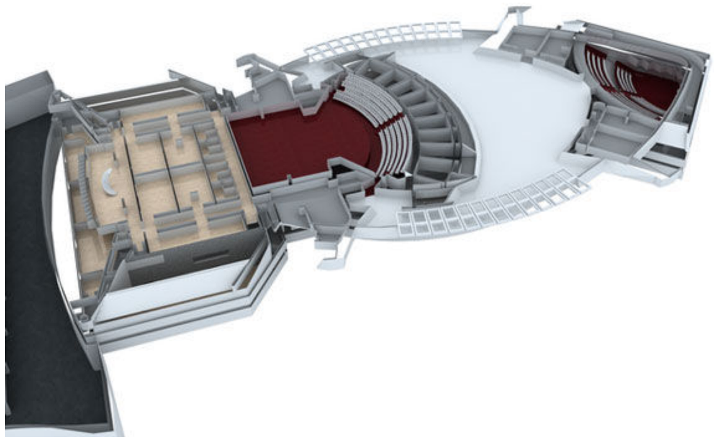


Figure 42 - Harbor (Puerto) Gallery

The main concert hall or Symphony has 1660 seats, a stage with a width of 16.5 meters and a depth of 14. Based on the stage, on both sides of the courtyard of seats are framed by an emerging body of tubes designed by Albert Blancafort who also took over the building of other organs such as the Cathedral of Alcala de Henares or that as is in the Auditorium Las Palmas de Gran Canaria. The body of the design is far from the traditional concept, trying to be a surround sound source arranged around the listener.



The concert hall's radical conical roof creates a unique acoustic characteristic. A series of convex forms reflect the sound, and the acoustic conditions are varied by regulation of sound-absorbent surfaces behind a rectangular grid.

Figure 43 - The concert hall's finished interior; such an unusual shape and a brave choice where acoustics are crucial

To fine tune the acoustics, the wood paneling of the interior takes on a crystalline form, which also contributes to the drama of the space. The placing of sound reflectors was determined by laser tests, which also helped define the dimensions of the vaulted interior. Instead of having stage curtains, the auditorium is provided with a concertina screen of vertical aluminum slats, which when opened lift up into the auditorium to act as a sound-reflector above the orchestra pit.

Figure 44 - concertina screen of vertical aluminum slats, which when opened lift up into the auditorium to act as a sound-reflector above the orchestra pit

The music chamber room for its part built on a smaller scale and has 428 seats. The lobby is accessed from two sides of the building and consists of the press room, a shop and a cafeteria. It also has a dozen individual dressing rooms and as many groups as well as sites for special services of hairdressing, makeup, costumes, etc.

Figure 45 - Music chamber room interior

Figure 46 - Lobby area of the building

The hall is an interior space with an incomparable view of the Atlantic Ocean. There are a clear 1200 m², framed by large wooden folding doors that open outward.

Figure 47 - The hall principal door

Calatrava's buildings and structures are all different, but each carries his signature. This building, the forerunner to a bigger version in the architect's home city, Valencia, will always be a favorite for visitors because of its location.

3.2 The Egg Theatre, Bath UK

The Egg is a theatre in Bath, England which was finished in 2005. It was built by architects Haworth Tompkins inside a Grade II Victorian building which was first built as a house, then converted to a cinema and a church hall. Both the hall and the theatre (a traditional proscenium arch theatre originally dating from 1805) are listed buildings.

Figure 48 - The Egg aerial satellite view

Figure 49 - The Egg plan view

The Egg is the third addition to the Theatre Royal, Bath (TRB), and is dedicated for young people of 0-25 years age group. In order to ensure that the Egg meets the requirements of young people, the brief was drawn up with the help of a group of twenty children between the ages of nine and seventeen.

One key aspect of this brief was the theatre's external appearance and visibility. The young consultants suggested smart ideas on the importance of physically communicating the theatre's activity to the outside environment, and integrating a cafe in the design for this reason. The all-important cafe is a specifically child- and family-friendly space.

Figure 50 - The inviting and attractive view from the theatre's entrance

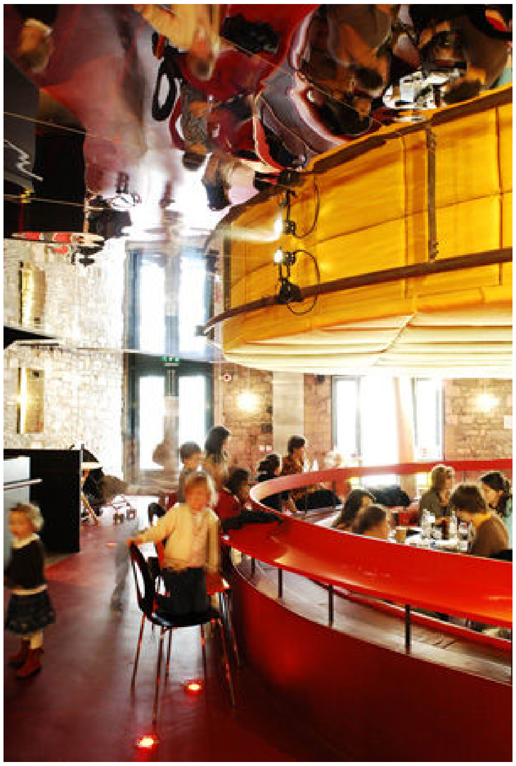


Figure 51 - The cafe, encouraging a sense of ownership and belonging

The addition of the new Egg shaped auditorium within the external walls of the existing building was an important move. The architects used an innovative structural solution to drop in a free standing, tightly fitting, and elliptical shaped 120-seat auditorium into the cleared rectangular interior space of the hall. The auditorium is usable in end on, in-the-round, flat-floor and traverse configurations.

