New Theatre Lucerne

Strategic Planning and Feasibility Study

ARUP

New Theatre Lucerne

Technical Concept | **Volume I**

ARUP

Volume I: Introduction

Volume I of the Strategic Planning and Feasibility Study presents the Technical Concept for the New Theatre Lucerne. The Technical Concept outlines the vision, components and requirements for the Facility in general, and the Venue in more specific detail. The document consists of the following elements:

- Chapter 1: Facility Description describes key characteristics of the New Theatre and defines the aspirational, absolute, minimal, maximal and approximate requirements of the project as well as associated recommendations.
- Chapter 2: Venue Concept explains the design intent of the transformable Salle Modulable that is at the heart of the project and provides technical concept drawings for the Large and Small Venues.

The goal of this Volume I is to define a Technical Concept which is consistent with the Concept Framework and economically viable.

Facility Description | **Chapter 1**

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Table of Contents

1 | Introduction

This Facility Description presents the Technical Concept developed by Arup undertaken as part of the Strategic Planning and Feasibility Study for the New Theatre Lucerne project. The Concept Framework and the vision of the Salle Modulable as described therein define the broad characteristics of the project and set out a framework within to design. Iterative consultations with artistic stakeholders have informed the development of the Technical Concept. This work represents 12 months of work with representatives of Stiftung Salle Modulable (SMF), City and Canton of Lucerne, Neue Theater Infrastruktur Luzern (NTI), Theater Werk Luzern, Lucerne Festival and Luzerner Theater about the project and its ambitions, available resources, site and other parameters. The present document is the Technical Concept developed by Arup as part of the Feasibility Report.

This document has been developed with the following intentions:

- to define a Technical Concept which is consistent with the Concept Framework
- to describe the key characteristics of the New Theatre; present the required spaces, key characteristics and adjacencies needed; and present specific design requirements where critical to the achievement of this Technical Concept
- to define the absolute, minimal, maximal, approximate and aspirational requirements as well as make recommendations of the New Theatre, which shall form the basis for technical compliance checks as the project progresses
- to serve as a design brief for the architectural design process and to form the technical basis for an architectural design competition

This Technical Concept is a concept-level set of requirements. More detailed technical requirements with respect to acoustics, theatre planning and specialised performance equipment systems will be defined during the Design Phase.

1.1 Definitions

The Technical Concept specifies the requirements for execution and technical compliance as follows:

- *Absolute requirements* are indicated by use of the words "will", "must", "shall" or similar terms and refer to requirements that must be met exactly as set out in the Technical Concept.
- *Minimal requirements* are indicated by the use of the word "minimum", "no less than", "at least" or similar terms. The number of units or components stated is to be understood to be the minimum number necessary for compliance with the Concept Framework. This number may be increased depending on the Architectural Design.
- *Maximal requirements* are indicated by the use of the word "maximum", "no more than" or similar terms. The number of units or components stated is to be understood to be the maximum number acceptable for compliance with the Concept Framework. This number may be decreased depending on the Architectural Design.
- *Approximate requirements* are indicated by the use of the word "approximately". The exact number of units or components required to achieve the functionality specified in the Technical Concept is subject to the Architectural Design. The range of deviation is indicated where appropriate and subject to minimal and maximal requirements as specified to be acceptable for compliance with the Concept Framework.
- *Aspirational requirements* are indicated by use of the words "should", "desirable" or similar terms. Aspirational requirements refer to functional and experiential goals that must be supported by the Architectural Design in order to comply with the Concept Framework.
- *Recommendations* are indicated by use of the word "recommended". Recommendations are best practice solutions in the experience of Arup.

The execution of and ongoing technical compliance with the Technical Concept is a condition of feasibility.

Requirements are expressed in words. Drawings illustrate design intent and indicate an absolute functional and acoustical requirement but assume that the precise shaping is open to change depending on the Architectural Design. Modifications to the recommended shaping herein must be reviewed and approved for compliance with the functional and acoustical requirements in the Technical Concept.

Where not stated otherwise or where none of the definitions above are used, requirements of the Technical Concept are understood to be absolute requirements.

2 | Vision

Section Overview	
2.1	Concept Framework
2.2	A Forum for the Community
2.3	Neue Theater Infrastruktur – A Platform for Collaboration
2.4	A Collection of Places for Collaboration
2.5	A Uniquely Transformable Performance Venue
2.6	Primary Artistic Stakeholders
2.7	Lucerne as a Tourist Destination

The following vision has been developed for the New Theatre Lucerne project.

The development of the Technical Concept has been framed and shaped by the Concept Framework and the vision for Salle Modulable as described therein. The Concept Framework and vision have been further elaborated with decisions taken during the Strategic Planning and Feasibility Study to serve as a foundation for the further development of the project and to guide the work of the Architectural Design Team.

2.1 Concept Framework

2.1.1 The Salle Modulable Vision

To create a "salle modulable" which shall be a performance arts venue in Lucerne known as the New Theatre that incorporates a uniquely flexible theatrical environment that affords artists a world class platform for performance and creative experimentation, and offers local and international audiences an exceptional experience that builds on the reputation of the Kultur- und Kongresszentrum Luzern ("KKL") and the Lucerne Festival. This facility will also be the home of the Lucerne Theatre.

2.1.2 Facility Success Factors

Each of the sub-paragraphs below set out the project criteria which are most relevant to the construction of the New Theatre.

2.1.2.1 Context

The venue shall be located so that it is integrated with the international visitor's "Lucerne Experience", is easily accessible on foot from the Lucerne railway station, and serves as a visual landmark.

The location shall provide a connected experience through proximity with other performing arts assets in Lucerne, maximizing opportunities for operational efficiencies and synergies.

The location shall have sufficient road access and parking for visitors, articulated trucks, and specialised broadcast and recording vehicles, and with a regard so far as may be reasonably practicable to tour bus access and parking.

2.1.2.2 Artist Experience

The venue should provide an internationally recognised platform for creative experimentation in musical theatre, opera, dance and drama.

The venue shall have the highest quality performance and rehearsal spaces. Quality considerations include size (dimensions), acoustics, theatre technical systems (theatre equipment, seating, light, sound and video), ergonomics and safety.

The venue shall have sufficient and appropriate support spaces for rehearsals, workshops, and creative discussions.

The operations plan shall assume a high quality of artist/technical support by experienced staff and shall include the staging of operas by the Lucerne Festival to the highest international standards.

2.1.2.3 Audience Experience

The venue shall have the capacity to deliver a world class quality of performance experience in opera, music theatre, dance and drama. Quality considerations include the optimal audience /artist relationship for each configuration of the New Theatre, sightlines, circulation dynamics, and acoustics.

The entire visitor experience shall complement the standard of quality and charm associated with the KKL.

The facility shall aspire to be universally accessible throughout and provide proximity access to handicap vehicles.

2.1.2.4 Community Expectations

The venue's location, spaces and programming shall aspire to be locally relevant and to be an urban environment, a centre of gravity, where people are drawn to stay and spend time.

2.1.2.5 Venue

The venue shall enable artists to create and audiences to experience unconventional work that cannot be mounted in traditional performance halls.

The venue shall offer multiple configurations transforming the artist and audience space that range from traditional proscenium theatre format to large "black-box" in such a way as to allow artists as much creative freedom as possible in exploring the way artist and audiences interact including seating/stage locations and floor plane, wall and ceiling variability.

> To create a performance arts venue "that incorporates a uniquely flexible theatrical environment that affords artists a world class platform for performance and creative experimentation, and offers local and international audiences an exceptional experience that builds on the reputation of the Kultur- und Kongresszentrum Luzern ('KKL') and the Lucerne Festival. This facility will also be the home of the Lucerne Theatre".

The venue should offer traditional performance formats at the highest international natural acoustics and sight-line standard. Non-traditional performance formats shall make effective use of cutting edge sound reinforcement and live video technology, as necessary.

Technical equipment systems installed in the New Theatre shall allow for time efficient and cost effective transformation between different configurations.

Support infrastructure for technical equipment systems shall be designed to support different scales and types of productions, as well as the intended range of usage and flexibility of the venue.

Audio/visual systems shall allow for multimedia, mixed-media, and immersive productions, seamlessly bridging between natural acoustics and reinforced sound, between natural sight and video, as well the use of physical décor and virtual environments.

Large scale performances in the New Theatre should accommodate up to 1,200 seated audience members.

2.1.2.6 Planning for Efficient Operations

The venue shall be well planned for efficient and safe operations including but not limited to materials handling, adjacencies of key spaces, circulation paths, and sufficient storage.

Construction and operational costs associated with designing, building and operating a flexible venue shall be carefully assessed at key milestones to ensure their adherence to the vision, the multiple-configuration nature of the venue, as well as the technical and financial viability of the project.

2.1.2.7 Reputation

It is an aspiration of the project that the facility draws admiration and praise from the local and global arts community, for the quality of experience and the uniqueness of the venue.

2.2 A Forum for the Community

The New Theatre will serve as a gathering space for the broader theatre community (artists, audiences, supporting professionals) in Lucerne. It should serve as a forum for social discourse and provide a setting for the exchange and exploration of ideas. It should also be a visible and inviting hub for the community and be intrinsically transparent.

To serve these goals, the Architectural Design will:

- make the Facility a visual landmark and visibly distinctive
- make the Facility a magnet, inviting all visitors to enter and breaking down the barrier between the world inside the building and the outside world, without compromising the sense of importance of the space or the magic of the theatre
- offer a sense of place that invites people to stay, to meet, to spend time and to explore
- give the sense that this is a meeting space, with
  - public spaces that celebrate the different work taking place in the multiple Performance and Rehearsal Spaces
  - artists, arts professionals and the broader community encouraged to spend time and work in the public spaces
- support a broader ambition to act as a civic gathering space — a forum — in which societal issues can be considered, debated and explored through discussion and theatrical events in
  - the open foyer
  - the foyer event area
  - meeting spaces (upstairs of café, convertible dressing rooms, greenroom)

The design of a surrounding park should complement the New Theatre, serving as a gathering space for community events, enhancing its historical usage as a park and supporting open air performances.

2.3 Neue Theater Infrastruktur – A Platform for Collaboration

The City and Canton of Lucerne, as the major funder of significant cultural activities in the city and region, has worked with the Luzerner Theater, the Lucerne Symphony Orchestra, the Lucerne Festival, KKL, Südpol (theatre) and the smaller theatre and dance companies (known as the Freie Theaterszene) to develop a vision for the future of a collaborative theatre community that shares infrastructure and resources to ensure diverse offerings and a strong artistic identity.

The Neue Theater Infrastruktur (NTI) working group has developed the Theater Werk Luzern Concept (see also http://theaterwerk-luzern.ch/documents/editorfiles/Vision_TheaterWerkLuzern.pdf), which proposes a vision of a collaborative platform of modern theatrical performance spaces in close proximity to the KKL, that would allow theatrical work of diverse genres at high levels of artistic and technical innovation. Opera, musical theatre, drama, dance and interdisciplinary productions that attract larger audiences are expected to take place in this space. The house is expected to develop and produce in-house performances and co-produce performances with selected partners, with the aim to exploit the potential of the New Theatre to the fullest and develop the theatre's strong pioneering identity. The Lucerne Festival's work in the area of music theatre is intrinsic to this concept. The annual program is expected to be complemented by performances and productions by other local companies as well as rental events.

2.4 A Collection of Places for Collaboration

To support the goals of NTI, the New Theatre project is defined as a collection of venues and spaces to simultaneously support a wide range of performances, rehearsals, workshops, discussions and individual work.

The New Theatre must be designed to fully support the simultaneous use of these spaces. Vibrancy and relevance, which are of utmost importance to the success and long-term sustainability of the project, depend in large part on the following:

- creating an environment that can support the entire range of theatrical expression at the highest professional level
- being a platform to showcase and support the creative planning, rehearsal and performance phases of theatrical production
- having spaces at different scales and usage cost levels to give access to a wide range of artistic users and production types
- allowing the simultaneous preparation and presentation of multiple productions at different scales
- offering the community a wide range of events, activities and performances in order to be relevant for the widest possible demographic and to maximize benefit for the community

To facilitate these requirements, the Technical Concept incorporates a series of performance venues at different scales, from the sophisticated and transformable Large Venue to the 200-seat Small Venue, as well as a series of small Studios. The Technical Concept also incorporates infrastructure to be able to present video projections on the outside façade of the Facility (in Inseli Park) of content being performed within the Venues or other content.

2.5 A Uniquely Transformable Performance Venue

At the core of this project is the Large Venue, a unique performance venue designed to meet the highest professional standards to support the artistic activities and ambitions of the Luzerner Theater and the Lucerne Festival.

The acoustic, functional and theatrical needs of the Large Venue are discussed in detail in this Technical Concept document. Architectural development will integrate these requirements without compromise, resulting in an Architectural Design that supports the experiential and contextual requirements of the project.

The ability to physically transform between configurations is central to the ambition to experiment and explore different ways to shape the interface between audience and artists. The Large Venue will offer artists an adaptable environment that has character at all times, creating a place that artists will want to work in.

This ability to transform will be balanced by the ability to operate the Large Venue with little or minimal additional cost when in traditional proscenium format. In this format, the Venue must offer audiences and artists an environment where the experience is not compromised by its transformability — the technology required for transformation must not be the defining characteristic of the experience.

Image: CC - Vancouver Film School (flickr)

2.6 Primary Artistic Stakeholders

The two primary artistic stakeholders and users of the New Theatre will be the Luzerner Theater and the Lucerne Festival. It is expected that, at their invitation, other local, regional and international arts groups will also use the Facility on a regular basis.

2.6.1 Luzerner Theater

Founded in 1961, the Luzerner Theater is a professional theatre organization that produces and presents performances in opera, speech drama and dance. Structured as a traditional “Dreisparten-Haus” with its own music theatre ensemble, a speech drama ensemble and a dance company, the company has 425 employees and is one of the major employers in the region. The Lucerne Symphony Orchestra is one of its major artistic partners.

The Luzerner Theater emphasizes innovative and entertaining works, and its program is designed not only to engage a broad audience, but also to challenge and arouse social discourse regarding the new and unknown. The theatre’s incoming intendant is Benedikt von Peter, who is known for his innovative staging and currently leads the opera company at Theater Bremen.

The current Luzerner Theater facility on Theaterplatz was built in 1838 and seats 481 in a traditional proscenium format. The facility is undersized for the company’s needs, and the Südpol facility was created by the City of Lucerne in 2008 to create a proper rehearsal and production home for the organization.

The company currently produces and presents more than 350 performances a season in the Luzerner Theater building and other secondary venues in the city.

2.6.2 Lucerne Festival

The Lucerne Festival is one the world’s great music festivals. The festival was founded in 1938, gathering esteemed artists such as Toscanini, Mengelberg, Ansermet and Walter around the summer home of Richard Wagner. It is now a premier showcase in Europe for the world’s greatest musicians and ensembles, including the Berlin and Vienna Philharmonics, the Royal Concertgebouw and the London Symphony, among many others who visit regularly. The Festival now encompasses the summer festival, an Easter festival, a piano festival in November, a Festival Orchestra, and the Lucerne Festival Academy — a training academy for young musicians that is focused on contemporary music. The current music director of the Lucerne Festival Orchestra is Riccardo Chailly, and in summer 2016 the artistic director of the Lucerne Festival Academy will be Wolfgang Rihm. The intendant of the Lucerne Festival is Michael Haefliger.

Starting in 2007, as part of a strategic look at the future, the festival proposed to start developing activities in the area of Musiktheater (theatre with music) and opera, concentrating on exploring the future of the genre and how artists and audiences interact in this art form.

Fig 1. Luzerner Theater

Fig 2. Lucerne Festival (Arturo Toscanini)

Fig 3. Lucerne Festival (Peter Fischli / LUCERNE FESTIVAL)

2.7 Lucerne as a Tourist Destination

Lucerne enjoys a long history and international reputation for its stunning natural setting and cultural activities. Nestled among the mountains, the city offers a lakeside context that today frames a vibrant community and prime tourist destination — bringing visitors from the region, across Switzerland and around the world.

