深圳歌剧院

SHENZEN OPERA HOUSE

建筑方案设计国际竞赛

INTERNATIONAL ARCHITECTURE DESIGN COMPETITION

ROBERT GUTOWSKI ARCHITECTS

Scale-modell 1:3000

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

使命

标志性和纪念意义

在此设计项目中，作为创造者，我们的目标是在平等的基础上展示现代建筑的雄伟壮观和艺术灵感。我们精心打造，用我们的设计去表达歌剧院的宗旨和使命：让深圳歌剧院成为世界上最著名的标志性建筑之一。
我们追求巴黎埃菲尔铁塔或悉尼歌剧院诞生时那种令人震憾的时刻。
深圳歌剧院雕塑般的造型源自传统，其建筑是世界级现代工程成就的一座丰碑。当人们在巴西、冰岛、法国或地球上任何其他地方看到新歌剧院的图片时，我们希望他们能想到同一座城市--深圳。

开放性和公开性

深圳歌剧院是一座开放、热情的公共建筑，是顶级文化和日常生活的家园。除了提供各种表演节目外，深圳歌剧院也是一个休闲娱乐的场所。歌剧院的规模和吸引力使其成为国内和国际旅游的首选目的地。

令人惊叹的体验和出色的声学效果

我们注重细节，以确保在标志性外观的背后，其内部特征也符合最高期望，无论是古典音乐的爱好者，还是享受沙滩的人们，抑或是远道而来的游客，深圳歌剧院都能给他们带来难忘的体验。
大歌剧厅、轻歌剧厅、交响音乐厅和多功能剧院提供独特的视觉和声学体验。只有对声学和建筑设计具有高度专业的理解，才能实现世界级的室内声学效果。

Mission

Iconic & memorable

Our creative intention is to equally represent the greatness of contemporary architecture and artistic inspiration in our competition design. Approaching from heart and soul, our starting point is to define the message and mission of the new opera house: the Shenzhen Opera House shall be one of the most famous and popular iconic buildings in the world. We are looking for that inspirational and solemn moment which can be similar to the creation of the Eiffel Tower in Paris or the Opera House in Sydney.
The sculpture-like form of the Shenzhen Opera House is rooted in tradition, but its engineering concept reveals world-class contemporary design knowledge. When seeing a photo of the new opera house, we want everyone in Brazil, Iceland, France, or anywhere in the world to think of the same city: Shenzhen.

Open & public

The Shenzhen Opera House is an open and receptive public building. It is both a cultural stronghold and a home of everyday life, which, in addition to its diverse range of programs, also serves the recreational needs of the local people. At the same time, due to its scale and appearance, it will also be the number one destination of domestic and international tourism.

Amazing experience & excellent acoustics

We have paid special attention to create real and valuable content behind the iconic appearance. The Shenzhen Opera House offers a memorable experience both for fans of classical music, for those who want to relax on the beach, as well as for tourists from far-away places.
The grand opera, the operetta hall, the symphony concert hall and the multifunctional theater provide a unique visual and acoustic experience in the world. Its world-class acoustics can only be created from the unity of architecture and the highest level of acoustic design knowledge and experience.

Mission

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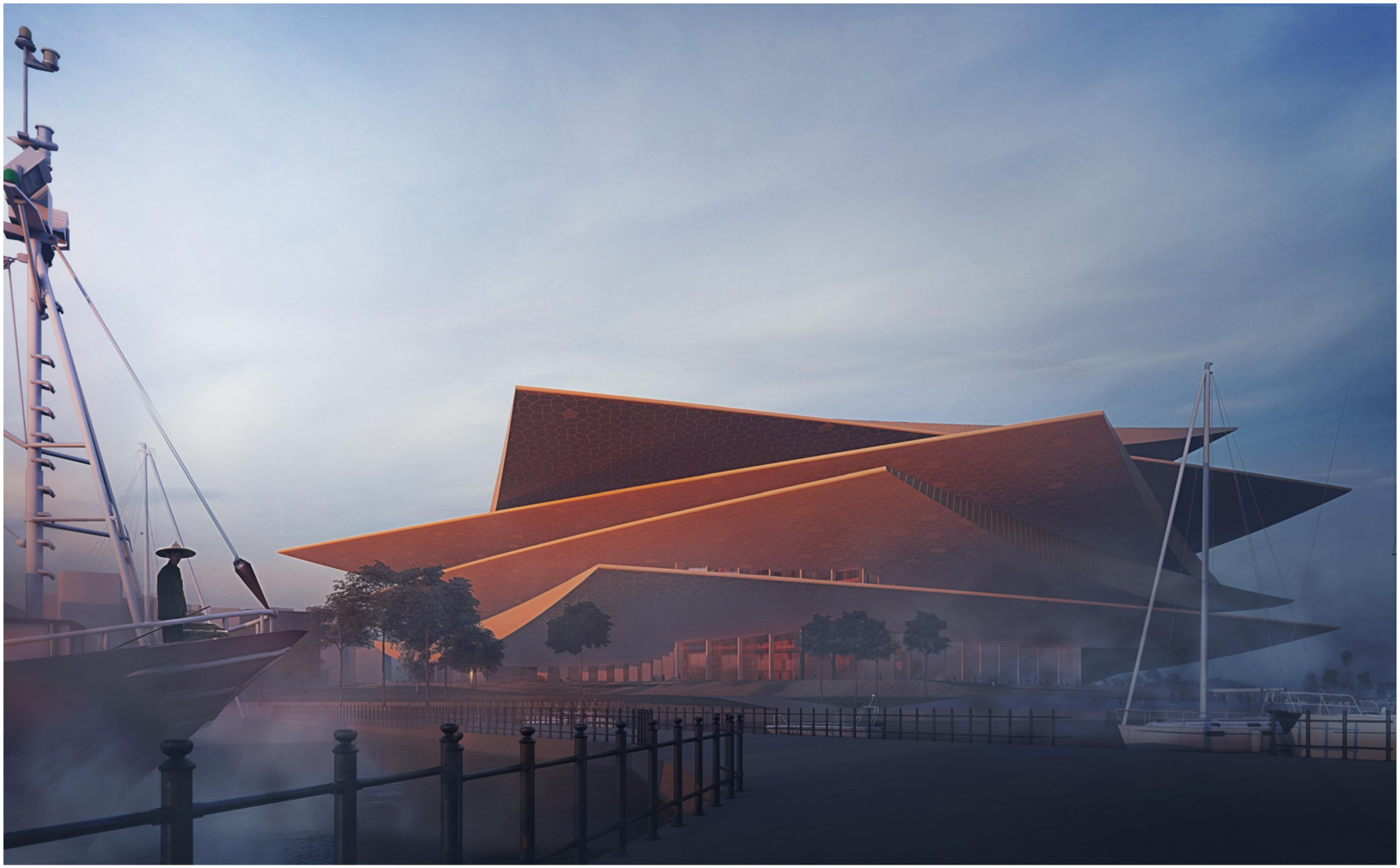

View from the south wharf

Shenzhen Opera House International Architecture Design Competition

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城市设计

城市规划理念

在精心打造我们的城市规划理念的同时，我们遵循竞赛的所有指导方针。我们根据设计规范的要求设计了交通运输通道和行人通道。歌剧院向四面八方开放，游客可以环绕歌剧院步行整整一圈。雕塑般的外观有别于这个城市的其他地方，但所有这些外观都具有令人叹为观止的气质。

交通

乘坐公共交通前来的步行者进入新歌剧院的主要通道是望海路下面宽阔的地下人行道。他们可以通过电梯和楼梯到达入口广场和新歌剧院的大厅。
一个由两部分组成的两层地下停车场可以满足停车需要。停车场只能通过一个地下坡道进入。可以从地面道路（望海路）到达停车场，也可以从地下快速路的东行方向到达。有两条车道穿过地下停车场B3层。内侧车道用于分流和汇合出入地下停车场两条通道的车辆。出口坡道通向快速路的西行方向。
新歌剧院的主要公交连接线路是地铁13号线。在地面上也设有几条到达歌剧院的公交线路站点。虽然公交站点离歌剧院很近，但它们不会影响歌剧院的景观。
地下停车场位于新歌剧院的旁边，由两部分两层的结构组成，通过B2层的一条通道连接。设置了内部坡道，作为不同楼层之间的通道。与歌剧院相连的地下停车场有1050个停车位。在停车场内部设计了一个清晰的停车系统。人们可以通过四个垂直的服务电梯到达停车场的各个楼层。针对很多人等待电梯的情况，在每个停车层，设置一个7.5米宽的特殊服务区。有特殊需要的人会得到照顾，而且会为残障人士预留车位。

装载区

歌剧院完全看不见的装载区位于大厅以下7.2米。货车（服务车辆）可以从望海路与后海大道交界处的辅路（主要承载行人）进入。装载区的大小足够重型车辆转弯，并足以停放4辆公共汽车。

Urban design

Urban planning concept

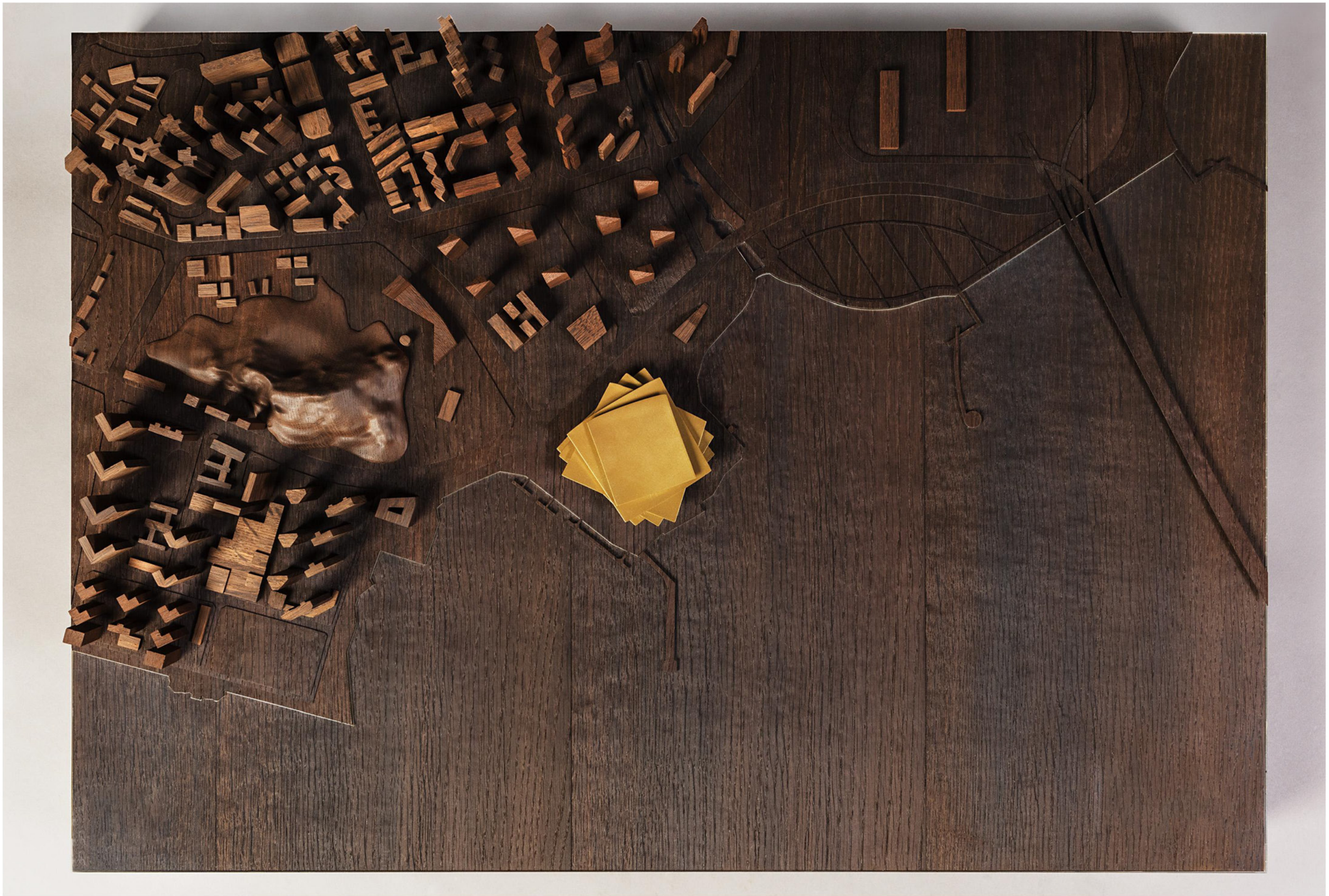
When developing our urban architecture concept, we considered the whole range of aspects indicated in the tender. We designed the specified transport systems and walking routes as expected. The building of the Opera House can be walked around, it is open and public from all directions. Due to its sculpture-like appearance, it looks different from the different parts of the city, but at the same time, if we look at the building from any direction, the view represents the same value and the same high quality.

Transportation

The main access to the new Opera House for pedestrians coming from the public transportation stops is via the wide underground pedestrian walkway under Wanghai Road, leading to the entrance square and to the lobby of the new building through elevators and staircases.
Parking needs are served by a two-part, two stories underground garage with only one entry leading through an underground ramp. It arrives from the surface road (Wanghai Road) and can be reached from the eastbound direction of the underground expressway as well. It passes through the garage floor B3 with two traffic lanes. The inner lane serves for exit and entrance traffic to and from the two access roads of the garage. The exit ramp leads to the westbound direction of the expressway.
The main public transportation connection for the new Opera House will be Metro line No. 13, but several bus stops are also provided for bus lines near the building on the surface roads. Bus stops are placed close to the building, but will not affect the view of the Opera House.
The underground parking facility is located next to the new building, and consists of a two part, two stories structure, connected by a passage road on floor B2. Access between the different floors is provided by indoor ramps. The underground garage connected to the Opera House has a parking capacity of 1050 parking spaces. Inside the garage a clearly organized parking system is designed. Garage floors can be accessed through four vertical service shafts. For the large number of people waiting for the lifts, a 7.5 m wide dedicated service area is provided along each parking floor. For people with special needs, parking spaces for disabled people are provided.

Loading bay

The completely invisible loading bay of the Opera House is placed 7.20 m below the lobby level. Trucks (service vehicles) can access this area from the service road (mostly for pedestrian traffic) from the junction of Wanghai Road and Houhai Boulevard. The size of the loading bay floor allows for heavy vehicles half-turn and provides 4 parking spaces for buses.



Urban design, scale-modell 1:3000

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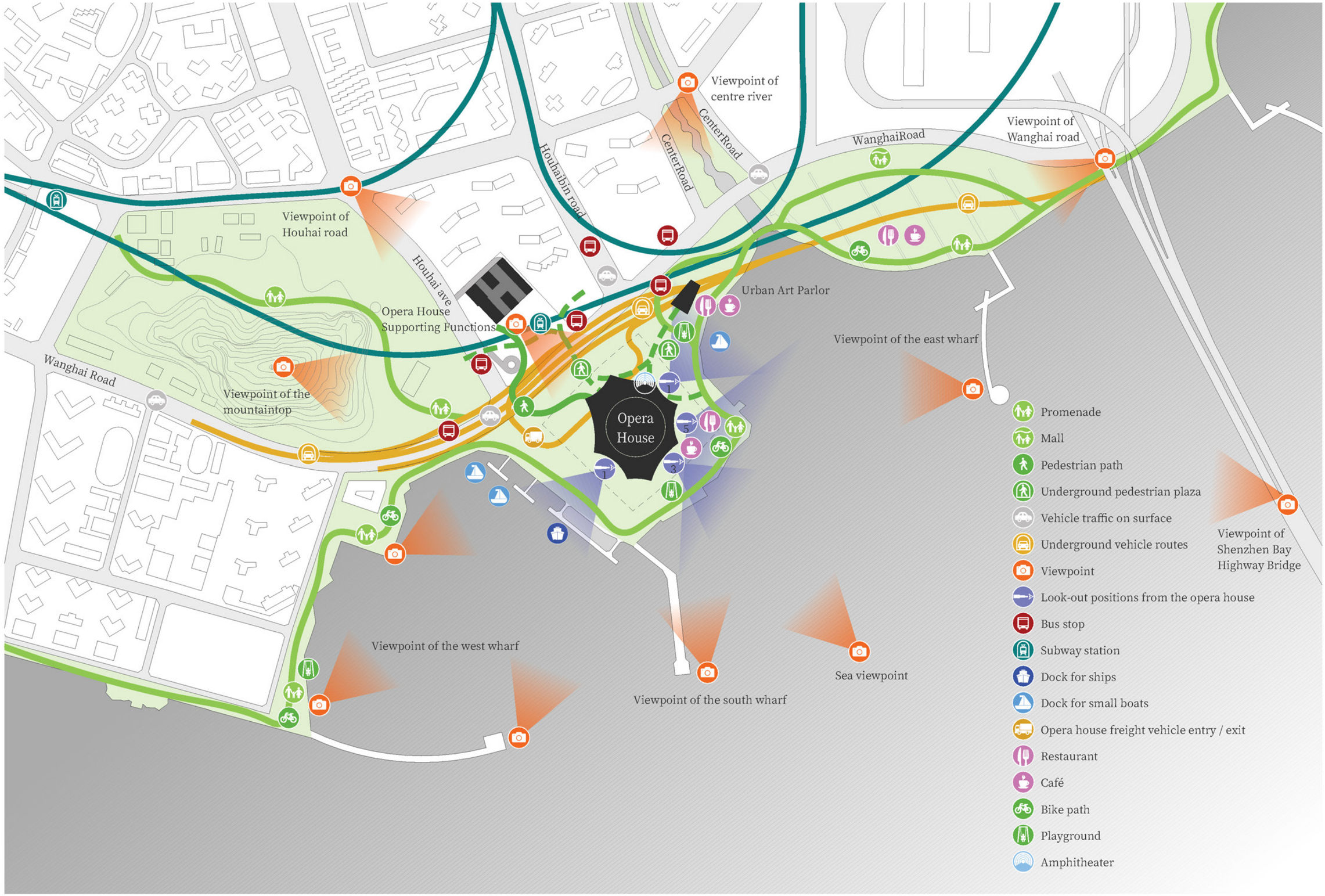
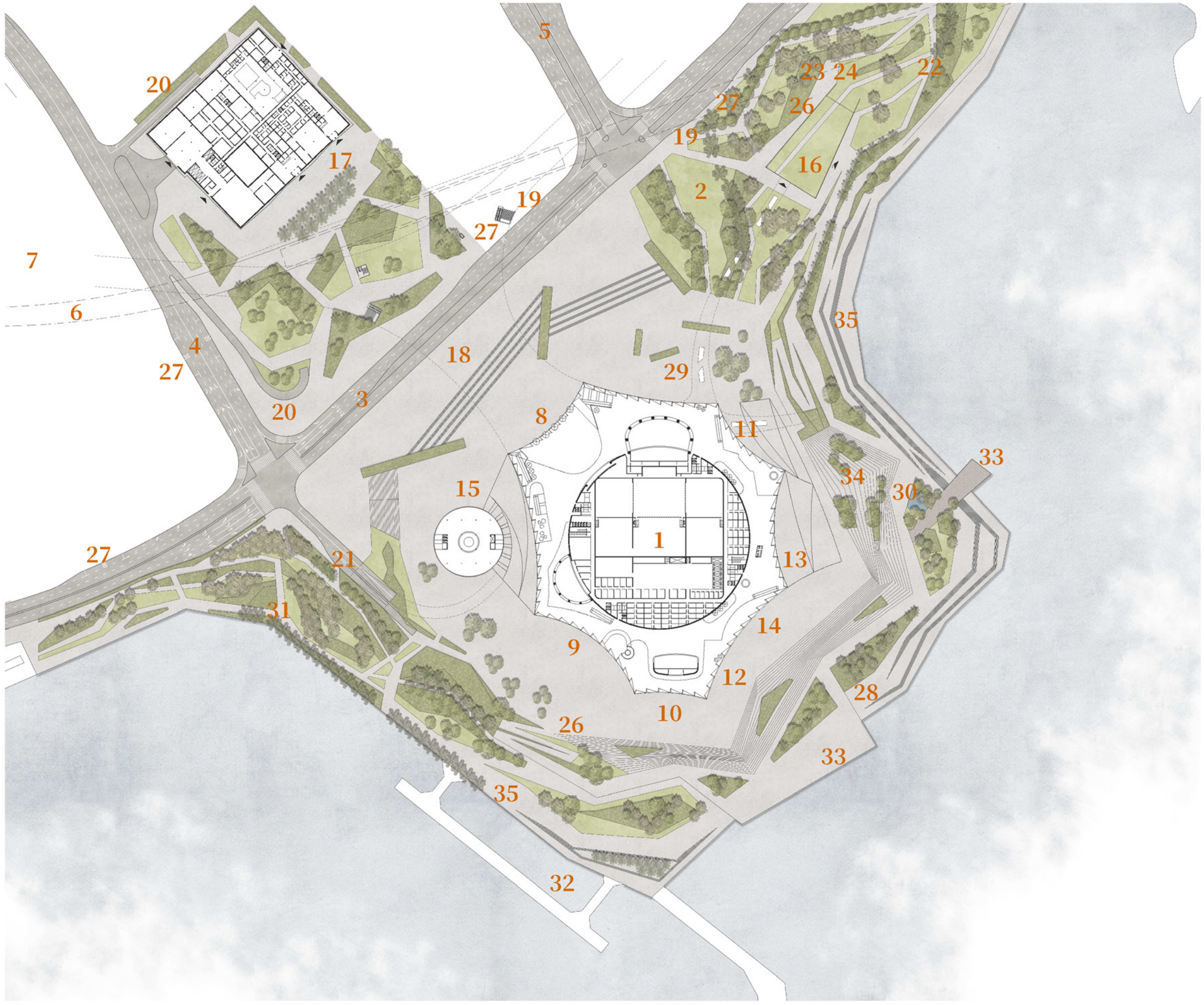


Urban design

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



1 - Shenzhen Opera House
2 - Shenzhen Bay Park
3 - Wanghai road
4 - Houhai ave
5 - Houhaibin road
6 - Metro line 13
7 - Shekou mountain plot

8 - Opera house main entrance and lobby
9 - Operetta hall entrance
10 - Concert hall entrance
11 - Multi-functional hall entrance
12 - Public hall entrance
13 - Restaurant entrance
14 - Café entrance
15 - Tourist centre entrance
16 - Urban art parlor
17 - North zone opera house supporting functions

18 - Underground passage
19 - Taxi drop-off
20 - Underground parking
21 - Loading bay entry and exit
22- Pedestrian path
23 - Shrubbery
24 - Lawn
25 - Cycling path
26 - Bicycle parking place
27 - Bus station

28 - Seasonal café and ice shop
29 - Natural outdoor amphitheatreon the first wing
30 - Children's playground
31 - Outdoor training equipment ground
32 - Wharf
33 - Pier
34 - Representative terraced steps
35 - Seashore promenade

Masterplan

Shenzhen Opera House International Architecture Design Competition

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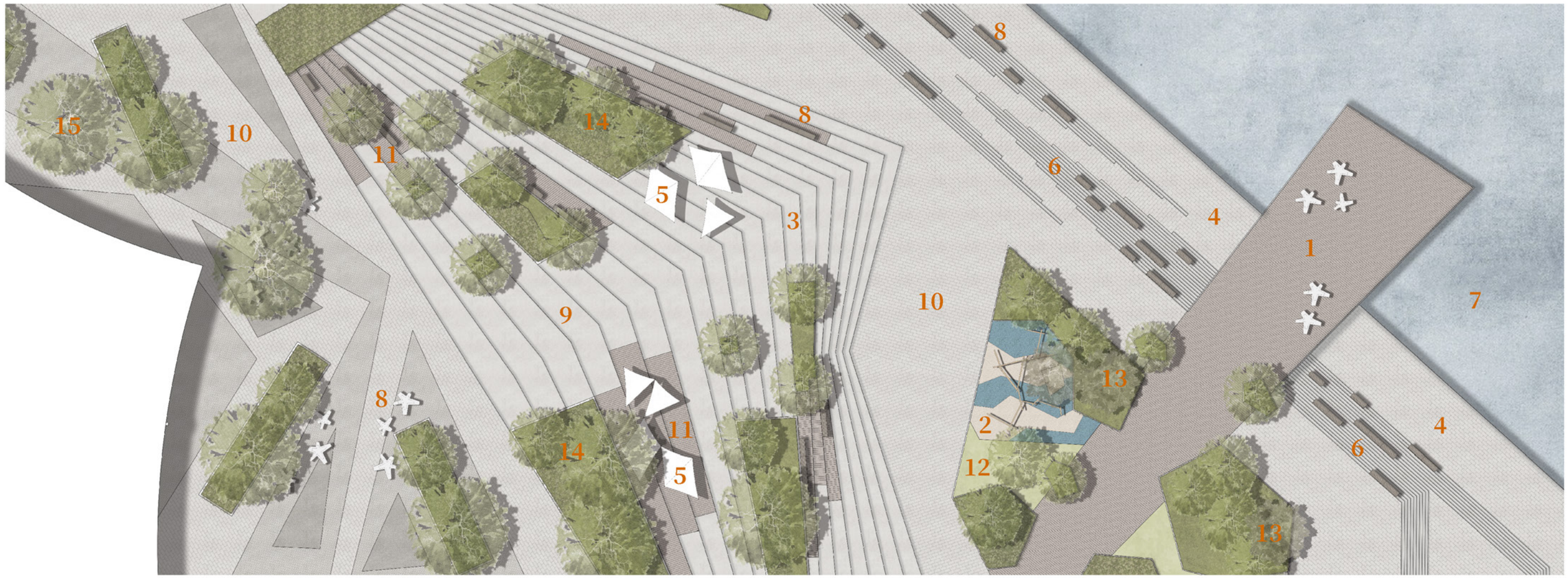


Landscape design

The park around the Opera House is designed with characteristic shapes that reflect, and at the same time accentuate the appearance of the building. The design of roads and green areas directs the park users towards the central element of the design area. The connection to the adjacent areas is fully ensured. The concept ensures accessible use in every detail.

The Opera House can be walked around, so that a large, cohesive paved area is created around the building, which functions as an urban forum. The reception area has a representative design, providing space also for outdoor events. The Opera House can be accessed through an impressive flight of stairs from Wanghai Road.

While representative functions dominate in the vicinity of the Opera House, leisure functions (playgrounds, fitness park, relaxation zones) become typical near the boundaries of the design area. Between the Opera House and the beach, there are flights of steps and ramps divided by green areas, where seats and shading systems ensure comfortable use. On the walking level of the coastal promenade, in some places radial observation decks extend above the water surface, strengthening the connection between sea and building. The promenades are shaded by rows of trees, creating a pleasant, shady space. The open lawn surfaces are divided by irregularly arranged groups of trees and grove areas. We keep the existing trees. The original function of the coastal promenade is also preserved.

1 - Pier (wooden pavement)
2 - Playground (rubber pavement)
3 - Representative terraced steps
4 - Seashore promenade (sectional pavement)
5 - Shaded terrace
6 - Amphitheatre steps
7 - Water surface
8 - Bank
9 - Terraced steps
10 - Sectional pavement
11 - Wooden pavement
12 - Lawn
13 - Shrub
14 - Raised plant bed
15 - Tree in pavement

深圳歌剧院

景观设计

我们在歌剧院的周围设计了公园。独特的公园设计体现和彰显了歌剧院建筑的魅力。道路和绿地的布局将游客引向主要景观区。该区与相邻地块也有很好的连通。
我们的设计也包含了针对残障人士的无障碍通道。
人们可以环绕歌剧院步行整整一圈。这就是我们为何选择在歌剧院的外面设计一个很大的铺设广场，这一设计也让广场具备了聚集点的功能。接待区具有代表性的设计，可以用来举办户外活动。从望海路的一侧，可以通过一个宽大台阶进入歌剧院。
虽然在歌剧院的附近，代表性功能占主导地位，但是在该区域的边缘，功能往往更面向户外（包括游乐场、健身公园、休闲放松区）。在歌剧院与海滩之间的区域，设置有绿地、坡道，台阶，也有长凳和公园树荫，身处其中，让人更加舒适。沿着海岸人行道有放射性的观景台，可以眺望一望无际的水面，这些平台延伸至水面上，加强了建筑与海的联系性。沿着人行道种植的遮荫树给这个地区带来了舒适感。在草坪上种有小树丛，打破草坪的单调性。我们将保留该地区所有的原始树木，同时还将保留沿海人行道的原有功能。

Landscape design

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

建筑理念和功能布局

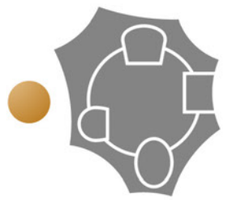
深圳歌剧院具有标志性的外观。屋顶巨大的弯曲拱门为观众带来持久难忘的体验。这些结构的多个点可以用作屋顶露台。上部也有额外的观景功能。歌剧院的主色调是金色。
歌剧院的正门面向望海路。入口比路面高三米。这个升高的区域不仅确保了歌剧院的良好的能见度，而且还将歌剧院与道路交通分开。从正门和接待大厅可以进入所有的功能单元（大歌剧厅、轻歌剧厅、音乐厅、多功能剧院），同时所有的独立单元都有各自的入口。这些文化单元可以单独使用，也可以作为连通的空间使用。
社交空间与接待大厅相互连接。所有这些不同的功能单元之间相互连接，为举办活动提供了很大的灵活性。大厅使用的颜色和建筑材料有助于游客为体验做好准备。大多数的内部空间都是阁楼式的。不同的楼层通过楼梯、自动扶梯和坡道相连。

世界级的文化服务只有在可靠、高效的前提下才能实现。在我们的实际设计中，我们精心设计了歌剧院综合体的所有交通功能。我们将所有的服务功能设置在歌剧院的核心环形区。这使我们具有将所有这些功能隐藏起来的优势。另一个好处是，我们紧凑的功能设计使各个大厅的技术支持更加灵活。这些大厅的后台区通过自动集装箱运输系统与北区的制作中心相连。该系统类似于气动管道运输系统，使货物在两座建筑物之间的水平和垂直移动快速高效。
我们遵循设计指导方针，将制作中心设置在北区。我们紧凑式设计的主要目标是实现功能性。
规模较小的美术馆位于海滩上。美术馆是歌剧院的“绿色标志”。美术馆是用木材建造而成的，使其成为此项目主要的可持续性景点。木材的使用赋予美术馆独特的特点和舒适的内部空间。

Architectural concept and functional layout

The appearance of the Shenzhen Opera House is iconic. The lasting experience of the view is provided by the large, curved roof elements. The unique structures are accessible as roof terraces in several places, and they also function as an observation deck from the higher floors. The dominant color of the building is golden yellow.
The main entrance to the Opera House opens from Wanghai Road. The entrance level of the building in the design is 3 meters higher than the road. This elevated "platform" provides a proper view of the building and distance from vehicle traffic. From the main entrance and the central foyer, all functional units (grand opera, operetta hall, concert hall, multifunctional theater) can be accessed, however, each individual function can also be accessed via its own entrance. The individual cultural units can be operated both together and independently of each other.
Public spaces are freely accessible from the central foyer. The various functions actually open from each other, providing a high degree of flexibility for each event. The material use and colors of the lobby contribute to the ambiance. The spaces are typically of gallery-type design. The floors are connected by stairs, escalators, and ramps.
A world-class cultural service may only be provided with an effective background. The well-functioning infrastructural design of the new building complex is a particularly important aspect of our tender plan. We placed the service functions in the inner, circular core of the building layout. The advantage of this is that all background functions remain hidden from the general public. Another advantage is that a high degree of flexibility can be provided in the technical service of each performance area with a compact functional layout. The backstage parts of the performance areas will be connected to the production center to be installed in the northern zone by an automatic container transport equipment. In this way, a horizontal and vertical transport system, similar to a pneumatic tube system, ensures fast and flexible freight transport between any floors of the two buildings. The production center is located in the northern zone according to the tender. The designed building is compact, and the design primarily strives for functional compliance.