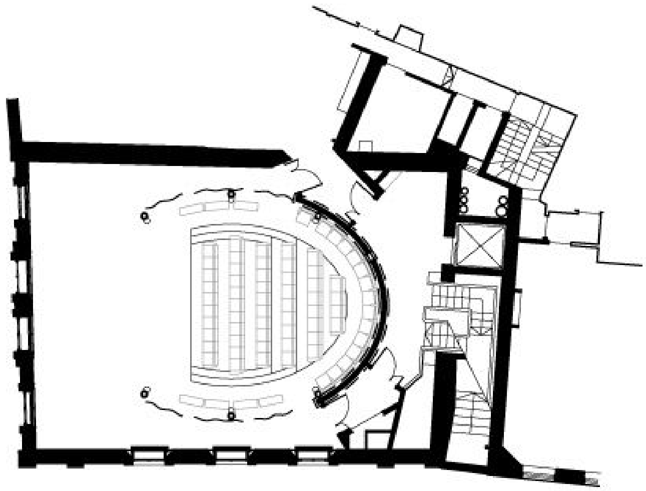


Figure 52 - The Egg-shaped auditorium plan

This steel structure does not affect the existing historic building's foundations and respects its original fabric, while showing the auditorium's unique and intimate shape.

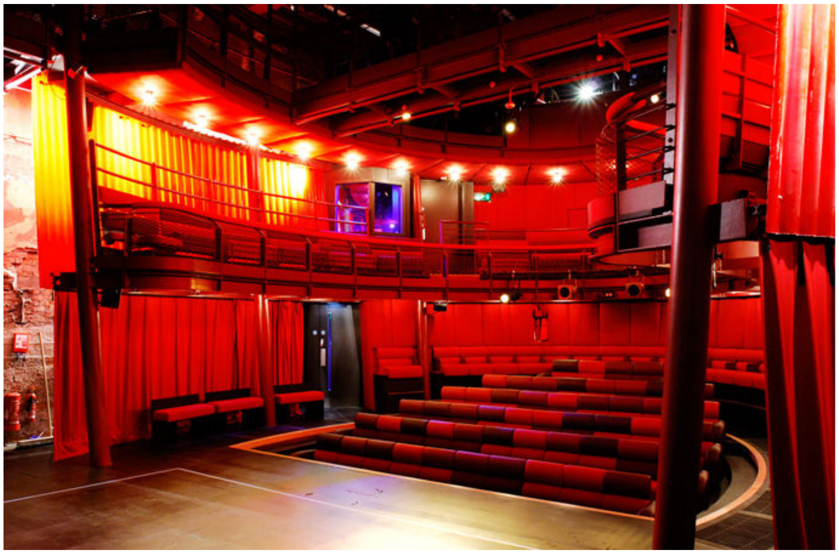


Figure 53 - The auditorium's interior arrangement

As intended the auditorium makes a bold structural presence throughout the theatre, with its bright red steel structure and leather bench seating contrasting with the mellowed Bath-stone walls of the original building. The auditorium is clad with translucent red corrugated plastic sheeting which glows with reflected light, providing a further playful reference to the interior of the adjacent Theatre Royal.

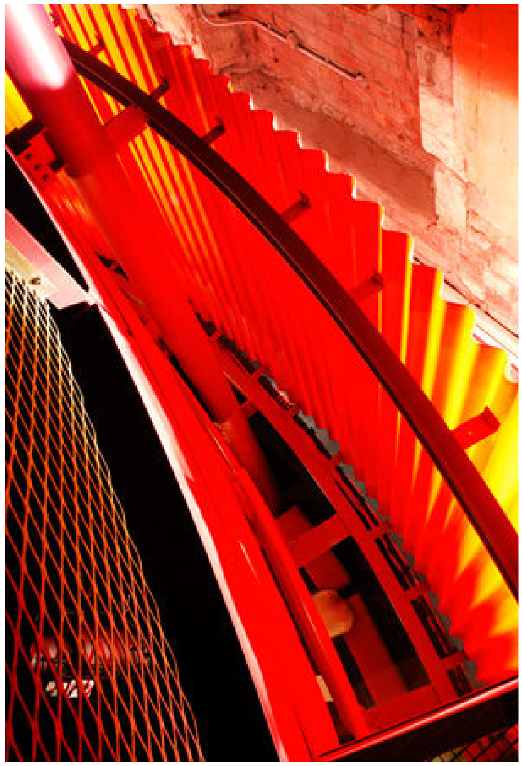


Figure 54 - Corrugated red plastic sheets reflecting the light from outside

The scale of all the spaces at the Egg is tiny and intimate, creating secret meeting places and vantage points in unexpected places. The main Circulation spaces twist around the central axis from the street-level cafe up to the rooftop rehearsal room with panoramic views across Bath.