2.7.1 The Kultur- und Kongresszentrum Luzern

The development of the Kultur- und Kongresszentrum (KKL), which opened in 1998, was an immense public and private effort to create a world-class platform for music that has rocketed the city to international stature and recognition. The facility, designed by the French architect Jean Nouvel, boasts an 1,800-seat concert hall designed with the late acoustician Russell Johnson, a multiform 600-seat venue, a museum and a lecture theatre, as well as a series of public amenities that has become a focus of international pilgrimage for music and architecture lovers.

The KKL has become a model beyond Switzerland as a successful cultural and convention facility. A 2011 study showed that the KKL has added about SFr74m (Swiss francs) in added value to the region of Lucerne.

The combination of this landmark facility immediately connected and contrasted with a charming and attractive historical centre, the well-developed supporting infrastructure of hotels and restaurants, and the stunning natural landscape together defines a superb international visitor experience.

2.7.2 International Reputation of Lucerne as a Cultural Destination

The success of the Lucerne Festival, the Lucerne Symphony Orchestra and the KKL have together put Lucerne on the international cultural map. The New Theatre Lucerne will create a parallel platform for theatrical performances, complementary to the KKL, that leverages the following:

- the work of the Luzerner Theater and its strong local and regional audience base
- the intent of the Lucerne Festival to undertake significant work in exploring the future of opera and theatrical performances with music

Intrinsic to the success of this project, therefore, will be the manner in which the New Theatre fits into the international visitor's experience of Lucerne and the already-strong international reputation of Lucerne as a cultural destination.

The selected site for the project, adjacent to the KKL and embedded in a park environment, has the potential to create a cultural focal point within the city, better activate the eastern side of the KKL and add a significant civic space for the benefit of the residents of Lucerne.

Fig 4. Lucerne view

Fig 5. KKL Concert Hall

Fig 6. KKL Building

3 | Context and Site

The selected site for New Theatre Lucerne is the southern portion of Inseli Park. The site is currently composed of a primarily gravel-covered park area towards the lake, an asphalted tour bus car park area on reclaimed land and a playground area to the south.

The site is bordered by a row of trees that divides it from Inseliquai Street. Trees also mark the eastern border between the park and the lake. In the northern and middle part of the park there are two rows of large significant trees bordering a pedestrian path orientated north–south as well as a cluster of trees on the south side around a playground.

Inseli Park is a community recreational area which holds emotional and historic significance for the people of Lucerne. Facing the lake, Inseli Park enjoys a broad horizon and the natural landscape is a key part of the visitor experience. The park is also periodically used for outdoor cultural events, including audiovisual projections of Lucerne Festival performances (from inside the KKL).

The park is immediately adjacent to the KKL (to the south-east) and is well connected to vehicular traffic routes (from the north-west and the south-east) which allow the maximum truck dimensions admitted in Switzerland.

The park is within easy walking distance of the train station. The mostly pedestrianised path from the station to the site would naturally pass around the KKL, which has an urban space also designed by Jean Nouvel (the architect of the KKL). The redevelopment of the park and the New Theatre would enhance the connected system of public spaces facing the lakeshore, culminating in an attractive cluster of contemporary facilities for the arts. Car parking is available for visitors primarily at Europaplatz (train station), which is a familiar landmark for visitors from the region.

Other existing cultural assets in the historic centre, including most of the tourist accommodations and complementary facilities (restaurants and retail), can be easily reached from the site. The site is therefore well integrated into the familiar experience of international visitors to Lucerne, who would enjoy the charms of the historical town with its restaurants and hotels, combined with the stunning natural landscape and the contemporary architectural beauty of the KKL. The New Theatre, visible from parts of the historic town centre, would form a natural extension of that experience.

While the park is an attractive space to enjoy the surrounding landscape, Inseli is relatively poor in terms of the attractiveness and variety of the facilities it offers, posing risks of a fluctuating density of people and fewer people during nights when there are no special events.

The project represents an opportunity to enhance the park as a community asset. The space between the KKL and the New Theatre should be reconceived and redeveloped as part of this project to give a coherent and unified character to the entire environment, creating a sense of a protected and enjoyable space and enhancing the attractiveness of Inseli as an urban focal point. Between the KKL to the north and New Theatre to the south, there is the potential to shape an urban space that invites the people of Lucerne to stay, explore and enjoy. Inseli is also close enough to the city centre and its museums and schools to serve as part of an attractive and lively environment for artists, potentially even enhancing the role of the KKL, which currently feels somewhat isolated. As Inseli Park is already used as an external venue for concerts, its use as an artistic environment would be a natural extension of the park's current identity.

To take full advantage of this opportunity, the New Theatre Lucerne and Inseli Park will also be designed to enable and encourage the following:

- large-scale audiovisual events (concerts and projection of images onto the façade of the Facility) in the park including production relays of events within the Facility
- arts groups, producers and presenters exploring different audience dynamics including performances that mix outdoor and indoor usage
- experiences in the foyer that highlight the beauty of the natural landscape and create both visual and physical relationships between indoor and outdoor experiences

Orientation and organisation of the Facility on the site will allow for logical experiential sequencing and intuitive wayfinding to the foyer entrances for pedestrians arriving from the train station.

This document includes test massing on-site that best meets these requirements as well as the functional requirements (see Figure 21 and Section 6.1.1).

Fig 7. Vehicular traffic access to the site

Fig 8. Vehicular traffic access to the site

Fig 9. Access routes

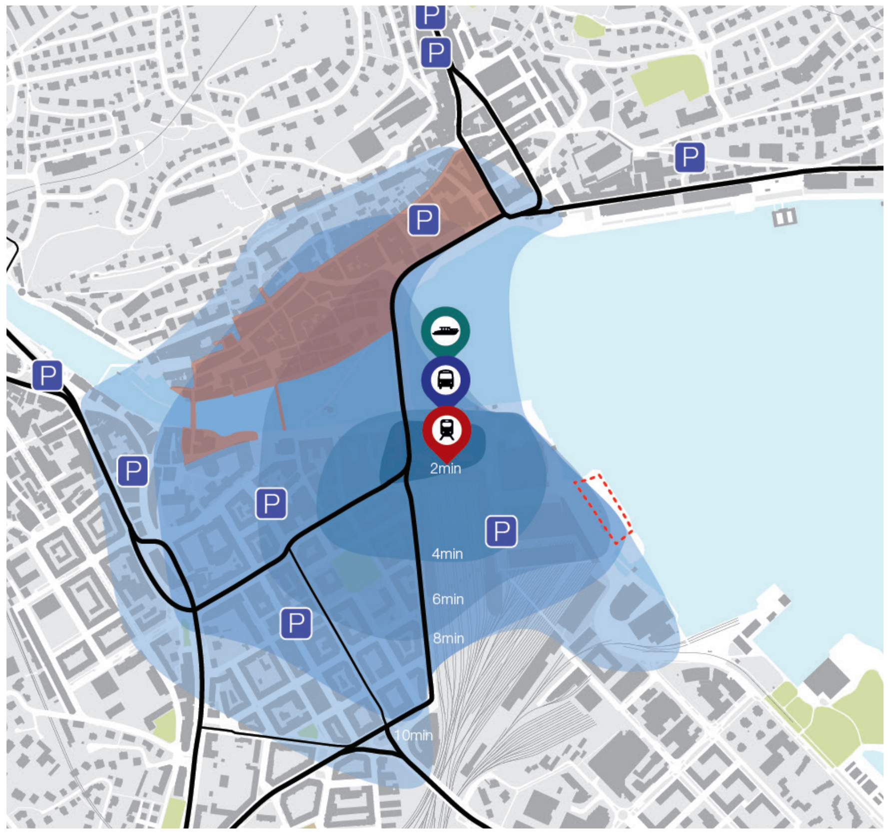


Fig 10. Accessibility from the station

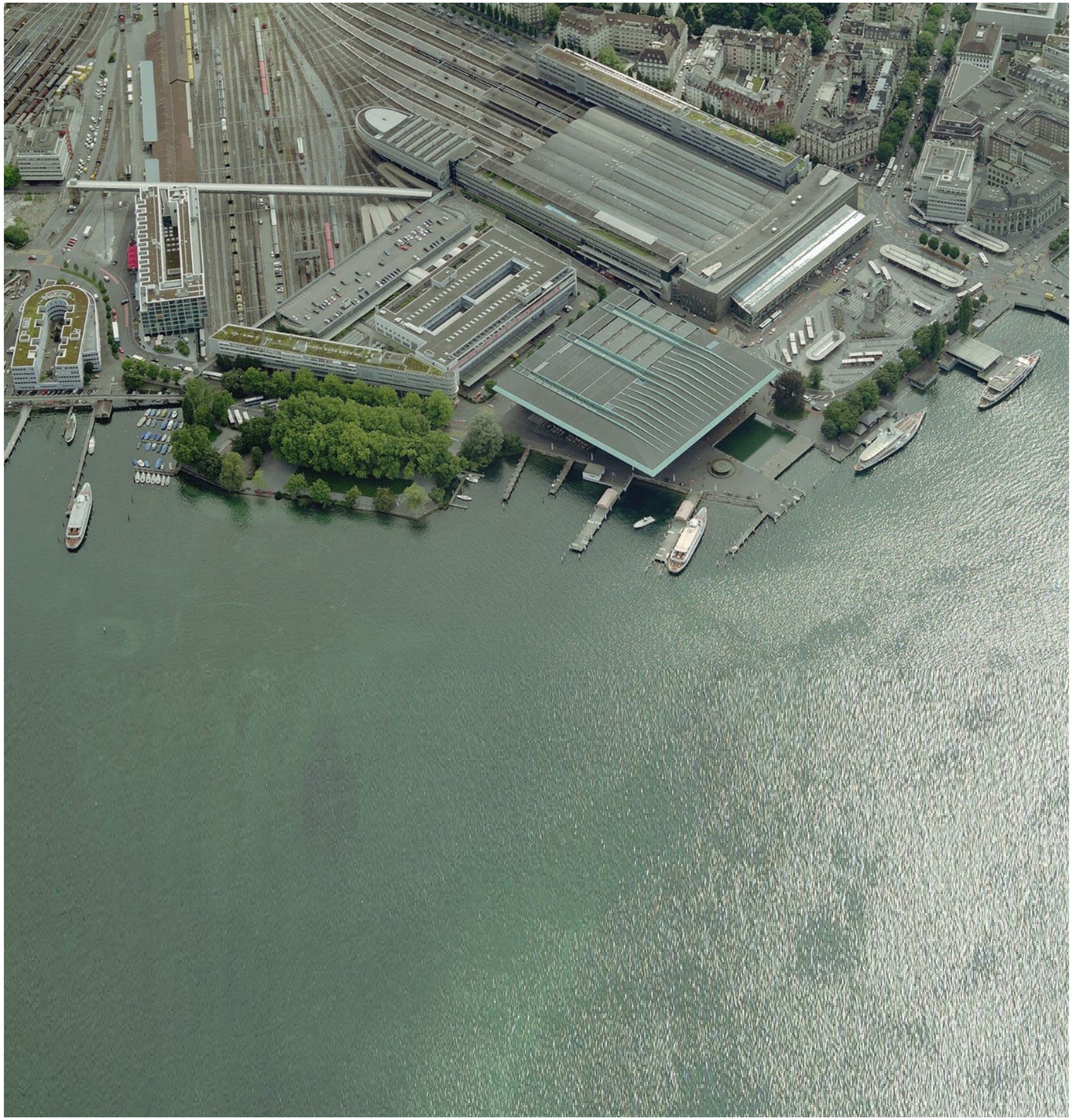


Fig 11. Aerial view of Inseli and the surrounding area

The park is within easy walking distance of the train station. The mostly pedestrianized path from the station to the site would naturally pass around the KKL.

Fig 12. Landscape view of Inseli area from the lake

Fig 13. View of the KKL from the lake

The project represents an opportunity to enhance the park as a community asset. The space between the KKL and the New Theatre should be reconceived and redeveloped.

Fig 14. Park cafés, view n.2 in Fig 18

Fig 15. Temporary facility , view n.3 in Fig 18

Fig 20. Street view, view n.5 in Fig 18

Fig 19. Tour bus parking, view n.4 in Fig 18

Fig 18. Aerial photo of Inseli, with reference numbers for the other views on this page

Fig 16. The public park, view n.1 in Fig 18

Fig 17. The public park, view n.6 in Fig 18

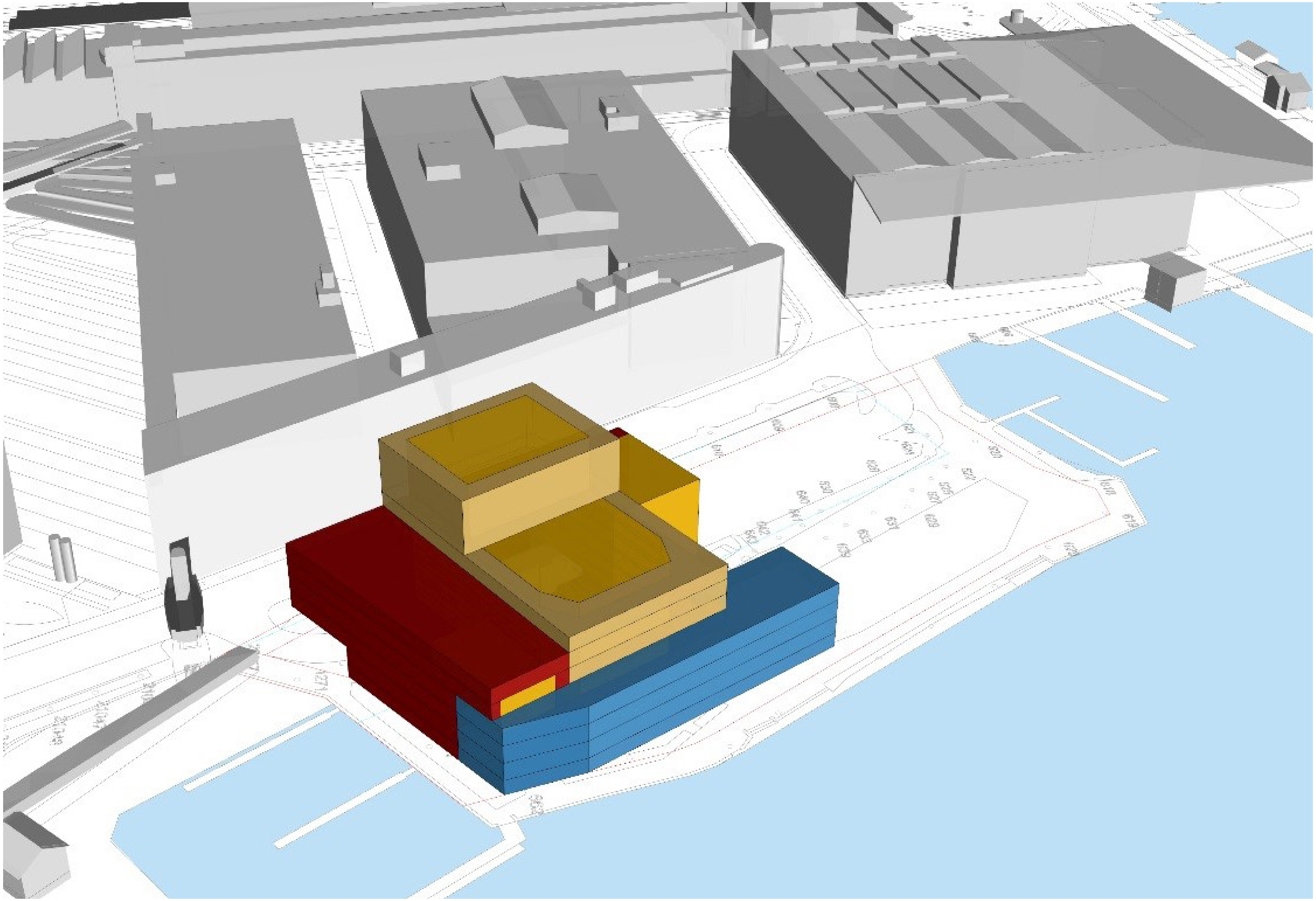


Fig 21. Site Test Massing Analysis

4 | Facility Description

4.1 Introduction

The New Theatre Lucerne will be a world-class performing arts venue with the attributes necessary to do the following:

- offer local, regional and international artists the platform to explore different audience/artist relationships with respect to theatrical performances with music — opera, dance — and theatrical performances in general
- create a place in the urban fabric and be a hub of activity for the community
- create a platform/facility that allows for all-day usage and relevance through programming both within the venues and in all public spaces

The New Theatre will feature the following:

- Large Venue – a transformable performance venue designed for the highest quality professional usage; the space will be highly flexible, allowing artists to use the Venue in different configurations depending on the production; audience capacity will vary depending on the configuration but will have a seated capacity in proscenium format with largest audience count (no orchestra pit and no stage extension) of approximately 750 audience members
- Small Venue – a technical theatre performance venue in the black box theatre style, designed to accommodate at least 200 seated audience members and provide side-stage connectivity with the Large Venue
- four Studios (for performance and rehearsal) intended to also serve as divisible group dressing rooms for large productions
- infrastructure to support video projection on the façade of the Facility with audience seated in the park
- a public foyer that invites artists, arts professionals and visitors to stay and spend time during the day, and appropriately accommodates audiences for performances
- an all-day café that is embedded in the public foyer, serves as food and refreshment support for performances and has an upper event area that can be used for dining service, events, meetings and VIP receptions
- a media/guest reception room whose primary function is to be a place for audiences to formally meet artists and can also be used for events, meetings and VIP receptions
- audience, technical, artist and office support spaces

4.2 Character and Experience

The architecture of the Facility will have the following character and evoke the following experiences for audience, artists and staff:

- inviting and welcoming
- open and transparent while preserving a sense of the magic of performance
- connected with its place in the world
- secure and comfortable as a place to meet, exchange, learn and explore
- ever-evolving and dynamic, allowing for different personalities and experiences evolving with the artists

“It’s been a continuity right from the beginning - that longing to weave together perceptions, to affirm the richness of us as human beings both as performers and audience members.”