The smaller-scale urban art parlor is located on the beach. The building represents the "green message" of the entire Opera House construction project. The entire building is uniformly made of wooden structures, which offers the sustainability aspects of the project to be communicated. However, the use of wood provides a unique appearance and friendly interiors.

CENTRAL CORE BACKSTAGE	GRAND OPERA	CONCERT HALL	OPERETTA HALL	MAIN LOBBY	PUBLIC SPACES	MULTI-FUNCTIONAL THEATRE	TOURIST CENTRE	PUBLIC TERRACES & WINGS
								
INVISIBLE SUPER-RATIONAL	PASSIONATE SUBLIME	WARM BRILLIANT	ENTERTAINING INTIMATE	INTUITIVE AMAZING	OPEN INVITING	FLEXIBLE ADAPTIVE	DETACHED 24/7	ICONIC INSPIRING

Architectural concept and functional layout

Shenzhen Opera House International Architecture Design Competition

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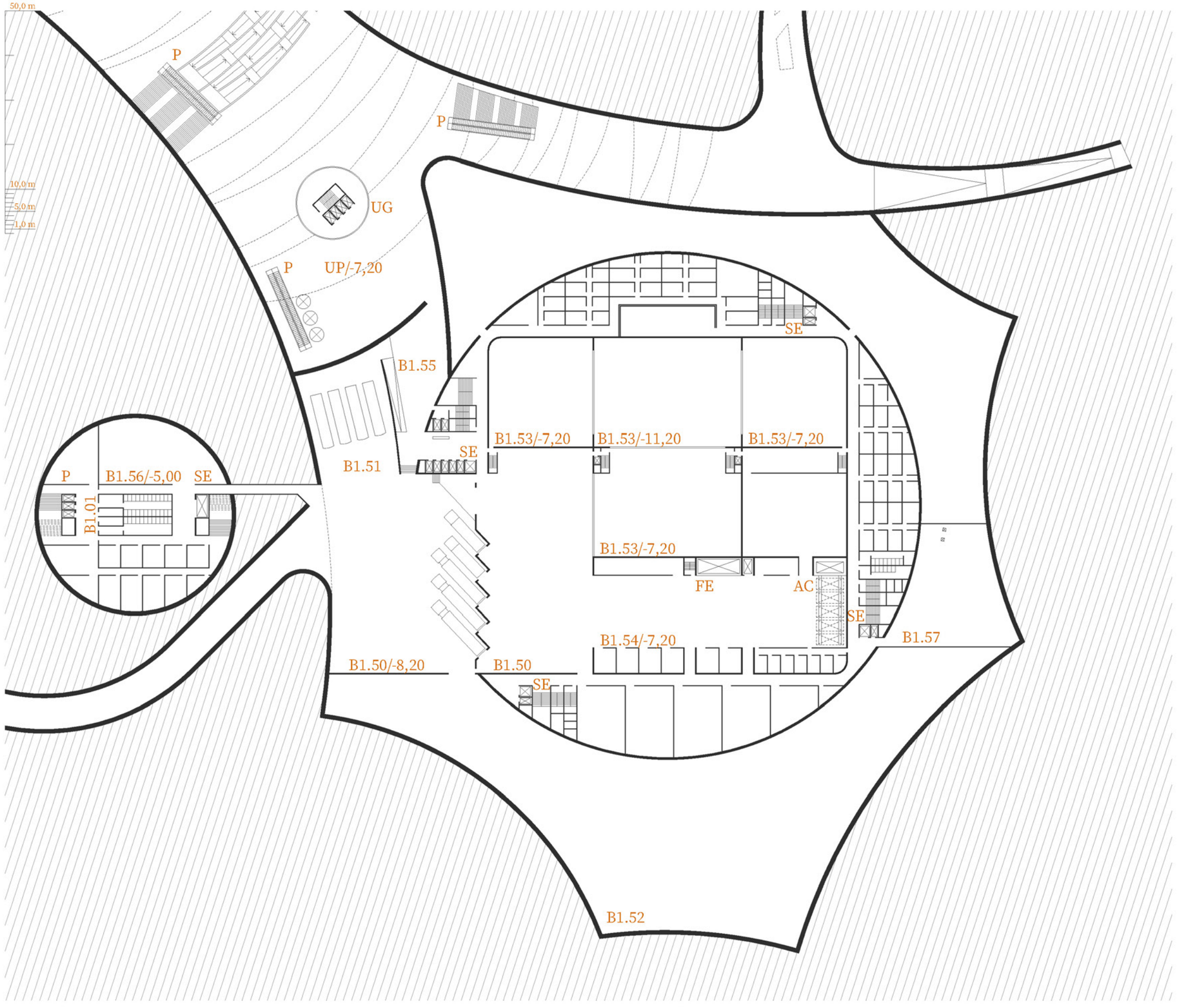

B1 underground level

B1.01	Tourist information centre
B1.50	Loading bay
B1.51	Bus parking places
B1.52	MEP rooms
B1.53	Grand opera stage area
B1.54	Grand opera backstage rooms, warehouse
B1.55	Staff and musician's entrance
B1.56	Stage art museum MEP and storage
B1.57	Main kitchen
UP	Underground plaza
UG	Connection to underground garage
M13	Connection to Metro line 13
SH	Shops, retail
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

B1 underground level floor plan

Shenzhen Opera House International Architecture Design Competition

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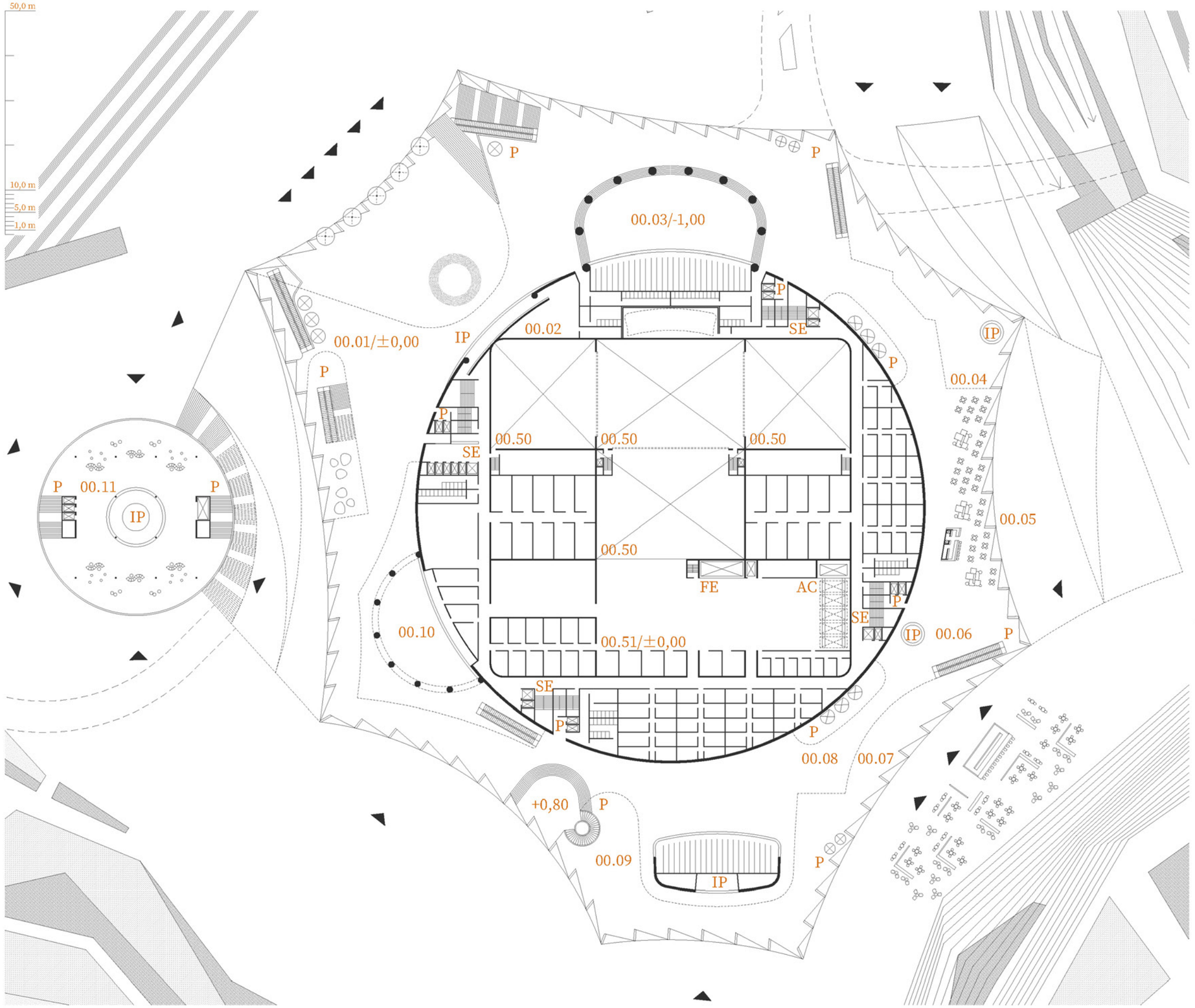
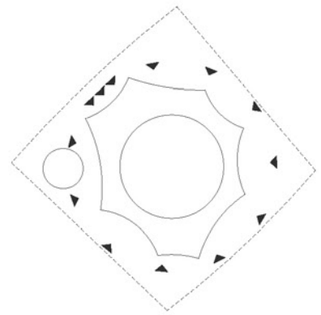




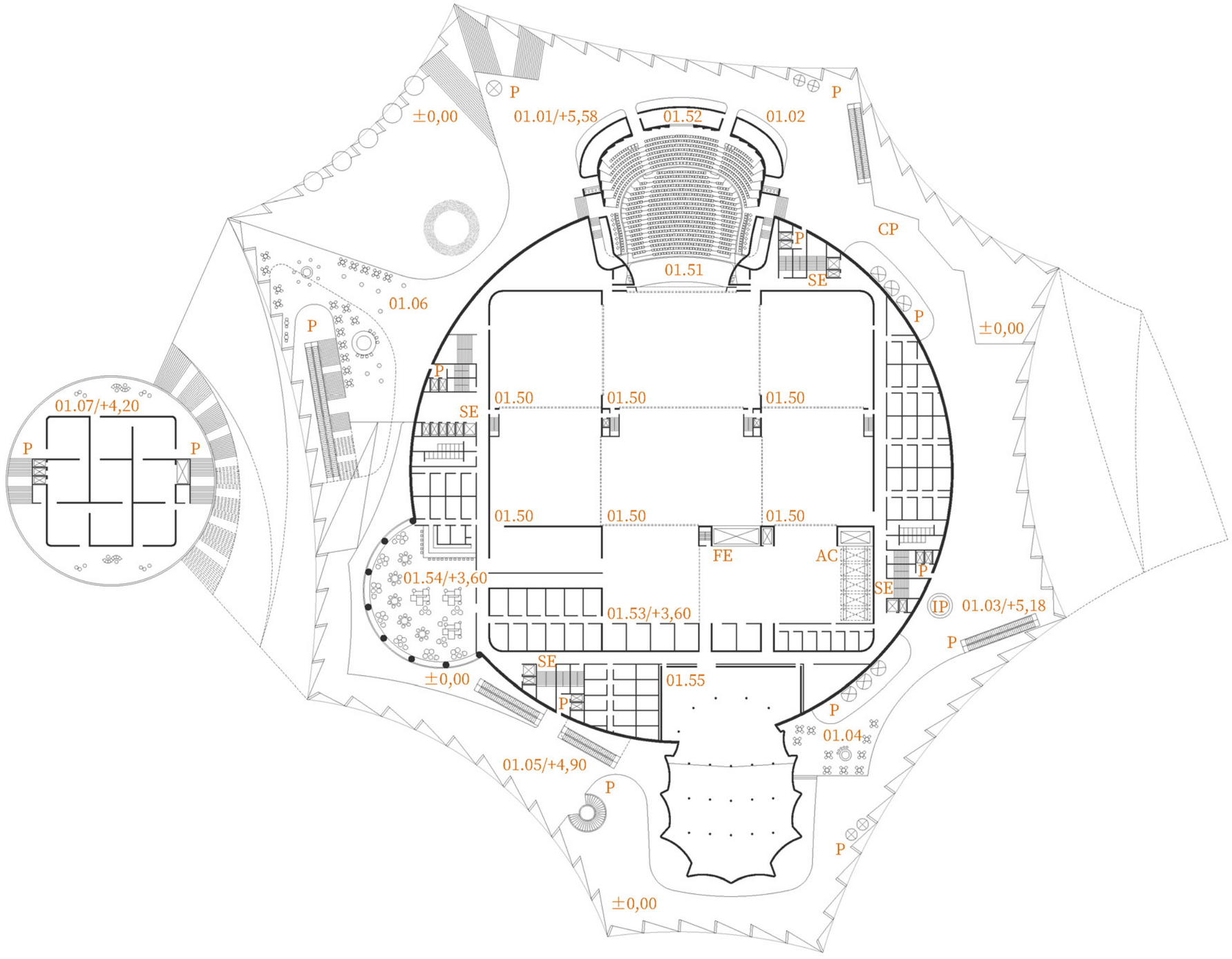
Ground level

00.01	Main entrance / main lobby / foyer
00.02	Opera house information centre / reception
00.03	Grand opera cloakroom
00.04	Multi-functional theatre entrance / foyer
00.05	Restaurant / Bistro / Bar
00.06	Public hall entrance / foyer
00.07	Café
00.08	Skybar entrance
00.09	Concert hall entrance / foyer / cloakroom
00.10	Box office / ticketing / front office
00.11	Tourist information centre
00.50	Grand opera stage area
00.51	Grand opera backstage (technical) rooms
IP	Info point
CP	Catering point
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

Gound floor plan

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



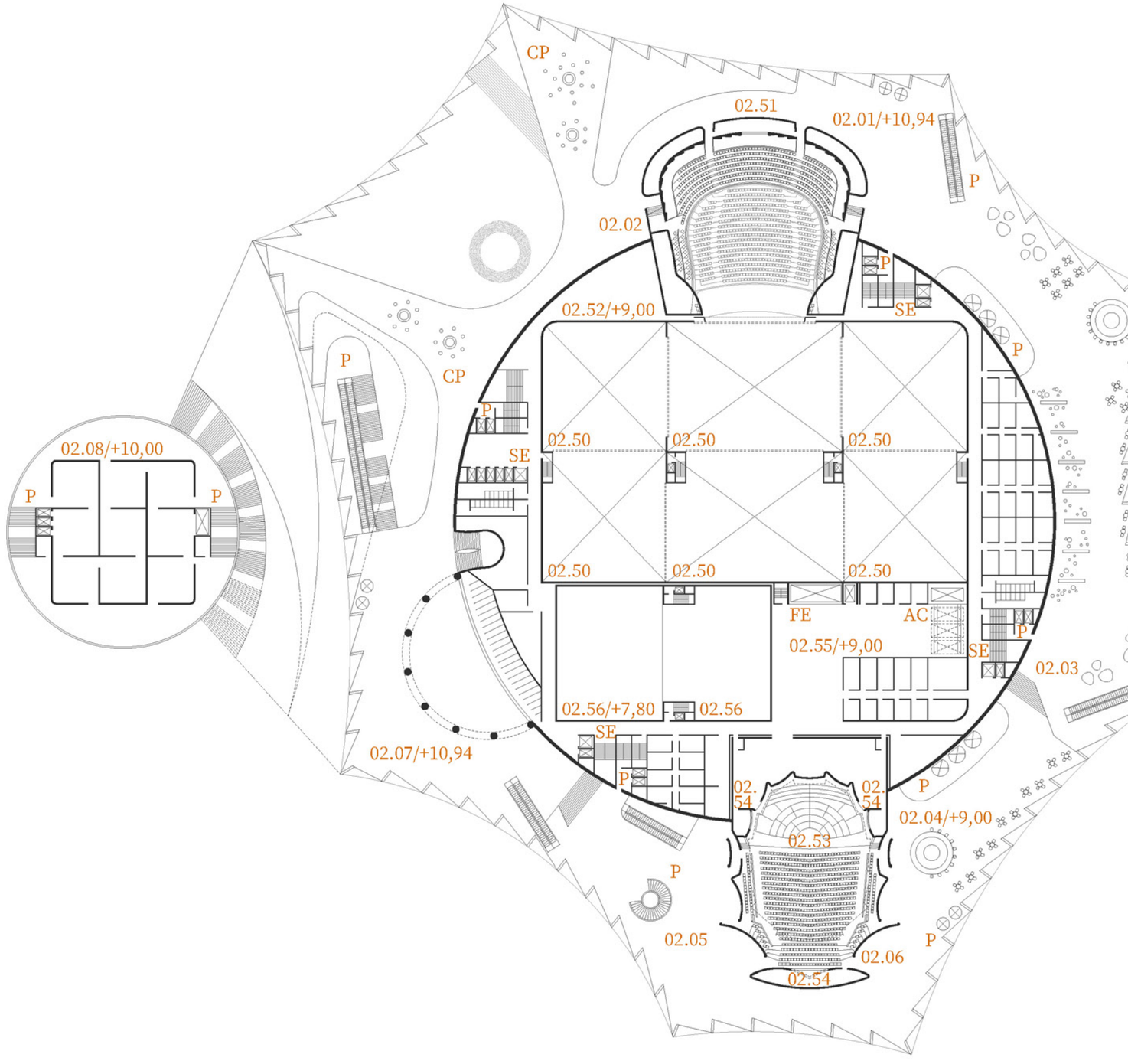
1. floor

01.01	Grand opera foyer
01.02	Grand opera hall
01.03	Book bar
01.04	Book bar café
01.05	Concert hall foyer
01.06	Grand café / bar
01.07	Stage art museum
01.50	Grand opera stage
01.51	Orchestra pit
01.52	Grand opera stage technical rooms
01.53	Grand opera backstage (and technical) rooms
01.54	Main greenroom
01.55	Concert hall backstage (and technical) rooms
IP	Info point
CP	Catering point
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

1. floor plan

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



2. floor

02.01	Grand opera foyer
02.02	Grand opera hall
02.03	Book bar
02.04	Concert hall café / bar
02.05	Concert hall foyer
02.06	Concert hall
02.07	Operett hall cloakroam and foyer
02.08	Stage art museum
02.50	Grand opera stage area
02.51	Grand opera stage technical rooms
02.52	Grand opera backstage (and technical) rooms
02.53	Concert hall stage
02.54	Concert hall stage technical rooms
02.55	Concert hall backstage (and technical) rooms
02.56	Operett stage area
IP	Info point
CP	Catering point
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

2. floor plan

Shenzhen Opera House International Architecture Design Competition

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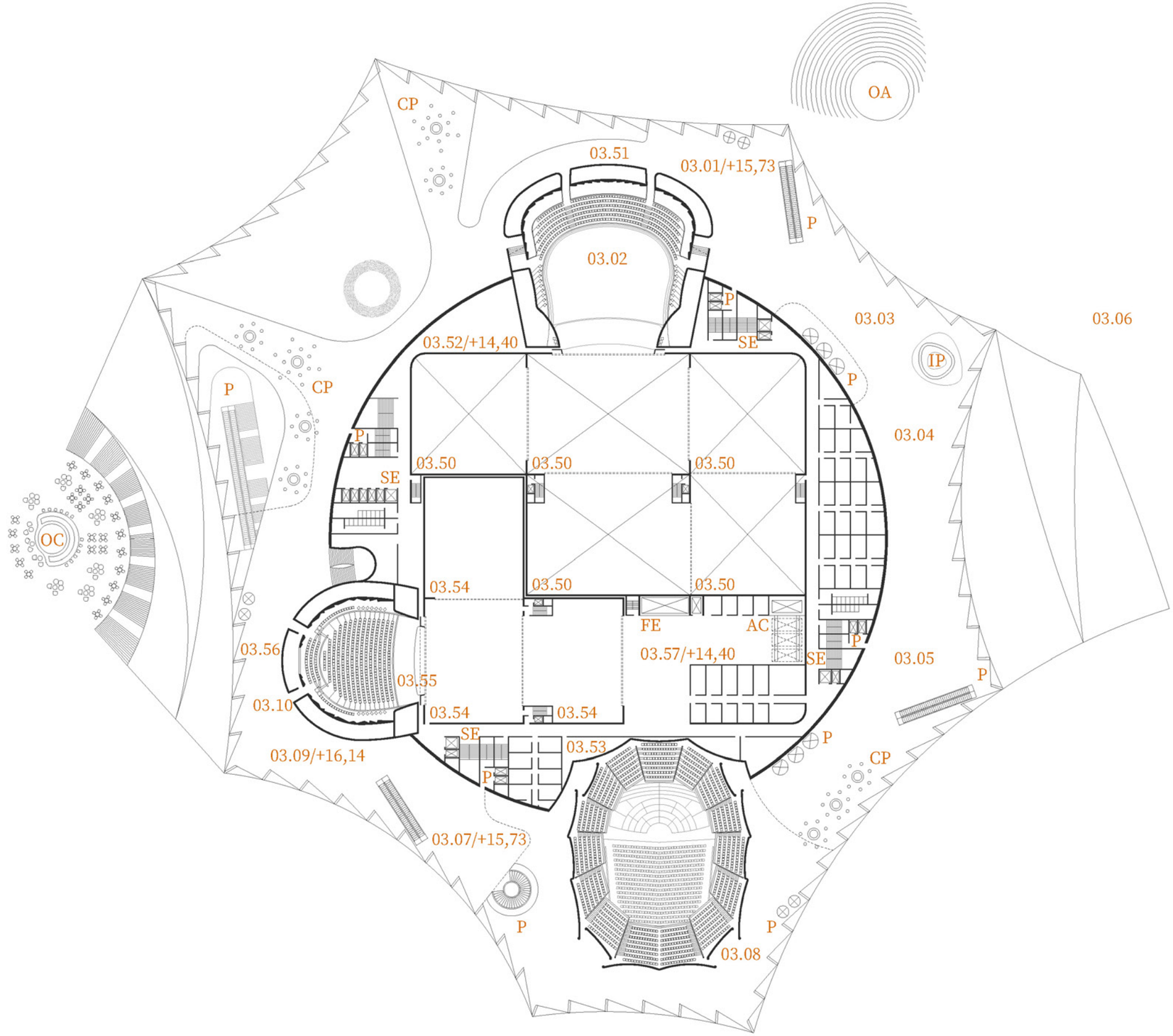

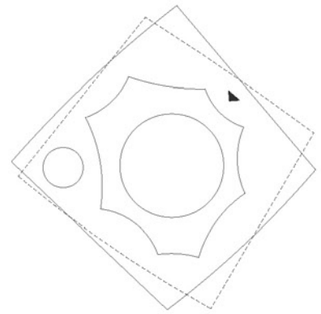

3. floor

03.01	Grand opera foyer
03.02	Grand opera hall
03.03	Public hall entrance / lounge
03.04	Public hall art gallery
03.05	Public hall model showroom
03.06	Public hall art street (outdoor)
03.07	Concert hall foyer
03.08	Concert hall
03.09	Operetta hall foyer
03.10	Operetta hall
03.50	Grand opera stage area
03.51	Grand opera stage technical rooms
03.52	Grand opera backstage (and technical) rooms
03.53	Concert hall backstage (and technical) rooms
03.54	Operetta stage
03.55	Orchestra pit
03.56	Operetta stage technical rooms
03.57	Operetta backstage rooms
IP	Info point
CP	Catering point
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system
OA	Outdoor arena
OC	Outdorr café

3. floor plan

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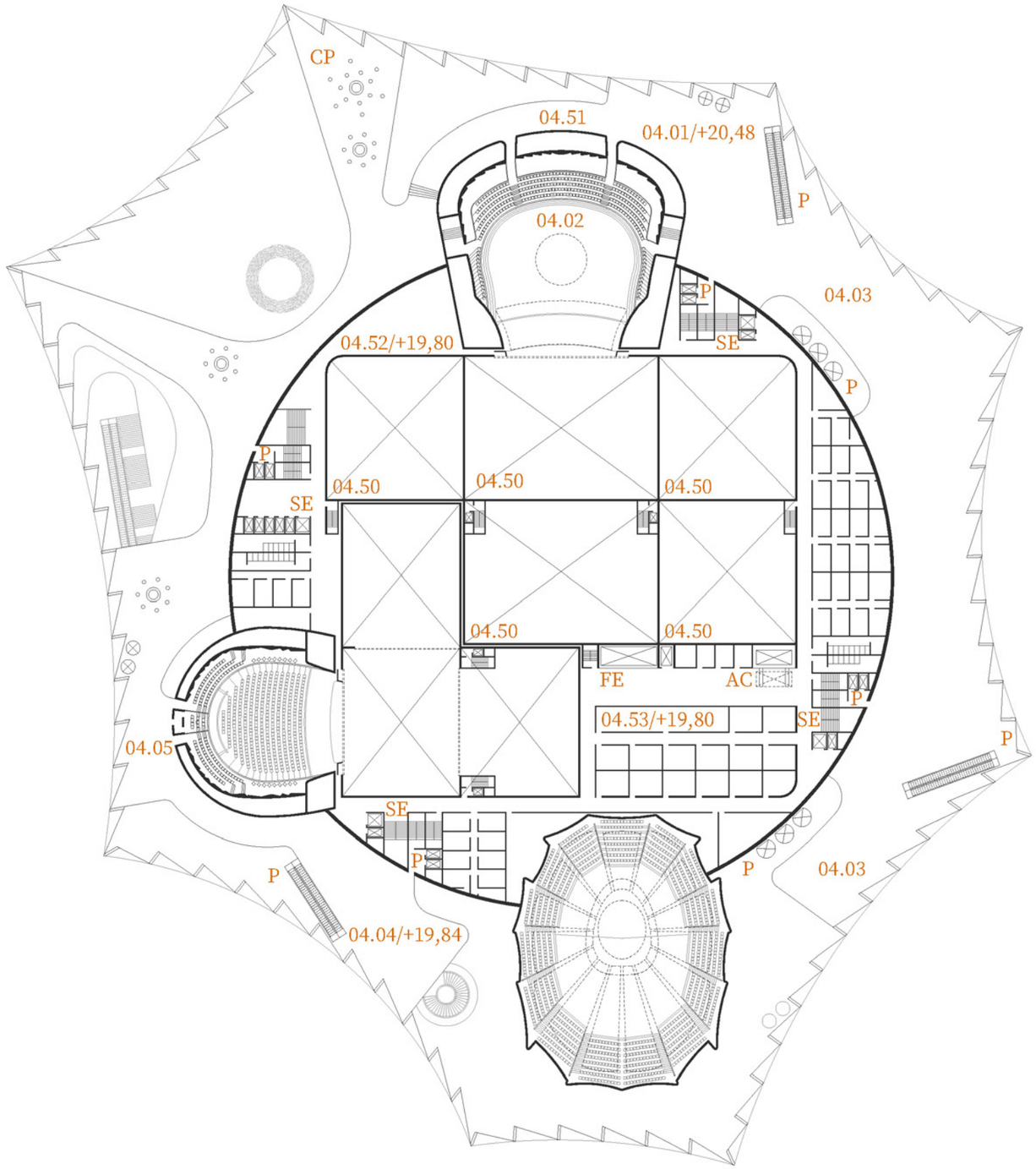

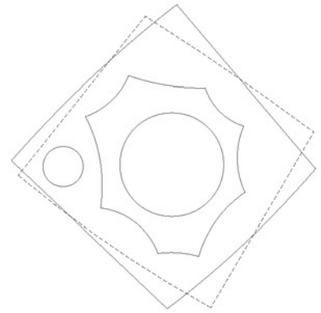

4. floor

04.01	Grand opera foyer
04.02	Grand opera hall
04.03	Public hall art education
04.04	Operetta hall foyer
04.05	Operetta hall
4.50	Grand opera stage area
4.51	Grand opera stage technical rooms
4.52	Grand opera backstage (and technical) rooms
4.53	Operetta and concert hall backstage rooms
IP	Info point
CP	Catering point
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

4. floor plan

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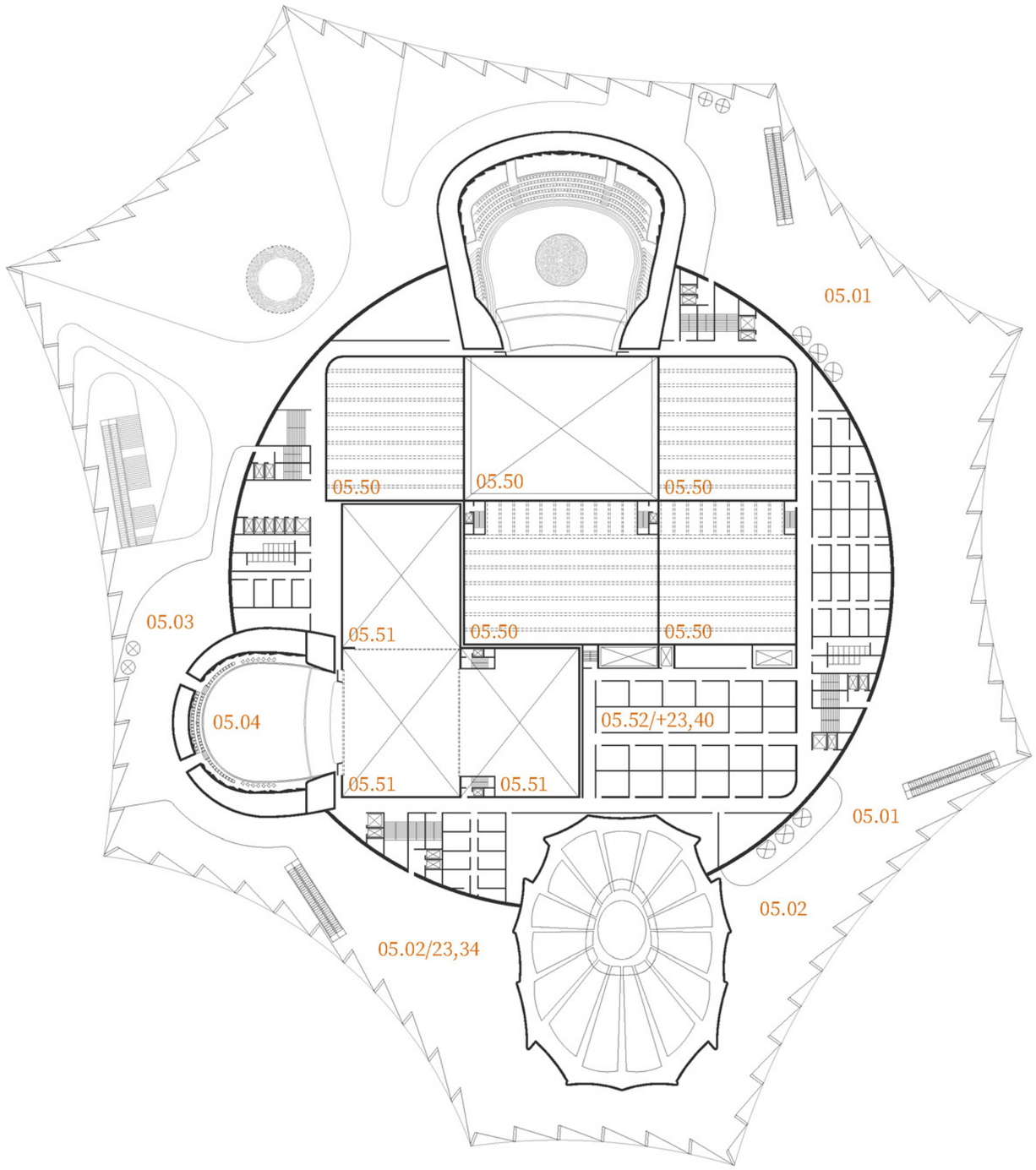