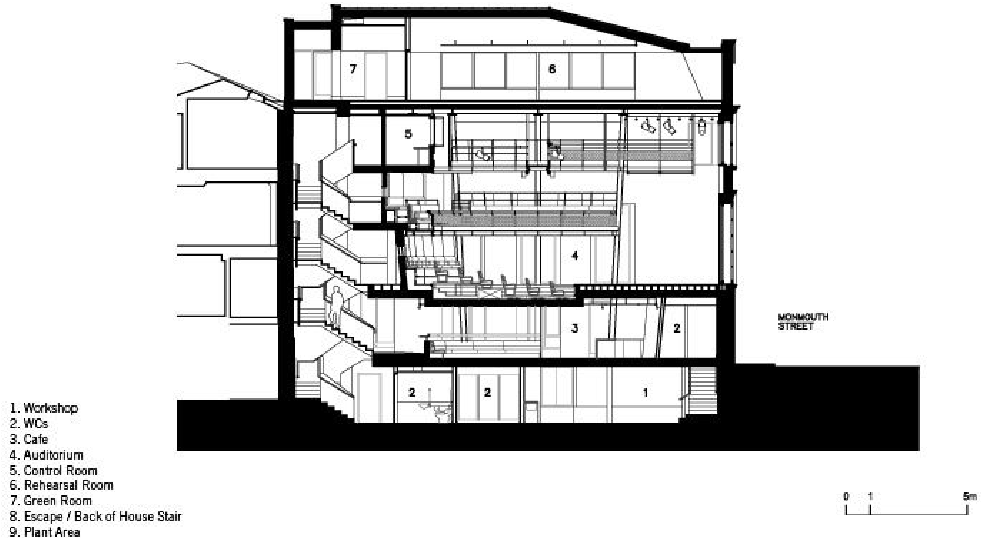


Figure 55 - The Egg theater section view

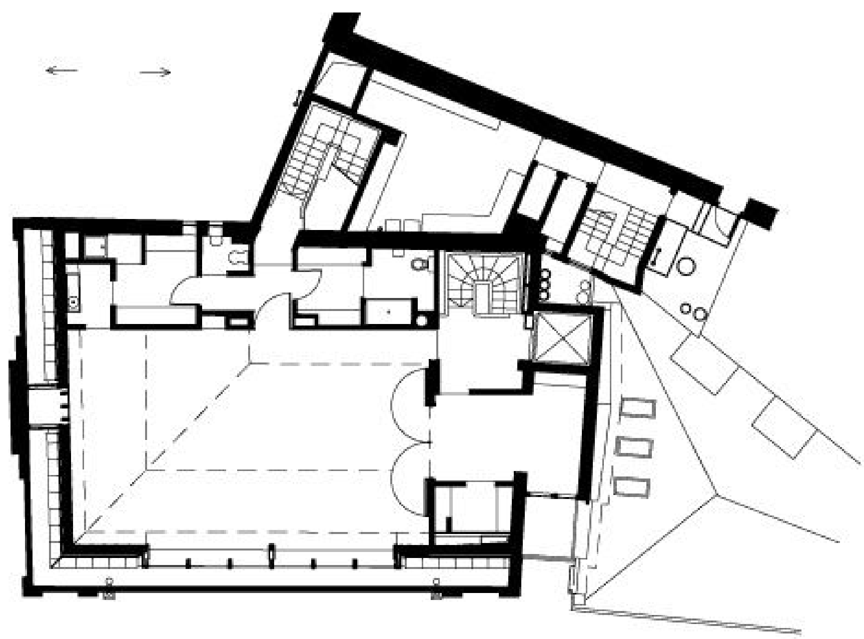


Figure 56 - Rehearsal room at the top

Figure 57 - The circulating stairs has proved popular with children, crossing and re-crossing the old stone walls

A high degree of flexibility was achieved, as the architects decided not to use the black-box studio approach to the theatre design, the large windows of the original building have been retained and now form a backdrop to the stage, enabling a unique dual feature of full blackout or day-lit use of the auditorium.

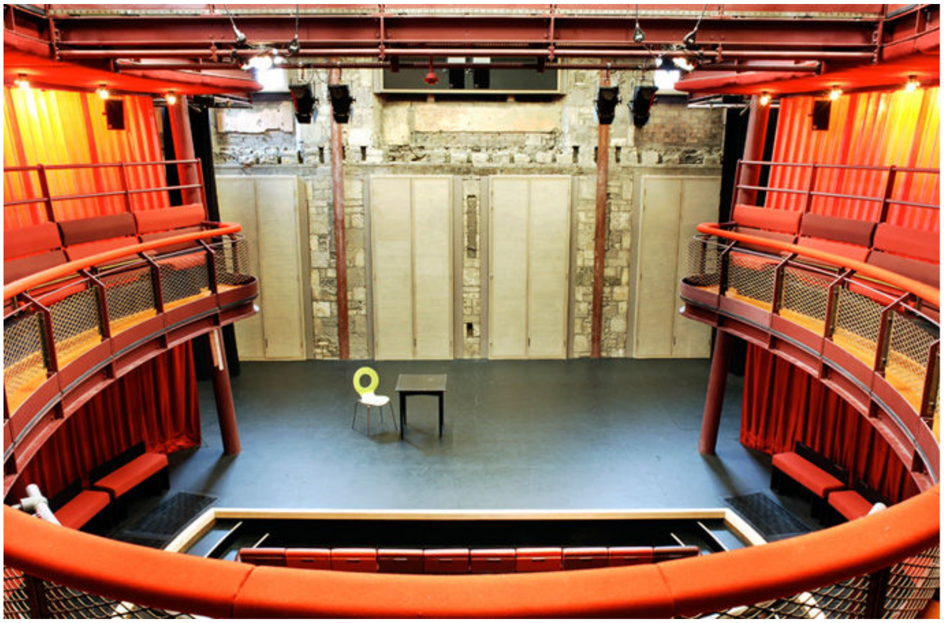


Figure 58 - Large windows full blackout

Figure 59 - Large windows open for sunlight use

The architects have responded to the request for exterior visibility by projecting colored light through the facade to the exterior of the building, creating the sense of a glowing ember of activity inside.

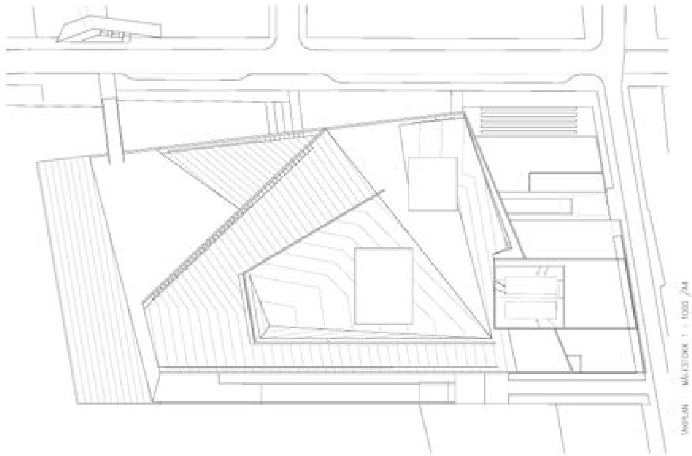
Figure 60 - The translucent red corrugated plastic sheeting surrounding the auditorium not only creates a sense of intimacy but also has an important light box effect

According to Rob Gregory of Architects Journal: “When it is full of children, the atmosphere is beyond electric, and prepared adults should enter at their own risk. There are no stifling facilities-management regimes. Nothing here is precious. This is very much a building for children and this has everything to do with the building's design. ”

3.3 Oslo, Norway Opera House

The Oslo opera house was built in 2008 on the site of an abandoned sawmill at the edge of Oslo Fjord waterfront, in the Bjorvika neighborhood, with the idea of redeveloping the decaying harbor area in the centre of the city. The Norwegian National Opera had no official home since its start in the year 1957 and its construction was the subject of debate for many years and hence described by the architects as 'the largest single culture-political project in contemporary Norway'.