-Meredith Monk

4.3 Key Uses

The spaces throughout the New Theatre Lucerne will be designed to accommodate the following uses:

Large Venue	• theatre with music – opera with unamplified or amplified sound, immersive sound experiences – dance with unamplified or amplified music accompaniment, immersive sound experiences • speech drama with unamplified or amplified sound, immersive sound experiences • other events
Small Venue	• smaller-scale or experimental performances – opera, dance, drama • rehearsals • other events
Studio 1	• rehearsals • immersive sound experiences and rehearsals • experimental performances • divisible dressing room (with mobile furniture) • lounge • other events
Studios 2–4	• rehearsals • experimental performances • divisible dressing room (with mobile furniture) • lounge • other events
Foyer and Café	• integrated café with daytime and intermission refreshment functions • meeting place • workshop space
Foyer Event Area	• immersive performances • small-scale music and informal theatrical events • pre-event discussions • presentations • press conferences • VIP events
Upper Café Space	• VIP events • presentations • meetings
Media/Guest Reception Room	• artists and audience meeting place (security controlled) • rentable for events • VIP events • presentations • meetings
Outdoor Spaces	• projected video – performance relay, film • amplified music events

Table 1. Key space uses for New Theatre Lucerne

4.4 Operations and Programming

The New Theatre will be a new platform for collaboration in the area of theatre (speech drama, opera and dance). Performances and events are expected to be self-produced or co-produced among local companies or with external groups, and may also include productions from outside Lucerne.

The primary users of the Facility are as follows:

- the Luzerner Theater, which will be the resident theatre organisation and is expected to produce and present its own productions; it is expected to also undertake co-productions with others and take a primary role in the presentation of works by the smaller theatre groups in Lucerne
- the Lucerne Festival, which is expected to undertake new opera productions as well as present works of other companies (including co-productions)

The management of the Facility will be responsible for ensuring that the Facility and its staff provide a high level of service to the artists and audience commensurate with Lucerne's reputation for international-quality experiences in the performing arts. The Schedule of Accommodations (Appendix C) assumes the following service areas will be provided by the management of the Facility:

- facility management
- production and event liaison
- ushers and Front of House
- box office
- technical staff
- cleaning
- security
- food and beverage services co-ordination

All other functions (artist productions etc.) will be provided by the artistic organisations using the Facility.

Food and beverage services are expected to be provided through an outsourced contract. In this scenario, the contracting company will be responsible for the fit-out of the kitchen areas and organisation of the food and beverage storage, preparation and delivery; the management of the Facility will co-ordinate with the contractor on these tasks through an on-staff catering co-ordinator.

Staffing Area	# FTE* Staff	# Needing Office/Desk
Executive office	2	2
Commercial Department	7	7
Customer Service Department	14	6
Operations Department	14.5	6
Technical Department	11.5	8
TOTALS	**49**	**29**

NOTES:

- * FTE = full-time equivalent, which may equate to a higher number of staff than listed (eg, two part-time staff may equal one full-time equivalent)
- Additional Front of House staff and technical staff may be engaged on an as-required basis at event times.
- Additional food and beverage staff will require accommodation; however, exact numbers are unlikely.
- Additional artistic production staff may also require space within the venue during performance periods.
- Prior to opening the Facility to the public, a proportion of these staff are expected to require access to the office spaces. Office spaces required during this period will need to accommodate up to 16 staff and must be accessible and functional while finalisation of the remainder of the Facility is taking place.

Table 2. Staffing and employment schedule

4.5 Summary Characteristics

The following key topics are covered in this section:

4.5.1 Front of House

The Facility will include the spaces listed below:

4.5.1.1 Foyer

The foyer is the primary access point for visitors to the Facility. Access from the outside will be through weather vestibules at all entry points.

The foyer will be arranged to accommodate 650 persons comfortably (including the event area below) assuming 450 audience members associated with the Large Venue and 200 audience members associated with the Small Venue simultaneously. Total capacity of the foyer (including the event area and the café) will not be less than 1,200 persons.

The foyer will be arranged with 100% of the effective floor area functionally at the stage level of the Large and Small Venues. Specific spaces will be functionally aligned with the stage level, one level above or one level below, of the Large and Small Venues with circulation connecting to all audience access points on all levels.[1] The foyer area will be arranged so that it can be effectively used by 1,200 persons in the Large Venue.

There will be at least two elevators allowing audiences stepless access to all foyer levels.

It is anticipated that the foyer will be activated via interactive uses with the public, so the space should be an area into which people are drawn and can congregate.

4.5.1.2 Event Area

The space allocation for the foyer will include an event area for 50 persons. Envisioned to be an architecturally distinct space, it is not expected to have partitions separating it from the rest of the foyer.

1 This will ensure that when the Large Venue is used in a configuration when all audience is at stage level, visitors will have comfortable access to the foyer and associated support spaces.

A storage and electrical room for performance-equipment-specific usage will be located in proximity of the event area.

4.5.1.3 Café

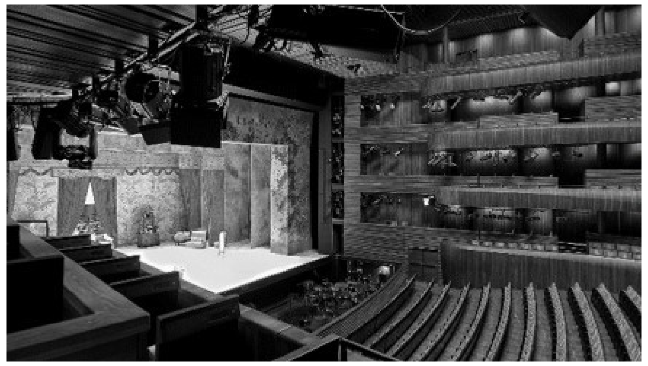
The Facility will have a café that will serve the following functions:

- daytime café for visitors, artists and staff serving hot food and beverages
- intermission refreshment service
- event catering

4.5.1.4 Other Spaces

Other spaces in the foyer will be as follows:

- media/guest reception room – event area with security-controlled access from both Front of House and Back of House
- box office / information service area
- retail space
- public toilets
- coat and bag check
- casual Front of House staff locker area
- first aid room and public toilets



- staff toilet
- ATM niche
- storage

4.5.2 Performance and Rehearsal Spaces

The Facility will include the following Performance and Rehearsal Spaces:

- Large Venue
- Small Venue
- Studios 1–4

The Large Venue, Small Venue and Studio 1 will be able to be operated simultaneously, and the design will incorporate structural discontinuities and isolation measures to make simultaneous usage acoustically possible without compromise.

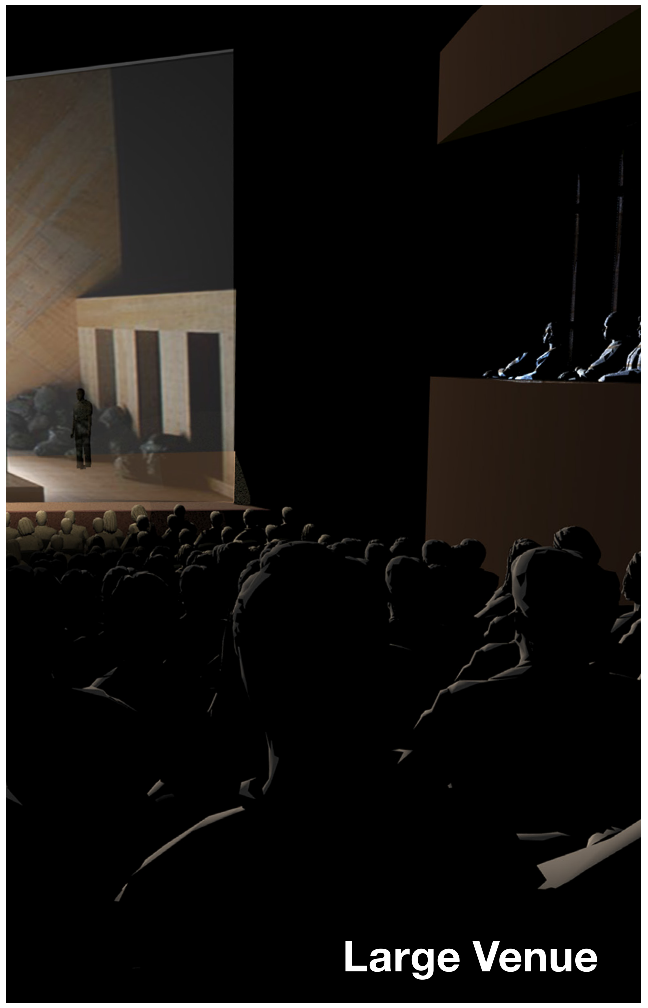
Studios 2–4 will be acoustically isolated from Studio 1 and each other. However, it is not expected that simultaneous usage will be needed under all acoustic conditions.

Visual connections between the foyer (or the outside) and the inside of the Venues are desirable provided that these connections do the following:

- achieve the required acoustical isolation
- can be completely visually occluded (blackout)

All principal dressing rooms and the recording booth will also be designed to be used as practice rooms.

Image: CC - Zhang (flickr)



4.5.2.1 Large Venue

The following summarizes the characteristics of the Large Venue of the New Theatre Lucerne.

4.5.2.1.1 Overview

The principal Venue of the New Theatre will be the Large Venue, which will be a transformable theatrical performance space as shown in more detail in Section 7.4.1.

The transformability of the Large Venue is characterised by a series of transformable elements that can be combined in different ways by the artists. Rather than a set number of configurations, there will be a spectrum of combinations. The two ends of this spectrum will be an open room configuration and a proscenium configuration.

The open room configuration will be as follows:

- The Large Venue will be a flat floor, open space.
- Audience and artist entry will take place on either side of the room through the Side Circulation Areas.
- The arrangement of doors will allow the Front of House / Back of House line to be adjusted as appropriate for the production.
- Seating wagon systems will be able to be moved around, creating different seating arrangements.
- Additional loose seating and a temporary platforming will also be able to be used to supplement the Seating Wagons.
- Overhead technical systems will allow for flexible rigging of theatrical elements and will support suspended production lighting and production audiovisual systems equipment, as appropriate.
- Production lighting and audiovisual systems equipment will also be able to be accommodated on prepared wall locations including the Demountable Wall Pipe Grids at all levels, and portable systems would be able to be plugged in at multiple locations in the periphery and floor of the room.

The proscenium configuration will be as follows:

- The Large Venue will be a proscenium theatre with audience on a raked main floor and three single-row Moving Balconies.
- Audience and artist entry will take place on either side of the room through the Side Circulation Areas.
- Seating layout and balcony shaping in the Technical Concept have been designed to achieve the most visually and acoustically intimate environment, considering proscenium opening widths of between 10m and 16m.
- Three Lifts will be usable as an orchestra pit. The area below the stage will additionally include a covered pit area. The third Lift closest to the fixed stage will be a two-level lift (Double-Deck Lift) to allow for different pit configurations. Temporary platforming will be used in conjunction with portable acoustic panels to create a stepped, covered pit area.
- The proscenium theatre will include world-class acoustics for unamplified opera, dance and theatre performance. A mechanised (retractable) acoustical reflector will be positioned over the orchestra pit as part of this requirement.
- Production audiovisual systems permanently installed on the Moving Balconies and hung at the proscenium position will ensure that reinforced voice and music, as well as playback, will be accommodated in a manner and quality level corresponding to a traditional world-class proscenium theatre. Additional audiovisual infrastructure will be provided for incorporation of immersive sound technology.
- The stage area in this configuration will feature an upper technical zone with three technical galleries.

Overhead technical systems in the stage area will allow for flexible rigging of theatrical elements. There will be a trapped floor with a trap room below the stage area.

- Overhead technical systems in the audience area in this configuration will allow for flexible rigging of additional theatrical elements.
- Production lighting systems equipment will be able to be accommodated on prepared wall locations including the Demountable Wall Pipe Grids, on balcony front positions and from follow-spot positions in the upper parts of the room.

4.5.2.1.2 Key Characteristics

Key characteristics that the design will incorporate are as follows:

- audience capacity
  - seating capacity in largest proscenium configuration (no orchestra pit and no stage extension) of approximately 750 persons; different orchestra pit and stage configurations will result in different seating capacities (see Appendix A)
  - seating capacity in open format of approximately 1,150 persons
  - maximum capacity of the Large Venue set for maximum occupancy for the entire floor area, according to applicable building code
- total room dimension – see Appendix A
- three levels of vertically moving balcony structures which will each allow one row of seating on all four walls of the Large Venue – the balcony structures will be organised as independently motorised and controllable segments allowing for different configurations; all access will be from pre-determined levels in the Side Circulation Areas
- multiple Lifts in the floor that will serve as
  - orchestra pit
  - raised stage
  - platform lift to carry Seating Wagons from storage levels to stage level
- Seating Wagons that will create raked seating in proscenium configurations – Seating Wagons will be able to be moved to other locations to support different performance configurations and will feature permanently installed fixed audience seating
- wall shaping as per Appendix A, texture and materials that will optimize natural (unamplified) acoustics performance in proscenium configurations and will be uniform across the entire wall surface of the Large Venue when seen in open configurations
- Side Circulation Areas on each side of the Venue that will provide circulation on each audience or technical access level – depending on the usage, these may be technical operations areas, audience circulation areas, performance spaces, artist/technical circulation areas or audience seating areas; finishes will allow for all uses
- connections for openings (Windows) at all balcony levels along the sides of the room used to support various uses – Windows will be sized as 2.4m high openings and a minimum of 1.5m wide, with a no-obstruction threshold and removable safety railings; they may be used with or without closure panels and safety railings; closure panels will be provided with a 0.75m by 0.75m optical glass port and full perimeter seals[2]
- Demountable Wall Pipe Grids to accommodate attachment of production lighting and production audiovisual equipment
- motorised system of sound absorptive cloth
  - Acoustic Banners on walls
  - walk-draw Curtains in the lower technical zone
- control spaces for performance equipment systems and associated electrical rooms
- production rooms
- quick change rooms and toilets
- off-stage and control room area toilets
- N-1 (threshold of hearing) background-noise-level environment
- all access to the Large Venue or the Side Circulation Areas will take place through sound- and light-lock vestibules
- load-in-size doors to Back of House circulation with step- and obstruction-free access to loading dock
- two 11.4m wide by 8m high Guillotine Doors will create an obstruction-free connection to the Small Venue as shown on drawings in Appendix B; the Guillotine Door surface towards the Large Venue will be finished in a similar manner to the rest of the wall surfaces to meet acoustical requirements[3]
- state-of-the-art performance equipment systems including rolling gantry rigging systems, motorised lineset rigging, multi-segment lift systems, production lighting system, production sound, and communication and video systems including infrastructure for projection, HD video broadcast, surtitling etc.