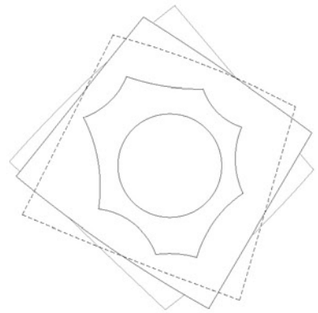

5. floor

05.01	Public hall art education
05.02	Opera and dance drama literature centre
05.03	Operetta hall foyer
05.04	Operetta hall
5.50	Grand opera stage area
5.51	Operetta hall stage area
5.52	Interchangeable backstage level
IP	Info point
CP	Catering point
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

5. floor plan

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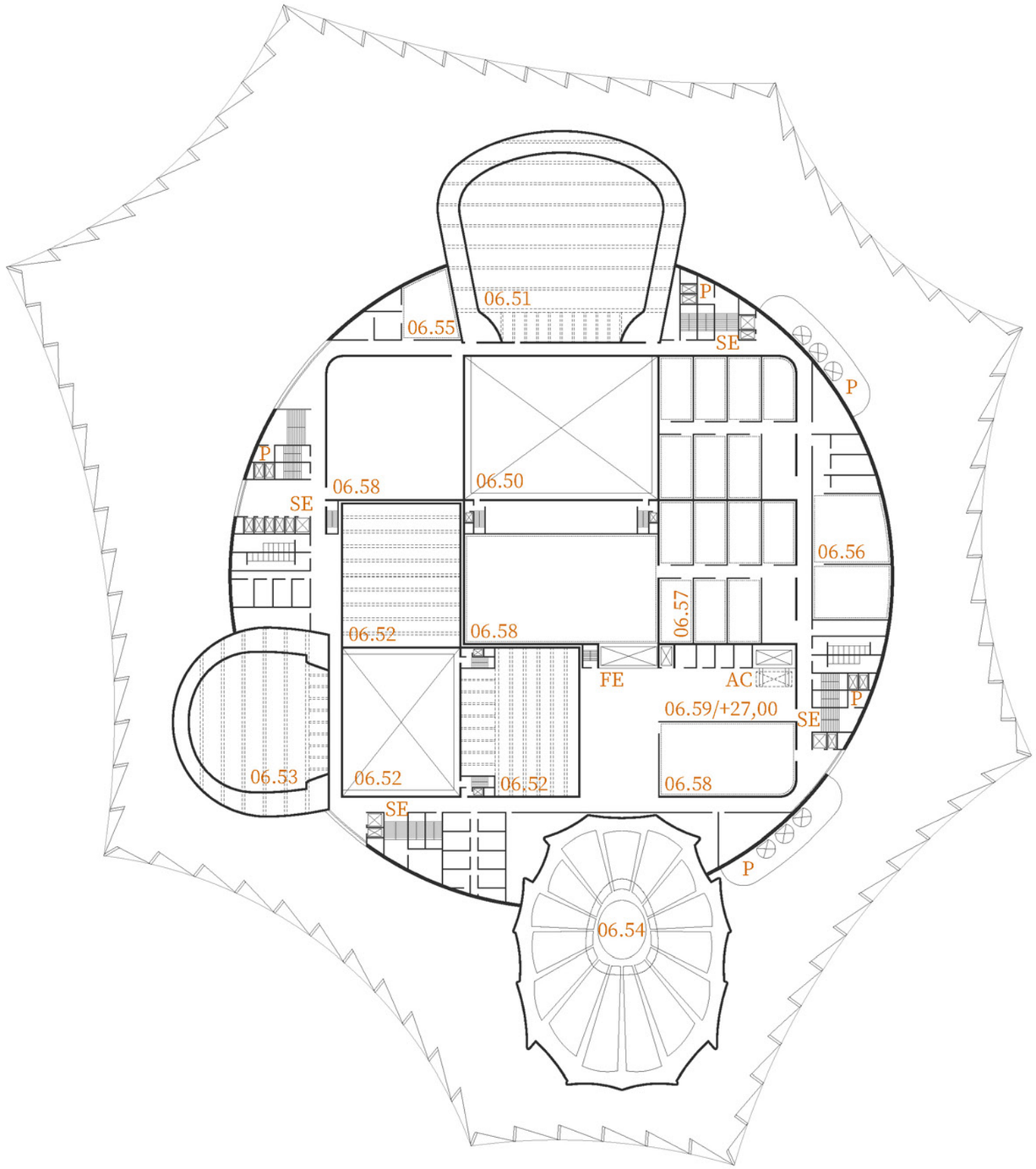

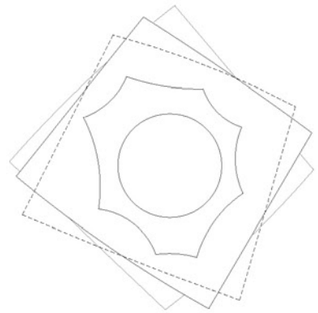

6. floor

06.50	Grand opera stage area
06.51	Grand opera technical rooms, lighting bridges
06.52	Operetta hall stage area
06.53	Operetta hall technical rooms, lighting bridges
06.54	Concert hall technical rooms, lighting bridges
06.55	Television broadcasting room
06.56	Live recording studio
06.57	Audio and video post-production rooms
06.58	Recording studios
06.59	Studio level service, storage and corridors
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

6. floor plan

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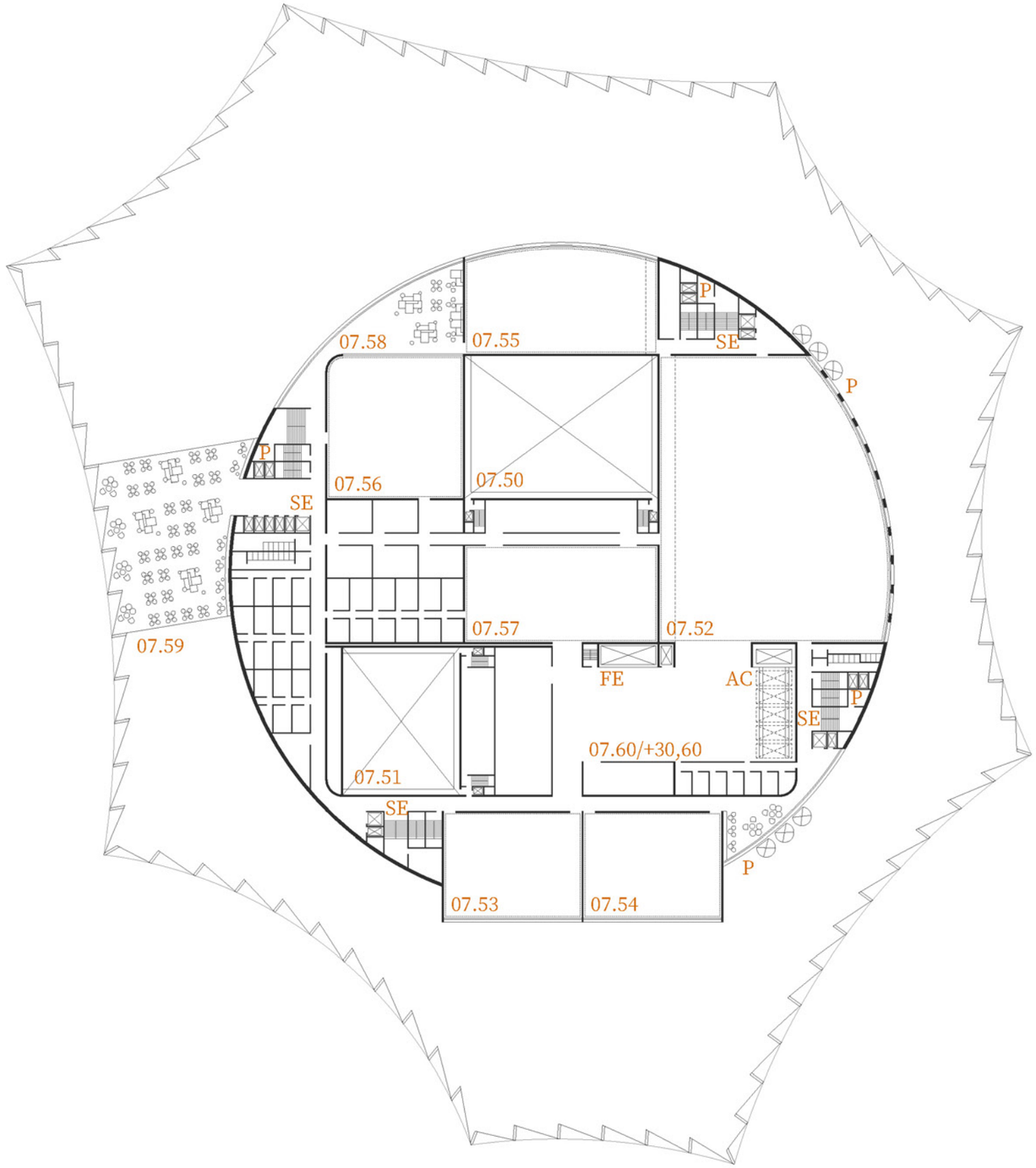

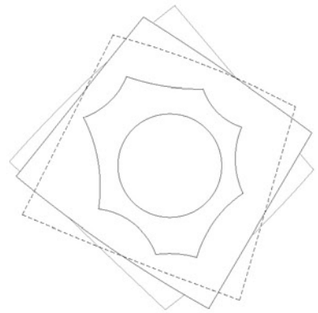

7. floor

7.50	Grand opera stage area
7.51	Operetta hall stage area
7.52	Mixing rehearsal hall
7.53	Opera rehearsal hall
7.54	Opera rehearsal hall
7.55	Dance rehearsal hall
7.56	Dance rehearsal hall
7.57	Dance rehearsal hall
7.58	Restroom
7.59	Greenroom
7.60	Service rooms, warehouse and corridors
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

7. floor plan

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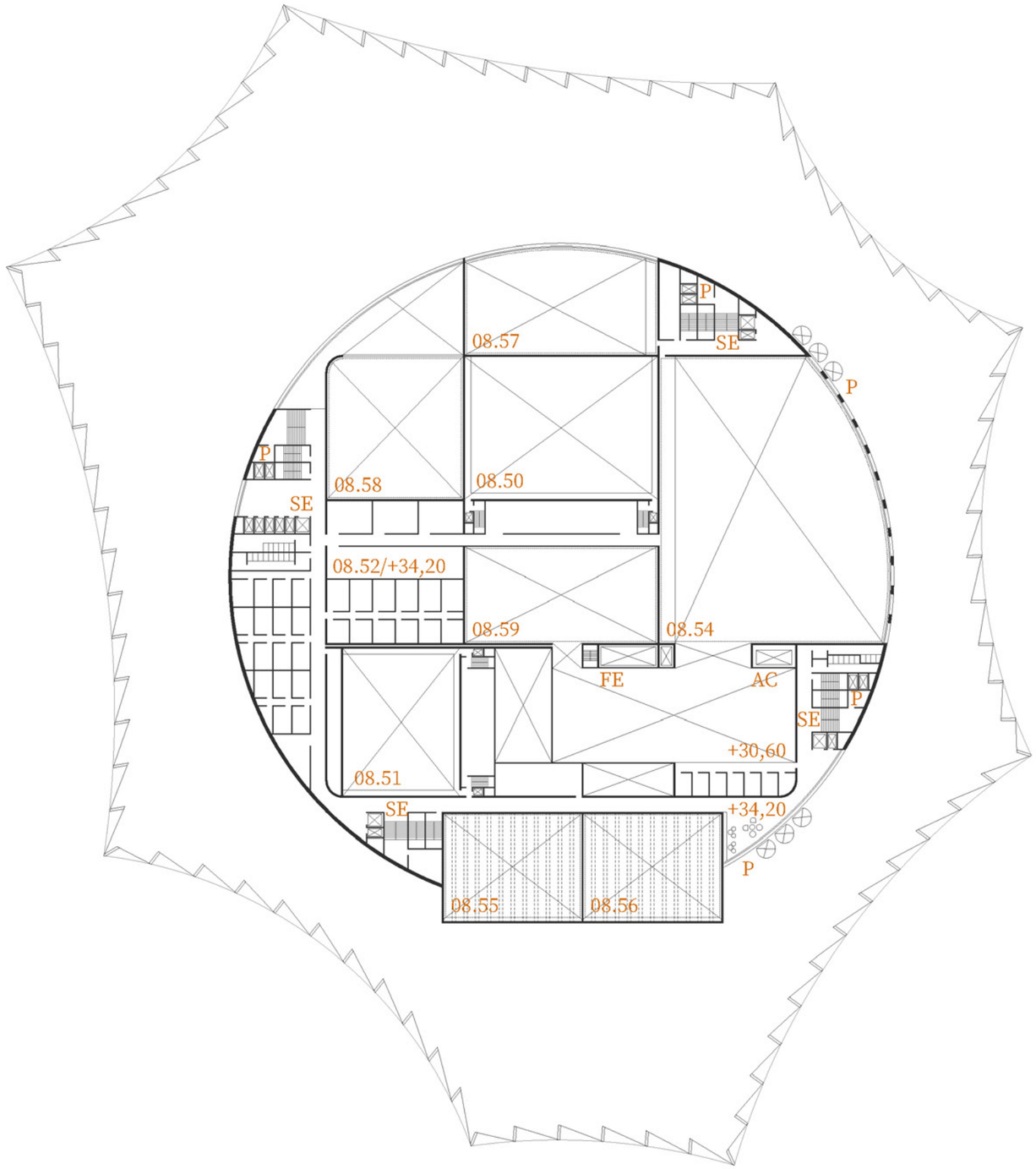

8. floor

8.50	Grand opera stage area
8.51	Operetta hall stage area
8.52	Warehouse
8.53	Service rooms, staiways and corridors
8.54	Mixing rehearsal hall area
8.55	Opera rehearsal hall area
8.56	Opera rehearsal hall area
8.57	Dance rehearsal hall area
8.58	Dance rehearsal hall area
8.59	Dance rehearsal hall area
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

8. floor plan

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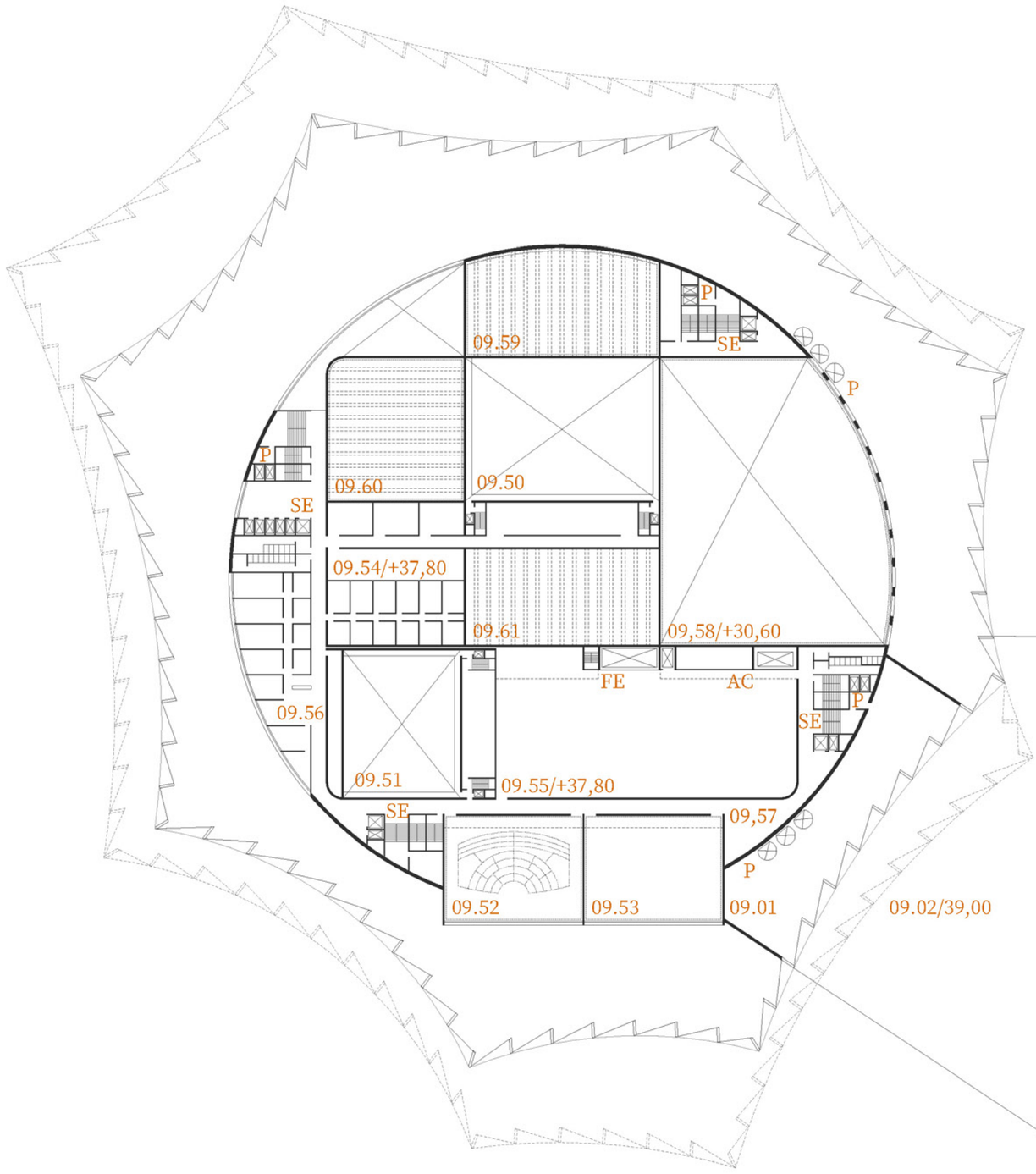

9. floor

9.01	Look-out terrace indoor premises
9.02	Look-out panorama terrace platform (outdoor)
9.50	Grand opera stage area
9.51	Operetta hall stage area
9.52	Orchestra rehearsal hall
9.53	Chorus rehearsal hall
9.54	Warehouse
9.55	MEP
9.56	Offices
9.57	Service rooms, staiways and corridors
9.58	Mixing rehearsal hall area
9.59	Dance rehearsal hall area
9.60	Dance rehearsal hall area
9.61	Dance rehearsal hall area
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

9. floor plan

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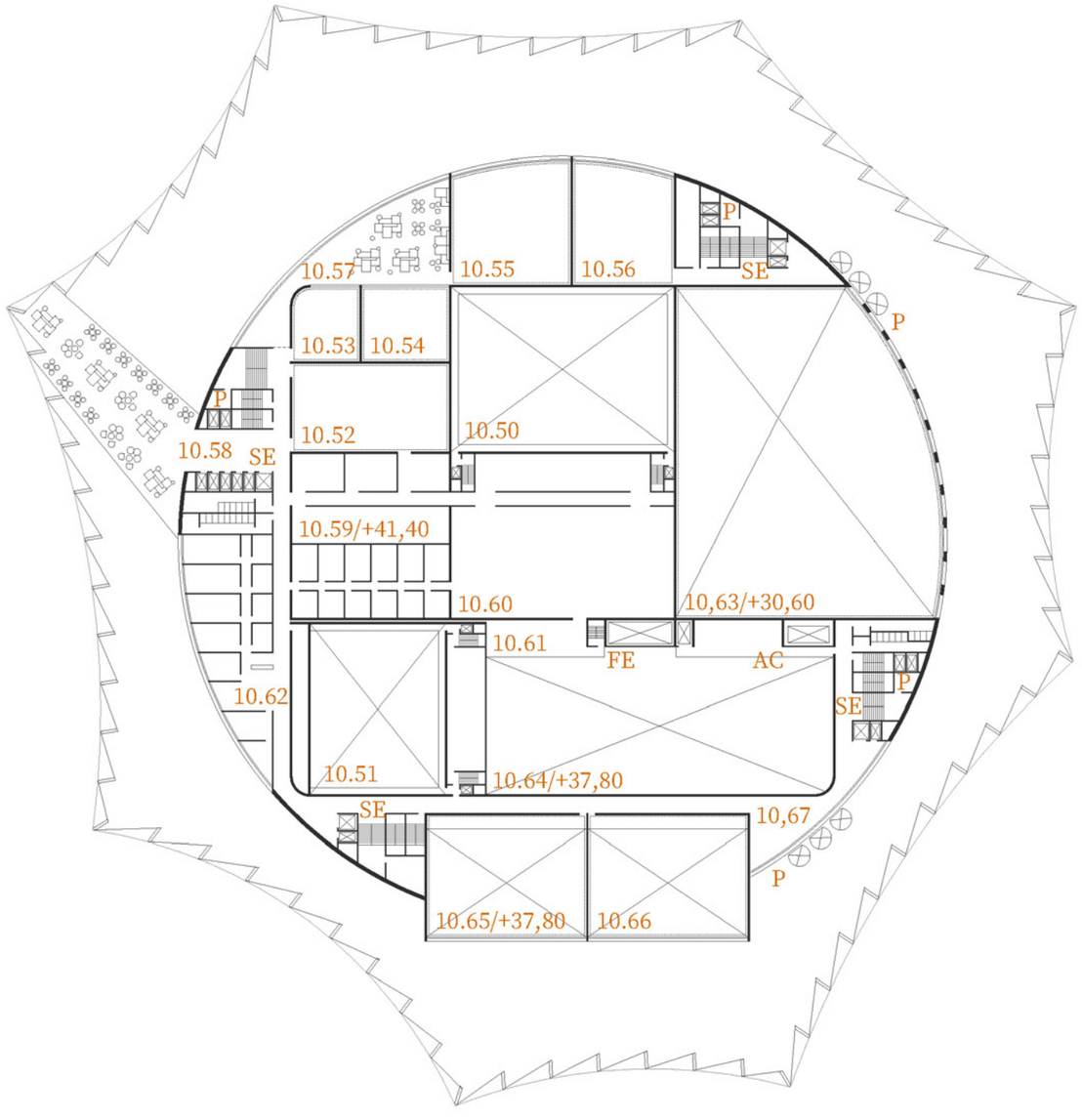

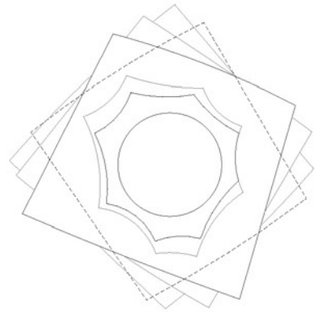

10. floor

10.50	Grand opera stage area
10.51	Operetta hall stage area
10.52	Band rehearsal hall
10.53	Band rehearsal hall
10.54	Band rehearsal hall
10.55	Band rehearsal hall
10.56	Band rehearsal hall
10.57	Restroom
10.58	Greenroom
10.59	Warehouse
10.60	MEP
10.61	MEP
10.62	Offices
10.63	Mixing rehearsal hall area
10.64	MEP area
10.65	Orchestra rehearsal hall area
10.66	Chorus rehearsal hall area
10.67	Service rooms, staiways and corridors
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

10. floor plan

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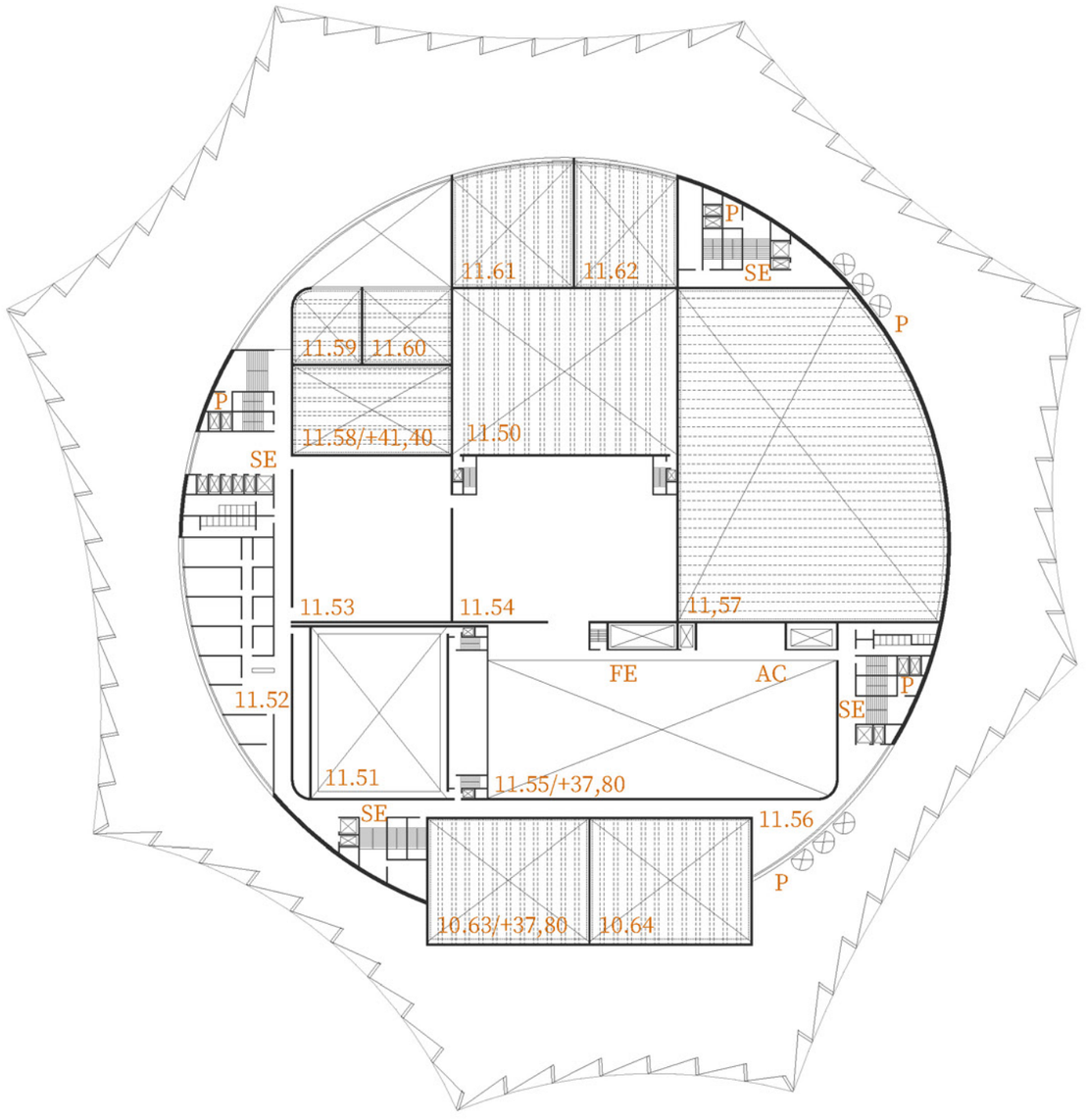

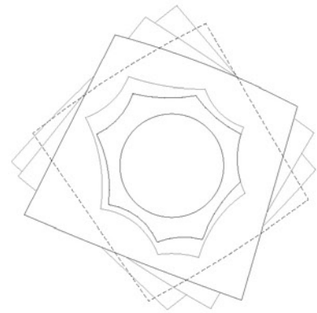

11. floor

11.50	Grand opera stage area
11.51	Operetta hall stage area
11.52	Offices
11.53	MEP
11.54	MEP
11.55	MEP area
11.56	Service rooms, staiways and corridors
11.57	Mixing rehearsal hall area, lighting bridges
11.58	Band rehearsal hall area
11.59	Band rehearsal hall area
11.60	Band rehearsal hall area
11.61	Band rehearsal hall area
11.62	Band rehearsal hall area
11.63	Orchestra rehearsal hall area
11.64	Chorus rehearsal hall area
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

11. floor plan

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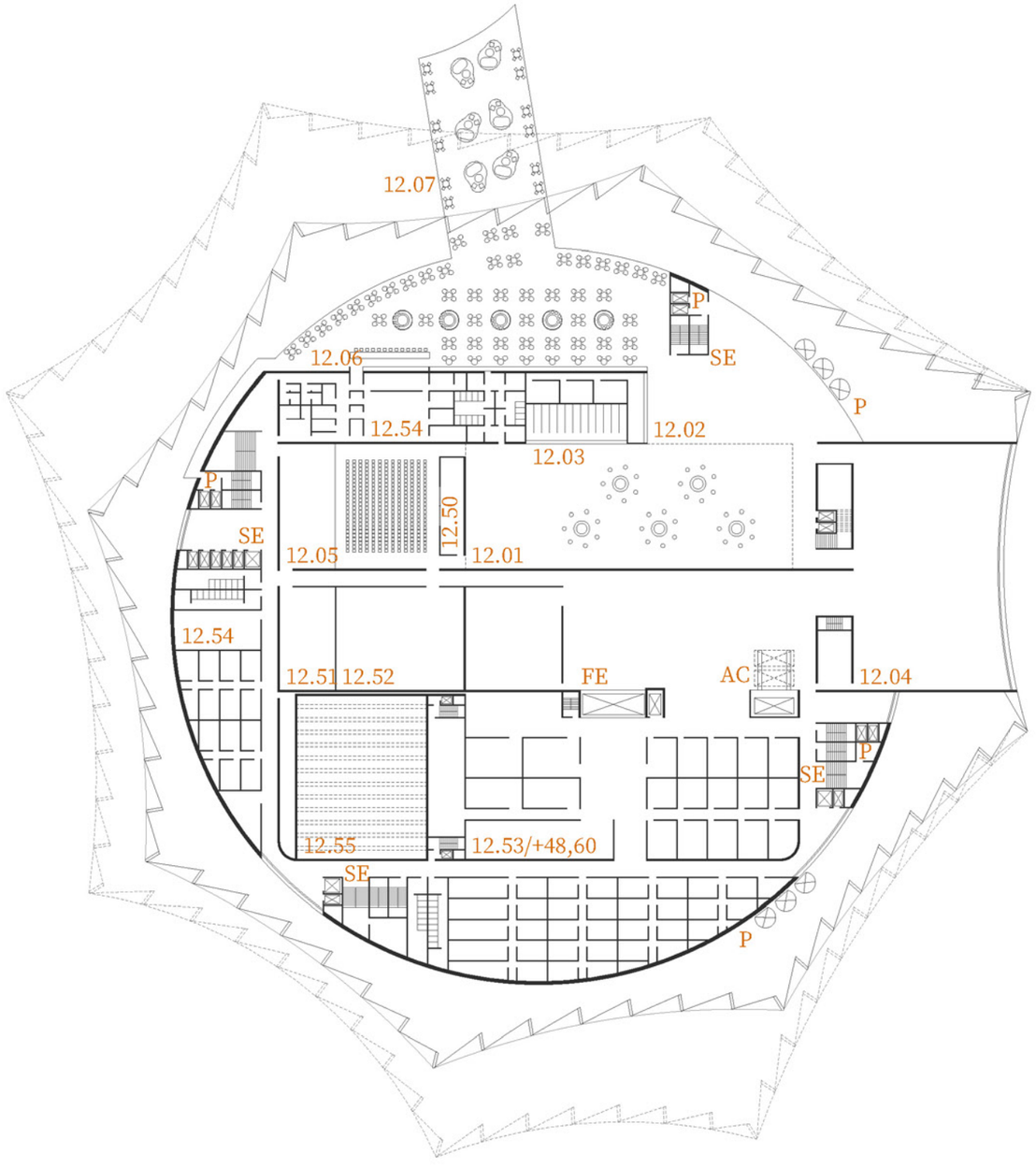