Figure 61 - Oslo Opera House – Arial View



The brief required a monumental and striking design, providing Oslo with an important national focus. Local design firm, Snohetta famous for their design of Alexandria library in Egypt won the competition to build this project. The architects major challenge was first to remove the water contamination caused by disposing of sawdust by the sawmill for more than a 100 years and also to overcome the structural problems related to building half of the structure on land and half in water.

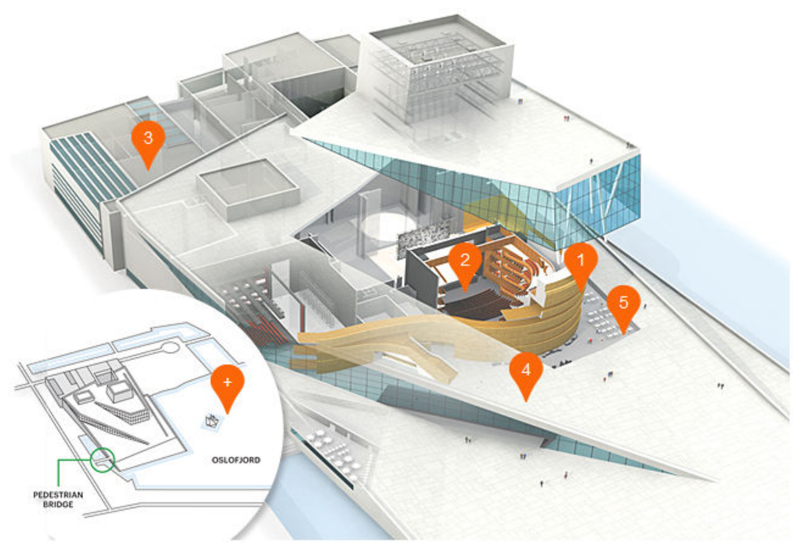


Figure 62 – Legend: 1. The Wave Wall 2. Main Auditorium 3. The Factory Building 4. The Carpet

The architects had suggested the concept of 'social monumentally', meaning a powerful design concept that has people at its centre. For this “The Carpet”, the opera house’s roof was designed, an uninterrupted plaza made of 36,000 slabs of white Italian marble that slopes down into the water like a ski-slope.

Figure 63 - The Carpet or the Opera House's Roof Made with Italian La Facciata Marble

It has become a hangout and sunbathing area during the sunny summer weather and also proposed for a daring, unofficial snowboarding event this winter. A panoramic view of Oslo is also visible from the roof. Other than monumentality the carpet was designed to make the opera accessible in the widest possible sense. This monumentality has been achieved through horizontal extension and not verticality.

Figure 64 - 'Social Monumentally' and Interaction of People with the Building

This design has allowed people to interact with the building in ways that would not involve them spending money as it is usually the case with commercial buildings.

One other main winning idea of the architects was the "The Factory", a self-contained section separate from the main structure. Wrapped in aluminum this factory is both functional and flexible in use. The flexibility has proved to be very important during the planning phase: a number of rooms have been adjusted in relationship with the end user. These changes have improved the buildings functionality without affecting the architecture. It contains the rehearsal rooms, makeup and costume workshops, dressing rooms, and offices.

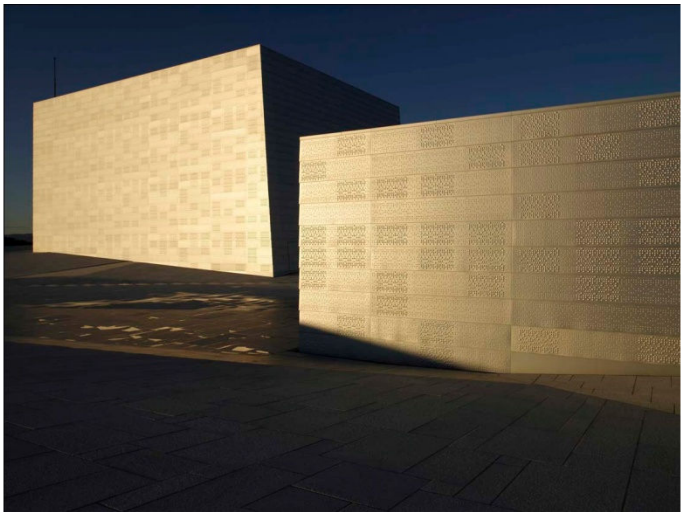


Figure 645 - The Self-contained Factory Building

The dividing line between the ground 'home land' and the water 'outside' is both a real and a symbolic threshold. This threshold is realized as a large wall, the "Wave Wall", on the line of the meeting between land and sea, Norway and the world, art and everyday life.