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2 Each window closure panel will comprised up to three individually removable units each with perimeter seals. Each unit will be sized so that two technicians can manipulate each section safely according to local workplace standards

3 Note that this will be two layers of Guillotine Doors to ensure adequate acoustical isolation.

4.5.2.2 Small Venue

The following summarizes the characteristics of the Small Venue of the New Theatre Lucerne.

4.5.2.2.1 Overview

The Small Venue will be a 200-seat black-box-type flat floor performance space. Audience seating will be accommodated primarily on a system of retractable seating platforms stored in a niche in the wall of the Venue when not in use.

The Venue will have a total floor area sized to accommodate at least a 14m by 14m performance area with a 0.4m adjustable acoustics zone on all sides. The centreline of the performance area in the Small Venue will align with the Large Venue, as shown in Appendices A and B.

4.5.2.2.2 Key Characteristics

Key characteristics that the design will incorporate are as follows:

- audience capacity
  - maximum capacity of the Small Venue set according to code capacity of the floor area to ensure flexibility in seating and configurations
  - retractable seating riser platforms (with loose seating) that can be organised in different configurations; a total of at least 200 seated patrons when in frontal format with a performance area of at least 10m wide by 4m deep
- total combined performance/seating floor area – see Appendix B
- wire-rope grid
- limited adjustable acoustics to accommodate both amplified and unamplified performances
- audience access directly from the foyer through sound- and light-lock vestibules
- 4m by 4m doors to Back of House circulation with step- and obstruction-free access to loading dock
- two 11.4m wide by 8m high Guillotine Doors which will create an obstruction-free connection to the Large Venue as shown on drawings in Appendix A[4]; the door surface towards the Small Venue will be finished in a similar manner to the rest of the wall surfaces to meet acoustical requirements
- all access to the Small Venue or the Side Circulation Areas will take place through sound- and light-lock vestibules

4 Note that this will be two layers of Guillotine Doors to ensure adequate acoustical isolation.

4.5.2.3 Studios

The Facility will also include a cluster of four divisible Studios designed for flexible usage. The Studios will be organised as a cluster around a shared foyer area with variable accessibility from the Front of House and Back of House so that the spaces can effectively serve all intended uses.

4.5.2.3.1 Key Characteristics

Key characteristics that the design will incorporate are as follows:

- audience capacity for each Studio
  - notional (planning) seating capacity of approximately 80 persons[5]
  - maximum capacity of each Studio set for maximum occupancy per area, according to applicable building code
- connected through doorways to Front of House and Back of House, allowing the spaces to serve as an integral part of either space depending on usage
- shared common foyer area that can serve as a common lounge area when used as dressing rooms
- shared group of toilet/shower units
- sprung floor for dance
- retractable conference-room-style divider to split each Studio into two equal sections for use as dressing rooms
- pipe grid included only for Studio 1; other Studios will have loading capacity to allow future addition
- future accommodation of walk-draw Curtains
- double-door access to Back of House circulation
- mobile furniture for use as dressing rooms or meeting spaces

5 Note that this will be two layers of Guillotine Doors to ensure adequate acoustical isolation.

4.5.3 Back of House

The Facility will include the following Back of House spaces:

4.5.3.1 Artist Support Spaces

The Facility will include an artist/staff entrance and dressing rooms.

4.5.3.1.1 Artist/Staff Entrance

The entrance to the Facility for artists and staff will primarily take place through a dedicated artist/staff entrance located out of sight of the foyer. This entrance will be located so that it provides the following:

- accessibility for vehicular drop-off with provision for (temporary) parking of a limousine
- a high-quality arrival and departure experience

This entrance area will include a waiting area, a waiting area toilet and a security office.

4.5.3.1.2 Dressing Rooms

The dressing rooms will include the following:

- single (one-person) and quad (four-person) principal dressing rooms which will also be usable as practice rooms
- conductor's dressing room with a connected rehearsal space (also connected to one of the single principal dressing rooms
- divisible group dressing rooms (see Section 4.5.2.3) with a total capacity of 160 artists
- make-up room
- media/guest reception room (see Section 4.5.1)
- lounge with catering kitchen

4.5.3.2 Technical Support Spaces

In addition to the theatre technical spaces directly associated with each Venue (see Appendix C), the Facility will have the following technical support spaces:

4.5.3.2.1 Broadcast Control / Recording Control Room and Recording Booth

This space will also be usable as a recording booth and practice room, and it will be adjacent to both the Large and Small Venues.

4.5.3.2.2 Loading Docks

The Facility will have two loading dock zones:

- interior loading zone 1 (performance delivery) – sized to simultaneously accommodate two 16.5m trucks and one delivery van
  - The raised dock will be 1m above the driveway surface and equipped with hydraulic dock levellers.
  - The loading zone will be immediately adjacent to the receiving area and holding/receiving lock-up area.
- interior loading zone 2 (catering and other delivery) – a fixed dock 0.6m above the driveway surface

The loading dock area will also have a trash room, a refrigerated garbage room, toilets and a security station.

4.5.3.2.3 Offices

The Facility will have offices for the following:

- venue management
- technical operations
- building operations
- box office operations (in foyer)

4.5.3.2.4 Workshop Spaces

The Facility will have performance support workshop spaces for the following:

- make-up and wigs
- carpentry
- sound
- lighting
- props

4.5.4 Outdoor Spaces

The following outdoor spaces and functionality will be integrated into the design:

- casual seating area facing the projection surface (currently envisioned to be a wall of the Facility)
- infrastructure to accommodate projection equipment and high-quality sound system
- foyer extension area with step- and obstruction-free access from the foyer

5 | Spatial Requirements

Space #	Summary of Spaces	Total Net Area (m^2)
1	Exterior of Building	N/A
2	Foyer / Arrival Area	1,376
3	Large Venue	2,385
4	Small Venue	314
5	Large Venue Technical Support	276
6	Large Venue Storage	368
7	Studios	520
8	Performer Spaces	431
9	Venue Management	202
10	Technical Offices and Staff Support	206
11	Workshops	110
12	Make-up and Wig Workshop and Laundry	111
13	Artist/Staff Entrance	37
14	Loading Dock and Receiving	199
15	Building Operations	153
16	Circulation	*
	SUBTOTAL	**6,688**

NOTES:
- *Included in gross area
- Appendix C provides a detailed Schedule of Accommodations that includes all of the required spaces in the Facility.

Table 3. Spatial requirements. Summary of the areas for the main zones of the New Theatre Lucerne

6 | Adjacency Requirements

Section Overview	
6.1	**Critical Adjacencies and Connectivity**
6.1.1	*Major Components Groups*
6.2	**Front of House**
6.3	**Performance and Rehearsal Spaces**
6.3.1	*Large Venue*
6.3.2	*Small Venue*
6.3.3	*Studio Spaces*
6.4	**Back of house**
6.4.1	*Artist Support Spaces*
6.4.2	*Technical Support Spaces*
6.4.3	*Back of House Circulation*

6.1 Critical Adjacencies and Connectivity

In a performing arts facility, functionality requires that certain spaces be in a fixed relationship to others. Details of that spatial relationship will remain for the Architectural Design Team to determine, but certain spaces will retain such a fixed relationship.

Other spaces are strongly recommended to be located in close proximity to, and in some cases in a fixed vertical relationship to, other spaces.

The adjacencies and connectivity that are highlighted in this document and in Appendix C are critical to the functional life of the Facility and must be accommodated. The connectivity requirements of these spaces range from "critical" to "connected but not necessarily adjacent", while some spaces do not have any connectivity requirements.

6.1.1 Major Components Groups

The Facility will be divided into three main component groups:

- Front of House
- Performance and Rehearsal Spaces
  - Large Venue with Side Circulation Areas
  - Small Venue
  - Studios
- Back of House (artist support and technical support spaces)

These all have a defined relationship to each other:

- The Front of House must have a direct connection and adjacency to all the Performance and Rehearsal Spaces.
- The Back of House spaces must have a direct connection and adjacency to all the Performance and Rehearsal Spaces.
- The Front of House must have security-controlled connections to some of the Back of House spaces as specified in Figure 24.

Offices must have direct connections to Front of House and Back of House spaces.

Within the three main components of the Facility, there are sub-components that will have defined relationships with each other and with the other main components.

The Functional Relationship Diagram in Figure 24 illustrates the functional requirements of the building organization in more detail. See also Appendix C.

Connectivity of spaces are described in this section as follows:

- adjacent – requires that the one space is located adjacent to and opens directly into the other; alignment requirements as specified
- direct access – requires that the spaces are no more than a corridor width away and will have access between spaces without passing through another functional area
- direct visual access – requires that one can see into a room from the other with sightlines appropriate for the intended function
- connected – requires that the spaces are easily and safely navigated via corridors sized and organised in a manner appropriate for the intended function

In a performing arts facility, functionality requires that certain spaces be in a fixed relationship to others. Details of that spatial relationship will remain for the Architectural Design Team to determine, but certain spaces will retain such a fixed relationship. The adjacencies and connectivity that are highlighted in this document are critical to the functional life of the building and must be accommodated.

Functional Massing Diagram

Fig 22.

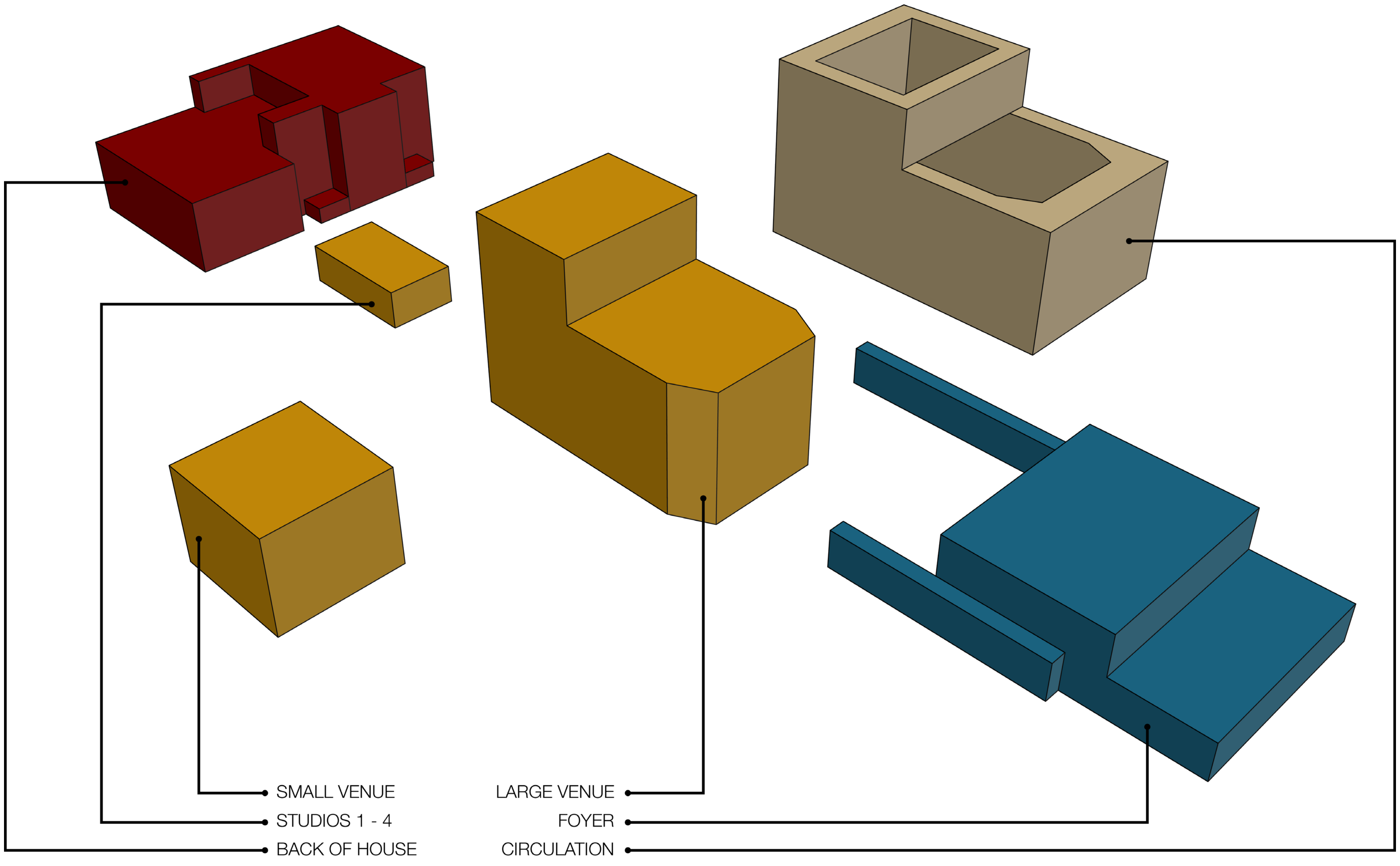
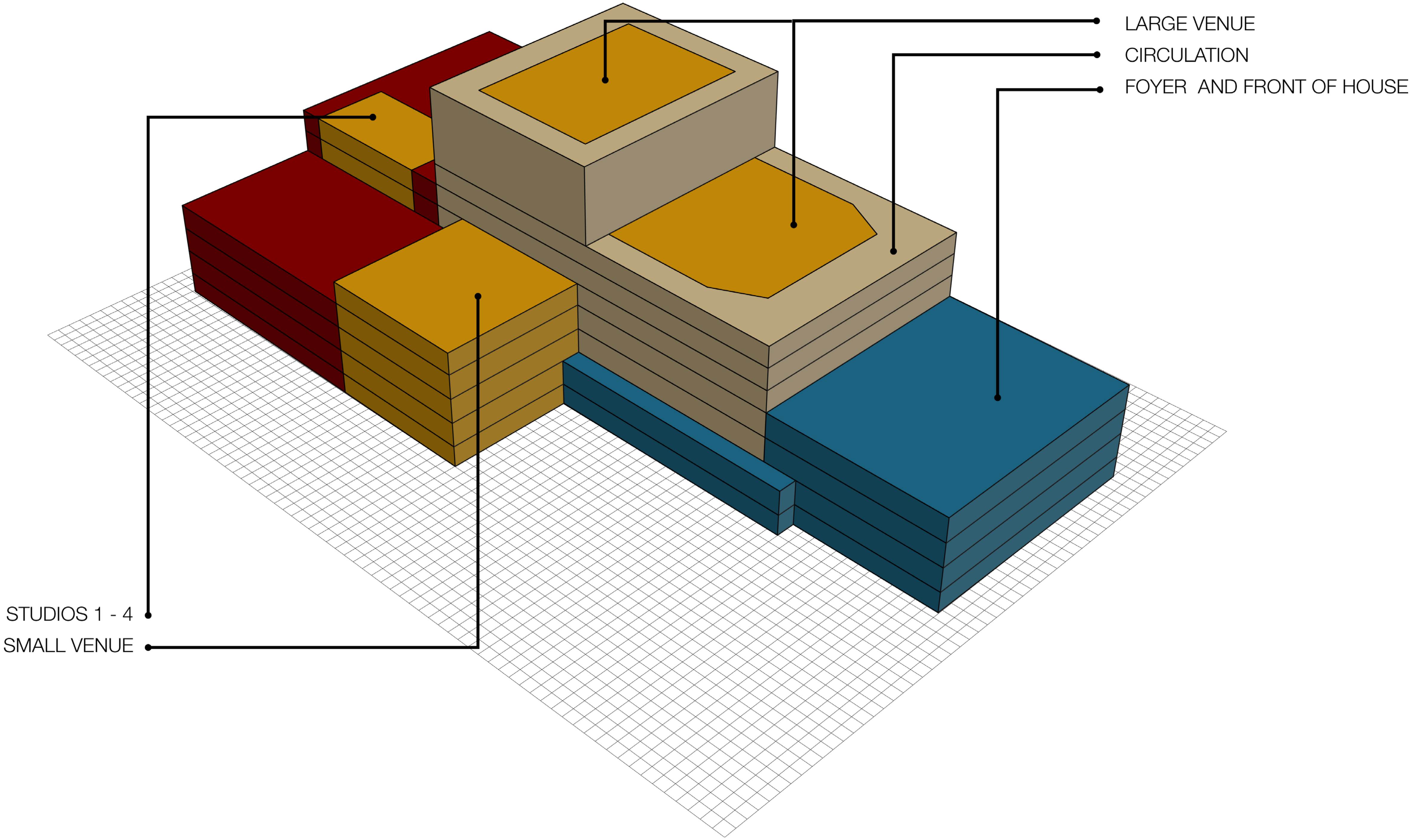
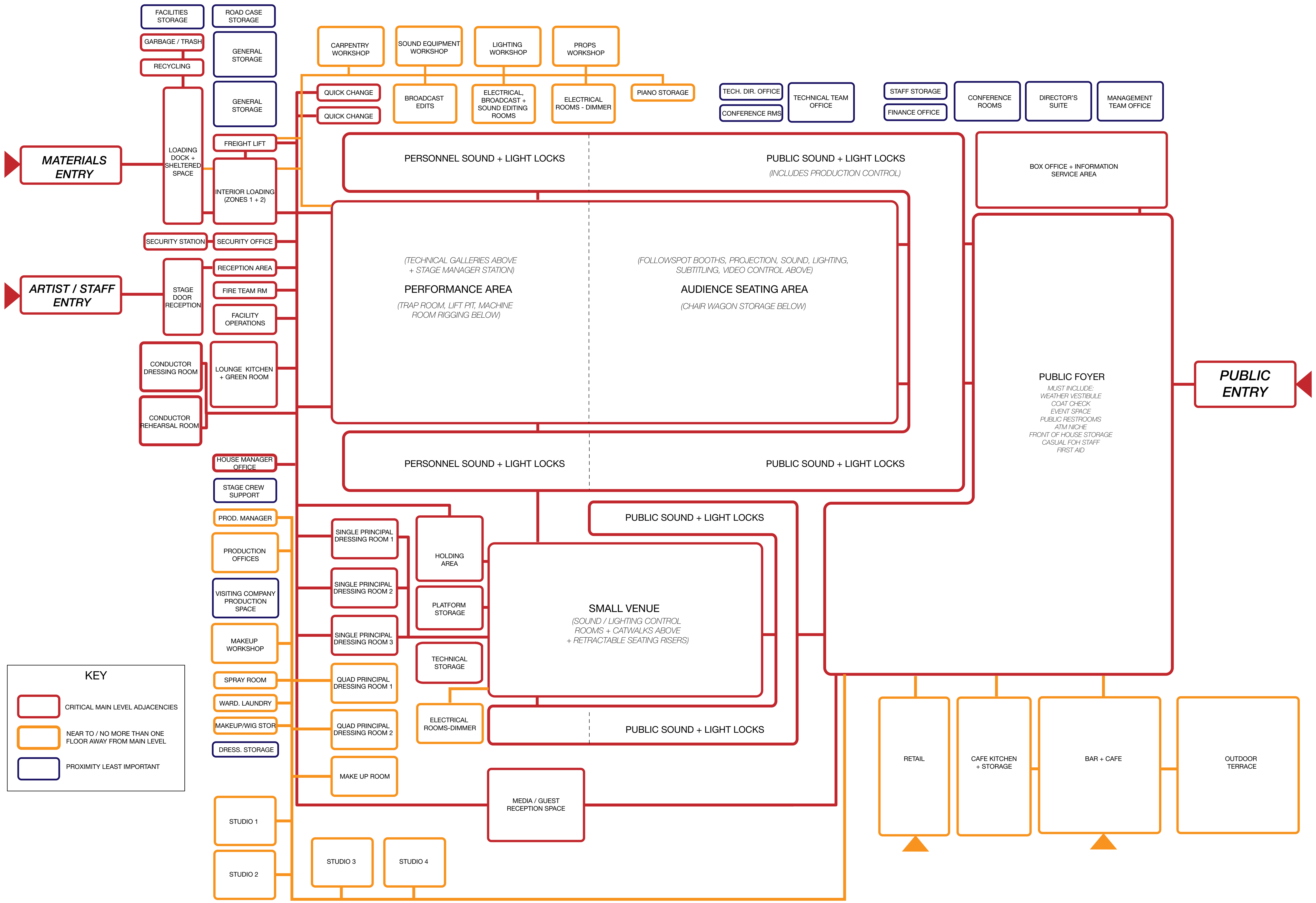