12. floor

12.01	Multifunctional Theatre foyer, lounge
12.02	Reception, front office, information point
12.03	Cloakroom
12.04	Multifunctional Theatre
12.05	Conferece room
12.06	Reastaurant, bar
12.07	Outdoor terrace
12.50	Conferece room technical room
12.51	Conferece room technical room
12.52	Conferece room storage
12.53	Multifunctional T. backstage (technical) rooms
12.54	Restaurant kitchen and service rooms
12.55	Operetta hall stage area
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
FE	Stage freight elevator
AC	Automatic container transportation system

12. floor plan

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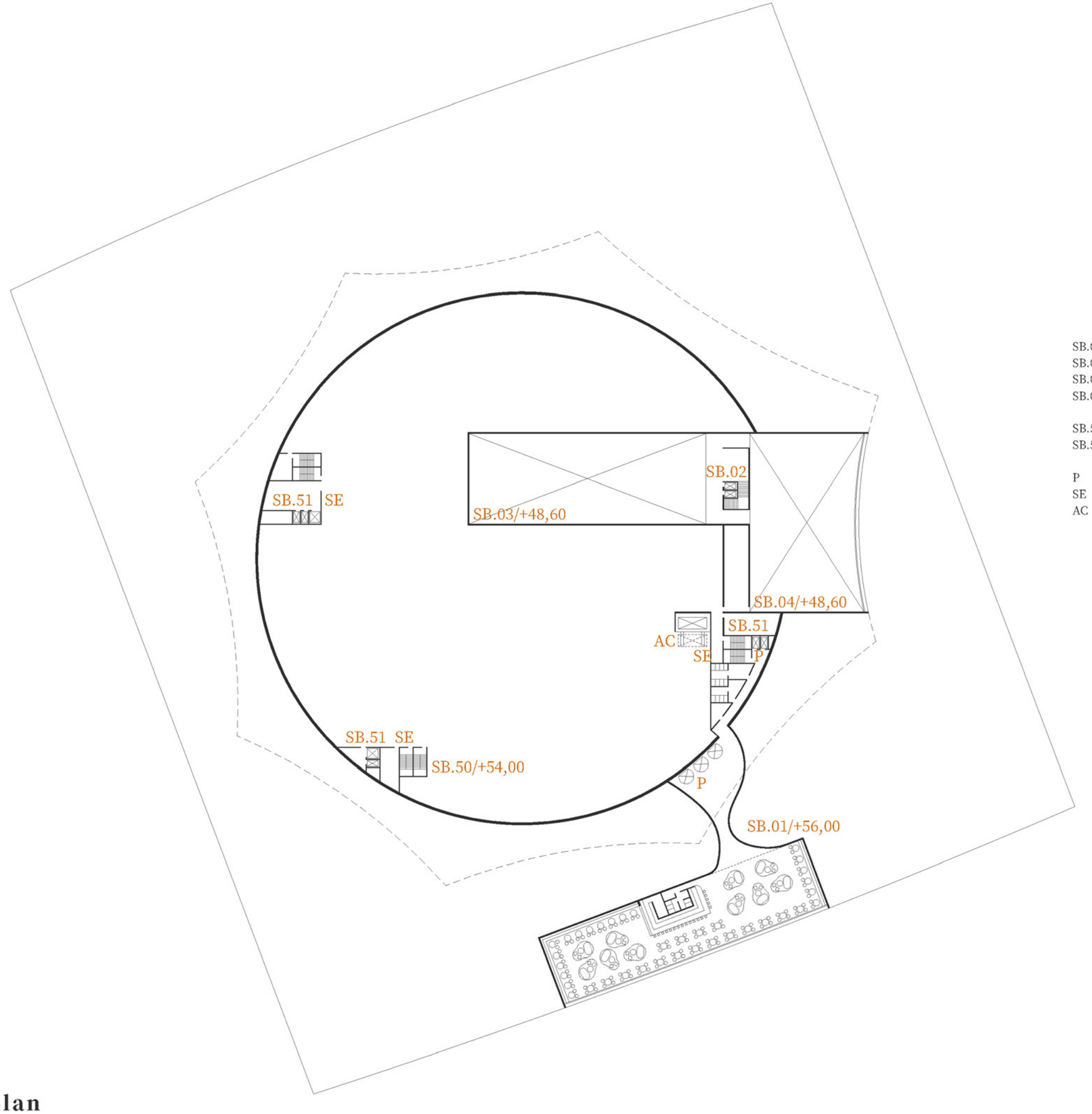

Skybar floor

SB.01	Skybar
SB.02	Multifunctional Theatre foyer
SB.03	Multifunctional Theatre foyer area
SB.04	Multifunctional Theatre area
SB.50	MEP
SB.51	Service rooms, staiways and corridors
P	Public (moving) staircase / elevator
SE	Staff (freight) elevator / stairway
AC	Automatic container transportation system

Skybar floor plan

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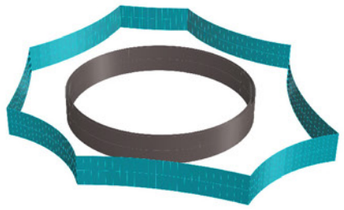
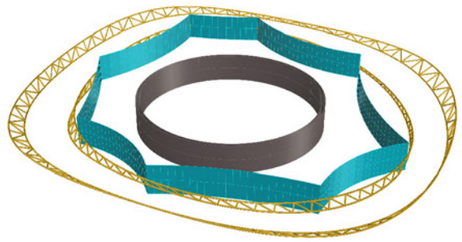
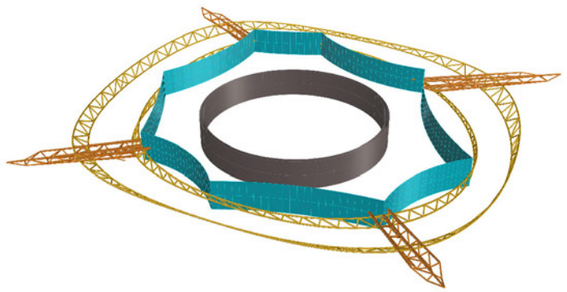


The build-up of the 3rd slab

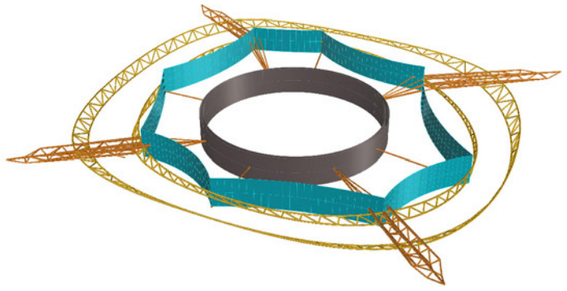
The internal reinforced concrete core and the curtain wall.



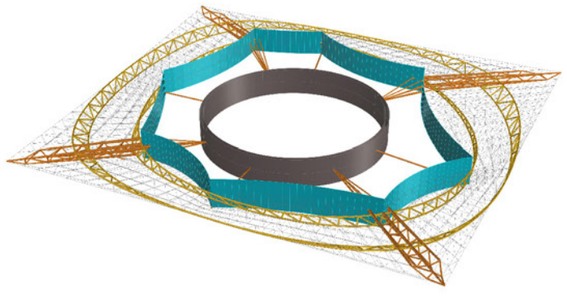
The inner and outer steel ring trusses. The rings works like tension ring to reduce the deformations and the forces of the cantilever.



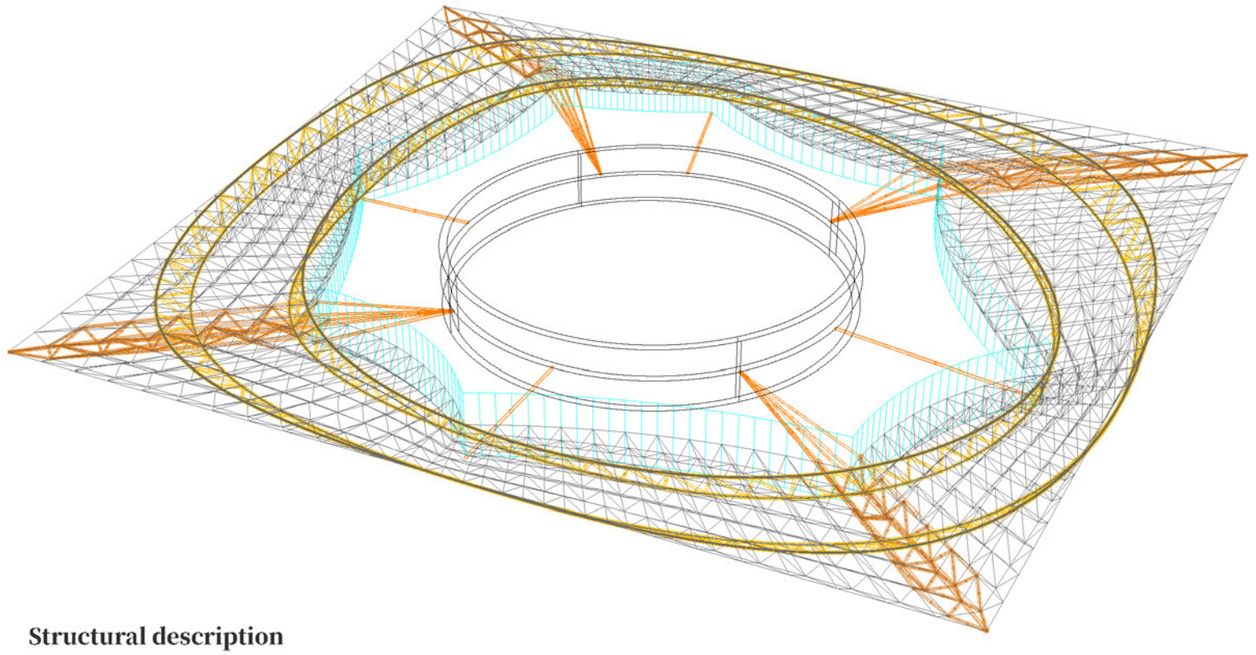
Cantilever trusses to support the corners of the roof.



The anchoring elements that transfer the horizontal actions to the internal core. The pillars at the corners of the curtain wall take up just vertical actions.



The space truss form the roof.



Structural description

The loadbearing structure has three basic elements: the RC core, the elevation skin, and the cantilever slabs.
The RC core is the solid base point of the building. It built up the envelop of the functional parts, it is one of the main vertical support of the slabs and it works like the shear wall against the horizontal effects like the wind and the earthquake. The RC core is a thick solid RC wall. There are only functional openings in that.
The elevation is basically a curtain wall system, but at the same time it also serves as support to the slabs. The curtain wall system is designed also for bearing vertical loads. It has relatively thin columns. In order to achieve the slenderest design, steel tubes are used for the columns.
The slabs are large plate elements supported by the RC core and the curtain wall system. They are made of two layers of steel space truss system. Both the top and bottom surfaces are horizontally rigid , and there is rigid lacing between the two layers. As the exceptionally large cantilevers are relatively soft against vertical load, the perimeter edge is used as a tie bar to make the structure stiffer and provide a kind of membrane behavior to the structure. Large, high strength hollow core steel elements are used for the truss.
The foundation is to be made by piles as there are different quality soil layers in the area concerned. A stable solution can be ensured with the piling, with small deformations against the large vertical forces, especially under the columns of the curtain walls.
We can expect substantial effects if any earthquake may occur, as the area is between Grade VII-VIII. The slabs are large and heavy, so that the effect on the bracing is large. Even though we can expect serious effects, the construction has a good resistance against dynamic horizontal effects: the RC core has strong resistance against both horizontal forces and torsion effects. The space truss is very rigid in the horizontal plane, so that it can distribute the horizontal forces evenly on the bracing system.
Shenzen is situated in a relatively endangered zone in terms of wind loads. There are several typhoons in every year. Sometimes we can expect 25-30 m/s wind speed. The RC core has a good horizontal resistance against this effect. The cantilever slabs also have vertical effects, not only horizontal.

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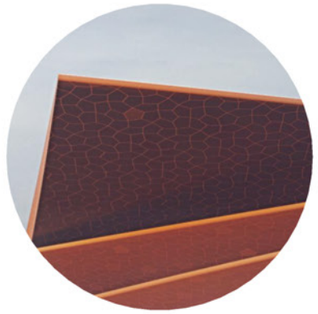
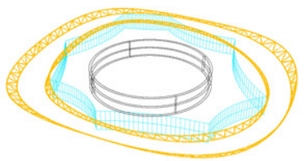
The cantilevers of the design have a scale like a wing of a giant Aeroplan. The wing of an Aeroplan is usually a simple truss with large loads on that and dynamic effects on that. Antonov An-225, length: 84m, wingspan: 88,4m

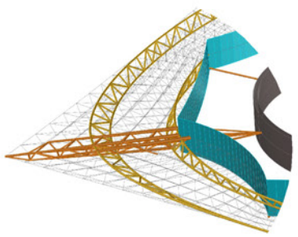


To have a better aerodynamic condition (smaller shape factor) the surface of a golf ball is not smooth but pockmarked. This method turns the vertexes of the air flow smaller and in this way it reduces the effect of the air flow around the ball. The wind-load of the revolved hyperbolic cooling tower was also reduced by rawer surface.

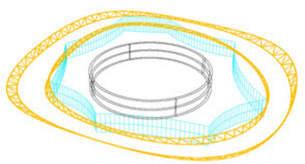
The upper surfaces of the terraces are designed with proper drainage. The uniquely designed surface also provides a reduction of rain noise impact.



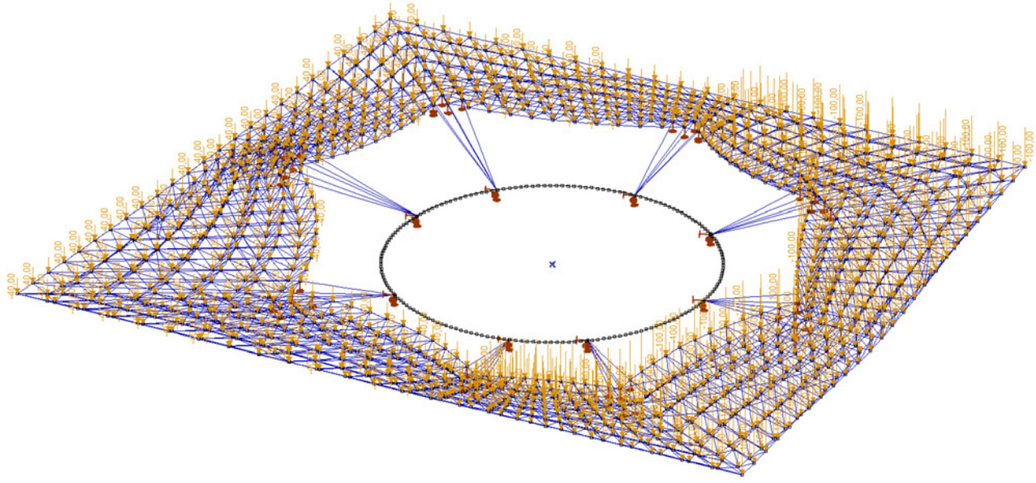
Filippo Brunelleschi was the designer of the Dome of Firenze. He designed one of the largest masonry cupola, all over. For such a large structure the reduction of the dead load was a principal. To get a proper structure the masonry was reinforced by tension rings: one wooden ring close to the bottom and two stone ring in the upper levels.



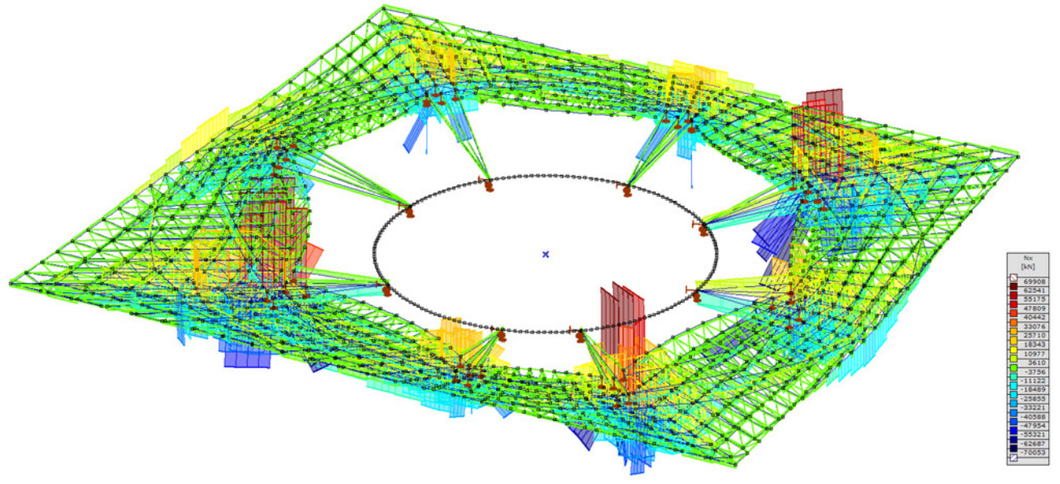
The ribbed slab is a concept to reduce the dead load of a structure with high stiffness: a small thickness plate has diaphragms to increase the inertia. In our space truss system, there is a truss surface with stiffness elements on the corners and tension rings close to the perimeter.



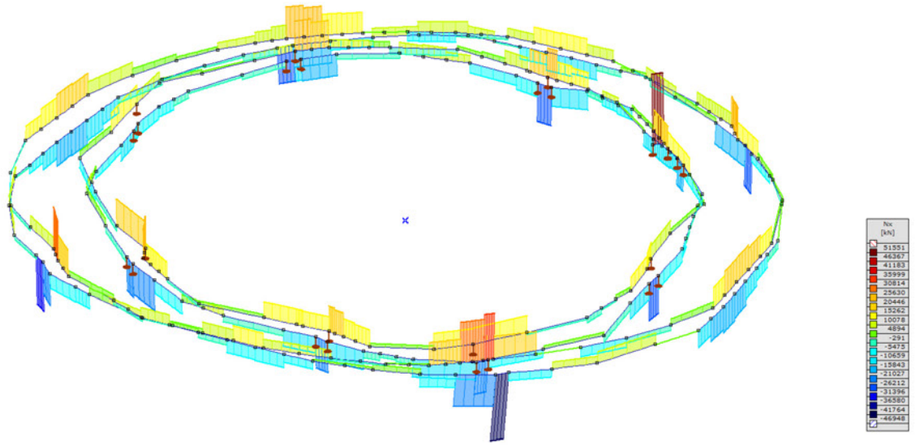
Our "inverse stadium” is a concept that turns upside-down the structure of the basics of a stadium. In a stadium there is a shell around the court and the spectator's seats, and there is a roof inside the shell. In our inverse concept the spectators are inside, but the roof is a cantilever outside. This extreme size of cantilevers cannot work as simple one direction system with such moderate structural dimensions. The revolved symmetry of the stadium helps on that.



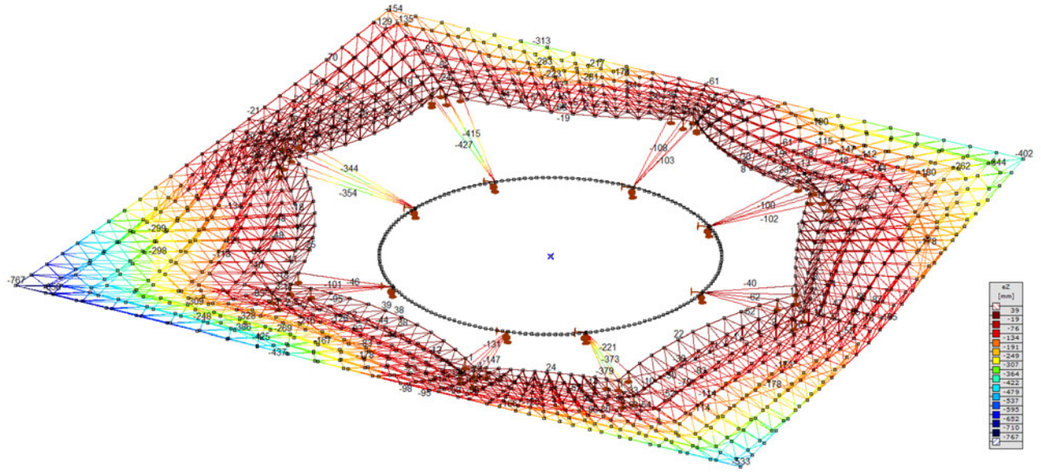
Loads
Apart from the dead load, the live load of the structure is 5kN/m2 at the sea-side part of the roof and 2,0 kN/m2 elsewhere.



Calculations
Normal forces within the members - Ultimate Limit State (ULS).
Maximum normal forces within the flanges of cantilever trusses: +/- 70.000 kN
Normal forces within the general elements of the space truss: +/- 4000 kN



Normal force within the upper and lower flanges of the rings. (+/- 52.000 kN)



Deflection of the roof considering quasy-permanent loads (SLS), taking the non-linear effects into consideration. Maximum deflection: 0,78 [m]. This deformation can be corrected by the undeformed geometry of the steel trusses.

View from the see

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View from the west sea-bank

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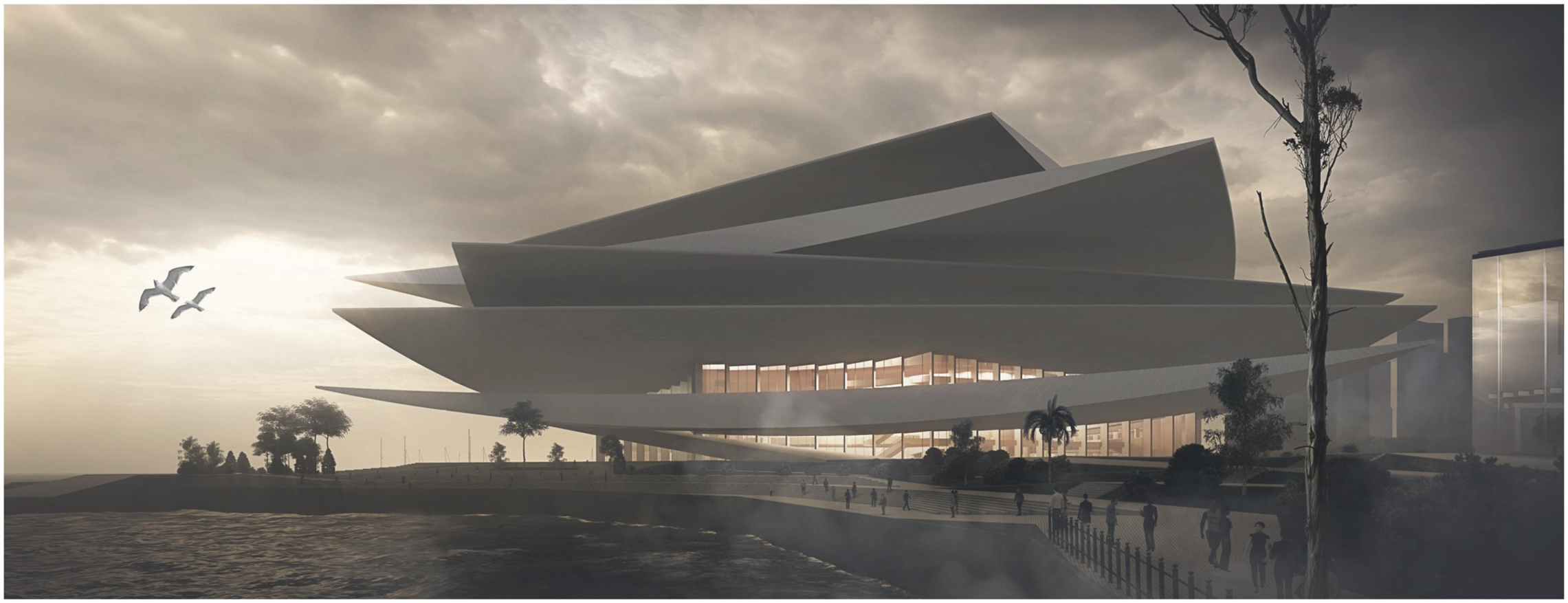

View from the east sea-bank

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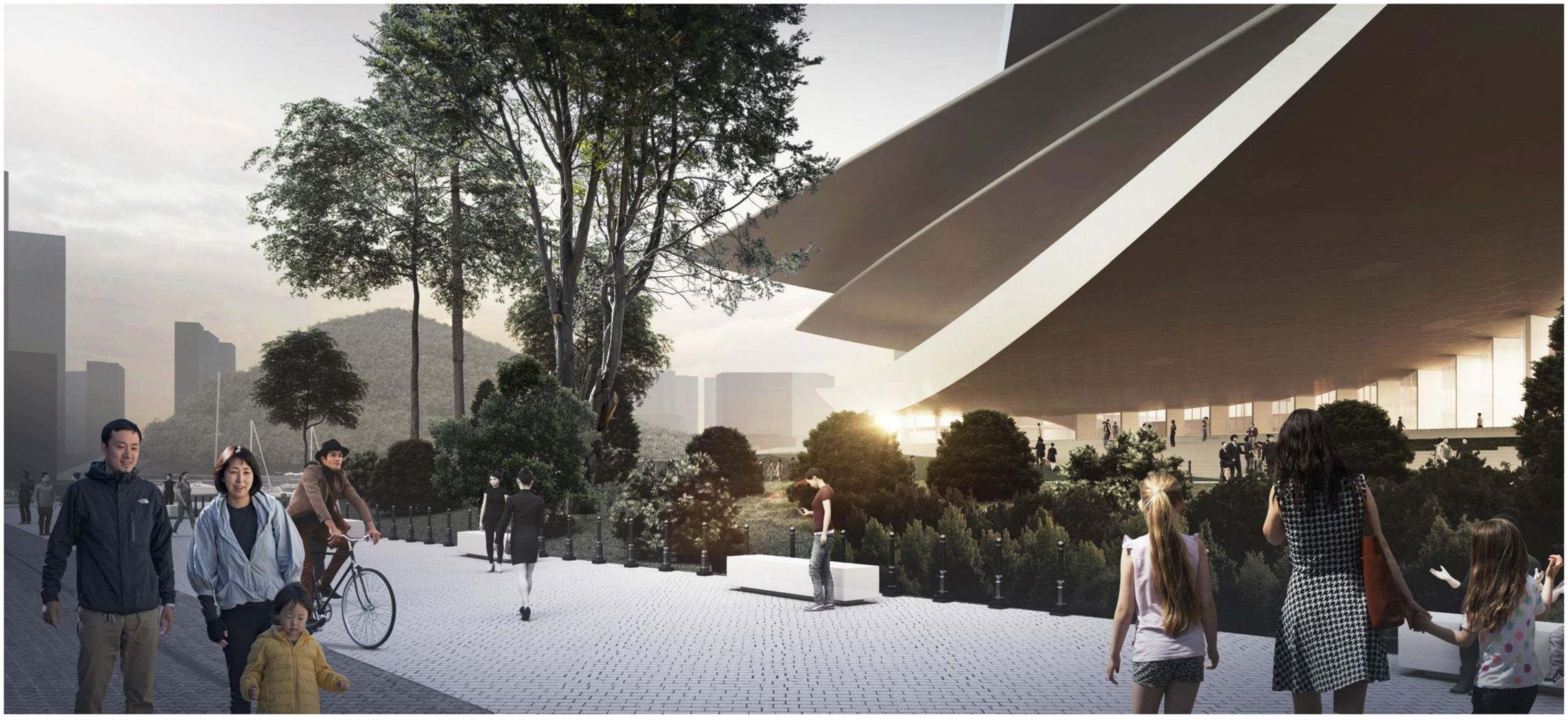

View from the passage

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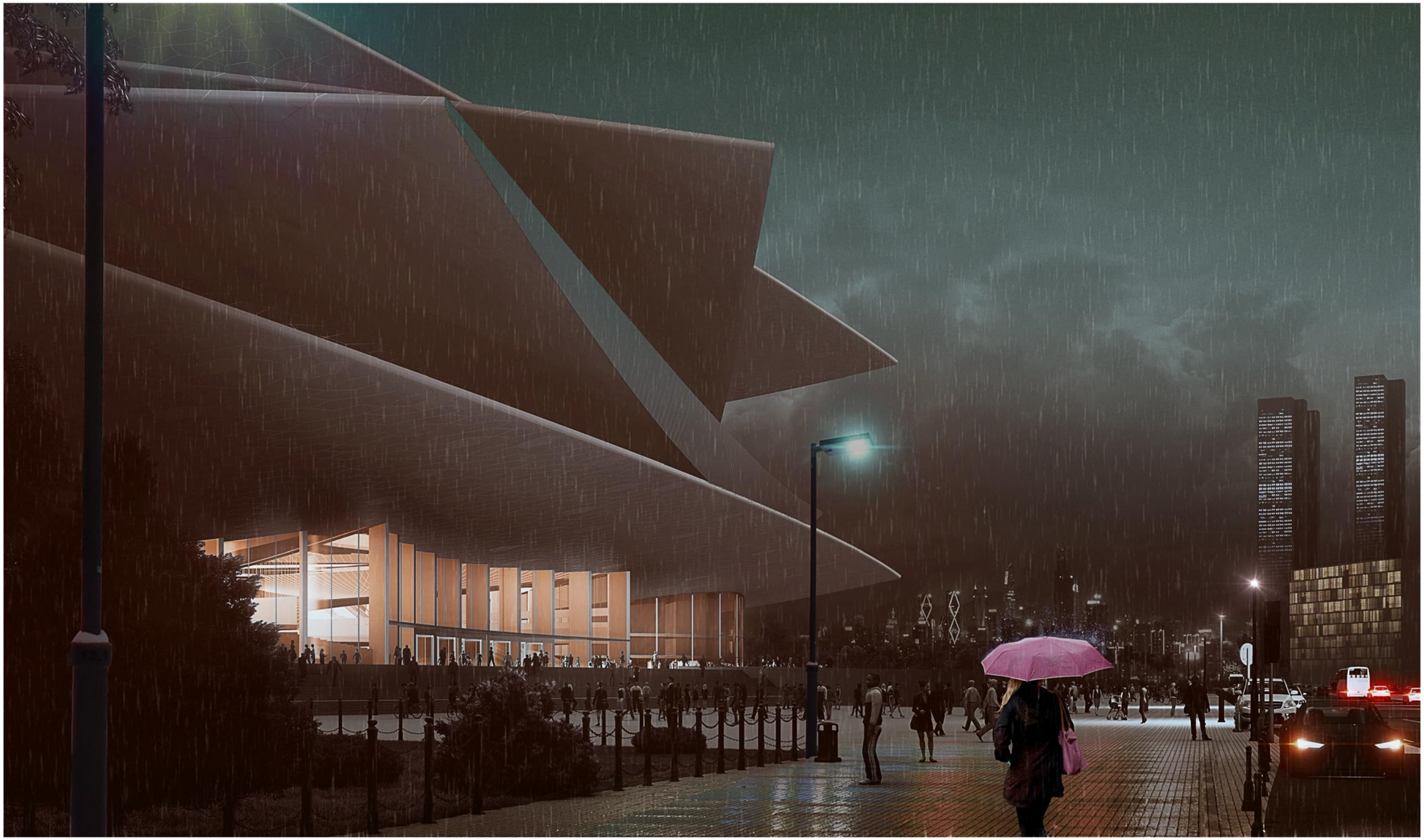
View from the north-zone