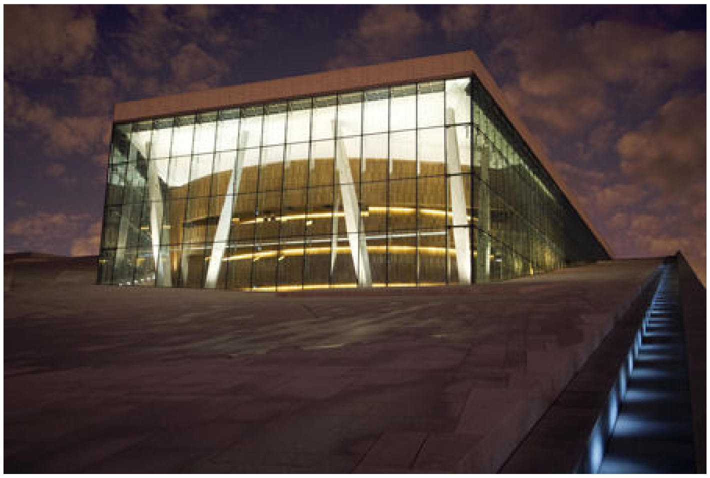


Figure 656 - The wall symbolizes the building's waterfront perch

The “Wave Wall”– Forged in Wood, constructed by Norwegian shipbuilders using slats of oak, a massive, curving wall that wends through the lobby.

Figure 667 – The warm wood tones act as a foil to the stark glass and marble exterior

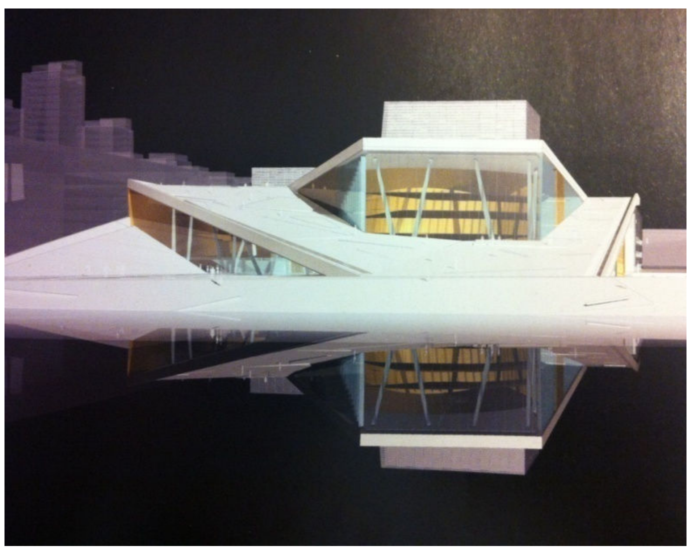


Figure 678 - The Opera house seen across the water. the wooden drum of the 'Wall Wall' is clearly visible even from a distance

The conceptual basis of the competition, and the final building, is a combination of these three elements – The wave wall, the factory and the carpet.

To connect the building with the city both topographically and politically, the building had to be designed very low. The building connects city and fjord, urbanity and landscape. To the East, the ‘factory’ is articulated and varied. One can see the activities within the building: Ballet rehearsal rooms at the upper levels, workshops at street level.

The overall height of the building is, however, deceiving as just under half of the accommodation lies below sea level.

Figure 689 - The building is designed as if it in goes in the water

The venue supports both the performance of ballet and opera and in many aspects these two art forms have conflicting requirements: as mentioned in the first section opera needs intimacy and a smaller stage, while ballet often needs much more space. They also have a very different lighting and acoustic requirements. Since there was not enough space to create separate performance halls, the architects and acoustic consultants had to come up with a design to incorporate the required flexibility.

The structure contains 1,100 rooms in a total area of 38,500 m^2. The building is split in two by a corridor running north-south, the 'opera street'. To the west of this line are located all the public areas and stage areas. The eastern part of the building houses the production areas which are simpler in form and finish, comprising 3 to 4 storeys above ground. There is also a basement level – U1 – below this part of the building. The sub stage area is a further 3 storeys deep.

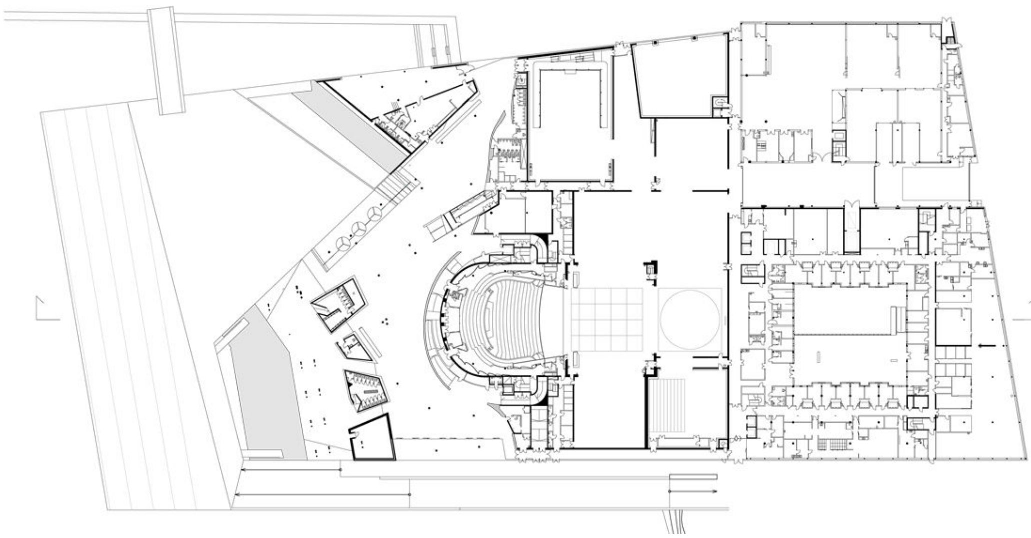


Figure 7069 - Plan solution, general arrangement

The main auditorium, Hovedscenen, has a horseshoe-shape plan and it can accommodate up to 1350 people, with stalls and three balconies vertically stacked to ensure that the furthest seat is no more than 33m from the stage.