Fig 23.


LARGE VENUE
CIRCULATION
FOYER AND FRONT OF HOUSE
STUDIOS 1 - 4
SMALL VENUE

Space Adjacency Diagram

Fig 24.



6.2 Front of House

The foyer is the primary node point for audience to connect with all the spaces they need to access in the Facility. The foyer must have direct access to the outside and be the main entrance point for the audience into the entire Facility. From the foyer, the audience will have direct access to the Large Venue, Small Venue and Studios.

Spaces that must have direct access to/from and must be adjacent to the foyer (with critical levels noted as necessary) are as follows:

- The box office / information service area must be located in the foyer at the closest level to and have direct visual access to the audience from the main entrance.
- The café must have direct access from the outside street level as well as the foyer.
- The first aid room must be on the main foyer level with direct access to the street as close as possible to a location where an ambulance will be able to park temporarily.
- Public toilets will be directly connected to the foyer at multiple levels.
- The coat and bag check must be located in the foyer.
- Retail will have direct access to the outside street level as well as the foyer.
- The Large Venue must have a direct connection to the foyer at multiple levels.
- The Small Venue must have direct access to the foyer on two levels.
- The Studios must be connected to the foyer but they do not need to be adjacent.
- The Back of House spaces in general must have a connection to the foyer.
- Vertical circulation will include at least two elevators connecting to all audience levels, open staircases and emergency circulation.

6.3 Performance and Rehearsal Spaces

6.3.1 Large Venue

The Large Venue will have connections/adjacencies to public, artist, technical and office spaces. These spaces have connectivity that ranges from critical to connected but not necessarily adjacent.

Spaces that must be adjacent to the Large Venue (with critical levels noted as necessary) are as follows:

- The foyer must be adjacent to the Large Venue at multiple levels.
- The single principal dressing room, the conductor's dressing room and the conductor's rehearsal space must be at the same level and in close proximity to the stage level of the Large and Small Venues. All other principal dressing rooms are recommended to be at stage level but must be no more than one level away.
- The primary and auxiliary followspot rooms must have direct and functionally appropriate visual access into the Large Venue.
- The lighting/surtitling/video control rooms must have direct and functionally appropriate visual access into the Large Venue at levels shown in Appendix C.
- The sound control rooms must have direct and functionally appropriate visual access into the Large Venue at levels shown in Appendix C.
- The projection booth must have direct and functionally appropriate visual access into the Large Venue at levels shown in Appendix C.
- The quick change rooms and toilets must be at stage level and have direct access to the stage area.
- The machine room (rigging) must be directly adjacent and connected to the upper technical grid area above the stage. See also Appendix C.
- The Small Venue stage must be at the same level as the Large Venue stage, directly adjacent to the Large Venue and connected through two large Guillotine Doors.
- The stage area must be connected to Back of House circulation through sound- and light-lock vestibules with 4m tall by 4m wide load-in doors.
- The 4m tall by 4m wide load-in doors must directly connect the loading dock area through the receiving area into the Large Venue so that extra wide and tall materials can be brought in from the outside when necessary.

The Large Venue will be connected by public corridors, Back of House corridors, public elevators, Back of House elevators, freight lift and staircases to meet the functional requirements of this Technical Concept.

6.3.2 Small Venue

The Small Venue will have connections/adjacencies to public, artist, technical and office spaces. These spaces have connectivity that ranges from critical to connected but not necessarily adjacent.

Spaces that must be adjacent and their level requirements to the Small Venue are as follows:

- The foyer must have access to the Small Venue on two levels.
- The single principal dressing room, the conductor's dressing room and the conductor's rehearsal space must be at the same level and in close proximity to the stage of the Large and Small Venues. All other principal dressing rooms are recommended to be at stage level, but must not be farther than one level away from the level of Small Venue stage.
- The lighting control room must be at the balcony level and have direct visual access with functionally appropriate sightlines as shown in Appendix C.
- The sound control room must be at the balcony level and have direct visual access with functionally appropriate sightlines as shown in Appendix C.
- The projection booth must be at the balcony level and have direct visual access with functionally appropriate sightlines as shown in Appendix C.
- The Small Venue stage must be at the same level of the Large Venue stage level, directly adjacent to the Large Venue and connected through two large Guillotine Doors.
- The stage area must be connected to Back of House circulation through a sound- and light-lock vestibule with 4m tall by 4m wide load-in doors for load-in and load-out of scenic materials, décor and technical equipment.

The Small Venue will be connected by public corridors, Back of House corridors, public elevators, Back of House elevators, freight lift and staircases, to meet the functional requirements of this Technical Concept.

6.3.3 Studios

The Studios will be arranged as a cluster around a shared foyer space with direct security-controlled connections to public circulation and Back of House circulation.

The cluster will also include a group of toilets and will be located in close proximity to the Studios' storage room that will be used for temporary storage of mobile dressing room furniture.

The cluster will be located as closely as possible to the Large Venue and the other dressing rooms. The Studios will be connected by public corridors, Back of House corridors, public elevators, Back of House elevators, freight lift and staircases, to meet the functional requirements of this Technical Concept..

6.4 Back of House

6.4.1 Artist Support Spaces

6.4.1.1 Artist/Staff Entrance

The artist/staff entrance area will be adjacent to a car drop-off area, and artists and staff will access the Facility through a security point in this area. Artists and staff will be able to access the dressing room and office areas without crossing through any technical zones such as loading docks or scenery assembly areas.

6.4.1.2 Dressing Rooms

The single principal dressing room, the conductor's dressing room and the conductor's rehearsal space must be at the same level and in close proximity to the stage of the Large and Small Venues. All other principal dressing rooms are recommended to be at stage level but must be no farther than one level away.

The conductor's dressing room must have efficient connection to the orchestra pit.

6.4.1.3 Quick Change Rooms and Toilets

Quick change rooms and toilets must have direct access to either side of the stage area of the Large Venue.

6.4.2 Technical Support Spaces

6.4.2.1 Loading Dock

The stage area of the Large and Small Venues will be at the same level of the loading dock. The interior loading zones will be 1m and 0.6m above the driveway. The driveway will be completely level to allow loading/unloading to happen on a level surface. Interior loading zone 1 will have direct, step- and obstruction-free level access to the stages with the minimum travel distance possible and will be arranged and sized to allow the entire contents of the articulated trucks to be moved to both stages. Interior loading zone 2 will have direct, step- and obstruction-free access to the kitchen area of the café, and also step- and obstruction-free access to all Back of House spaces.

The loading dock must be connected to the Large Venue in such a manner that extra large materials up to 4m wide by 4m tall can be brought in from the outside when desired. All corridors from the loading dock to all the Venues will be served by 2.4m wide (clear) corridors and level pathways to accommodate the expected weight and size loads. These pathways must be as efficient as possible.

6.4.2.2 Storage Areas

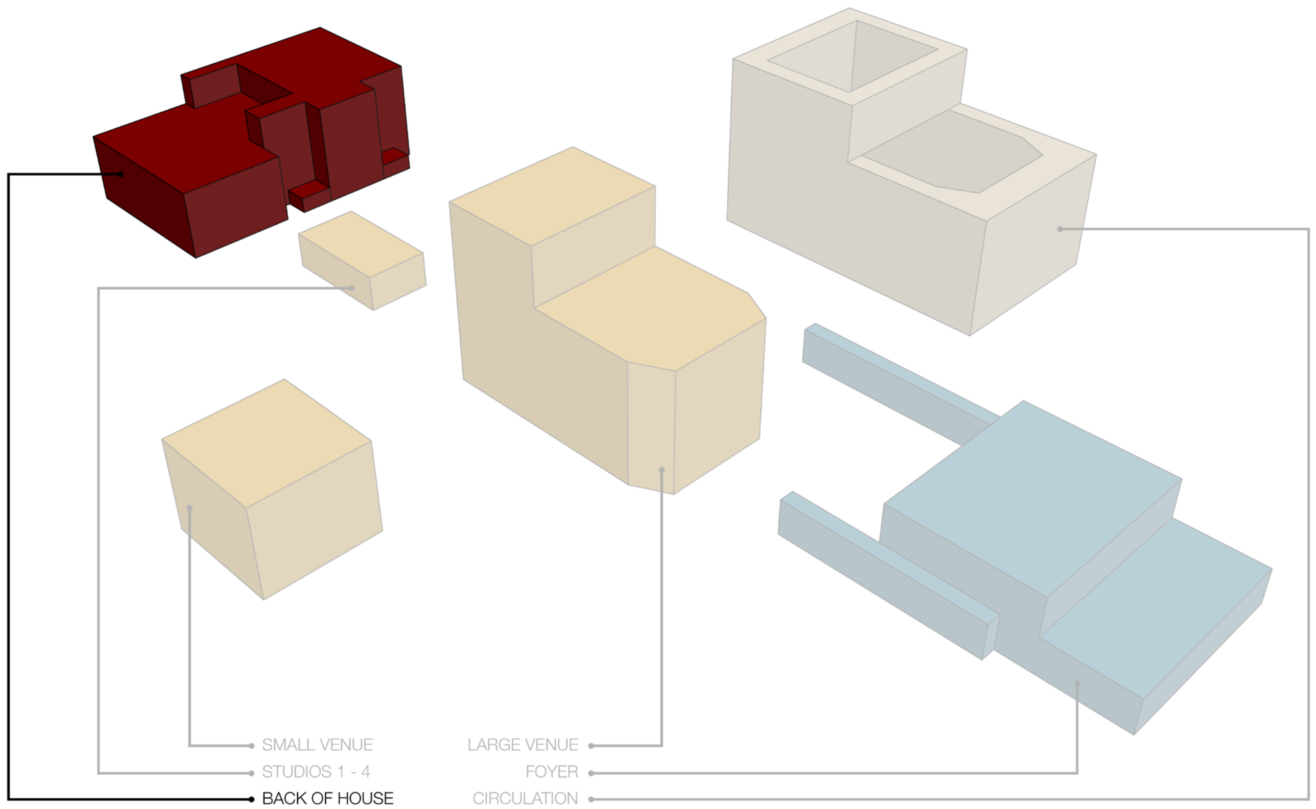
All large storage areas will be served by 2.4m wide (clear) corridors and will have level pathways to and from the rooms they serve. Level changes to and from storage areas will be acceptable provided they are served by a freight lift.

6.4.3 Back of House Circulation

All Back of House circulation serving public, artist or technical spaces will be served by 2.4m wide (clear) corridors and step- and obstruction-free pathways. These pathways must be as efficient and intuitive as possible.

Vertical circulation will include Back of House artist staircases (aesthetically upgraded for artists), emergency egress circulation, a freight lift and at least one Back of House lift connecting from the basement to the technical working grid level of the upper technical zone.

A freight lift will connect the basement to the level of any performance, rehearsal or technical storage space. The freight lift will have minimum dimensions of 6.4m by 3m (minimum 3m wide door opening clear) and have a minimum capacity of 6,500kg.