Shenzhen Opera House International Architecture Design Competition

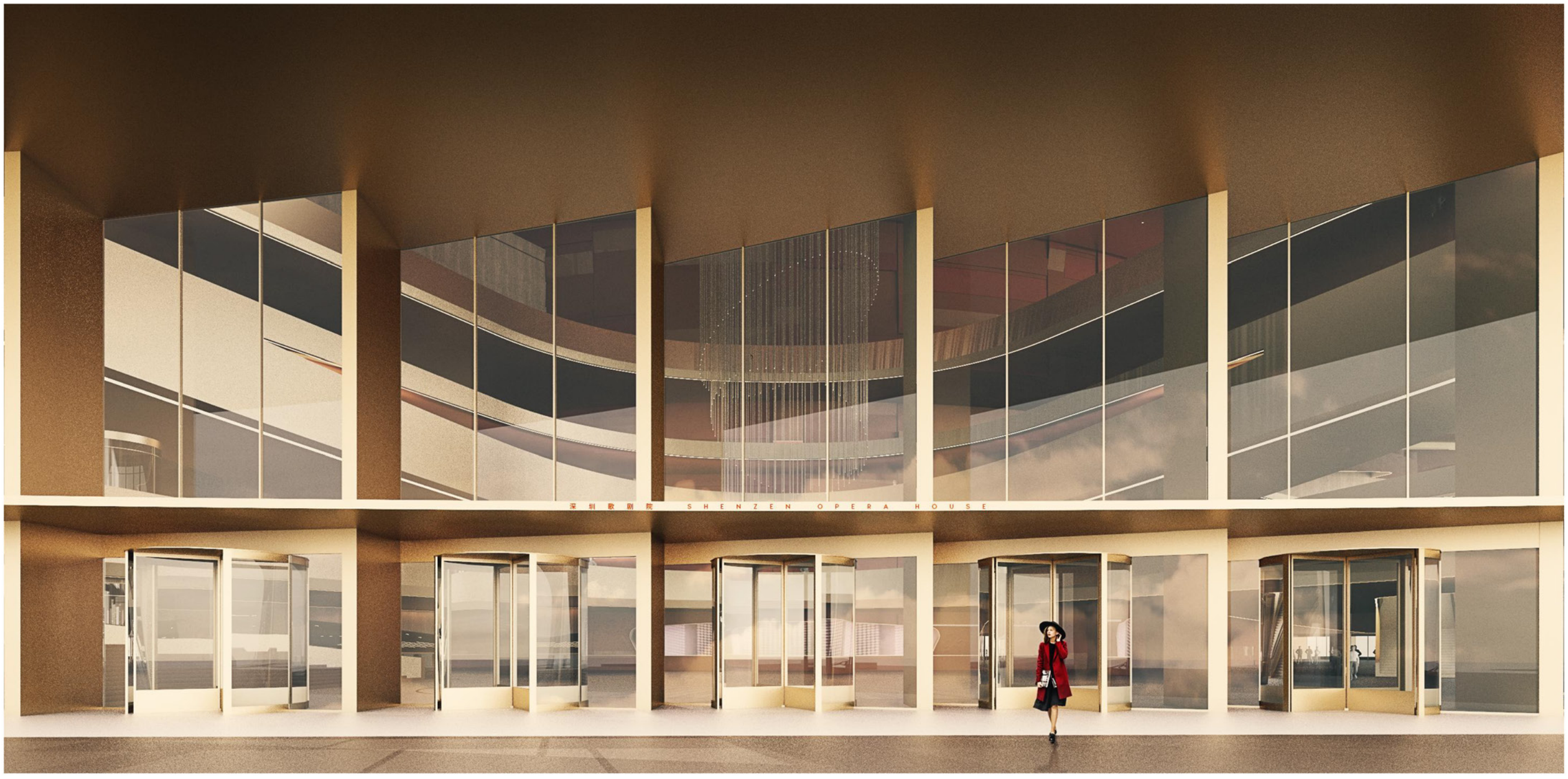
深圳歌剧院



Entrance view

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



Main entrance and lobby

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

Main lobby

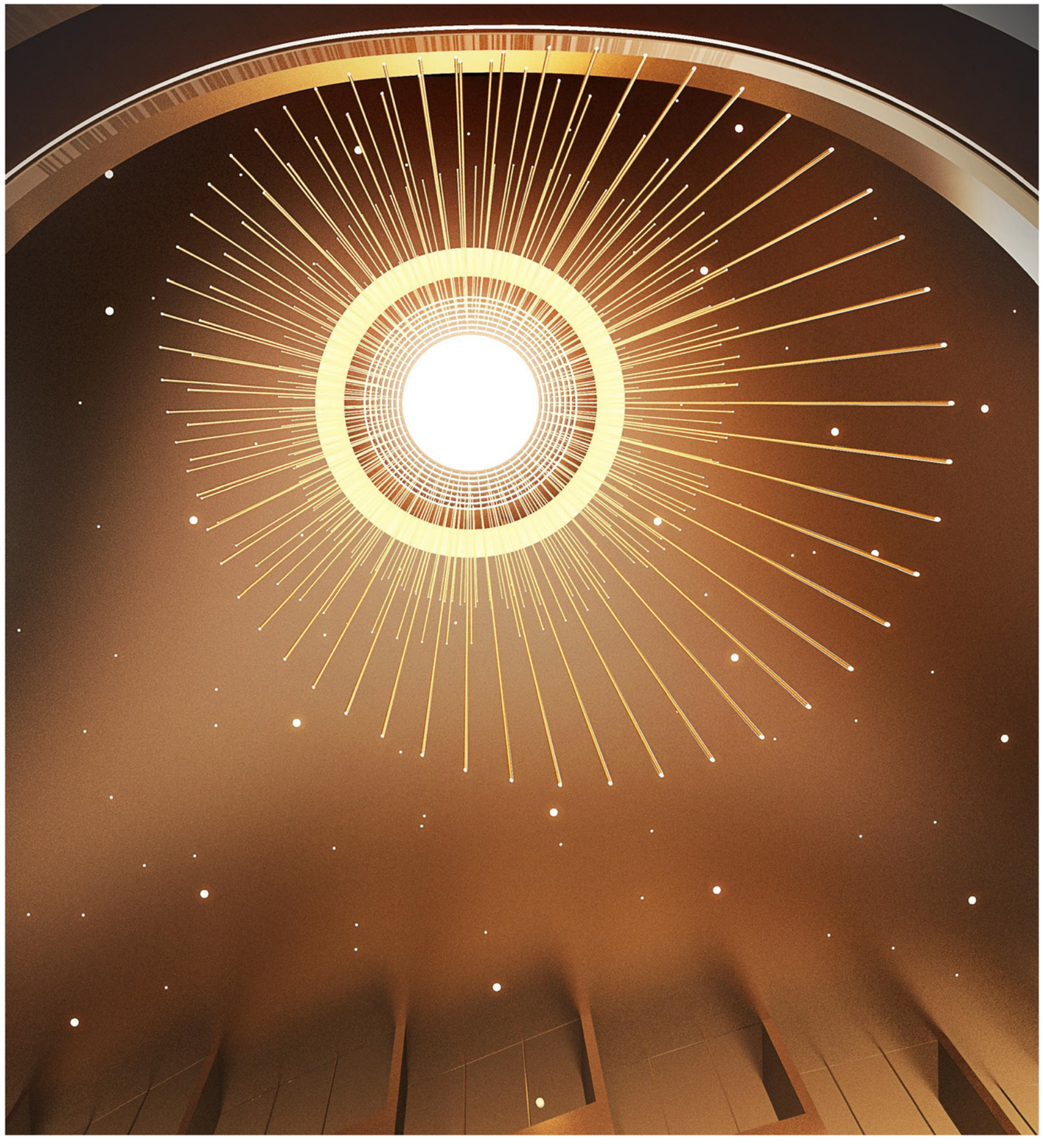
Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

Main lobby

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



Chandelier of the main lobby

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

深圳歌剧院的声学设计目标

在深圳歌剧院的规划中，声学设计是重中之重。实现卓越的声学效果涉及建筑设计的各个环节，包括歌剧院中各个房间和大厅的位置规划、建造原则和建筑材料的选择、各个大厅和排练室体积和形状的选择、吸音和声音反射材料的选择、地板的类型、建筑服务设施、剧院设备的设计和优质电声系统的设计。此外，在设计噪音严重房间的地基时，应考虑对建筑工地附近的道路和铁路交通进行振动隔离的最终需要。

因此，声学设计的主要领域包括：

- 室内声学效果
- 建筑声学效果
- 建筑服务系统（暖通空调系统、电气设备和剧院机械系统）的噪音控制
- 视听系统

必须将所有这些方面结合起来，才能实现总体设计目标：打造一个具有最卓越、最先进的声学效果的歌剧院和音乐表演中心。
为了在各个大厅和功能室创造最佳的室内声学条件，必须仔细检查和设计多用途房间的体积、房间形状、内部装饰材料和可变声学措施。
为了在不同表演大厅之间实现充分的隔音效果，将采用“箱中箱”建造原则建造四个表演大厅和主要的排练空间。
在设计过程中，将与建筑工程团队合作设计暖通空调系统。

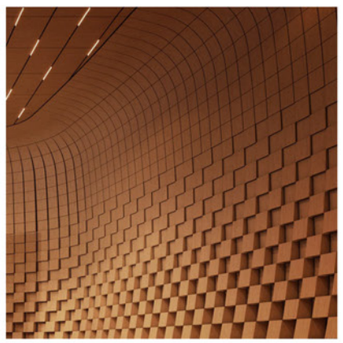
Acoustical design goal of Shenzen Opera House

The acoustics design has a very high priority in the design of the Shenzhen Opera House. Achievement of excellent acoustics involves all stages of the building design: the layout design of the premises and halls within the building, the choice of construction principles and building materials, choice of volume and shape of the individual halls and rehearsal rooms, of sound absorbing and sound reflecting materials, types of flooring, design of building MEP and theater equipment and of high quality electro-acoustic systems. Besides, the design of foundations under noise-related premises should consider an eventual need for isolation of vibration from road and rail traffic present in the vicinity of the building site.

Thus, the main areas of acoustical design are:

- Room Acoustics
- Building Acoustics
- Noise Control of the building MEP systems (HVAC, electrical equipment and theater mechanics systems)
- A/V systems

All of these aspects have to be integrated in order to achieve the overall design goal: to create an Opera House and music performance center with excellent, state of the art acoustics.
In order to create optimal acoustical conditions in the various halls and rooms, room volume, room shape, interior finish materials and variable acoustic measures for multi-purpose use have to be carefully examined and designed.
To achieve sufficient sound insulation between different halls, the “box in box” construction principle will be used for the construction of the four performance halls and for the major rehearsal spaces.
In the design process, the HVACsystem will be designed in cooperation with the building MEP expert team.



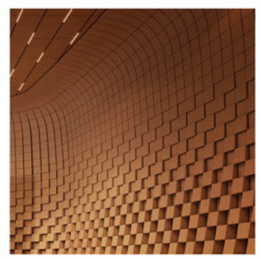
深圳歌剧院

噪音控制和隔音

深圳歌剧院各个部分内的噪音控制不但对表演者和观众的声学体验非常重要，而且也是深圳歌剧院每位雇员工作环境质量控制的一部分。相关噪音控制参数的主要目标值规定如下。
深圳歌剧院的内部空间，将对来自室外交通、通过建筑结构传播的相邻房间、以及来自与建筑技术服务设施（暖通空调系统和电气系统）和剧院技术设备相关的内部噪音源的噪音和振动进行处理。在不同的表演大厅内，来自任何此类噪音源的噪音不应超过下列数值：
歌剧厅：NR15
音乐厅：NR10
轻歌剧厅：NR15
多功能剧院：NR15
在其他功能室中，以下区域最值得关注：
排练室：L_{Aeq} = 25 dB, L_{Amax} = 30 dB
更衣室：L_{Aeq} = 30 dB
办公空间和食堂：L_{Aeq} = 35 dB
门厅和其他公共区域：L_{Aeq} = 35 dB
深圳歌剧院的外立面和屋顶将根据防止声音传出/传入歌剧厅和音乐厅的目标进行设计，必要时采用“箱中箱”结构。此外，如果现场振动分析结果表明有必要时，则可以采用弹簧和橡胶垫隔离的形式对特别敏感的功能室进行结构振动隔离。
一般而言，通过精心的房间布局（避免嘈杂和对噪音敏感的房间相互靠近），适当的结构分离，以及必要时采用适当的大体积结构及/或双重（箱中箱）结构，可确保房间之间有足够的隔音效果。
将通过仔细计算机械旋转的最大噪音水平、必要的风道尺寸和必要的消音器衰减量对暖通空调系统进行设计。此外，还将确保建筑服务设施和进出建筑物的交通不会向环境排放不可接受的噪音。

Noise control and sound insulation

The noise control is very important in all parts of the building for both the acoustic experience of the performers and the audience, but also as part of the quality of the work environment for all employees working in the building. The main target values for the relevant noise control parameters are specified in the following.
In the interior spaces of the building, both noise and vibration from outside traffic, from adjacent rooms transmitted through the building structures and from internal noise sources related to building’ s MEP systems (HVACand electrical systems) and the theater technical equipment will be managed. The values for the different performance halls from any of these sources should not exceed the values given below:
Opera Hall: NR15
Concert hall: NR10
Operetta Hall: NR15
Multi-functional Theatre: NR15
Among the other premises, the following are of primary interest:
Rehearsal rooms: L_{Aeq} = 25 dB, L_{Amax} = 30 dB
Dressing rooms: L_{Aeq} = 30 dB
Office spaces and canteen: L_{Aeq} = 35 dB
Foyer and other public areas: L_{Aeq} = 35 dB
The facade and the roof of the building will be designed according to the goal to prevent sound both emerging from and entering the opera and concert spaces, using “box in box” construction where necessary. Also structural vibration isolation in the form of spring and rubber pad isolation of particularly sensitive rooms can be implemented if a site vibration analysis indicates this to be necessary.
In general, sufficient sound insulation between rooms is ensured through a careful room layout (so as to avoid noisy and noise sensitive rooms to be placed close to each other), through proper structural separations and through suitably massive and/or double (box in box) constructions where necessary.
The HVACsystems will be designed with careful calculation of necessary maximum noise levels of rotating machinery, duct dimensions and necessary noise attenuation. It will also be ensured that building MEP installations and traffic to and from the building do not emit unacceptable noise levels to the environment.



Opera Hall

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

大歌剧厅

大歌剧厅主要用于歌剧表演，包括中国民族歌剧、芭蕾舞、中国民间舞蹈、现代舞和大型戏剧表演。大厅有2300个座位，其形状和体积的设计考虑到了视线，声学设计和美观的视觉效果。我们设计了一个独特的楼座系统，使每个座位的视线距离小于33米。这个歌剧厅可能是世界上第一个有“空中”楼座的歌剧院。

镜框式舞台设计有台口。主舞台和侧翼副台采用六方形布局设计。后主台宽34米，深25米，其他四个副台宽24米，深25米。台口的大小为19x13米，可以通过一个假台口最大限度地缩小到15x9米.

管弦乐池可容纳100人的管弦乐队，可以整体升降或单独升降。当上升到与舞台表面相平时，可以作为舞台的延伸部分；当下降到大厅地面时，可以安装座位。

大歌剧厅的设计方案是基于“马蹄”形状的意大利巴洛克歌剧院的设计理念。这一设计理念经过400多年的不断发展，证明了它对于舞台形式歌剧的优越性。这一理念的主要优点是尽量缩短表演者与观众之间的物理距离，因此实现最佳的亲密度和清晰度。然而，在现代歌剧厅中，也需要丰富的混响效果，这意味着大歌剧厅也应该包含一个“蓄声池”，在其中可以产生适量的混响声。通常，这个“蓄声池”位于顶部楼座及其上方，仅用于安装技术设备（舞台灯光和其他技术设备）。在许多有几层楼座的马蹄形表演厅中，使这种丰富的混响声到达楼座下面的后排座位是一个巨大的挑战。在我们的设计理念中，我们通过将楼座与四周墙体分开克服了这个挑战。通过这个方法，混响声可以从后面向下飘到很远的座位，并产生卓越的环绕声效果。同时，通过将楼座与墙体分开，可以使观众更接近舞台。此外，对声音具有反射作用的楼座前表面更接近舞台，而通过这些表面产生的反射作用更加有效（通过更早到达和更高强度）。

在一个可容纳2300人的大厅内，要实现33米的最大距离，这对设计的要求很高。这就是马蹄形状的宽度在大厅中稍微向后延伸的原因。

为了确保视线能够看到舞台口的全貌（同时也使混响声最大限度地渗透到后排座位），楼座各层之间的距离不能太小。足够的楼座间距也使我们能够在楼座之间设计墙壁，从而有效地将早期反射的声音传播到所有座位区域。

舞台台口拱架周围略带弧度的墙壁和天蓬反声板有助于将演唱者的声音传播到整个大厅，这样他们的声音就不太可能被乐池中的管弦乐所淹没。

朝向舞台口的侧面露台和侧面楼座稍微向下倾斜，以改善视线，并减少座位排的倾斜度。

在设计阶段，将对天花板和悬挂在天花板上的一个备选反射灯（或枝形吊灯）的形状设计，以及舞台表面、楼座和 “之”字形墙壁的细节形状设计进行优化，以确保声音在座位区域实现最佳分布。

大厅内各部位的表面材料和座椅的选择将使混响特性与频率达到一个很好的平衡。另外，将安装可变表面（使用纺织品横幅），以实现混响时间在1.4-1.8秒之间的推荐变化范围。

下表列出了主要室内声学参数的建议值:

座位数 - N	2300
体积 - V（立方米）	23000
人均体积 - V/N（立方米）	10
混响时间 - RT_{min}（秒）	1.4
混响时间 - RT_{max}（秒）	1.8
早期衰减时间 - EDT（秒）	1.6
清晰度 - C（dB）	2 +/- 1
强度 - G（dB）	0 +/- 1
来自技术设备和外部声源的最大噪音级-NR	NR15

Opera Hall

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

Grand Opera Hall

The Grand Opera Hall mainly accommodates opera, including Chinese traditional opera, ballet, Chinese folk dance, modern dance and large theatrical performances. The auditorium has 2300 seats, with shape and volume designed in consideration of the sightline, the acoustic design and pleasant visual experiences. We designed a unique balcony system, which provides less than 33 m of sight distance for every seat. This opera hall could be the very first opera venue in the world with "flying" balconies.

Proscenium stage is designed with apron. The main stage and wing spaces are designed with a six-square layout. The main and rear stage are 34 m wide and 25 m deep and the other four wing spaces are 24 m wide and 25 m deep. The size of the proscenium opening is 19x13 m, which may be minimized to 15x9 m with a false proscenium.

The orchestra pit accommodates a 100 person orchestra and allows integrated or separate lifting. When raised to the level of the stage surface, it serves as an extension of the stage; when lowered to the level of the auditorium floor, it allows for installation of seats.

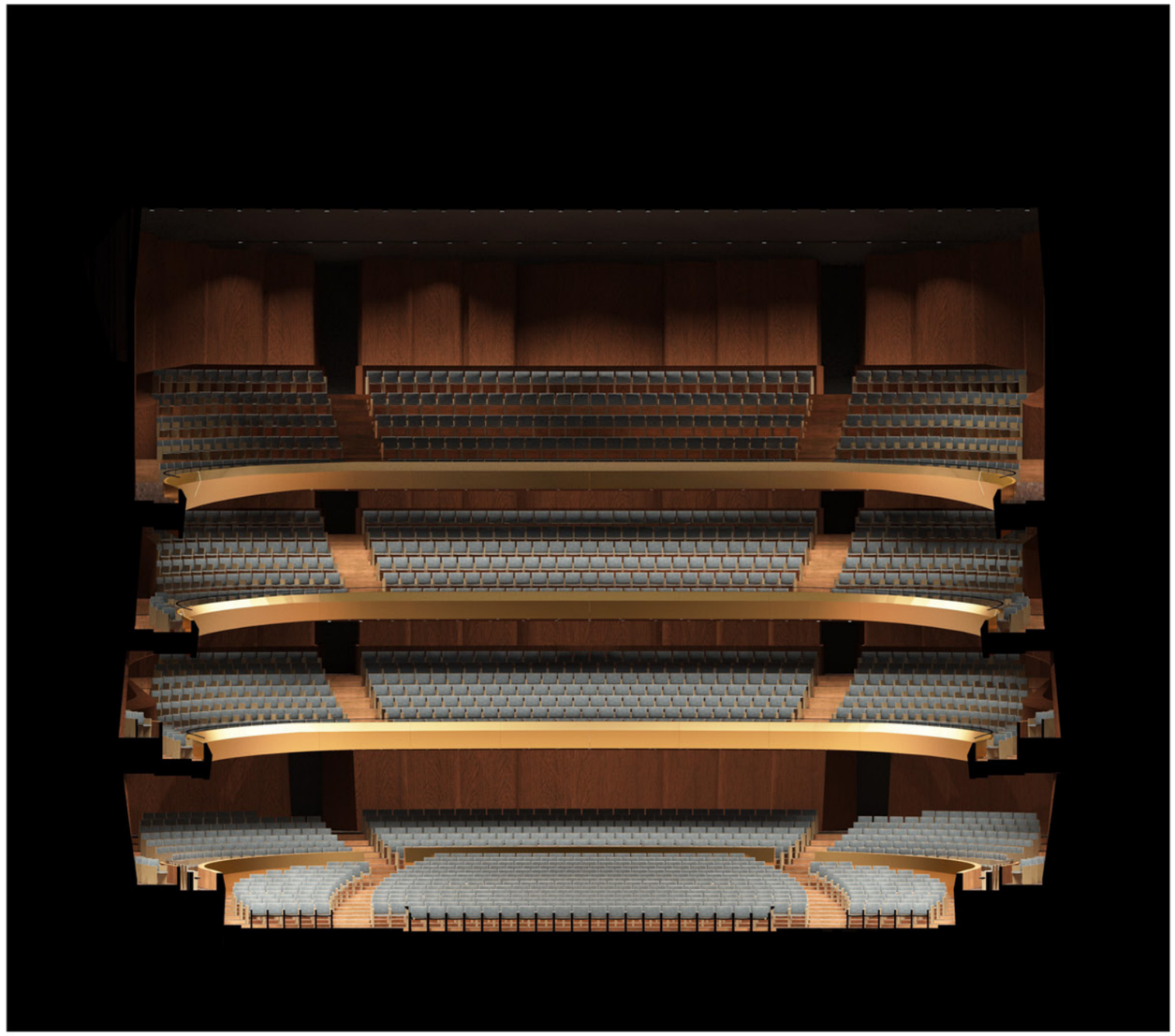
The proposed design of the Grand Opera Hall is based on the "horse shoe" shaped Italian Baroque Opera concept, a concept which has demonstrated its superiority for proscenium format opera through continuous development over a period of more than 400 years. The main virtues of this concept are minimized physical distance between performers and audience and therefore also optimal intimacy and clarity. However, in modern opera halls, also a rich reverberance is desired, which means that the hall should also contain a "reservoir" in which a suitable amount of reverberant sound can be developed. Normally, this reserve is situated at and above the top balcony, which should then only be used for technical installations (stage lights and other technical equipment). In many horse shoe shaped halls with several levels of balconies, it is a challenge to make this rich reverberant sound reach the rear seat rows under the balconies. In our concept, this challenge is overcome by detaching the balconies from the surrounding walls whereby the reverberance can drizzle down from behind to the remote seat rows and provide a high sense of acoustic envelopment. At the same time, detaching the balconies from the walls moves the audience closer to the stage. Also the reflective balcony front surfaces come closer to the stage, whereby the reflections of these surfaces become more efficient (by arriving earlier and with higher intensity).

It is demanding for the design to fulfill the need for a max. distance of 33 m in a hall seating 2300 people which is the reason why the width of the horse shoe is slightly extended towards the rear in the auditorium.

In order to ensure a free line of sight to the full height of the stage opening (and in order to allow for maximum penetration of reverberant sound to the rear seat rows) the distance between the balcony levels must not be too small.

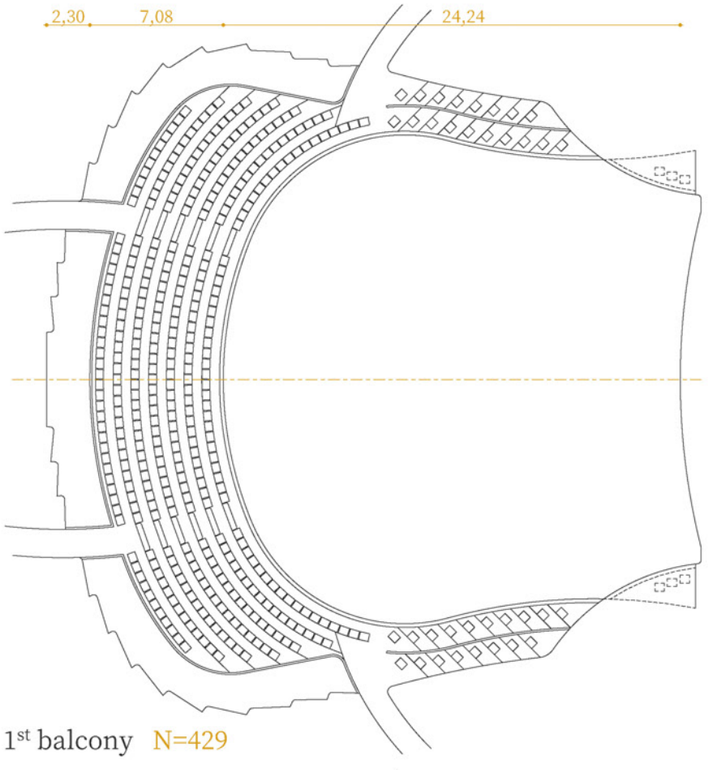
Sufficient inter balcony distance also makes it possible to design the walls between the balconies so that they contribute efficiently to the distribution of early reflected sound to all seating areas.

The slightly curved walls and canopy around the proscenium arch help to propagate the singers voices into the auditorium so that they are less likely to be overpowered by the orchestra in the pit.