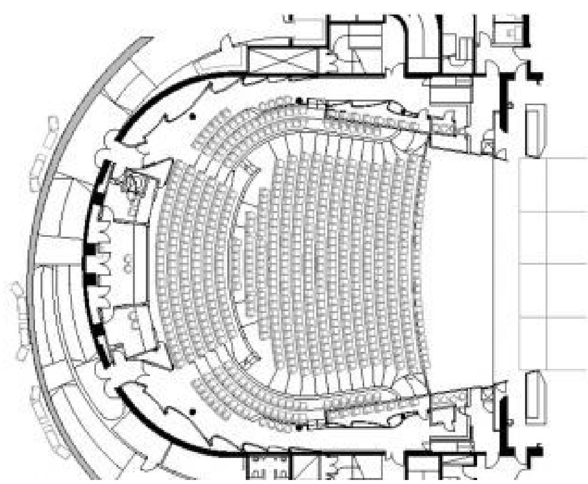


Figure 701 - Main Auditorium Horseshoe Plan

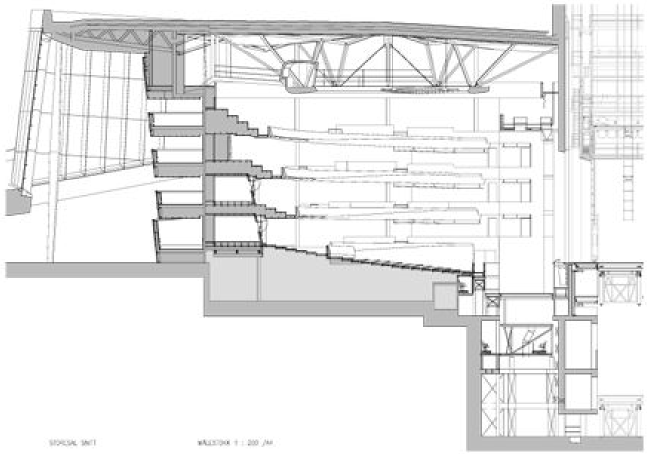


Figure 712 - Main Auditorium Section View

The high ceiling of the auditorium does not require artificial amplification and its surfaces are carefully planned to reflect sound around the hall. At the sides the form reflects sound back down to the audience whilst at the rear it sends sounds in multiple directions to avoid focusing. The oval ceiling reflector visually finishes the hall and also reflects sounds in very specific ways. The same principle is used as with the balcony fronts. The rear walls at each level are made up of convex panels to avoid focusing and to spread sound evenly through the room.

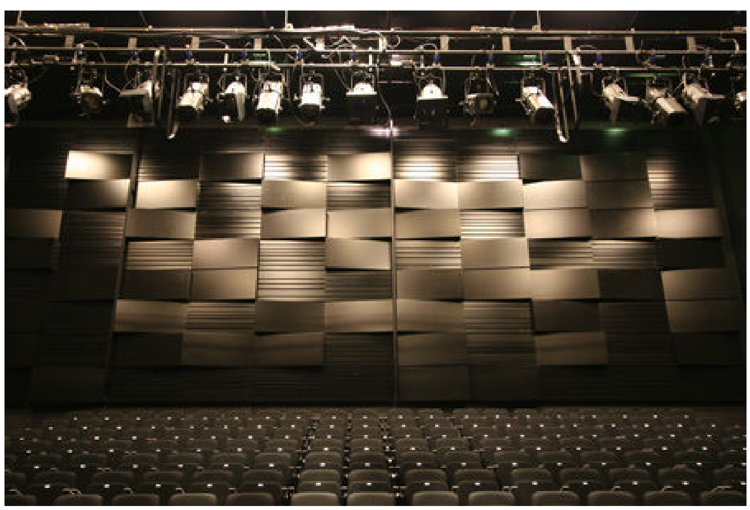


Figure 723 - Rear wall sound reflectors

The orchestra pit is highly flexible and can be adjusted in height and area with the use of three separate lifts. On each side of the stage are mobile towers which allow for adjustments in the proscenium width for ballet or opera without damaging the acoustics of the hall.

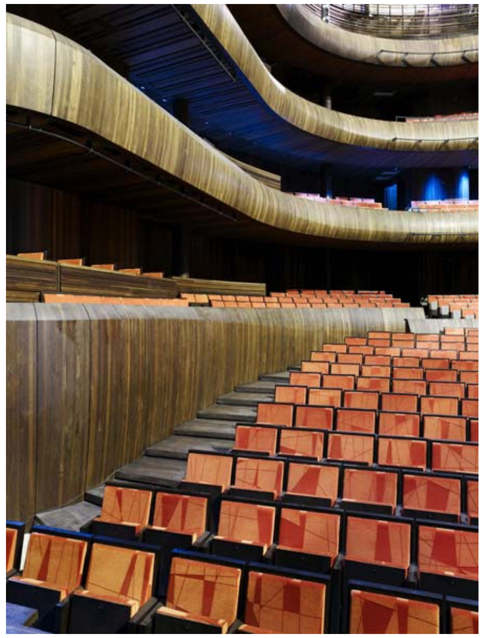


Figure 734 - Main Auditorium Stalls and 3 Balconies Vertically Stacked

Each seat back has its own individual screen enabling subtitles to be made available in eight languages, while the humidified air maintains the purity of the vocals and orchestral instruments. The interior of the auditorium is simple, with hand-carved Baltic oak to provide a wall between the public areas and the performance spaces and on the balcony fronts.

Figure 745 - The Interior of the Main Auditorium

The two other smaller rectangular-shape performance spaces can seat 200 and 400, and instead have a more flexible acoustics and can accommodate a variety of performances than just opera and ballet. This flexible and variable acoustics is achieved by the use of adjustable paneling and drapes. As it was called in the brief, it has a large orchestra pit, a deep stage, a flexible seating plan, and a flat floor option. This was possible through the installation of lifts (to raise and lower the floor) and a series of wagons to move blocks of seating. The backstage areas contain all the facilities required to produce an opera or ballet to an international standard. They are housed over five levels and designed to offer sufficient flexibility to enable the theatre to respond to different requirements in the future.