7 | Facility Design Requirements

Section Overview	
7.1	Introduction
7.2	General
7.3	Front of House
7.4	Performance and Rehearsal Spaces
7.5	Back of House
7.6	Facility-wide Requirements

7.1 Introduction

In this section, experiential expectations as well as technical design and operations related requirements for the main spaces of the Facility are defined.

This section is intended to be read in conjunction with Appendix C where additional detailed information about all these spaces such as critical dimensions, area, occupancy, security level and required background noise level performance is provided.

7.2 General

The key areas covered in this section are as follows:

7.2.1	Accessibility
7.2.2	Vehicular Access
7.2.3	Circulation

7.2.1 Accessibility

The design of the Facility will ensure universal accessibility for artists, staff and audience/visitors. This is understood to include the following:

- obstruction-free movement for artists, staff and audience to all levels and performance, rehearsal, and office areas from external arrival points, including vehicular drop-off and pick-up areas
- independence of movement

7.2.2 Vehicular Access

The Facility will have the following access for vehicles:

7.2.2.1 Loading Dock

Materials load-in and load-out is critical to the success of the venue and the design will ensure that vehicular access to the loading dock area is flat and easily manageable for trucks.

The design will ensure that when trucks back up to the loading dock there is enough space between docks for rear doors to be opened and folded back without conflict.

7.2.2.2 External Broadcast Truck

The design will provide for a temporary parking location for an external broadcast truck with direct line of sight to satellites.

7.2.2.3 Audience Drop-Off / Pick-Up for Private Vehicles and Taxis

A layby will be provided for audience drop-off / pick-up for private vehicles with a pedestrian path that is intuitive and as close as practical to the primary entrance to the foyer. This location will also be designed to be able to be used as short term parking for access to the box office. The design will ensure that the access requirements for mobility-impaired visitor vehicles and ambulances are appropriately accommodated.

It is recommended that consideration be given to pick-up of audiences by taxi.

7.2.3 Circulation

Alongside the appropriate architectural, functional and acoustic design of key spaces, it is recommended to consider appropriate adjacencies — according to each space's required function — and the provision of sufficient and safe circulation paths to ensure the success and operational efficiency of the Facility.

Clear, safe and intuitive circulation will be required for the entire Facility.

Circulation paths will be designed so that the floor areas of the Large Venue, Small Venue, Studios, main foyer level, foyer event area and upper café space will have step- and obstruction-free access sized for a grand piano (at minimum) from the loading dock.

7.2.3.1 Sound- and Light-Lock Vestibules

The Large and Small Venues will be accessed at all entry points through sound- and light-lock vestibules. In this context, the Side Circulation Areas of the Large Venue must be considered as part of the Large Venue.

7.2.3.2 Back of House circulation

Technical circulation areas must be at least 2.4m wide.

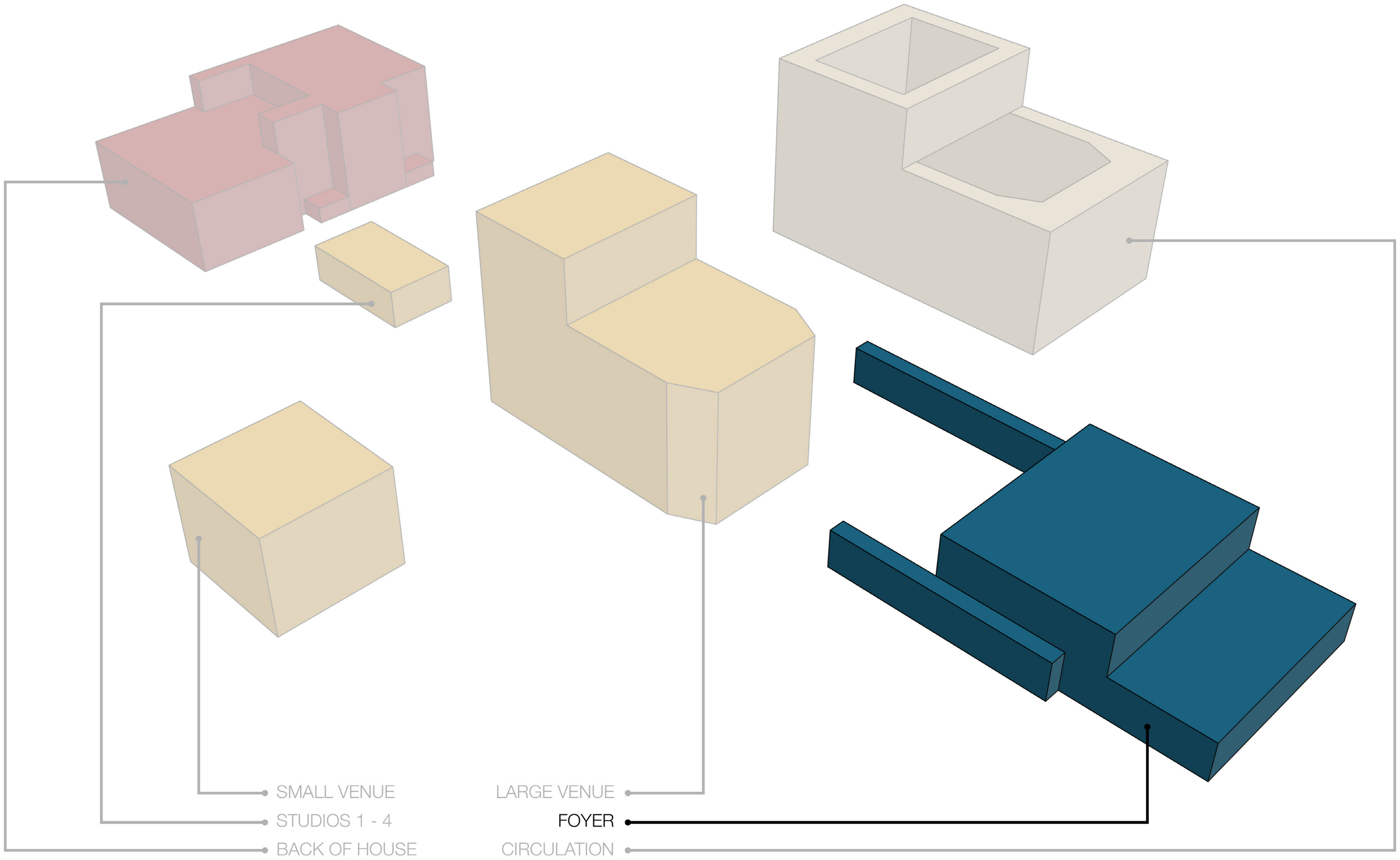
All circulation paths that would be reasonably used for materials handling (paths between loading dock area, performance areas and relevant storage) will be equipped with wall bumpers at multiple levels and corner protectors.

Artist circulation will — to the extent possible — be separate from material load-in and load-out, as well as catering related circulation.

The circulation will contain sufficient sound-absorbing surfaces, primarily on the ceiling, to control noise levels.

All entrances into the Large and Small Venues (or into the Side Circulation Areas of the Large Venue) will include sound- and light-lock vestibules as part of the acoustic isolation of these spaces.

Front of House



7.3 Front of House

The following key public spaces are addressed in this section:

7.3.1	Foyer
7.3.2	Event Area
7.3.3	Café
7.3.4	Media/Guest Reception Room
7.3.5	Box Office / Information Service Area
7.3.6	Coat and Bag Check
7.3.7	Public Toilets
7.3.8	Retail
7.3.9	Casual Front of House Staff Locker Area
7.3.10	First Aid Room
7.3.11	Public Circulation

7.3.1 Foyer

The foyer will be designed to be a welcoming space accommodating visitors, artists and staff during the day, and serve as the primary gathering space for audiences before and after performances, as well as during intermission.

This space will be designed to

- be inviting for audiences, artists, and staff to spend time
- accommodate cosy discussions and workgroups
- be creative, inspiring, uplifting at all times of the day and evening
- have a strong visual connection with the landscape and outdoor areas
- promote physical connection with the outdoor areas, allowing for the extension of foyer functions and activities into outdoor areas around the Facility

The foyer will be designed to be open to the public all day until after performances.

The foyer space will primarily distributed on three levels with stairs connecting to upper entrances to the Large Venue:

- below grade, mainly for toilets
- mezzanine with access to the stage level of the Large and Small Venues
- upper foyer for balcony access in the Large Venue

The foyer will be organised so that audiences will approach the main entrances to the right and left sides of the Large Venue from a central location.

The foyer will include the following:

- electronic interactive screen areas (for educational/ information exhibition and display)
- queuing area for café service counter (for intermission service), as appropriate
- queuing areas for coat and bag check location(s)
- queuing areas for box office / information service area
- latecomer's area(s) with TV screens and audio monitors
- ticket control stations and program niches next to all entrances to the Large Venue, Small Venue, and Studios

The foyer will contain sufficient sound-absorbing surfaces, primarily on the ceiling, to control noise levels appropriate for comfortable discussions and workgroups.

Key Goals of the Foyer
be inviting for audiences, artists, and staff to spend time
accommodate cosy discussions and workgroups
be creative, inspiring, uplifting at all times of the day and evening
have a strong visual connection with the landscape and outdoor areas
promote physical connection with the outdoor areas, allowing for the extension of foyer functions and activities into outdoor areas around the Facility

Table 4. Key goals of the foyer

Circulation around Venue entrances will be enlarged to accommodate minor congestion before entry into the Venues.

7.3.2 Event Area

The event area is envisioned to be an architecturally distinct space but is not expected to have partitions separating it from the rest of the foyer. It must be accessible for mobility impaired artists and visitors.

This area will contain sufficient sound-absorbing surfaces, primarily on the ceiling, to control noise levels and promote good speech intelligibility appropriate for the expected usage.

This space will be designed to accommodate theatrical events with immersive sound. Audiences for these events could be seated on steps or on loose chairs (or a combination of both).

7.3.3 Café

The café will be fully integrated with the main level of the foyer and will have an upper level which will be able to be used as a separate event area. A mobile bar will support any events in this space, and be able to be moved to be used as an additional foyer café sales point location. The upper level is also envisioned to have an outdoor terrace.

The café service area has been defined according to the Consultant's international experience relative to the amount of audience to be served during intermission.

An external visitor entrance directly into the café will be provided.

The café will contain sufficient sound-absorbing surfaces, primarily on the ceiling, to control noise levels appropriate for the expected usage.

7.3.4 Media/Guest Reception Room

The media/guest reception room will be used as a lounge type space for VIPs that serves as a secure meeting point for artists with audience. It will be located in proximity of the principal dressing rooms, and easily accessible from the foyer. Access to the Back of House space and from the Front of House space will be security controlled. This room will also contain sufficient sound-absorbing surfaces, primarily on the ceiling, to control noise levels and promote intelligibility appropriate for the expected usage.

7.3.5 Box Office / Information Service Area

The box office / information service area is envisioned to be an open plan work area for four people with an open counter where staff will interface with visitors. An office will be accessible from the open plan work area.

The open counter will be sized to accommodate three work positions and at least one of these will be at a height appropriate for a visitor in a wheelchair. The queuing area for the counter will be in the foyer. There will also be a staff toilet in the vicinity of this area.

Sound-absorbing surfaces will be provided around and/or over the counter to ensure optimal acoustical conditions for communication. The ticket counter will be well illuminated.

7.3.6 Coat and Bag Check

The coat and bag check will have a total capacity of approximately 900 coats which may be organised in one or more areas, each with an open counter area or areas with shutter closure. The counter(s) may also be used for distribution of assistive listening units (See Appendix C).

7.3.7 Public Toilets

Public toilets for audiences will be provided as per the Schedule of Accommodations (Appendix C) and distributed on two primary levels so that audiences do not have to move more than one level at intermission. The majority of toilets will be near stage level of the Large and Small Venues. The size and number of toilets have been specified according to international practice and local regulations. All toilet areas will have barrier-free (no door) access from the foyer to minimize queuing time, avoid congestion at doorways, and increase hygiene (no contact with door handles).

Designers will ensure visual privacy for those within the toilet area, and a logical arrangement of cubicles and basins to ensure fluid circulation.

Detailed Design of the toilets will include the following:

- ledges for purses and programme books both within cubicles and at basins
- hooks for jackets within cubicles
- dividers for urinals
- extra mirror areas within the female toilet areas for make-up touch-up

7.3.8 Retail

The design of the Facility will include a retail space that is accessible from the foyer and directly from the exterior. The nature of the retail space will be determined at a later date.

7.3.9 Casual Front of House Staff Locker Area

This area is for use by volunteer ushers and other Front of House staff who are not full-time employees of the Facility. The area will be located in a secure area accessed primarily from the foyer, which will limit casual staff access to secure areas.

The area will include lockers and benches and will be used by men and women. Lockers will be for storage of coats, umbrellas, purses and other personal items during their service. The area will be equipped with a minimum of two basins with mirrors. The area will include no dedicated toilets or showers.

7.3.10 First Aid Room

A first aid room with en-suite accessible toilet will be located in the foyer area. This room will serve the entire Facility and the design will ensure obstruction-free access from the foyer and performance areas, as well as access for emergency medical personnel.

7.3.11 Public Circulation

Public circulation will be designed to provide intuitive pathways minimizing the need for signage. It is recommended that consideration be given from the outset of the design process for signage strategy and locations.

Two public elevators will connect all foyer levels to all venue access levels.

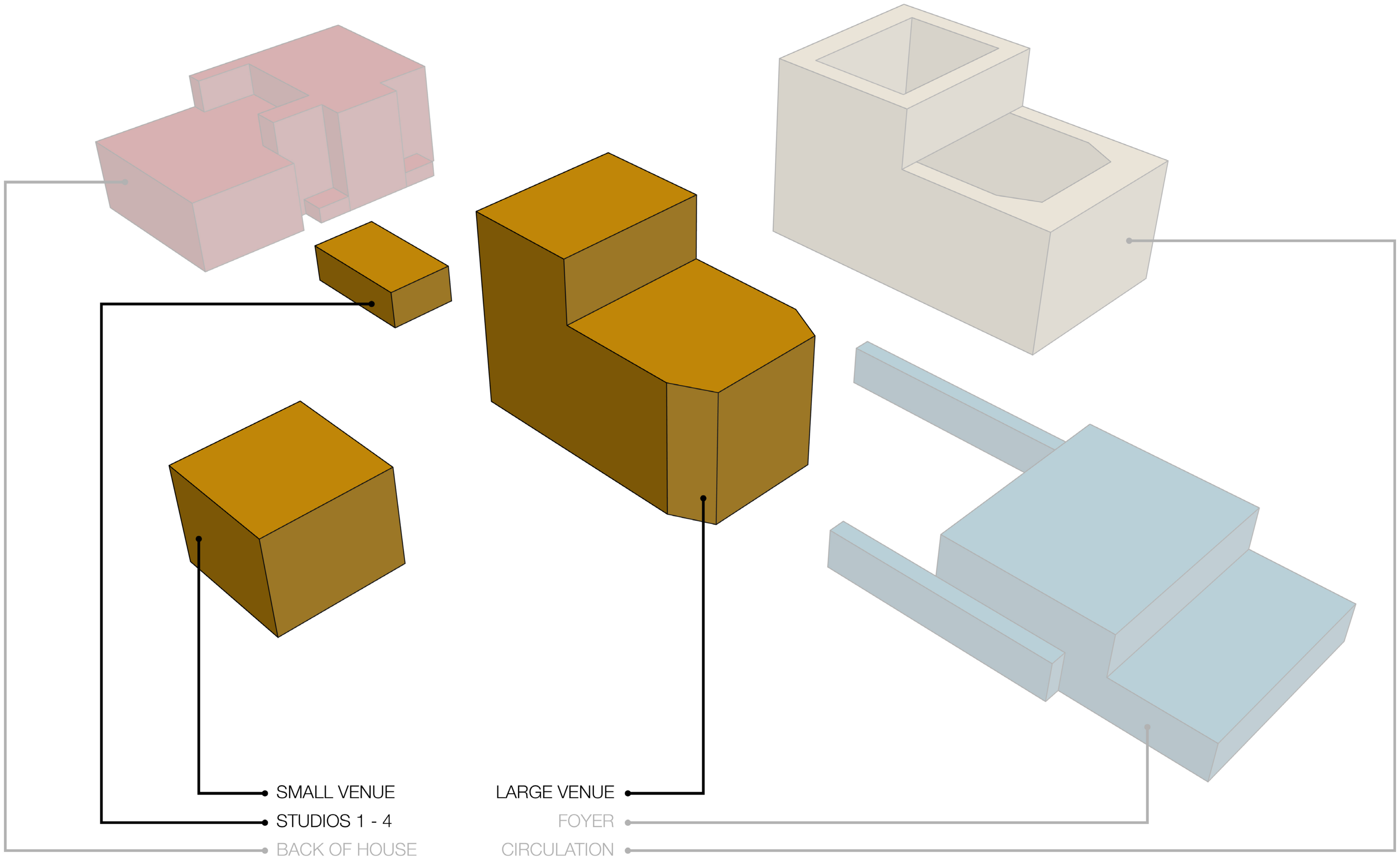
All entrances into the Large and Small Venues (or into the Side Circulation Areas of the Large Venue) will include sound- and light-lock vestibules as part of acoustic isolation of these spaces.