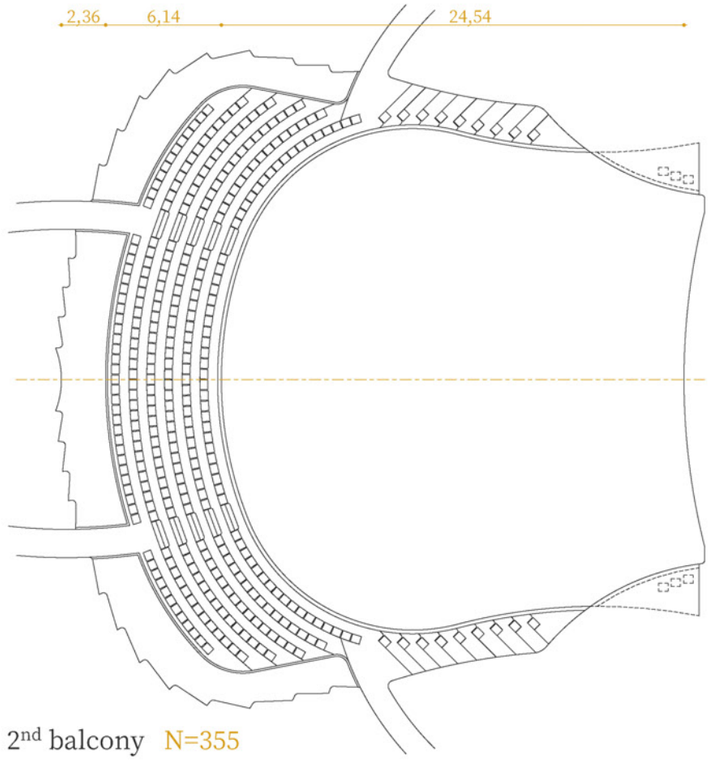


The side terraces and side balconies are slightly sloping downwards towards the proscenium in order to improve sightlines and reduce the need for a steep raking of the seating rows.
In the design phase the shaping of the ceiling and of an optional reflector (or chandelier) hung from the ceiling as well as the detailed shaping of the proscenium surfaces, the balconies and the zig zag shaped walls will be optimized so as to ensure optimal distribution of sound over the seating areas.
The surface materials and seating in the hall will be chosen so that a well-balanced reverberation characteristic versus frequency is achieved, and variable surfaces (using textile banners) will be installed to fulfill a proposed range of variation for the Reverberation Time between 1.4 and 1.8 seconds. Suggested values for the main room acoustic parameters are listed in the table below:

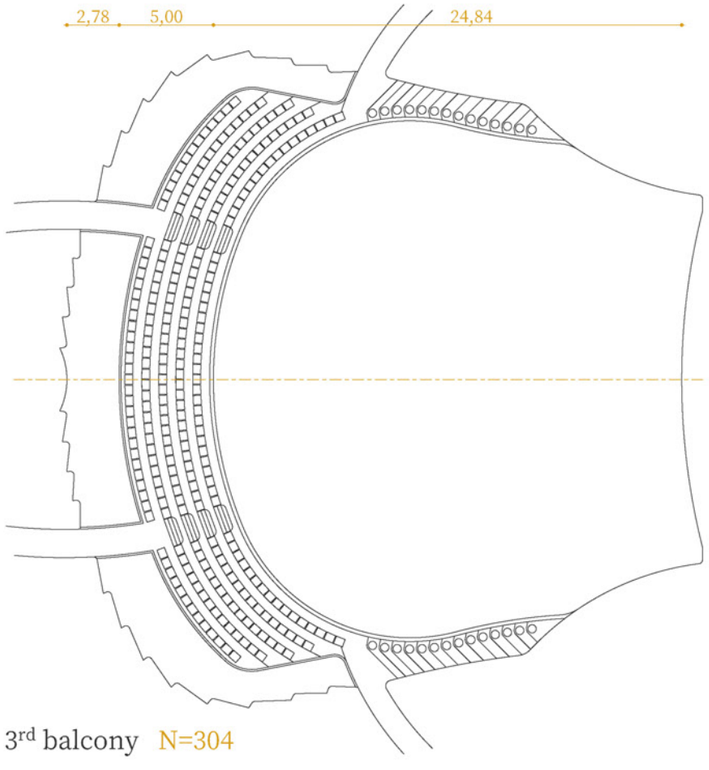
No seats - N	2300
Volume - V (m3)	23000
Volume per person - V/N (m3)	10
Reverberation Time - RTmin (sec)	1,4
Reverberation Time - RTmax (sec)	1,8
Early Decay Time - EDT (sec)	1,6
Clarity - C (dB)	2 +/- 1
Strength - G (dB)	0 +/- 1
Max. Noise level from technical installations and outside sources	NR15



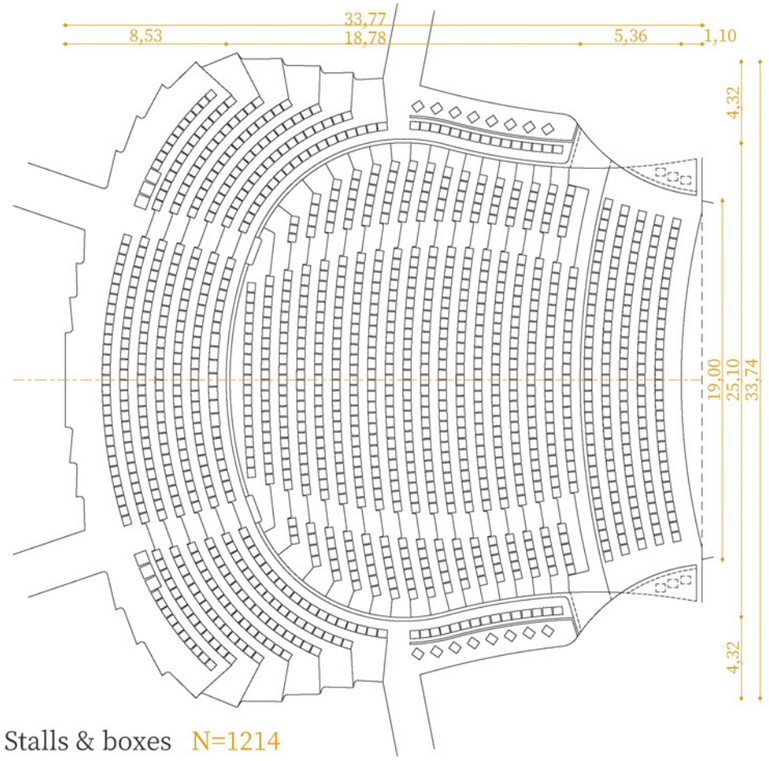
1st balcony N=429



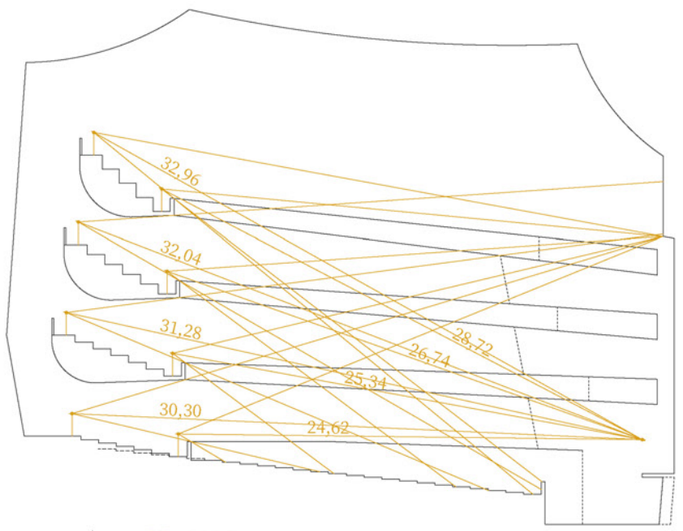
2nd balcony N=355



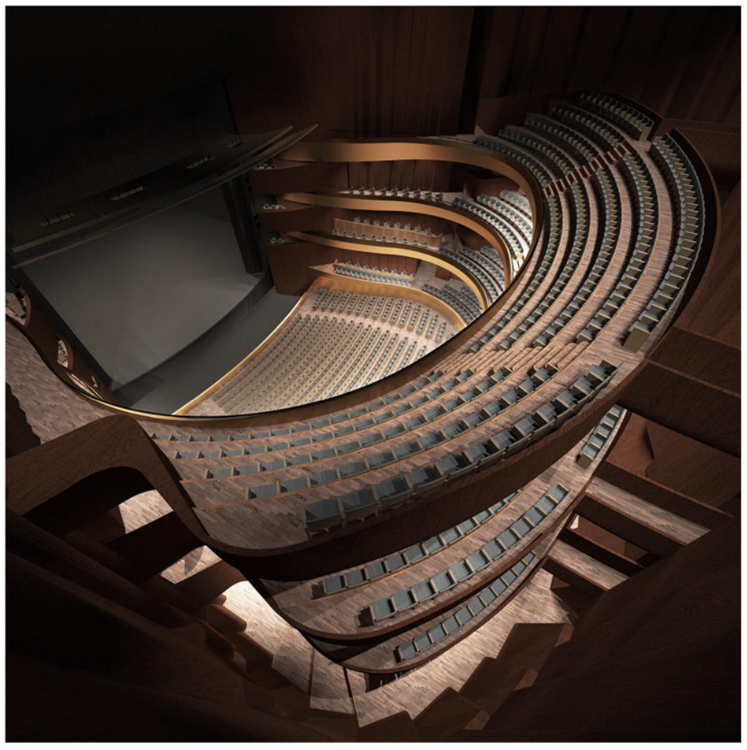
3rd balcony N=304



Stalls & boxes N=1214



Cross-section N=2302



Main geometry of the grand opera hall

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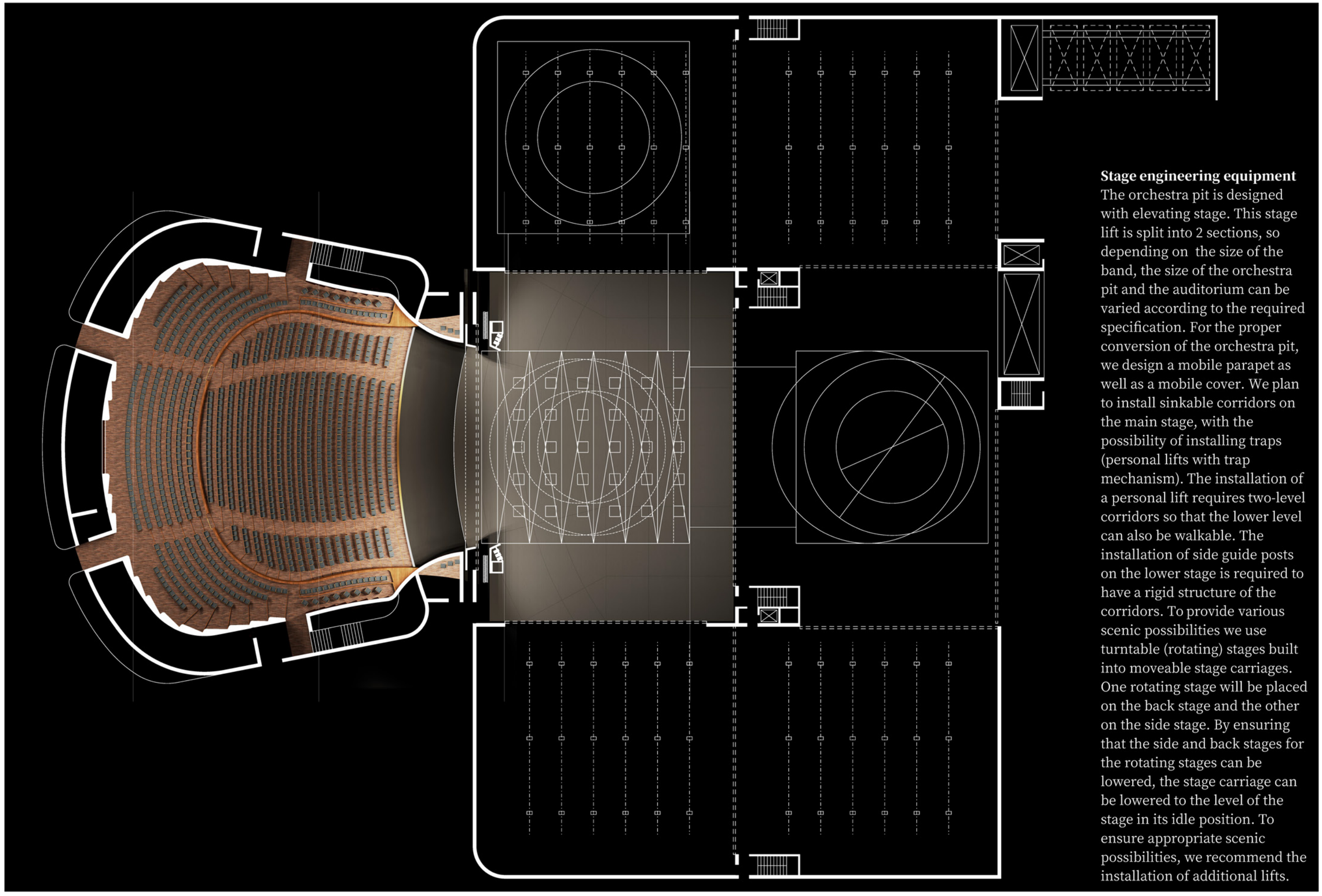
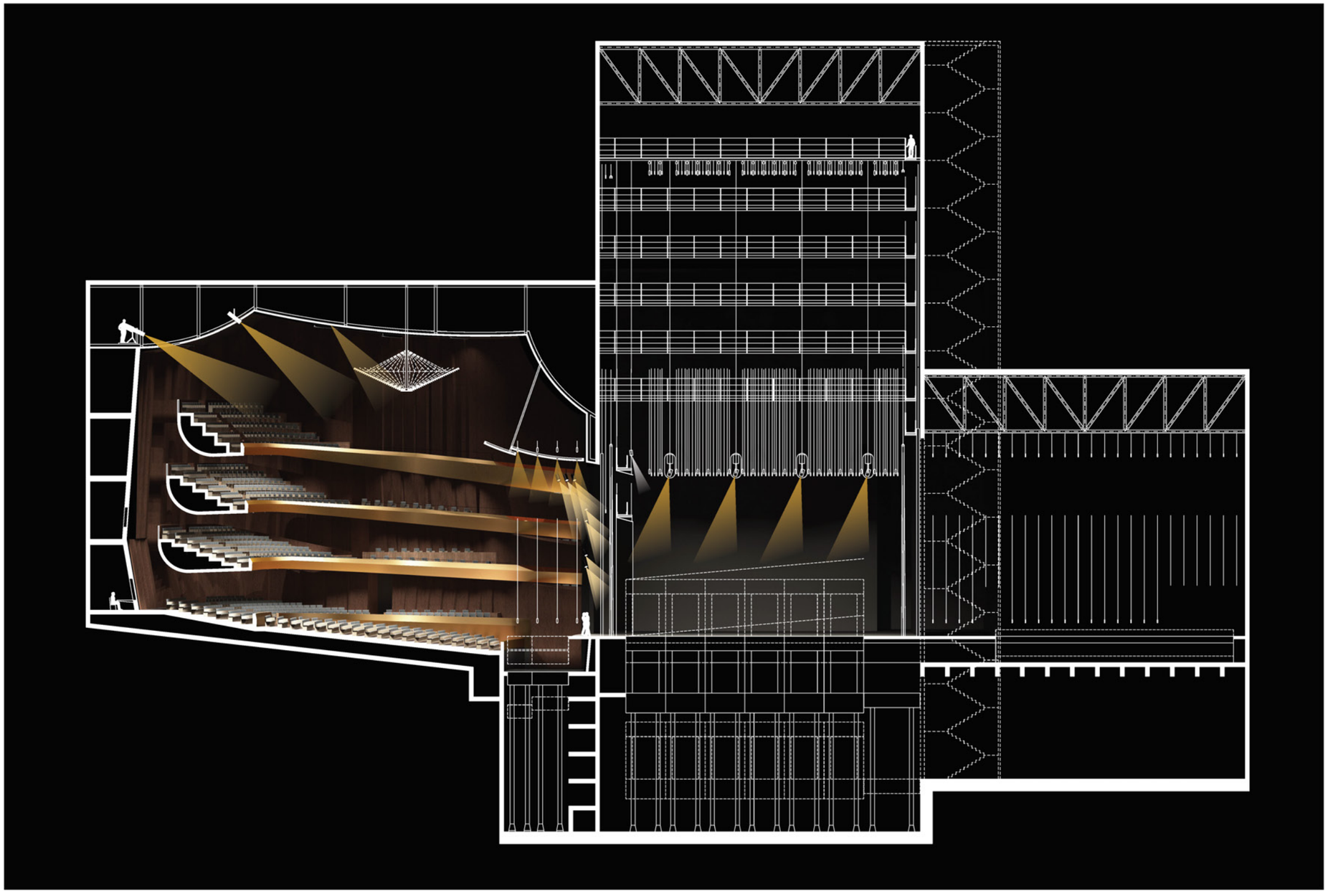
深圳歌剧院



Stage engineering equipment
The orchestra pit is designed with elevating stage. This stage lift is split into 2 sections, so depending on the size of the band, the size of the orchestra pit and the auditorium can be varied according to the required specification. For the proper conversion of the orchestra pit, we design a mobile parapet as well as a mobile cover. We plan to install sinkable corridors on the main stage, with the possibility of installing traps (personal lifts with trap mechanism). The installation of a personal lift requires two-level corridors so that the lower level can also be walkable. The installation of side guide posts on the lower stage is required to have a rigid structure of the corridors. To provide various scenic possibilities we use turntable (rotating) stages built into moveable stage carriages. One rotating stage will be placed on the back stage and the other on the side stage. By ensuring that the side and back stages for the rotating stages can be lowered, the stage carriage can be lowered to the level of the stage in its idle position. To ensure appropriate scenic possibilities, we recommend the installation of additional lifts.

Opera Hall Stage Engineering Equipment
Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

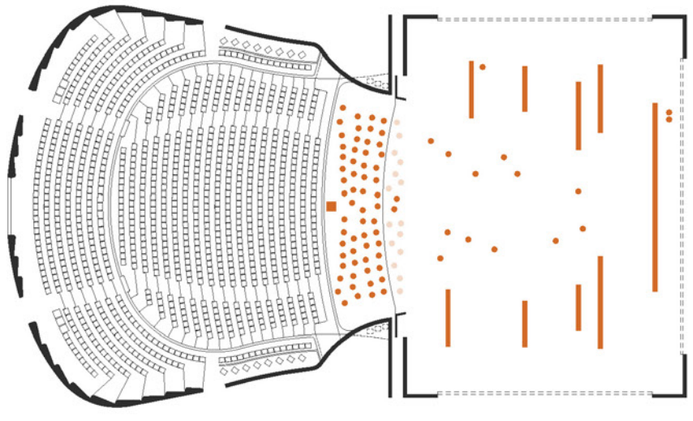


In accordance with fire regulations, the auditorium must be separated from the stage, and the stage must be separated from the side stages by safety curtains that can be lowered. Above the orchestra pit, in the forestage area we install synchronous, programmable pointhoists. The equipment of the proscenium opening is a multifunctional curtain, a high-speed scenery hoist, variable-size proscenium opening reducers, and a movable two-level lighting bridge. The stage is built with at least 60 scenery hoist and at least 100 transversely movable, synchronous, programmable point hoists. The stage is closed at the back by a back drop, and on both sides by panoramic legs. In addition to the panoramic legs, movable lighting brackets will be made for side lighting. The dimensions of the stage require several movable, programmable lighting hoist with a load bearing capacity of at least 1 t. At least 24 scenery hoists are recommended to set the back stage. On the side stages, chain hoists are required for the setting that can be moved mechanically in the longitudinal direction on rail tracks, at least 20 units in each space.

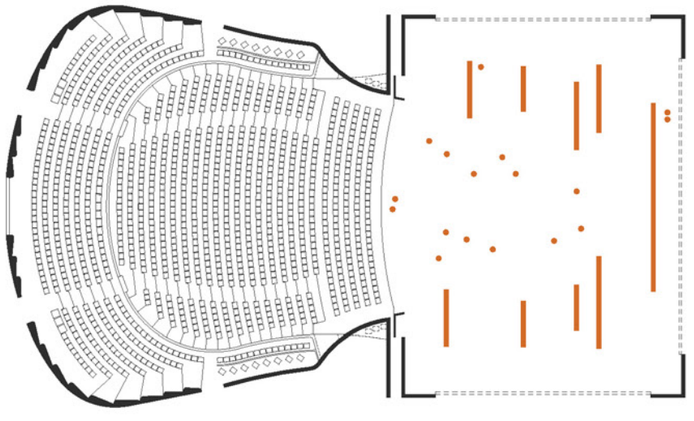
Opera Hall Stage Engineering Equipment

Shenzhen Opera House International Architecture Design Competition

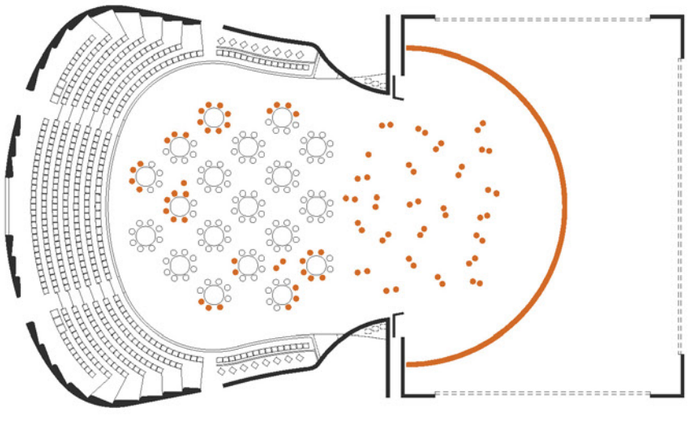
深圳歌剧院



Opera



Theatre

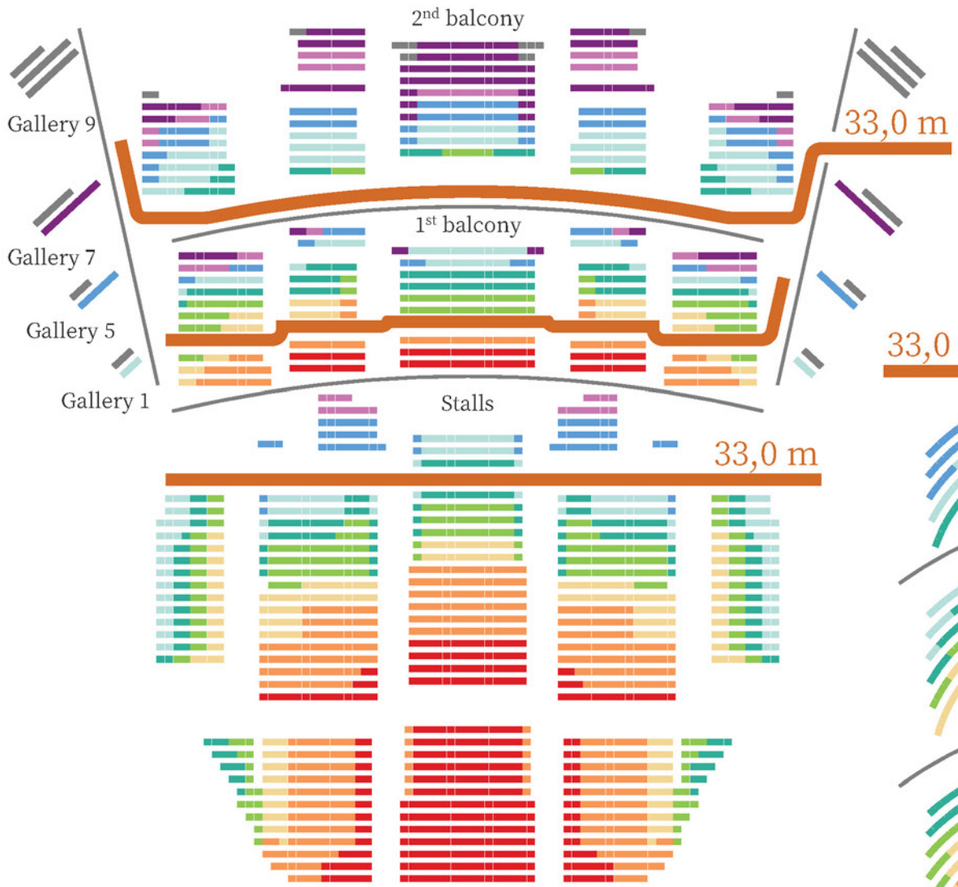


Banquet, business event

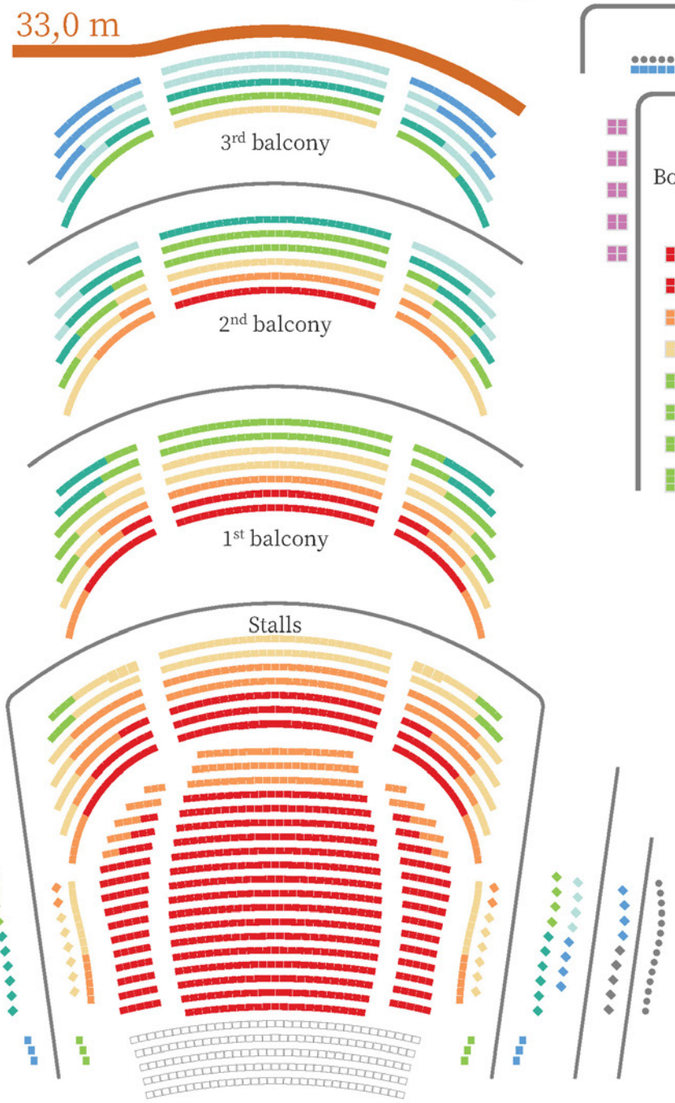
Opera Hall functional layouts

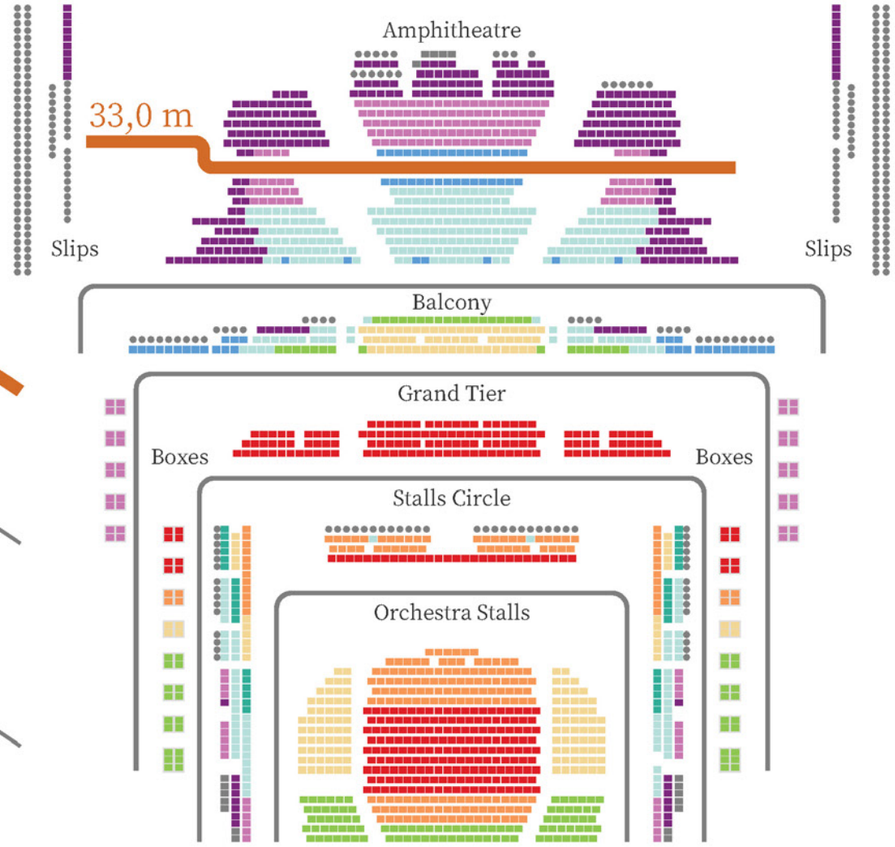
Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



PARIS





LONDON

	Opéra Bastille			Shenzhen Opera House			
	%	price value	revenues	revenues	price value	%	
1. category	15%	1,00	15,4	35,0	1,00	35%	1. category
2. category	19%	0,89	17,1	14,8	0,89	17%	2. category
3. category	9%	0,79	7,3	13,0	0,79	17%	3. category
4. category	12%	0,68	7,9	8,4	0,68	12%	4. category
5. category	11%	0,61	6,6	4,6	0,61	8%	5. category
6. category	12%	0,46	5,6	3,1	0,46	7%	6. category
7. category	8%	0,36	2,7	1,2	0,36	3%	7. category
8. category	4%	0,27	1,1	0,0	0,27	0%	8. category
9. category	7%	0,21	1,4	0,0	0,21	0%	9. category
10. category	3%	0,14	0,4	0,3	0,14	2%	10. category
	100	5,41	65,7	80,4	5,41	100%	

100% < 122%

	Shenzhen Opera House			Royal Opera House			
	%	price value	revenues	revenues	price value	%	
1. category	35%	1,00	35,0	15,9	1,00	16%	1. category
2. category	17%	0,89	14,8	8,7	0,89	10%	2. category
3. category	17%	0,79	13,0	6,9	0,79	9%	3. category
4. category	12%	0,68	8,4	4,9	0,68	7%	4. category
5. category	8%	0,61	4,6	1,0	0,61	2%	5. category
6. category	7%	0,46	3,1	7,0	0,46	15%	6. category
7. category	3%	0,36	1,2	1,1	0,36	3%	7. category
8. category	0%	0,27	0,0	2,6	0,27	10%	8. category
9. category	0%	0,21	0,0	3,1	0,21	14%	9. category
10. category	2%	0,14	0,3	2,1	0,14	14%	10. category
	100%	5,41	80,4	53,26	5,41	100%	

151% > 100%

Our novelty of the "flying" balconies provides closer seats to the stage with better sightlines. The innovation helps to avoid deep balconies and back seats with dry sound. In many horse shoe shaped halls with several levels of balconies, it is impossible to provide rich reverberant sound for the rear seat rows under the balconies. In our concept, this challenge is overcome by detaching the balconies from the surrounding walls whereby the reverberance can drizzle down from behind to the remote seat rows and provide a high sense of acoustic envelopment. Our concept also provides advantages in the ticketing pricing.