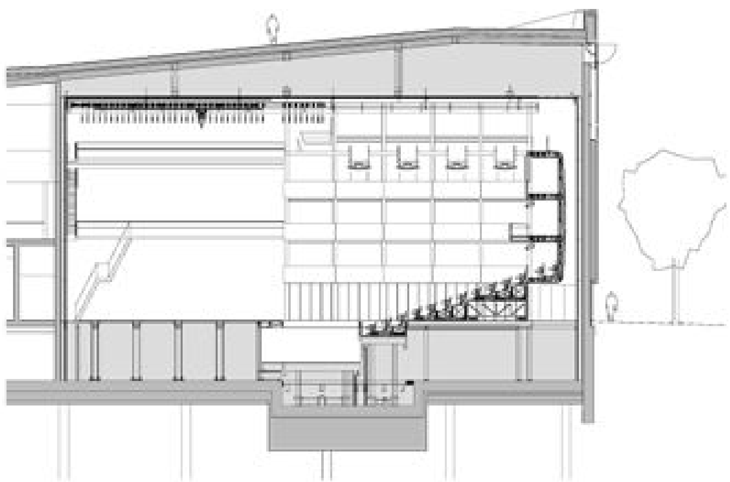


Figure 756 - Orchestra rehearsal room - section view

The architectural firm Snohetta had to prove the cultural benefits of the building to the public and city because of its high cost. In addition, since opera still is perceived as an "older" audience's interest, Snohetta was determined to separate this building from this typical image of opera houses, so they have designed a contemporary structure to which especially young people can relate to. However, the architects included only half of the originally designed features because of the political and financial constraints. For example the initial design of foyer was 90 meters long running through the building and there was a private garden in the back of the house for staff and performers. The city also insisted on using strictly Norwegian materials but the architects considered this restrictive; White Italian marble and darker Norwegian granite dominate the exterior, and wood, largely oak, is used extensively inside.

Section 4: Last Say

In conclusion, it is understood that in all theatre forms every effort should be made to enhance the life and energy of live performance. The past shows a way ahead. Before electricity and amplification, theatres simply had to be intimate. The opera houses of Europe and the theatres of London's West End and New York City's Broadway were the product of 400 years of evolution. Theatre owners build theatres for audiences, whom they both knew and understood. They knew that theatre sparked to life when an audience was tightly gathered together and close to the actor. This three-dimensional stacking of an audience in a tight embrace of stage makes for that acceleration of human energy and a sense of participation which in turn makes every performance a unique event.

__Section 5: Bibliography__

Written Material: Online Resources

1. archrecord.construction.com/
2. www.architecturaldigest.com
3. http://www.archdaily.com/
4. http://en.wikiarquitectura.com/index.php/Tenerife
5. http://www.arcspace.com/features/santiago-calatrava/
6. www.peri.com/ww/en/projects
7. http://www.theegg.org/
8. http://www.haworthtompkins.com/built/proj17/index.html
9. http://www.operaen.no/Default.aspx?ID=29006
10. http://www.ibsen.net/index.gan?id=11115137&subid=0

Written Material: Books & Articles

1. Mortensen, Jorn. Visual Art in the Oslo Opera House, Forlaget Press, 2011
2. MacKintosh, Iain. Architecture, Actor and Audience (Theatre Concepts), Routledge, 1993
3. Purchla, Jacek. Theatre architecture of the late 19th century in central Europe, Cracow : International Cultural Centre, 1993
4. Hardy, Hugh. Building Type Basics for Performing Arts Facilities. 1932. John Wiley & Sons, Inc. 2006.

5. Hammond, Michael. Performing Architecture Opera Houses, Theatres and Concert Halls for the Twenty-First Century. 2006. Merrell Publishers Limited. 2006
6. Medau, Peer. The Architecture of National Theatre. Univeritat Paderborn, Cutural Heritage, 2002
7. Strong, Judith. Theatre Buildings: A Design Guide (Association of British Theatre). Routledge, 2010

Figures: Books & Online Resources

Figure 1. http://www.whitman.edu/theatre/theatretour/glossary/glossary%20images/parados.jpg

Figure 2. http://www.docstoc.com/docs/102938093/Elizabethan-Theater-Elizabethan-theater-The-Elizabethan-theater-

Figure 3. http://www.capturemychicago.com/photos/171160

Figure 4. http://www.tsevents.com/enews/current/?pg=6

Figure 5. Hardy, Hugh. Building Type Basics for Performing Arts Facilities. 1932. John Wiley & Sons, Inc. 2006. Page 20.

Figure 6. http://claricesmithcenter.umd.edu/venues/kay-theatre

Figure 7. http://www.london-theatreland.co.uk/theatres/courtyard-theatre/seatingchart.php

Figure 8. Hardy, Hugh. Building Type Basics for Performing Arts Facilities. 1932. John Wiley & Sons, Inc. 2006. Page 22.

Figure 9. Hardy, Hugh. Building Type Basics for Performing Arts Facilities. 1932. John Wiley & Sons, Inc. 2006. Page 22.

Figure 10. http://www.topboxdesign.com/edith-cowan-university-lecture-theatre-in-perth-australia/

Figure 11. http://www.martin.com/casestory/casestory.asp?id=1660

Figure 12. http://www.debritz.com/str/node/38 and Book, Performin arts facilities, page 33

Figure 13. http://www.muellerbbm.com/buildings_room_acoustics_line_of_sight_analyses.mbbm

Figure 14. http://www.nntt.jac.go.jp/english/access/index.html

Figure 15. http://www.eventfinda.com/venue/whitaker-center-harrisburg

Figure 16. http://patrickwoodroffe.com/projects/bathegg

Figure 17. https://maps.google.com/maps?hl=en&q=Tenerife+Auditorium&bav=on.2,or.r_gc.r_pw.r_cp.r_qf.&bpcl=39650382&biw=898&bih=607&um=1&ie=UTF-8&sa=N&tab=wl