Mobility-impaired access must be from the outside to all public areas, as well as to all levels and sections within the audience chamber. It is recommended that consideration be given to the integration of tactile features and assistive listening systems to allow visitors with disabilities to access all public spaces with minimal staff intervention.

Public circulation areas will contain sufficient sound-absorbing surfaces, primarily on the ceiling, to mitigate propagation of noise between connected areas.


Image: CC - Anders Carlsson (flickr)

7.4 Performance and Rehearsal Spaces



7.4 Performance and Rehearsal Spaces

A first class performing arts space is defined by the quality of its architecture, acoustics, theatre systems and functionality. Nevertheless, the quality of the artist and audience experience in the performance spaces will be a key characteristic by which performers and audience members will judge the success of the Facility.

A primary driver of audience experience is the quality of the aural and visual interaction with the artists; supported by the quality of the audience seating, the way the audience circulation is achieved and the effectiveness and unobtrusiveness of the specialised performance equipment systems.

At the same time, it is vital that the geometry and finishes of the spaces work together to create a place that embodies their character and identity.

This section will explore the following in detail:

7.4.1	Large Venue
7.4.2	Small Venue
7.4.3	Studios

The quality of the experience in the performance spaces will be a key characteristic by which performers and audience members judge the success of the Facility.

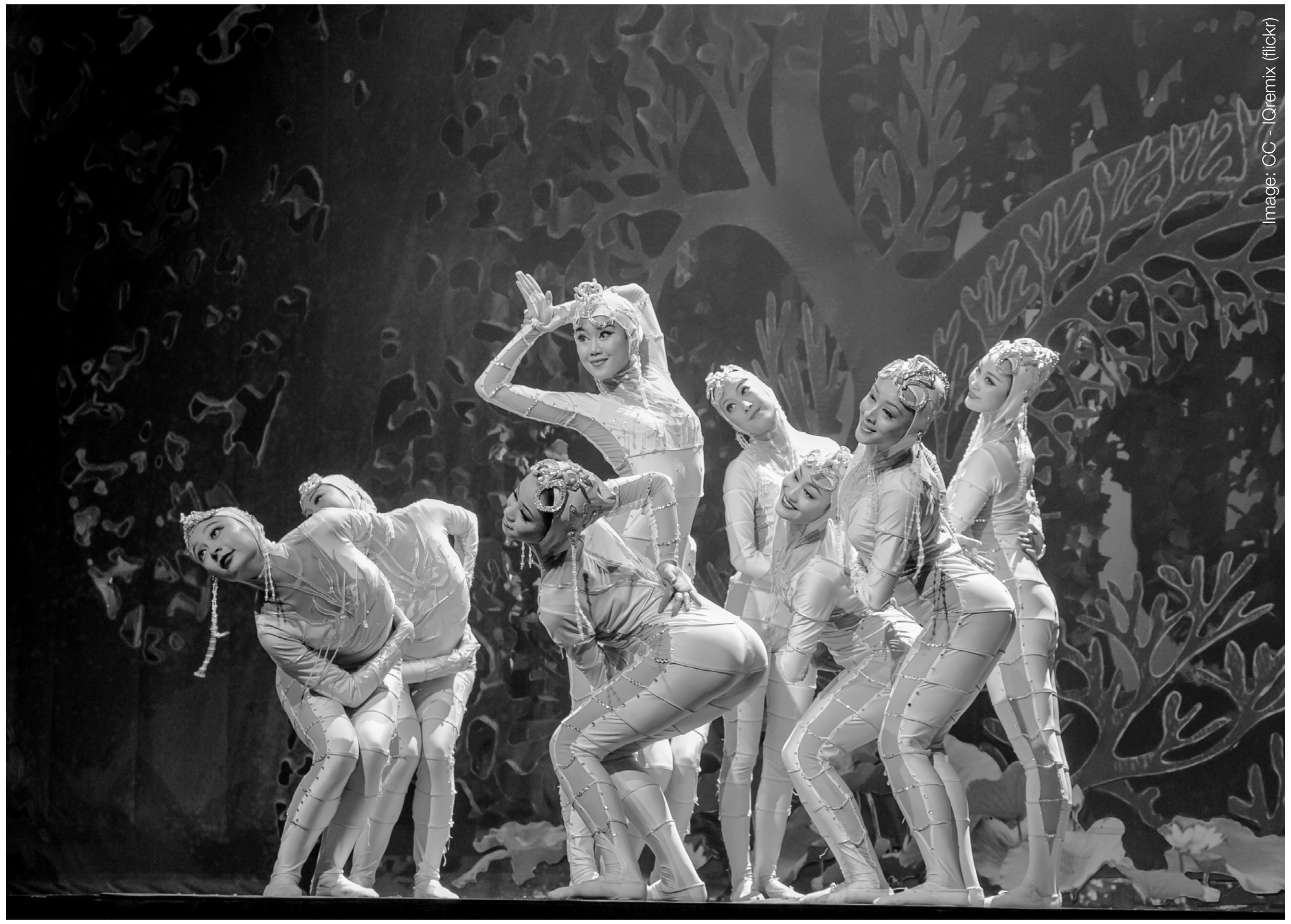
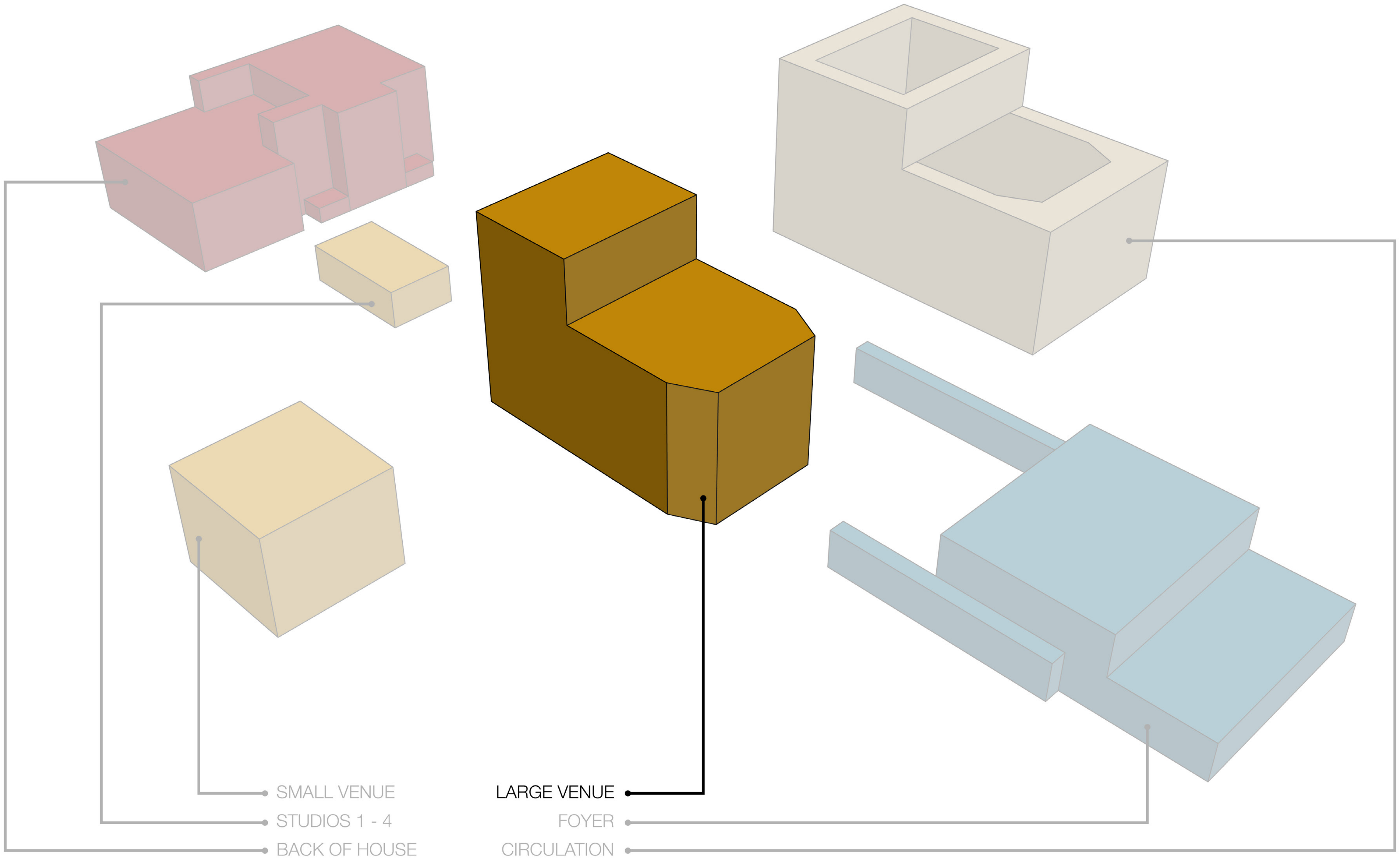


Image: CC - IQremix (flickr)

7.4.1 Large Venue



7.4.1 Large Venue

At the core of the Facility is the Large Venue which is a theatrical space that will support and provoke the exploration of the relationship of audience/artist and the future of theatrical performance with music.

Drawings for this space are provided in Appendix A.

This section will address the following key topics in detail in order to give more dimension and specificity to the Large Venue:

- *7.4.1.1 Architectural Character*
- *7.4.1.2 Architectural Lighting*
- *7.4.1.3 Side Circulation Areas and Public Access*
- *7.4.1.4 Approach to Transformability*
- *7.4.1.5 Variable Elements*
- *7.4.1.6 Venue Configurations*
- *7.4.1.7 Acoustics Requirements*
- *7.4.1.8 Structural Requirements*
- *7.4.1.9 Mechanical Systems Requirements*
- *7.4.1.10 Specialised Performance Equipment Systems and Technical Spaces*
- *7.4.1.11 Control Spaces*
- *7.4.1.12 Large Venue Technical Circulation*

7.4.1.1 Architectural Character

The Large Venue will be designed to be a space that incites artists to respond. In every configuration, it will project a clear character; it will not be a space without personality, nor will the room dominate or overshadow the performance taking place.

The architecture of the space will allow for changes of character as the configuration and usage changes, but the intrinsic identity of the space will be recognisable to artists and audiences in every configuration.

Theatrical performances can range from the intimate to the grandiose, but the need for intimacy in the relationship between artist and audience is a requirement that is particularly true of today's audiences. For this reason, the arrangement of audience prioritises sightlines and visual and acoustical intimacy and the architect will ensure that the Architectural Design will support and enhance these goals.

The designers must avoid any light-reflecting surfaces so that reflections from production lighting systems do not unintentionally distract audiences from the performance. Finishes and colour will be selected to ensure that, when artistically desired, the entire Venue can disappear.

It is recommended that consideration be given to creating opportunities for visual or even physical connections with the foyer or directly with the outside. Because the Venues have stringent requirements with regard to noise isolation, any such connections or openings must be able to be closed mechanically and, when closed, achieve the noise isolation requirements as well as be able to achieve a complete blackout condition.

7.4.1.2 Architectural Lighting

The composition of the architectural lighting design will be balanced to accentuate the envelope of the room so the audience feels the intimacy and quality of the Venue. The design will highlight the architectural features including the balcony fronts, Windows and Side Circulation Areas (as appropriate). The architectural lighting will have dimmable, multiple layers of light for the different functions. Layers will include the following:

- venue wall and accent layers
- Side Circulation Area layers
- aisles and circulation areas
- ambient lighting for the seating areas

Performances may take place in many different lighting conditions and the design will allow the Venue to be configured for completely dark rehearsal and performance conditions so that the production lighting designer can work without conflict with the architectural lighting design. The architectural lighting design for the Large Venue must consider the following:

- The design of the circulation lighting will be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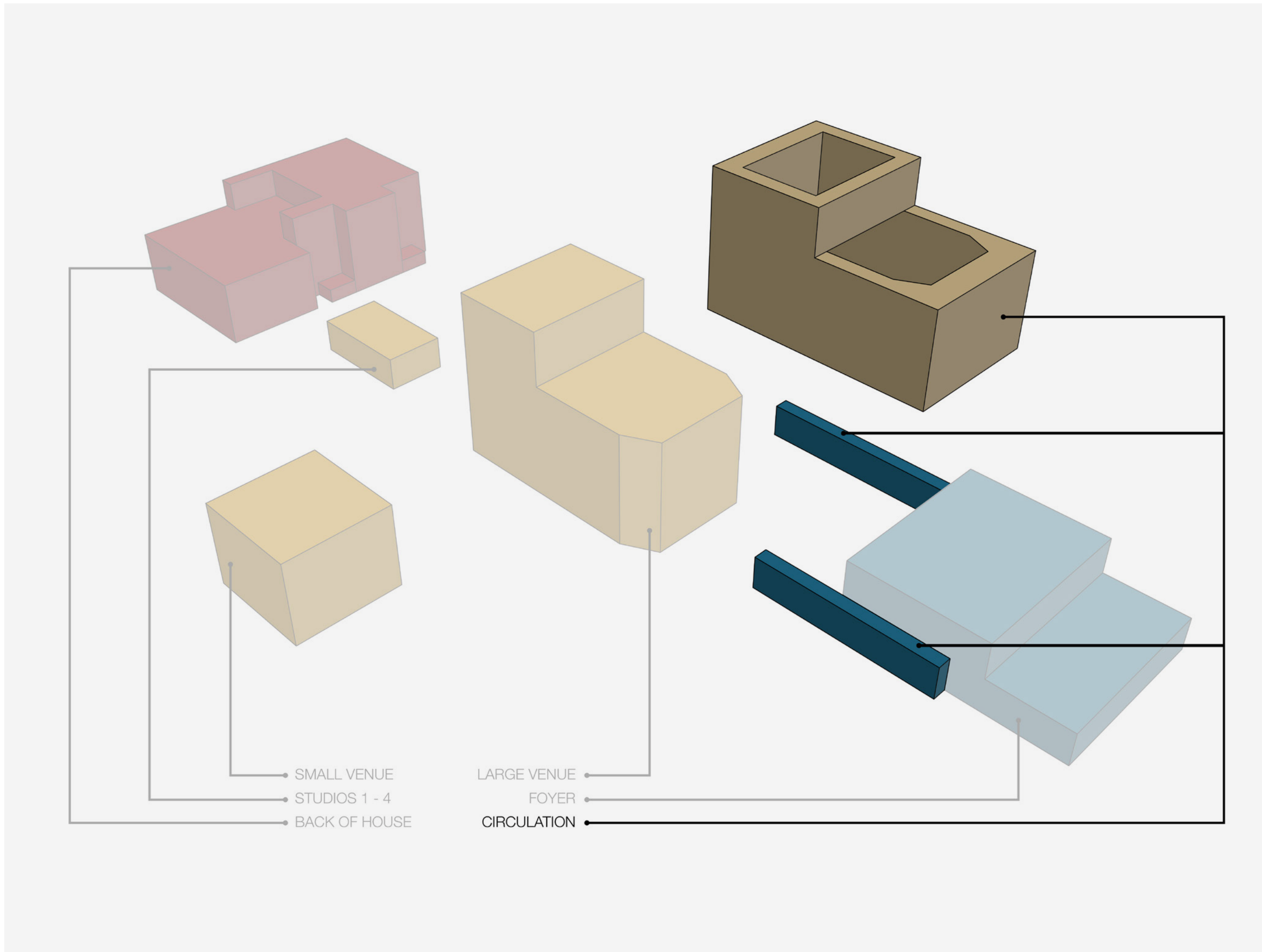


planned so that in fully dark conditions they provide safe circulation conditions and will include seat end-panel units, step edge lighting, and other measures as necessary. At the same time, they will be designed so as to not distract audiences or artists. Exit signs will also be planned to avoid being a distraction; there must be no lights from detectors, electronic card readers, alarms units, etc. (except during an emergency).