Opera Hall Ticketing

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

Opera Hall

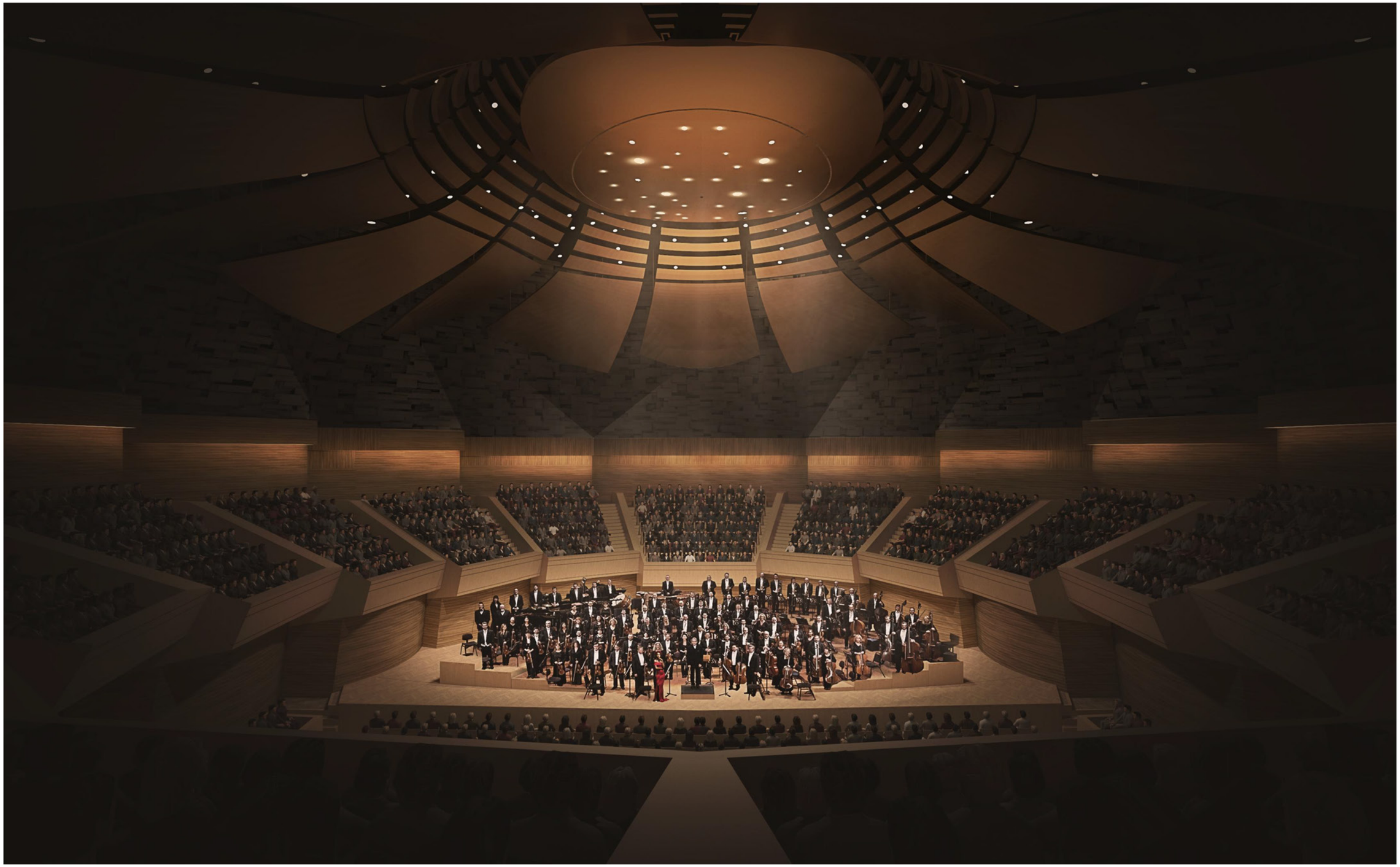
Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

Opera Hall

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



Concert Hall

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

音乐厅

有1800个座位的深圳歌剧院音乐厅将采用最新的科学技术和经验进行设计，以确保交响乐的最佳表演和欣赏条件。同时将采用可变声学措施，使其适用于民间音乐会、音乐会歌剧、半歌剧和扩音音乐会的表演。因此，规划过程的基本目标将是确保观众在音乐会期间以及表演者（管弦乐队成员、独奏者和演唱者）在表演、排练和录音期间享受最佳条件。
所选的音乐厅的形式为：观众围绕在管弦乐队周围的演奏场形状---很像竞赛简介中要求的葡萄园理念；但我们的设计灵感也来自于哈罗德·马歇尔爵士提出的 “定向反射序列”（DRS）理念。这一理念最初在新西兰的基督城市政厅实现，它不仅具有实现葡萄园大厅（经过精心设计）那样高声学清晰度和宽敞度的潜力，而且还具有实现丰富的混响效果、高强度，尤其是在视觉和听觉上的高亲和力。
在根据DRS理念设计音乐厅时，为了确保所有一次反射声在所有座位区域的入射时间(50毫秒内)、入射方向（主要来自横向）和水平方向上正确分布，反射面的位置和方向特别重要。结合宽敞的室内体积，这种对反射面的精心设计将确保实现上述声学质量，而不会有管弦乐队中乐器聚焦或错误定位的风险。反射面将以外露且经过仔细定向的墙壁区、露台/楼座正面和足够的空间以及相当大的自由悬挂式反射器的形式实现。悬挂式反射器还可以根据反射器上方的体积调整耦合，从而优化清晰度与混响声之间的平衡。另一个优点是，这一理念往往会产生非常壮观的视觉效果，就像在基督城和最近在法国巴黎爱乐音乐厅实现的效果。
主楼层和楼座中的座位布局也确保所有听众毫无障碍地直接听到声音。
按照设计，会将大厅中选用的表面材料与这些表面的详细几何图形组合起来，以确保温暖、弥散，但仍美妙响亮的声音。
观众座椅的设计将使大厅的声学差异最小化，无论是在大厅空无一人还是满座的情况下；但同时，座椅将设计为舒适型，但具有适度吸音功能，以避免过度吸音，这将减少大厅所需的动态和强烈的声音响应。

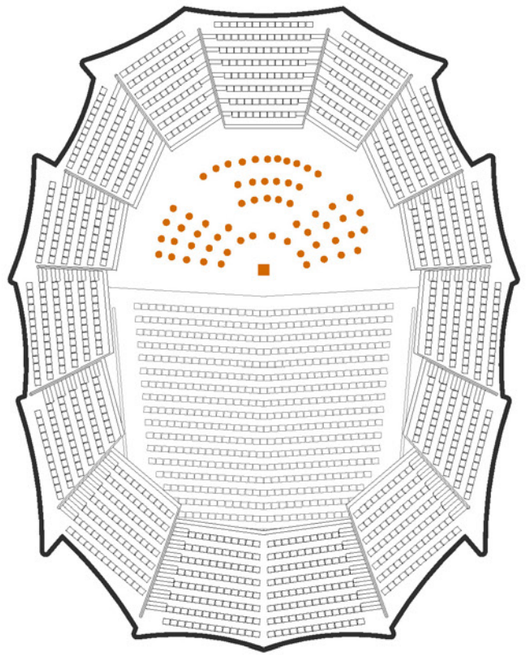
为了满足可变混响时间的要求，我们采用可移动式吸音横幅或窗帘，将上侧和后墙区域覆盖起来。这将减少混响时间，使大厅同样适合举行扩音音乐会和会议。大多数的现代音乐厅-即使“专”为交响乐而设计-均配备此类可变声学手段。部分此类可变吸音区也可用于在沉重的浪漫曲目与更现代或更古老的曲目之间微调声学效果。对于更现代或更古老的曲目而言，更适合混响音少一点，更清晰的声音。此外，这也可以弥补大厅空无一人时与满座时的任何微小差异，以便使排练时的声学效果可以与满座音乐会的声学效果完全相似或者较之略微干一点。
获得的声学参数的组合将决定大厅的声学“个性化”。我们建议，设计应从我们的设计团队与大厅业主/主要用户之间密切交谈开始，以确保此声学“个性化”满足预期效果。在此过程中，在不同的大厅里体验音乐会并在事后讨论获得的印象通常是有利的，以便对有时难以言表的声学印象达成共识。
声学参数在某种程度上相互关联，但也以一种相当复杂的方式与各种建筑变量相关联。因此，能够通过设计方案中三维计算机模型中的声学模拟预测并控制声学参数是很重要的。为了说明这一点，我们已经进行了设计方案中的初步声学模拟，如附图所示。
请注意，我们建议将混响时间的可变范围扩大到计划中所列的范围以外，以确保混响的高度丰富性及高音背景下的高清晰度-以及低音背景下演讲和扩音音乐会扬声器增音的最佳条件。
在下表中，我们列出了主要目标室内声学参数的建议目标值。需要注意的是，除混响时间外，所有参数值与高混响设置（2.4秒）有关。

座位数 - N	1800
体积 - V（立方米）	25000
人均体积（包括管弦乐队）- V/N（立方米）	13
混响时间 - RTmin（秒）	1.7
混响时间 - RTmax（秒）	2.4
早期衰减时间 - EDT（秒）	2.2
清晰度 - C（dB）	0 +/-1
强度 - G（dB）	+5 -/+1
横向效应- LEF	0,2 - 0,25
舞台支持-舞台早期支持度（dB）	-13 +/-1
来自技术设施和外部声源的最大噪音级- NR	NR10

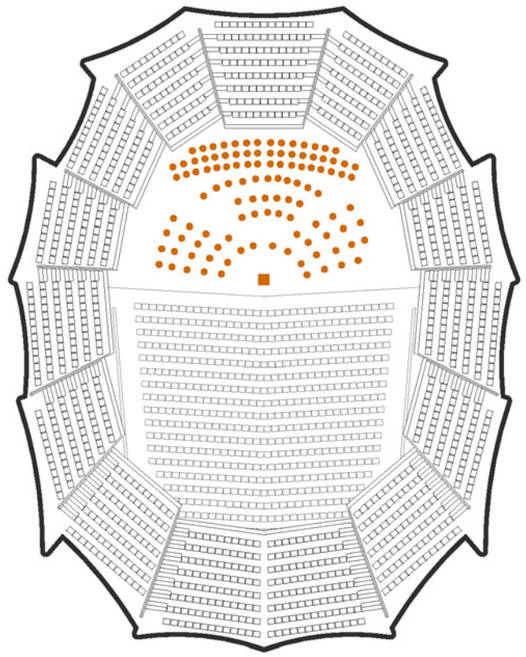
Concert Hall

The 1800-seat Concert Hall of the Shenzhen Opera House will be designed using the latest scientific advancements and experiences in order to ensure optimal conditions for performing and enjoying symphonic music, and incorporating variable acoustic measures to make it suitable for folk music concerts, concert opera , semi-opera and amplified music concerts as well.
The basic objectives in the planning process will be to ensure optimal conditions for both the audience during concerts and for the performers (orchestra members, soloists and singers) during performances, rehearsals and recordings.
The chosen format for the Concert Hall is the arena shape with the audience surrounding the orchestra - much like the vineyard concept asked for in the competition brief; but our design is also inspired by the so called "Directed Reflection Sequence" (DRS) concept introduced by Sir Harold Marshall, which was first realized in the Christchurch Town Hall in New Zealand, and which has the potential for achieving not only high acoustic Clarity and Spaciousness like in a vineyard hall (when carefully designed), but also rich Reverberance, high Strength and not least high intimacy both visually and acoustically.
When designing a concert hall according to the DRS concept, the placement and orientation of the reflecting surfaces is of particular concern in order to ensure that all primary reflections are correctly distributed both in time (within 50 ms), direction of incidence (primarily from lateral directions) and level in all seating areas. In combination with a generous room volume, this careful design of the reflecting surfaces will ensure the realization of the above mentioned acoustic qualities - without the risk of focusing or false localization of instruments in the orchestra. The reflective surfaces will be realized in the form of exposed and carefully oriented wall areas, terrace / balcony front and suffits and - not least - freely suspended reflectors of considerable size. The suspended reflectors will also make it possible to adjust the coupling to the volume above the reflectors, so that the balance between Clarity and Reverberance can be optimized. Another advantage is that this concept often leads to a very spectacular visual identity like in Christchurch and - in its most recent realization - the Philharmonie de Paris, France.
The seating layout both on the main floor and in the balconies also ensures that all listeners are fully exposed to the direct sound without any obstruction.
The combination of materials chosen for the gray surfaces and the detailed geometry of these surfaces will be designed to ensure a warm and diffuse, but still brilliant sound.
The audience chairs will be designed for minimal difference in the acoustics of the hall regardless of whether the hall is empty or fully occupied; but at the same time the seating will be designed to be comfortable but moderately sound absorbing in order to avoid excess absorption which would reduce the desired dynamic and strong sound response from the hall.
In order to fulfill the requirement for a variable reverberation time, we use moveable sound absorbing banners or curtains which can be made to cover the upper side and rear wall areas. This will make it possible to reduce the reverberation time to make the hall suitable also for amplified music and conferences. Most modern concert halls - even if designed "exclusively" for symphonic music - are equipped with such means of variable acoustics. Part of such variable absorption areas may also be used to fine tune the acoustics between a heavy romantic repertoire and more modern or older repertoire for which a less reverberant and more clear sound can be favorable. Besides, this can also compensate for any minor difference between the empty and occupied hall, so that the acoustics for rehearsals can be made exactly similar to or slightly more dry than the fully occupied concert situation.
The combination of the acoustic parameters obtained will determine the acoustic "personality" of the hall. We suggest that the design process should start with a close dialogue between our design team and the client/primary users of the hall in order to make sure that this acoustic "personality" meet the expectations. In this process, it is often advantageous to experience concerts in different halls and discuss the impressions afterwards in order to reach a mutual understanding of the acoustic impressions which are sometimes difficult to express in wording.
The acoustic parameters are interrelated to some extent but also related to the various architectural variables in a quite complicated manner. Therefore, it is important to be able to predict - and control - the parameters through acoustic simulations in a 3D computer model of the proposed design. To illustrate this, we have performed preliminary acoustic simulations of the proposed design as shown in the plots enclosed.
Please notice that we suggest to extend the variable range for the Reverberation Time beyond the range listed in the program in order to ensure high fullness of reverberation as well as high clarity in the high setting - and also optimal conditions for a loudspeaker reinforcement of speech and amplified music in the low setting.
In the following table, we have listed suggested target values for the main objective acoustic parameters. Please observe that the values for all parameters except Reverberation Time relate to the high Reverberation setting (2.4 sec). Suggested values for the main room acoustic parameters are listed in the table below:

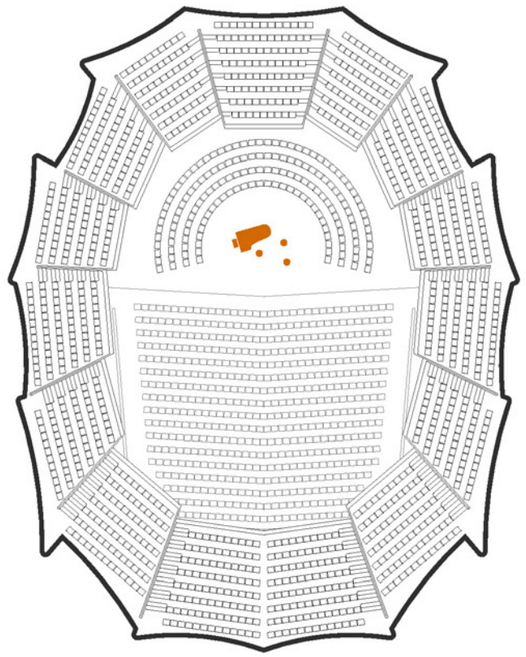
No seats - N	1800
Volume - V (m3)	25 000
Volume per person (incl. Orchestra) - V/N (m3)	13
Reverberation Time - RTmin (sec)	1,7
Reverberation Time - RTmax (sec)	2,4
Early Decay Tima - EDT (sec)	2,2
Clarity - C (dB)	0 +/-1
Strength - G (dB)	+5 -/+1
Lateral Efficiency - LEF	0,2 - 0,25
Stage Support - Stearly (dB)	-13 +/-1
Max. Noise level from technical installations and outside sources NR	NR10



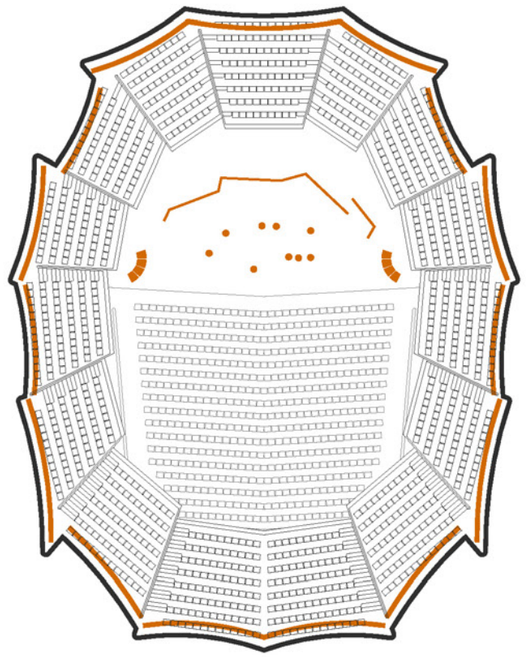
Symphonic music



Symphonic orchestra with chorus



Chamber music



Amplified music with sound absorbing banners

Concert Hall functional layouts

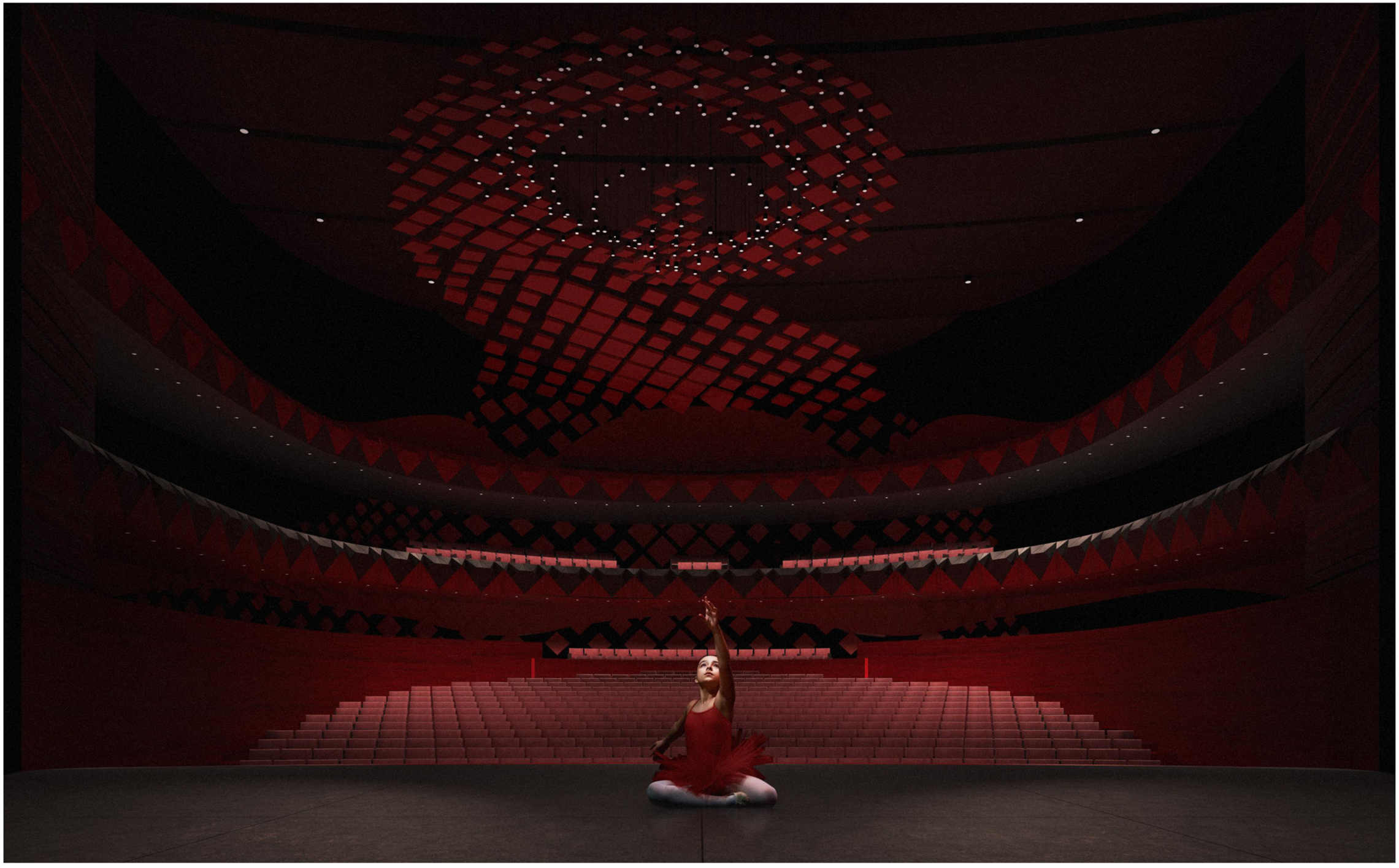
Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

Concert Hall

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



Operetta Hall

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

Operetta Hall

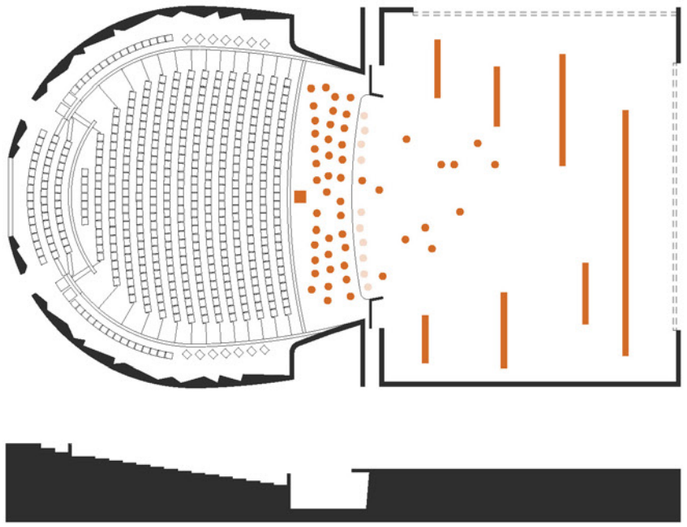
The Operetta Hall planned in Shenzhen Opera House accommodates comic opera, operetta, children's opera, traditional opera, modern dance. The seating capacity is 800 with a proposed volume of 8000 m^3. The volume per seats is 10 m3 / person which is acoustically advantageous. According to the program the hall should suit different types of performances, which requires different acoustical conditions.
The Hall is horse shoe shaped - as in the case of the Grand Opera Hall - with an irregular zig-zag shape to achieve optimal sound distribution and to avoid the focusing effect of the concave shape. The ceiling and the balconies are designed to promote optimal sound distribution throughout the hall and the side balconies are gently sloping downwards towards the stage to create optimal sight lines for the audience.
The different type of events calls for the hall to have variable acoustics. The solution consists of moveable sound absorbing elements, for example curtains and banners.
The basic acoustical parameter of the premises is the Reverberation Time (RT). The required mean value of the RT at the mid frequencies - with audience (people).
The range of adjustable reverberation time is 0.6 sec, RT = 1.2 - 1.8 sec. We plan to extend the lower limit of the RT interval to 1.2 sec, which better suits amplified music events and speech.
A carefully designed electroacoustic system will be incorporated to obtain optimal sound distribution, Clarity and Intelligibility for amplified events such as rhythmical music concerts, prerecorded music accompanying dance performances, conferences, etc.
Suggested values for the main room acoustic parameters are listed in the table below:

No seats - N	800
Volume - V (m^3)	8000
Volume per person - V/N (m^3)	10
Reverberation Time - RT_{min} (sec)	1,2
Reverberation Time - RT_{max} (sec)	1,8
Early Decay Time - EDT (sec)	1,6
Clarity - C (dB)	-1 + 0,5
Strength - G (dB)	4,5
Max. Noise level from technical installations and outside sources	NR15

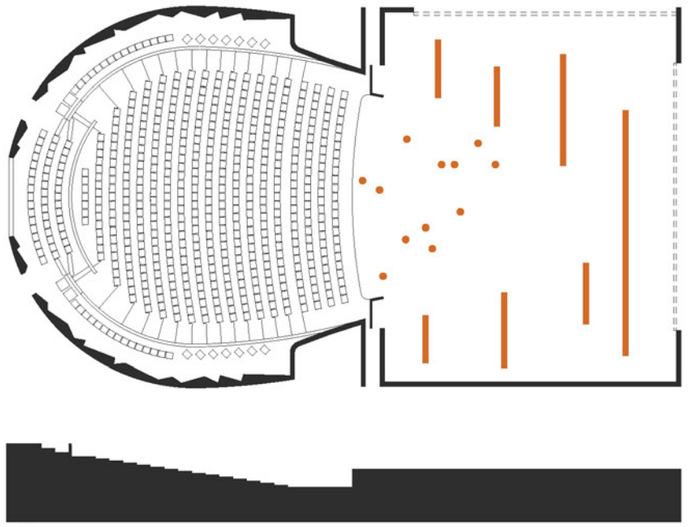
轻歌剧厅

在深圳歌剧院规划的轻歌剧厅用于喜剧歌剧、轻歌剧、儿童歌剧、传统歌剧、现代舞的表演。可容纳人数为800人，建议体积为8000立方米。每个座位的体积为10立方米/每人，这在声学方面非常有利。按照计划，轻歌剧厅应适合不同类型的表演，这需要不同的声学条件。
轻歌剧厅的形状为马蹄形，就像大歌剧厅一样，呈不规则的“之”字形，以实现最佳的声音分布效果，并避免凹形的聚焦作用。天花板和楼座的设计旨在促进声音在整个大厅实现最佳分布。朝向舞台的侧面楼座向下微微倾斜，从而为观众创造最佳视线。
不同类型的活动要求轻歌剧厅具有可变的声学效果。解决方案是采用可移动式吸音器材，例如窗帘和横幅。
最重要的声学参数之一是混响时间（RT）。在中频率时所需的RT平均值--有观众（人）的情况下。
可调混响时间范围为0.6秒，RT=1.2-1.8秒。我们计划将RT间隔的下限延长到1.2秒，这更适合扩音音乐活动和演讲。
我们将结合精心设计的电声系统，以实现扩音活动，如节奏性强的音乐会、预先录制的音乐伴舞表演、会议等活动的最佳声音分布、清晰度和可理解性。下表列出了主要室内声学参数的建议值：

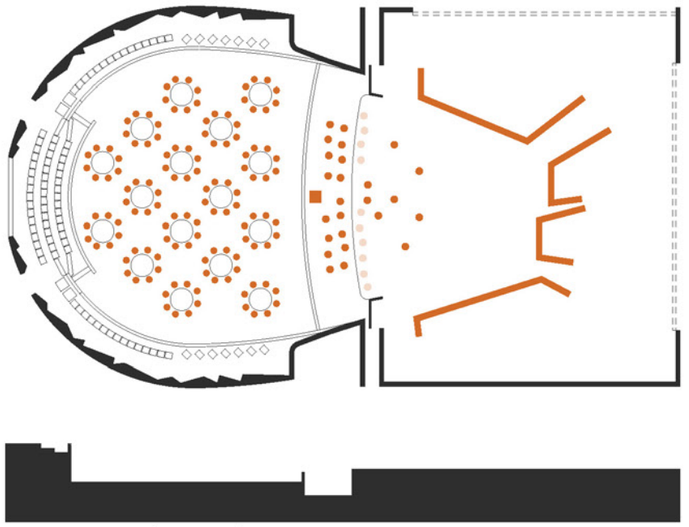
座位数 - N	800
体积 - V（立方米）	8000
人均体积- V/N（立方米）	10
混响时间- RT_{min}（秒）	1.2
混响时间- RT_{max}（秒）	1.8
早期衰减时间 - EDT（秒）	1.6
清晰度 - C（dB）	-1 + 0.5
强度 - G（dB）	4.5
来自技术设施和外部源的最大噪音级-NR	NR15



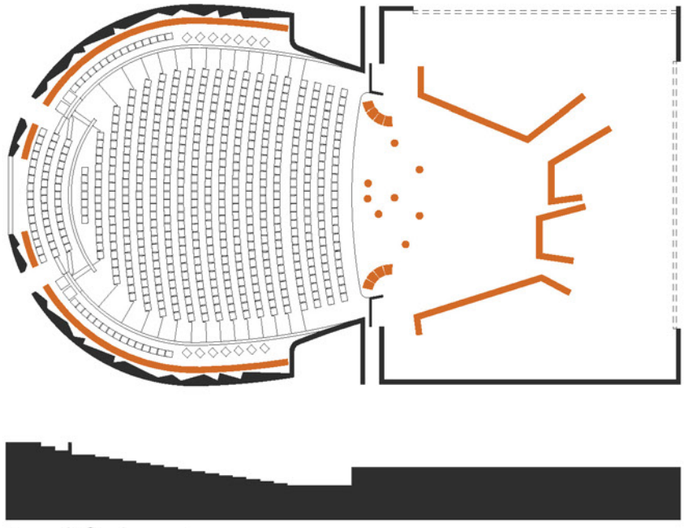
Opera, operetta



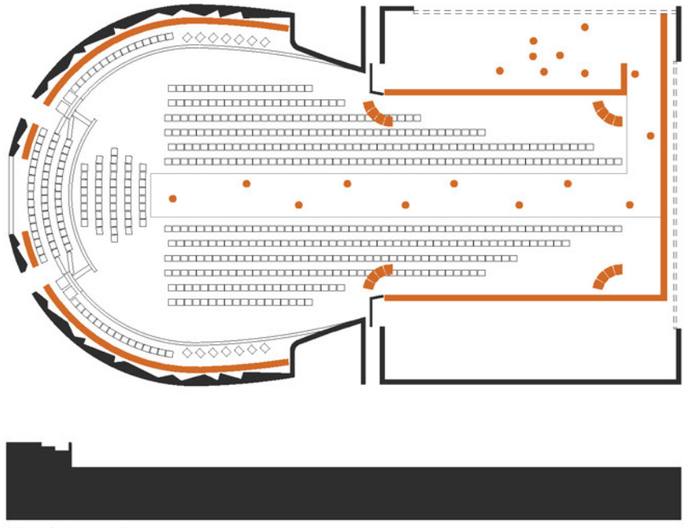
Theatre



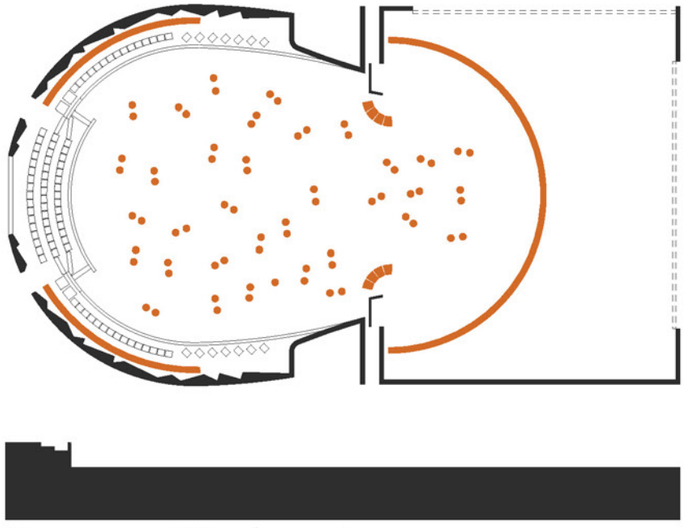
Operetta, cabaret show



Amplified music



Fashion show



Dance competition, banquet

Operetta Hall functional layouts

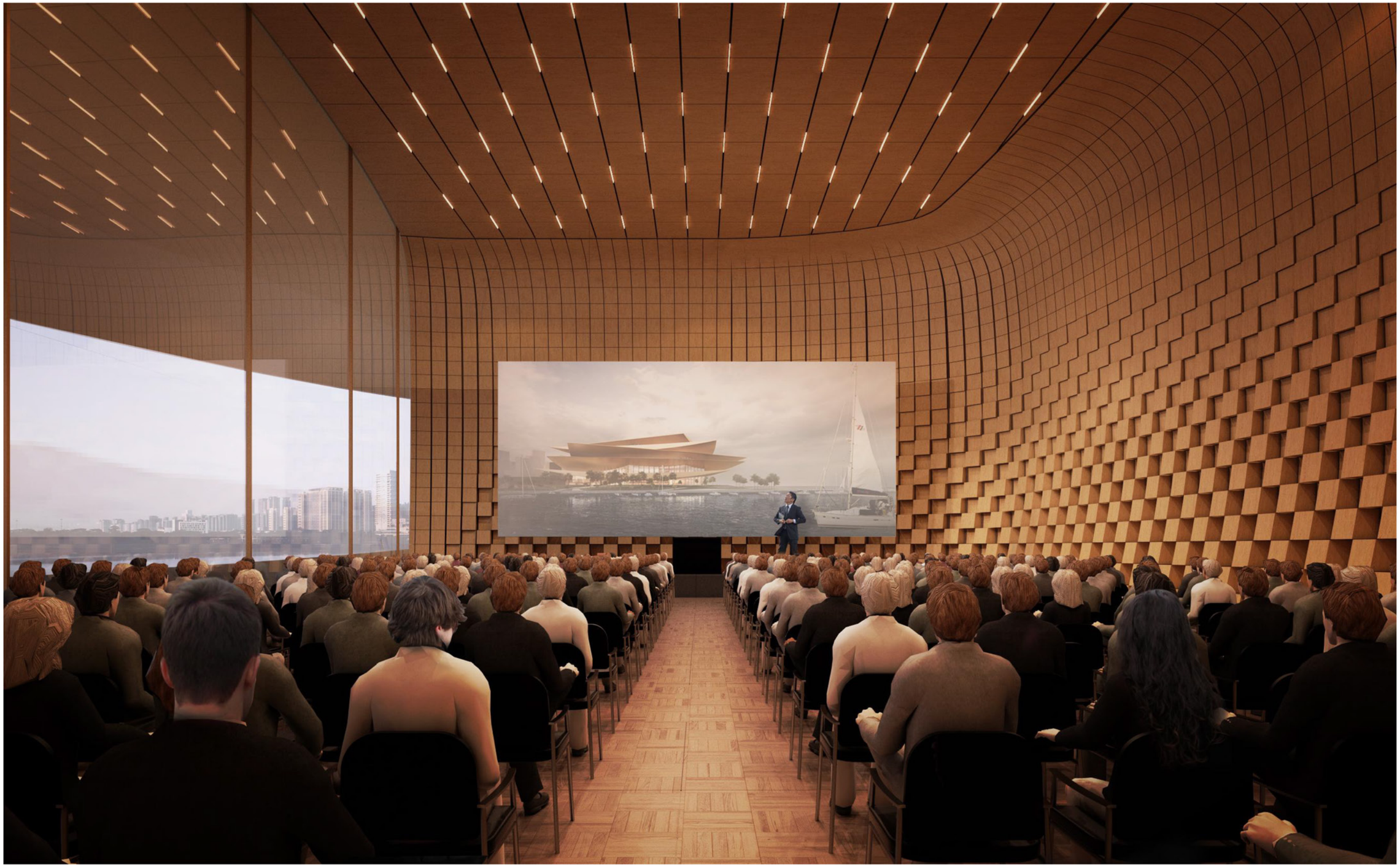
Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