Figure 18. http://www.spainisculture.com/en/espacios_culturales/tenerife/auditorio_tenerife_adan_martin.html

Figure 19. http://www.arcspace.com/features/santiago-calatrava/tenerife-concert-hall/

Figure 20. http://www.greentraveller.co.uk/where-visit-tenerife

Figure 21. http://en.wikipedia.org/wiki/Torres_de_Santa_Cruz

Figure 22. http://www.rinconcitocanario.com/SantaCruz/fotosemana/fotosemana.htm

Figure 23. www.worldarchitecturemap.org/buildings/tenerife-concert-hall

Figure 24. www.en.wikiarquitectura.com/images/d/d4/

Figure 25. www.peri.com/ww/en/projects.cfm/fuseaction/diashow/.../2.cfm

Figure 26. unusual-architecture.com/tenerife-concert-hall-canary-islands-spain/

Figure 27. Hammond, Michael. Performing Architecture Opera Houses, Theatres and Concert Halls for the Twenty-First Century. 2006. Merrell Publishers Limited. 2006. Page 75

Figure 28. http://www.arcspace.com/features/santiago-calatrava/tenerife-concert-hall/

Figure 29. Hammond, Michael. Performing Architecture Opera Houses, Theatres and Concert Halls for the Twenty-First Century. 2006. Merrell Publishers Limited. 2006. Page 76

Figure 30. www.peri.com/ww/en/projects.cfm/fuseaction/diashow/

Figure 31. www.peri.com/ww/en/projects.cfm/fuseaction/diashow/.../1.cfm

Figure 32. www.peri.com/ww/en/projects.cfm/fuseaction/diashow/

Figure 33. www.peri.com/ww/en/projects.cfm/fuseaction/diashow/

Figure 34. www.peri.com/ww/en/projects.cfm/fuseaction/diashow/

Figure 35. en.wikiarquitectura.com/index.php/Tenerife's_Auditorium

Figure 36. http://www.flickr.com/photos/auditoriodetenerife/6754829539/&docid=Z1MvlAUzSboFTM&itg

Figure 37. http://en.wikiarquitectura.com/index.php/Tenerife%27s_Auditorium

Figure 38. https://auditoriodetenerife.com/en/conferences-and-events

Figure 39. http://en.wikiarquitectura.com/index.php/Tenerife%27s_Auditorium

Figure 40. www.auditoriodetenerife.com/en/exteriors

Figure 41. http://en.wikiarquitectura.com/index.php/Tenerife%27s_Auditorium

Figure 42. http://en.wikiarquitectura.com/index.php/Tenerife%27s_Auditorium

Figure 43. Hammond, Michael. Performing Architecture Opera Houses, Theatres and Concert Halls for the Twenty-First Century. 2006. Merrell Publishers Limited. 2006. Page 77

Figure 44. cafeurbanite.yuku.com/topic/538/More-Calatrava

Figure 45. http://www.arcspace.com/features/santiago-calatrava/tenerife-concert-hall/

Figure 46. lightingarchitecture.wordpress.com/.../santa-cruz-de-tenerife-concer

Figure 47. www.auditoriodetenerife.com/en/node/1804

Figure 48. https://maps.google.com/maps?hl=en&biw=898&bih=607&ie=UTF-8&sa=N&tab=il

Figure 49. Fig 49: www.haworthtompkins.com/built/proj17/index.html

Figure 50. Fig 50: www.haworthtompkins.com/built/proj17/index.html

Figure 51. Fig 51: www.haworthtompkins.com/built/proj17/index.html

Figure 52. http://en.urbarama.com/project/the-egg-theatre-royal-bath

Figure 53. http://en.urbarama.com/project/the-egg-theatre-royal-bath

Figure 54. www.haworthtompkins.com/built/proj17/index.html

Figure 55. www.haworthtompkins.com/built/proj17/index.html

Figure 56. www.haworthtompkins.com/built/proj17/index.html

Figure 57. www.en.urbarama.com/project/the-egg-theatre-royal-bath

Figure 58. http://www.architecture.com/Awards/RIBAAwards/Winners2006/Wessex/TheEggBath.aspx

Figure 59. http://www.architecture.com/Awards/RIBAAwards/Winners2006/Wessex/TheEggBath.aspx

Figure 60. http://patrickwoodroffe.com/projects/bathegg

Figure 61. https://maps.google.com/maps?hl=en&bav=on.2,or.r_gc.r_pw.r_cp.r_qf.&bpcl=39650382&biw

Figure 62. www.cntraveler.com/search/oslo

Figure 63. wwwtestadcom.archdaily.com/440/oslo-opera-house-snohetta/

Figure 64. www.topboxdesign.com/tag/snøhetta/

Figure 65. www.dezeen.com/2008/04/04/opera-house-oslo-by-snøhetta/

Figure 66. www.openbuildings.com/buildings/oslo-opera-house-profile-6175

Figure 67. www.archiscene.net/cultural/opera-house-in-oslo-by-snohetta/

Figure 68. Hammond, Michael. Performing Architecture Opera Houses, Theatres and Concert Halls for the Twenty-First Century. 2006. Merrell Publishers Limited. 2006. Page 189

Figure 69. http://www.archdaily.com/440/oslo-opera-house-snohetta/

Figure 70. http://www.archdaily.com/440/oslo-opera-house-snohetta/

Figure 71. http://www.architectureweek.com/2008/1112/design_3-3.html

Figure 72. http://www.architectureweek.com/2008/1112/design_3-3.html

Figure 73. http://www.architecture-buildings.com/post/oslo-opera-house-architecture-design-by-snohetta/

Figure 74. http://arqa.com/en/architecture/operahouse.html

Figure 75. http://www.urbanfile.org/blog/2011/10/oslo-opera-house/snohetta-oslo-opera-house-interior-opera-huose/

Figure 76. http://www.dezeen.com/2008/04/09/opera-house-oslo-by-snohetta-2/