Operetta Hall

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院



Multi-functional Theatre business talk

Shenzhen Opera House International Architecture Design Competition

深圳歌剧院

多功能剧院

多功能剧院，顾名思义，将是规划中的深圳歌剧院综合体的一个重要组成部分。容纳人数为600人，我们建议大厅体积为9000立方米。按照计划，多功能是指大厅在声学上应同样适用于古典（室内）乐、小型音乐会、歌剧、戏剧、舞蹈、会议和多媒体表演。这些功能需要不同的声学特性，包括灵活的电声设施。
为了实现这些不同的目的，我们建议将多功能剧院设计成一个没有固定舞台和楼座的“黑盒子”。大厅的形状呈“鞋盒”形，具有有利于声学效果的房间比。室内声学设计将与电声设计紧密配合。

多重功能需要可变声学效果。解决方案是采用可移动式吸音板：一侧设置广频吸音器（低频、中频和高频），而另一侧配备漫射型木表面狭缝，以提供低频吸音功能。吸音板可以打开，并可以在任何位置进行调整。天花板采用张力金属丝网格。作为索具的一部分，在需要时可以安装悬挂式可调反射器。

此多功能室的基本室内声学参数是混响时间（RT）。在中频率--有观众（人）的情况下，获得的RT的平均值建议在0.8秒（对于戏剧和多媒体）与1.2秒（对于室内和其他古典音乐表演）之间变化。这种变化效果将通过转动可移动式吸音面来实现。
进一步的可变声学效果将通过电声增强系统获得。如为了达到戏剧幻觉的目的时，可通过此系统，将RT延长到2.0秒甚至更长时间。通过采取可变声学措施和安装悬挂式反射器，还将获得除混响时间外的其他重要声学参数的适当数值。
下表列出了主要室内声学参数的建议值：

座位数 - N	600
体积 - V（立方米）	9000
人均体积- V/N（立方米）	8.3
混响时间- Rtmin（秒）	0.8
混响时间- Rtmax（秒）	1.2
早期衰减时间 - EDT（秒）	0.9
清晰度 - C（dB）	1.5
强度 - G（dB）	6
来自技术设施和外部源的最大噪音级- NR	NR15

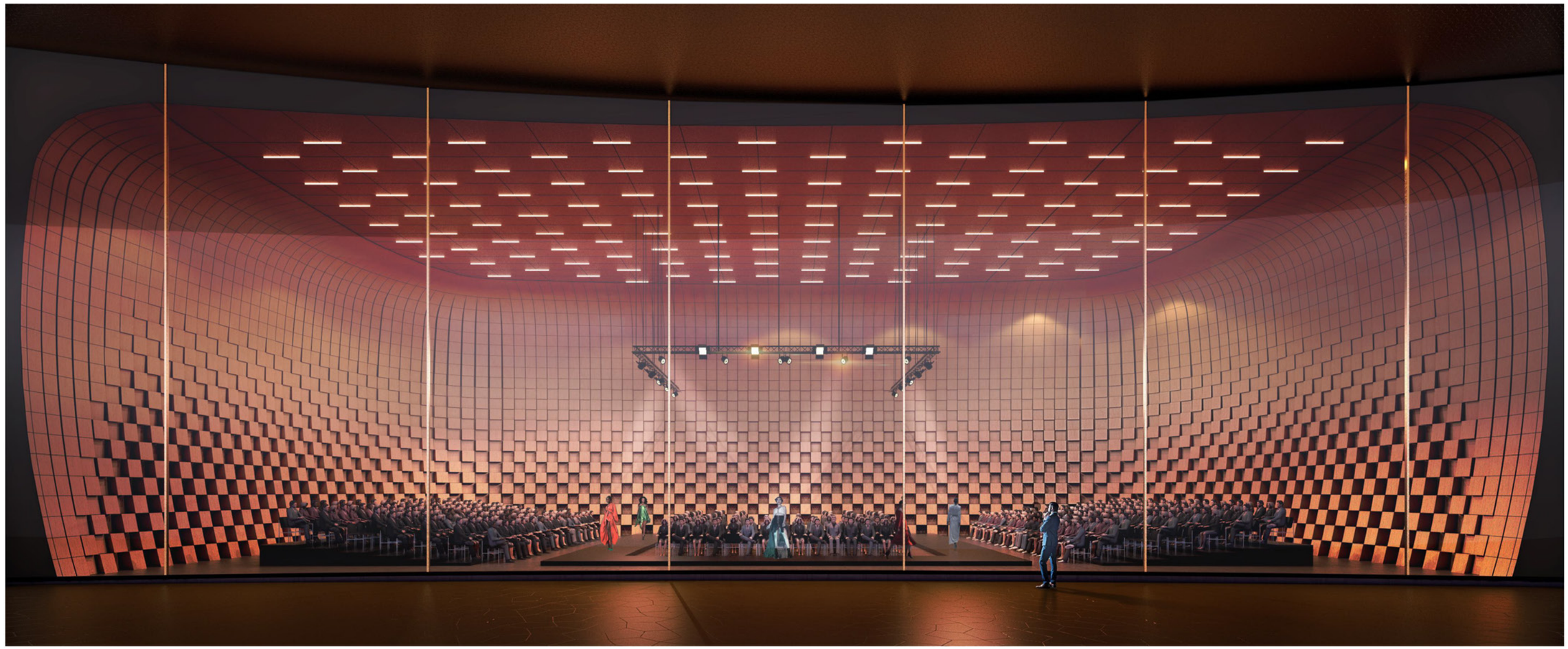
Multi-functional Theatre

The hall - as the name implies - will be an important part of the planned Shenzhen Opera House complex. The seating capacity should be 600 for which we propose a hall volume of 9000 m^3. According to the program, the multiple function means that the hall should be equally suitable acoustically for classical (chamber) music, small shows of concerts, operas, drama theater, dance, conferences and multimedia performances. These functions require different acoustical properties including flexible electroacoustic installations.

To serve these different purposes, we suggest the Multi-functional Theater to be designed as a “black-box” without a fixed stage and balcony. The shape of the Hall is a “shoebox” with an acoustically advantageous room ratio. The room acoustic design will be closely coordinated with the electroacoustic design.

The multiple function needs variable acoustics. The solution consists of moveable sound absorbing panels: one side with wide range absorber (low, mid and high frequency) and the other side with diffuse wooden surface slits to provide low frequency absorption. The panels are openable and can be adjusted in any position. The ceiling is made of a tensioned wire grid. As part of the rigging, suspended, adjustable reflectors can be installed when needed.
The basic acoustical parameter of the premises is the Reverberation Time (RT). The mean value of the physically obtained RT at the mid frequencies - with audience (people) present - is suggested to be from 0.8 sec (for drama theater and multimedia) to 1.2 sec (for chamber and other classical music performances). This variation will be provided by means of turning the moveable absorbing surfaces.
Further acoustic variation will be obtained by means of an electro-acoustic enhancement system by means of which the RT can be extended to 2.0 sec - and even further - if desired for theatrical illusion purposes. Through the variable acoustic measures and the possibility to install suspended reflectors, suitable values of other important acoustic parameters than Reverberation Time will also be obtained. Suggested values for the main room acoustic parameters are listed in the table below:

No seats - N	600
Volume - V (m3)	9 000
Volume per person - V/N (m3)	8,3
Reverberation Time - Rtmin (sec)	0,8
Reverberation Time - Rtmax (sec)	1,2
Early Decay Tima - EDT (sec)	0,9
Clarity - C (dB)	1,5
Strength - G (dB)	6
Max. Noise level from technical installations and outside sources NR	NR15



Multi-functional Theatre fashion-show

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Multi-functional Theatre amplified music

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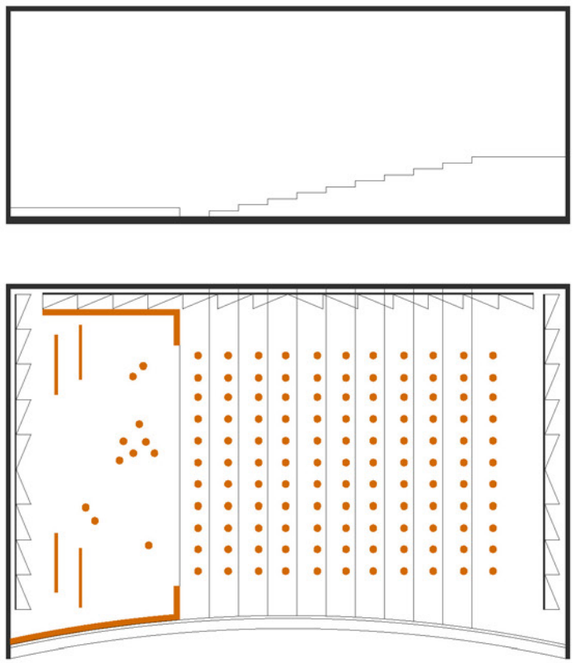
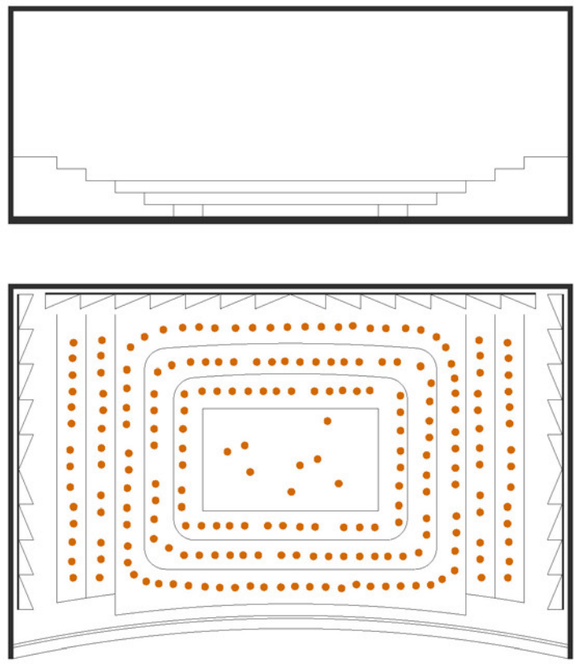
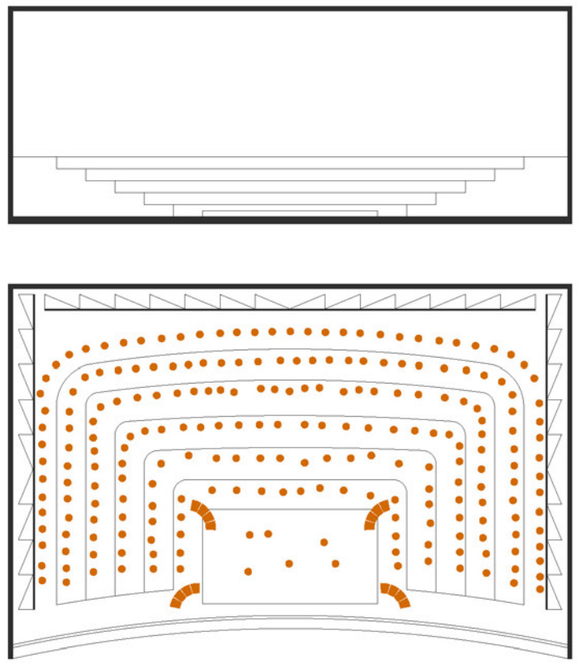


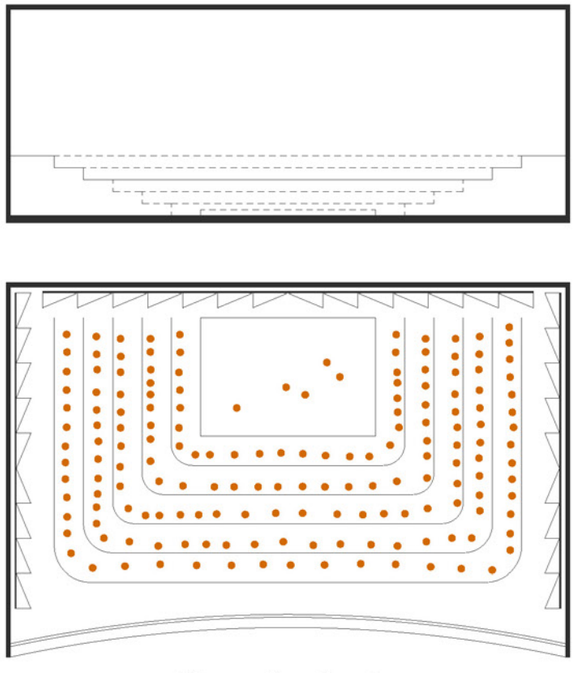
Theatre with proscenium



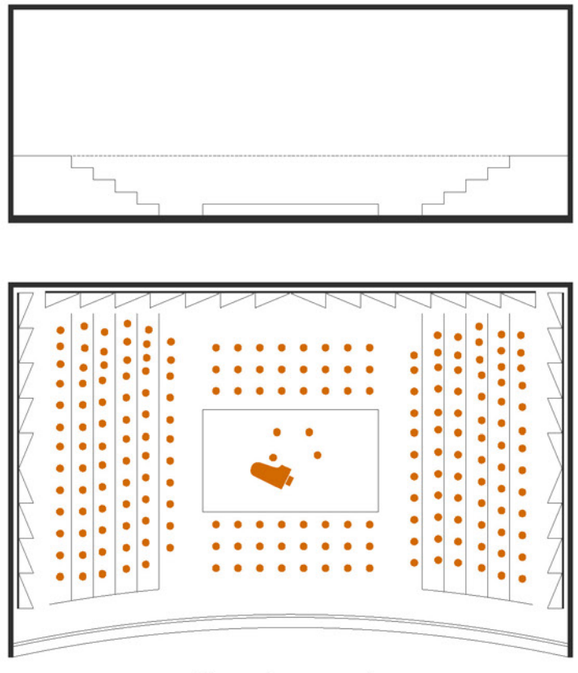
Chamber music, alternative theatre



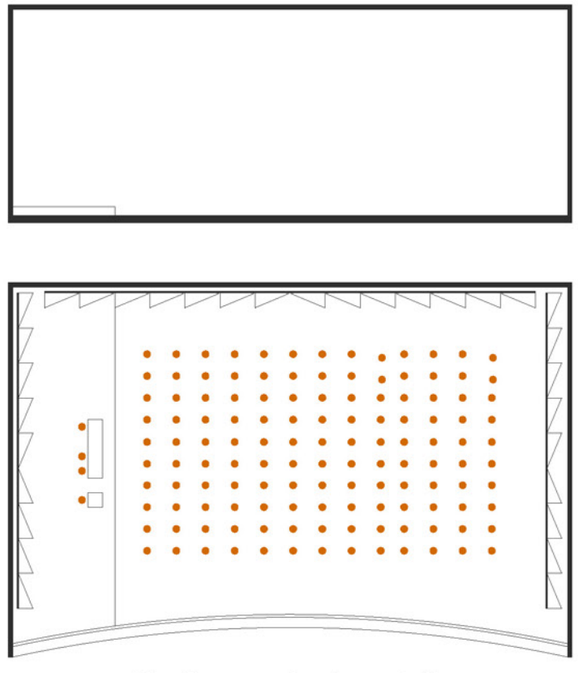
Amplified music



Alternative theatre



Chamber music



Conference, business talk

Rotating wall panels
Sound reflective wooden surface
Sound absorbing black surface

Multi-functional Theatre functional layouts

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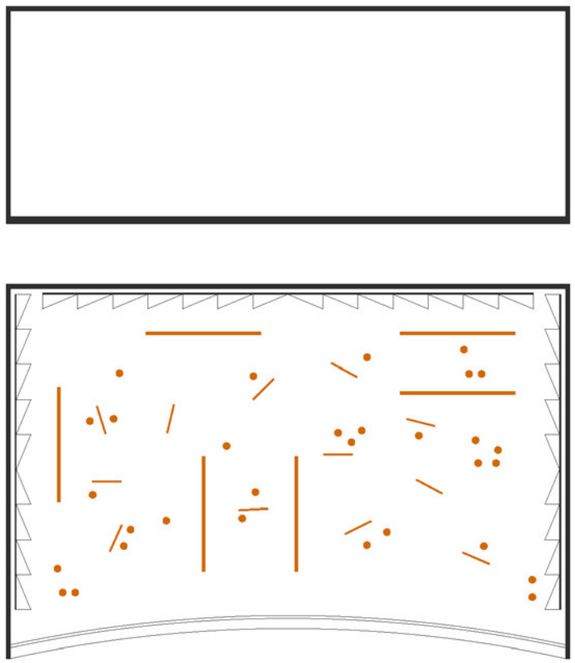
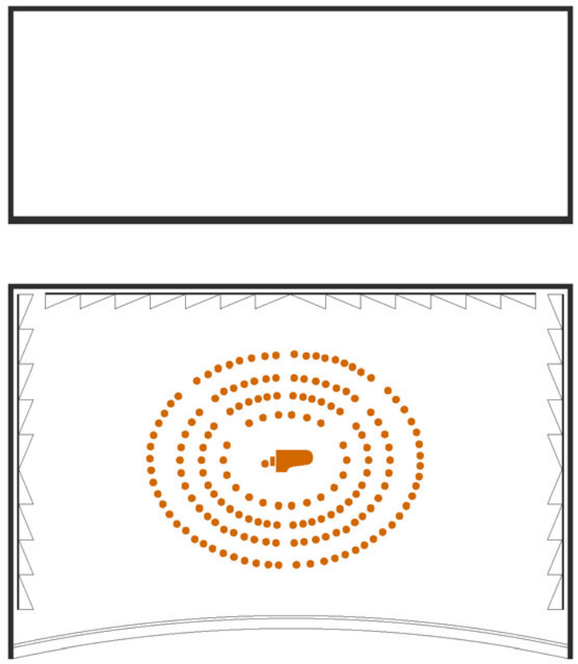
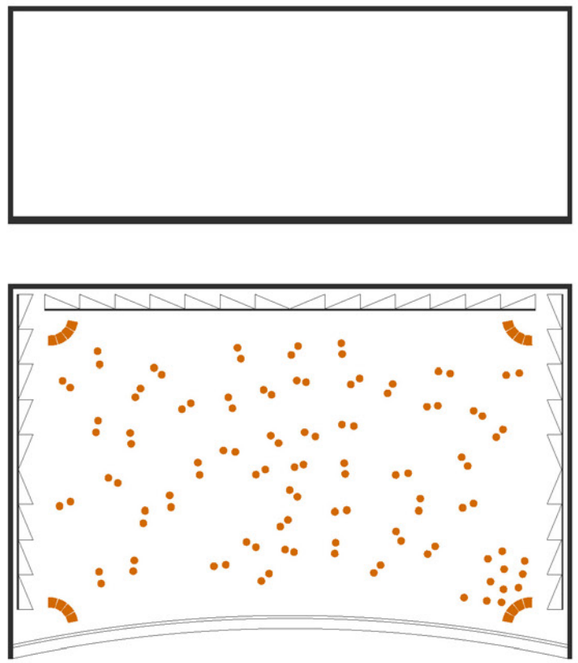


Exhibition



Music education



Dance school

Chamber music

School performance

Fashion-show

Rotating wall panels
Sound reflective wooden surface
Sound absorbing black surface

Multi-functional Theatre functional layouts

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Skybar - VIP Lounge

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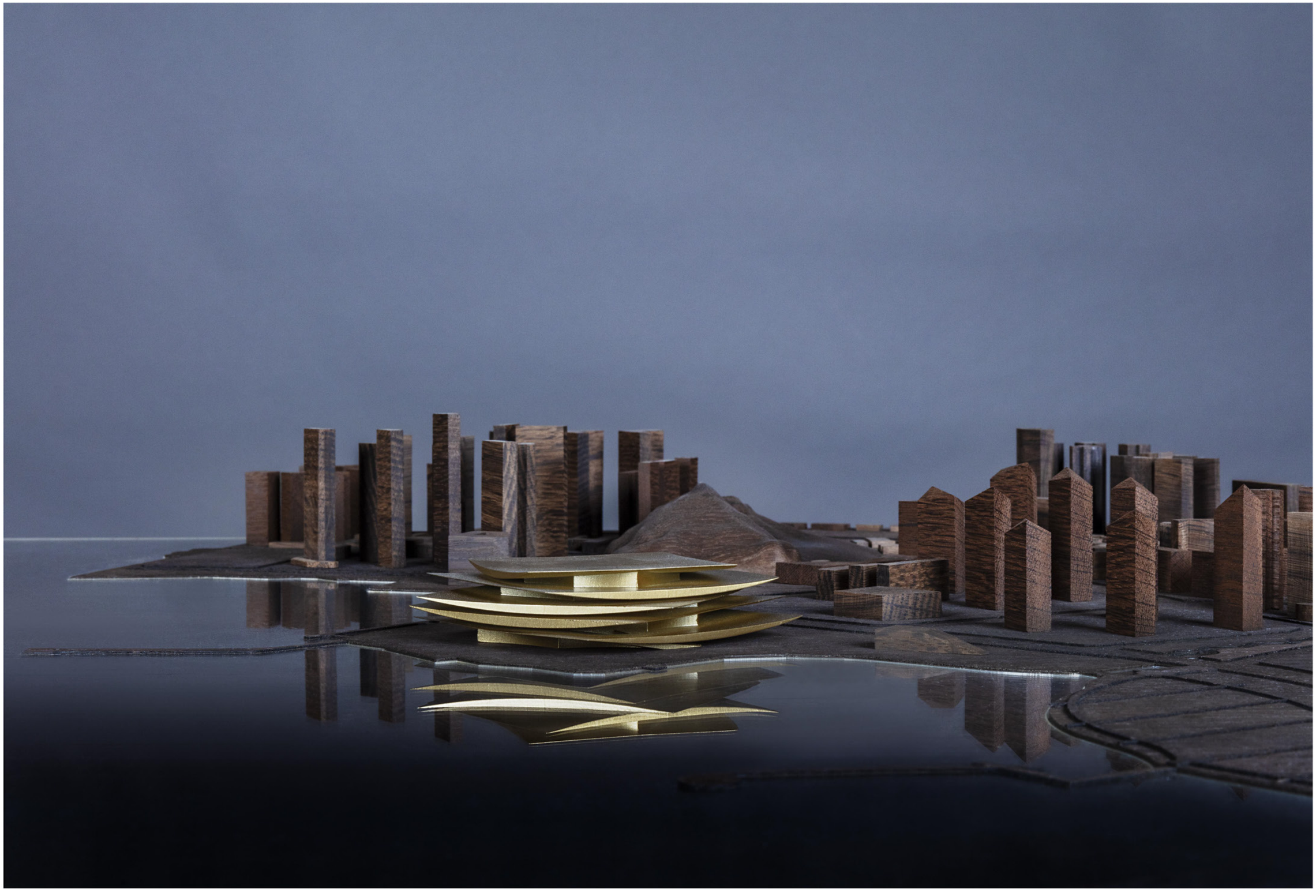

Scale-modell 1:3000

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Scale-modell 1:500

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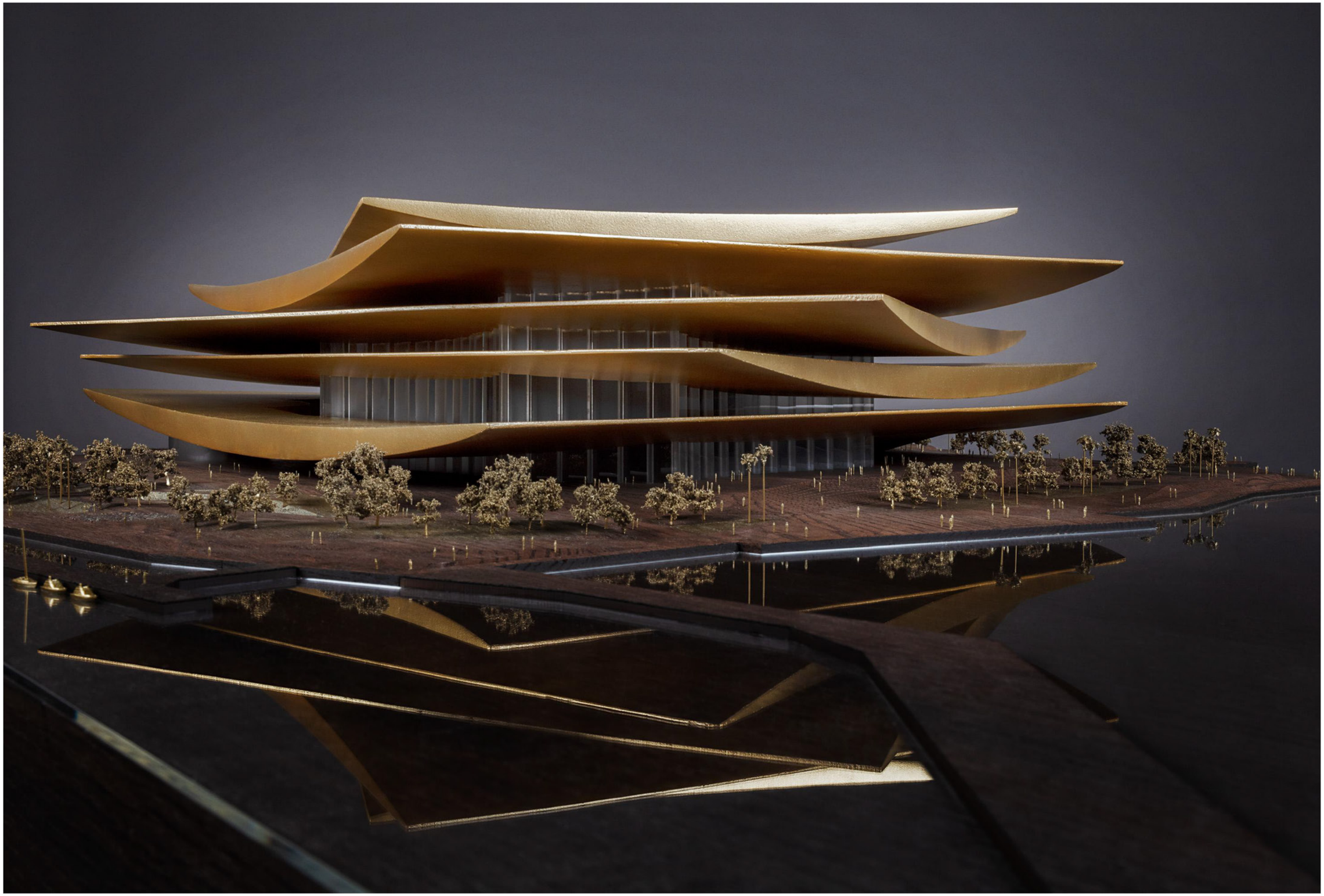

Scale-modell 1:500

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Scale-modell 1:500

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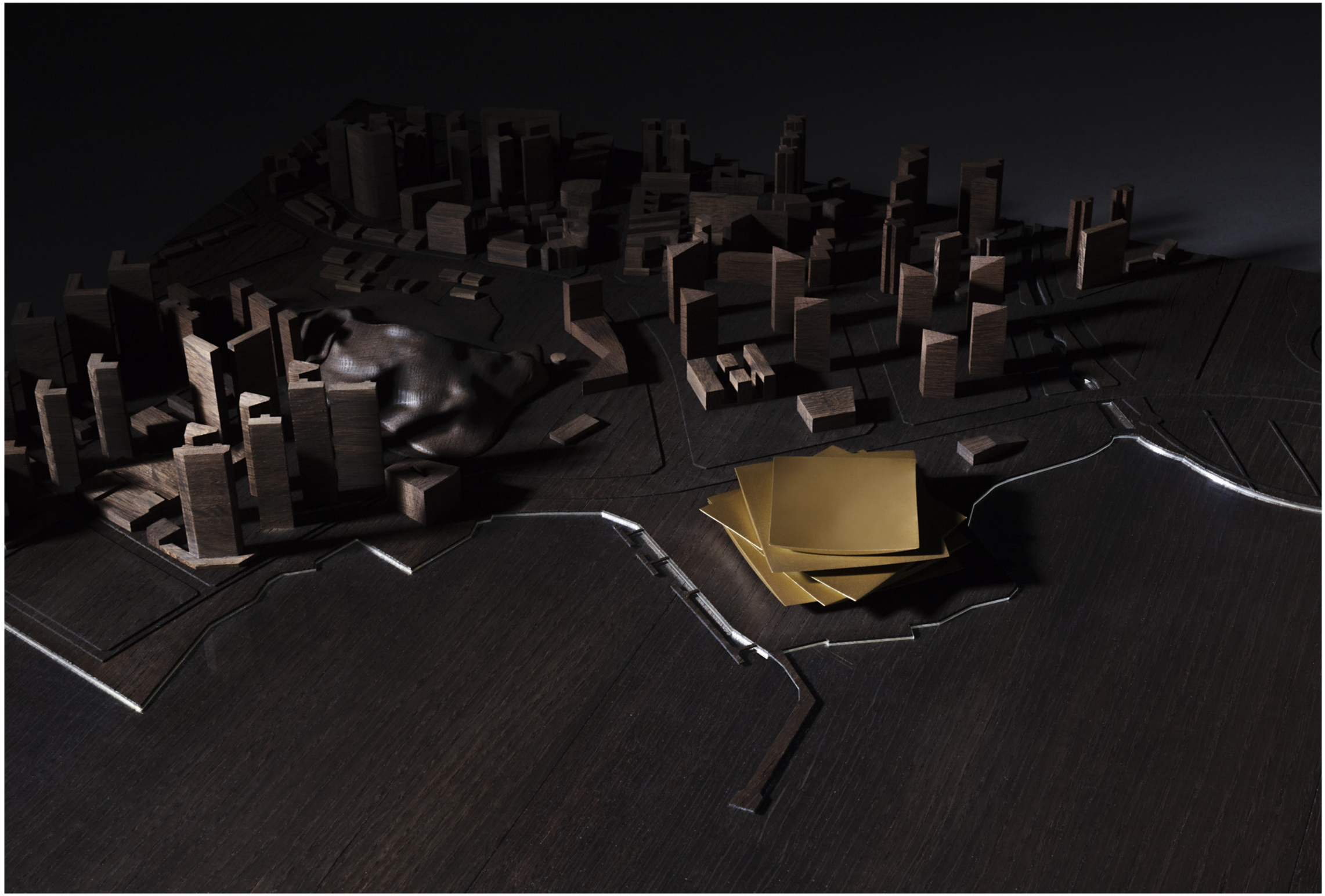

... to talk well and eloquently is a very great art, but that an equally great one is to know the right moment to stop (Wolfgang Amadeus Mozart)

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