- The architectural lighting design will take into consideration the different likely configurations and types of usage and include specific lighting conditions for each. Performances taking place in full-light and bright lighting conditions will also be anticipated.
- Architectural lighting systems will also include a low energy work light system which will also be used for cleaning and other non-performance or event operations.
- The design of the architectural lighting system will ensure that the background noise level goal will not be compromised when the architectural lighting is used.
- Accessibility to architectural lighting fixtures will be considered for efficient long term maintenance.

Sound- and light-lock vestibules will incorporate shielded down lights and low level circulation lighting. The architectural lighting designer will ensure that when sound- and light-lock vestibule doors are opened into the Venue, there will be no light spillage disturbing audience or artists.

7.4.1.3 Side Circulation Areas and Public Access

On both sides of the Large Venue on all levels there will be horizontally continuous circulation spaces. These areas, which will at times be part of the performance space, will be the primary circulation zone for audience and artists. This dual function will be achieved through removable wall surfaces on the walls of the Venue that, when removed, form openings (Windows) which can then be filled with décor, props, actors, musicians or audience. These openings will also be a major defining element of the character of the space, in particular when the Moving Balconies are stored. For some performances, these spaces will also be used as auxiliary technical spaces. To achieve this, the removable surfaces on the walls will contain a 0.75m by 0.75m optical glass port (that can be covered when not needed to match the finish of the hall) that will allow projection without equipment noise interfering with the performance.

These circulation areas will have sound-absorbing treatments on floors, walls and ceilings, to control noise levels when used as circulation areas or technical spaces. Finishes will assume that any of these areas can become public circulation or seating areas. All access to the Side Circulation Areas (from the Front of House and from the Back of House) will be through sound- and light-lock vestibules.

7.4.1.4 Approach to Transformability

The Large Venue will physically transform to create multiple performance formats (ranging from an experimental black box theatre to a traditional opera house) through positioning of various moving components.

7.4.1.5 Variable Elements

There are numerous elements that will be required to enable all of the different configurations that the Large Venue will take. They are as follows:

7.4.1.5.1	**Moving Balconies**
7.4.1.5.2	**Lifts**
7.4.1.5.2.1	*Orchestra Pit Configurations*
7.4.1.5.2.2	*Seating Wagons*
7.4.1.5.3	**Windows**
7.4.1.5.4	**Acoustic Banners and Curtains**
7.4.1.5.5	**Tip-and-Fly Forestage Reflector**
7.4.1.5.6	**Tip-and-Fly Grid Ceiling**
7.4.1.5.7	**Removable Portal**
7.4.1.5.8	**Trap Floor**
7.4.1.5.9	**Demountable Wall Pipe Grids**
7.4.1.5.10	**Guillotine Doors**

7.4.1.5.1 Moving Balconies

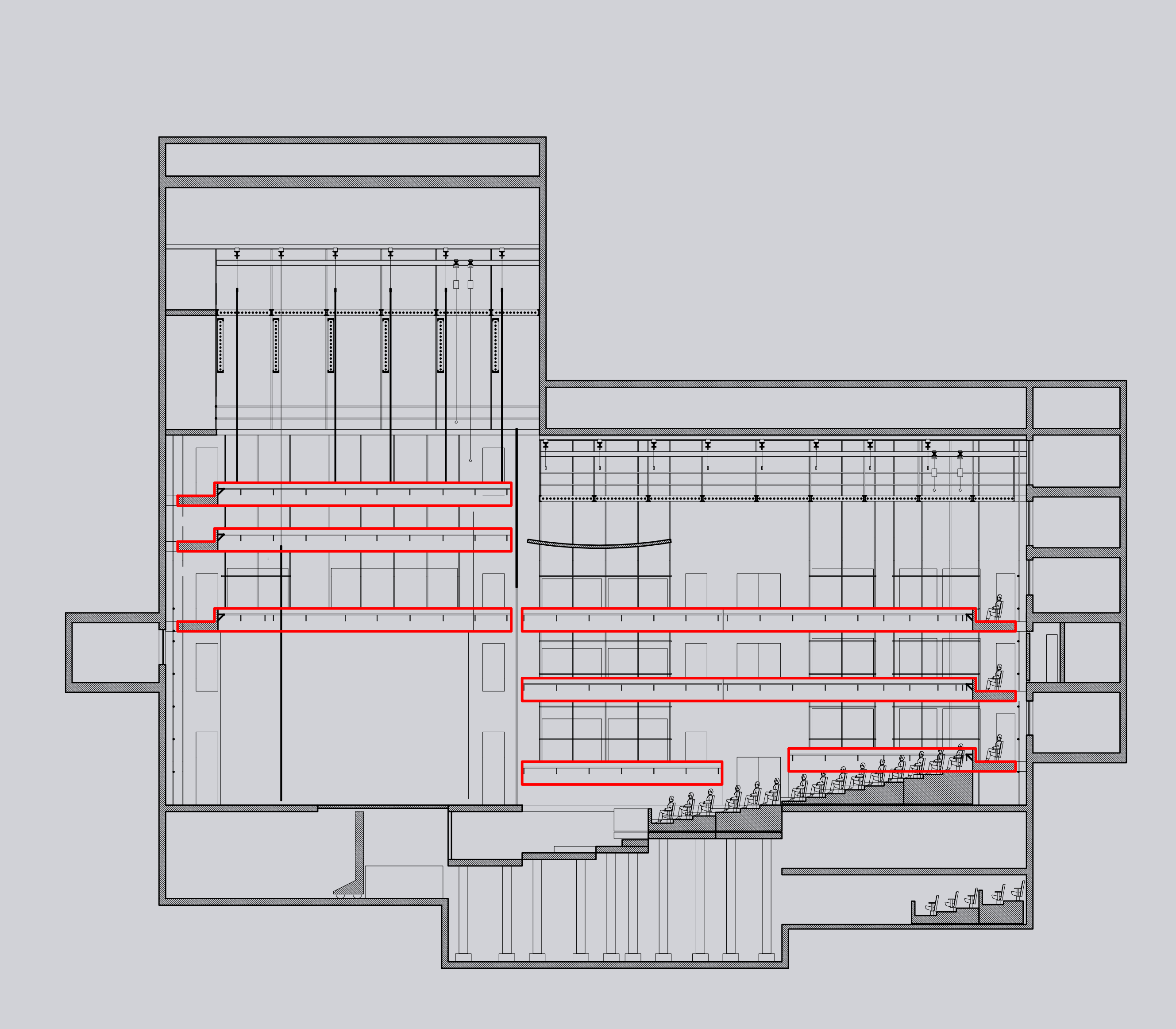


Fig 25. Moving Balconies

There will be three levels of vertically moving balconies on all four walls of the Large Venue to allow for transformability. The Moving Balconies can be raised and lowered individually in multiple configurations. They will have a single row of fixed theatre seats each to allow for the optimal sightlines in every conceivable configuration.

See Section 7.4.1.10.3 for further technical requirements of the Moving Balconies.

7.4.1.5.2 Lifts

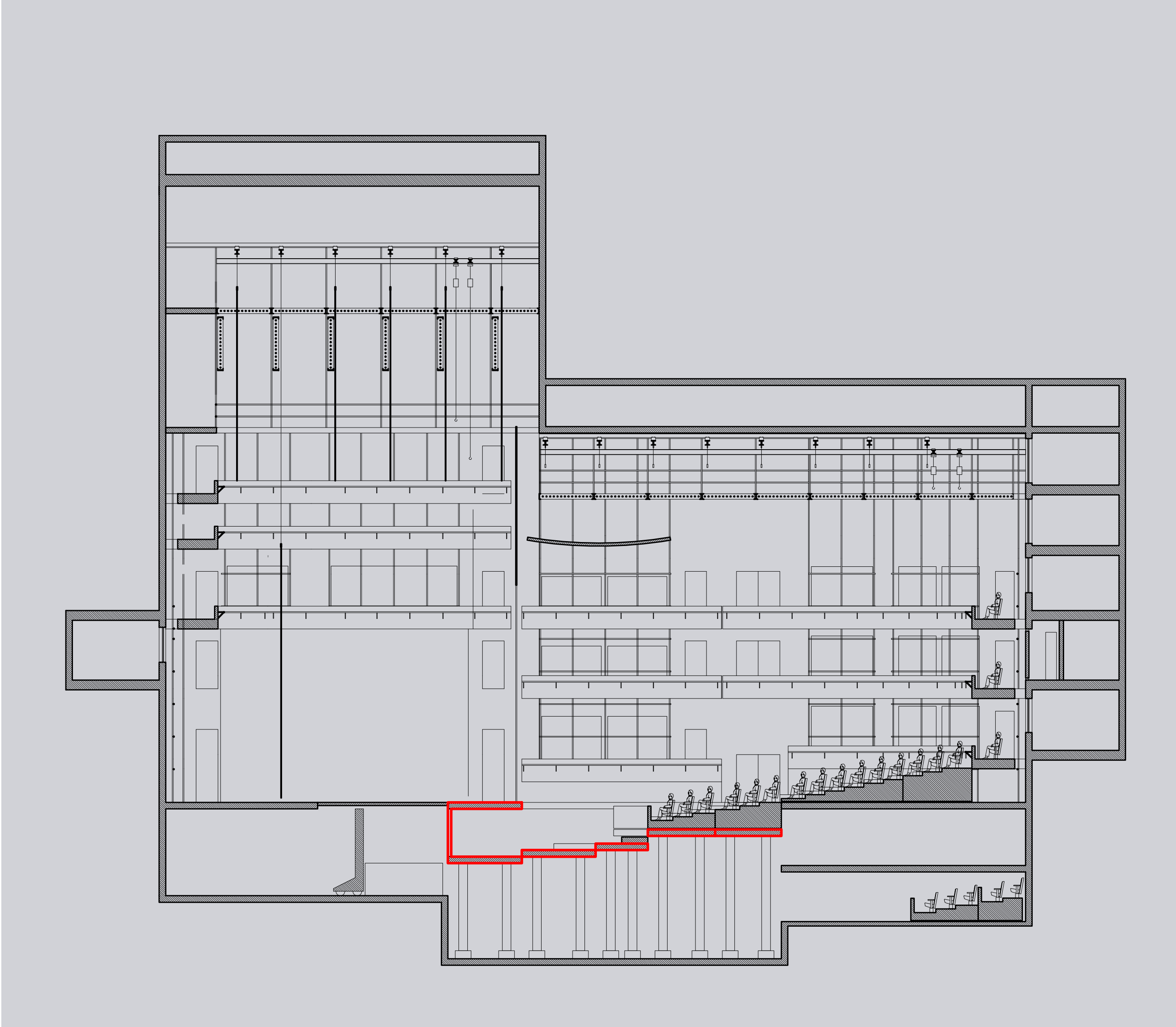


Fig 26. Lifts

The Large Venue will be equipped with four Single-Deck Lifts and one Double-Deck Lift (Doppelgänger Lift; see also Appendix D) that will be used as follows:

- raised stage or part of the flat floor
- the orchestra pit
- to carry Seating Wagons

7.4.1.5.2.1 Orchestra Pit Configurations

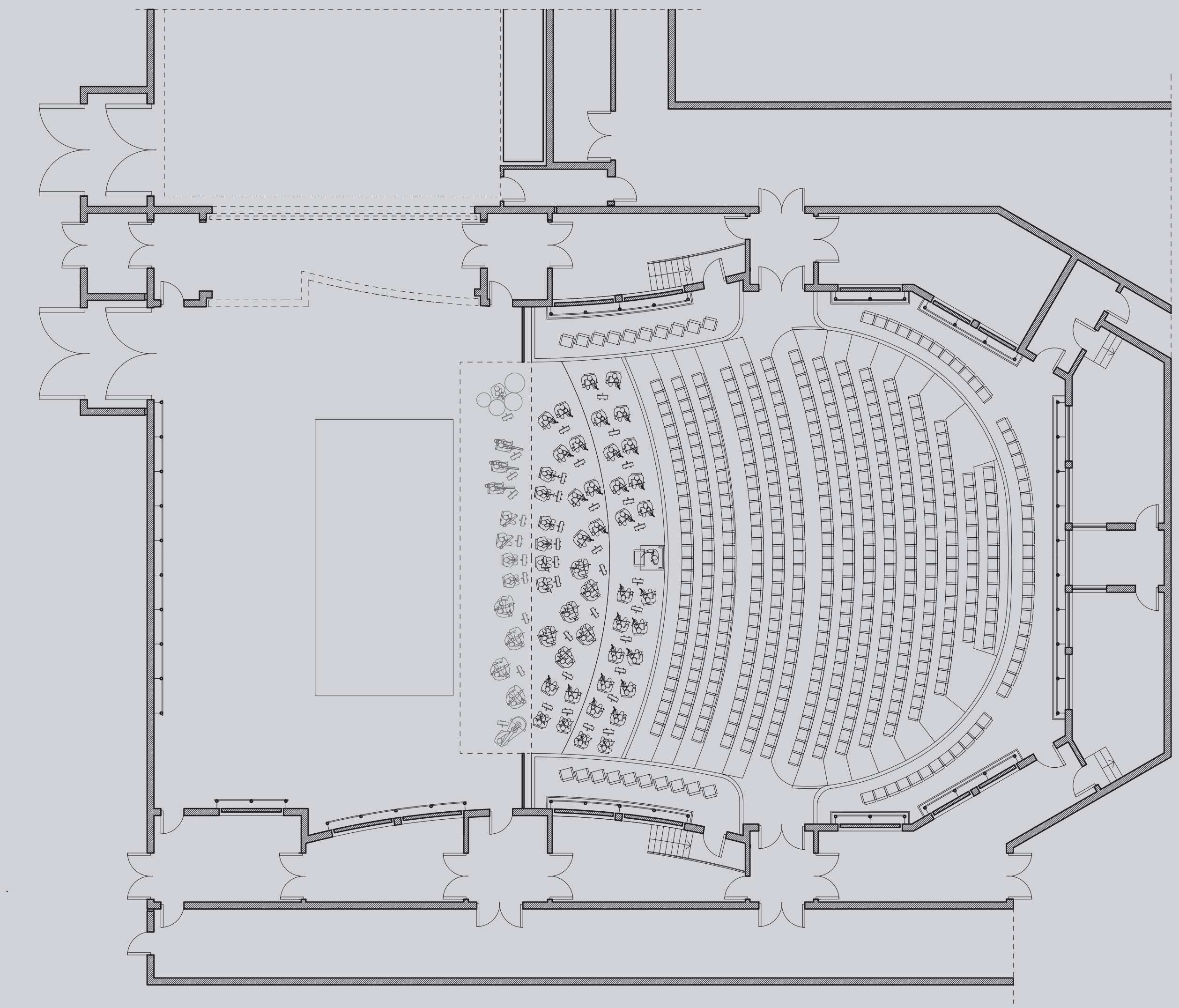


Fig 27. Orchestra pit plan – Option 1 (large stage, reduced seat count)

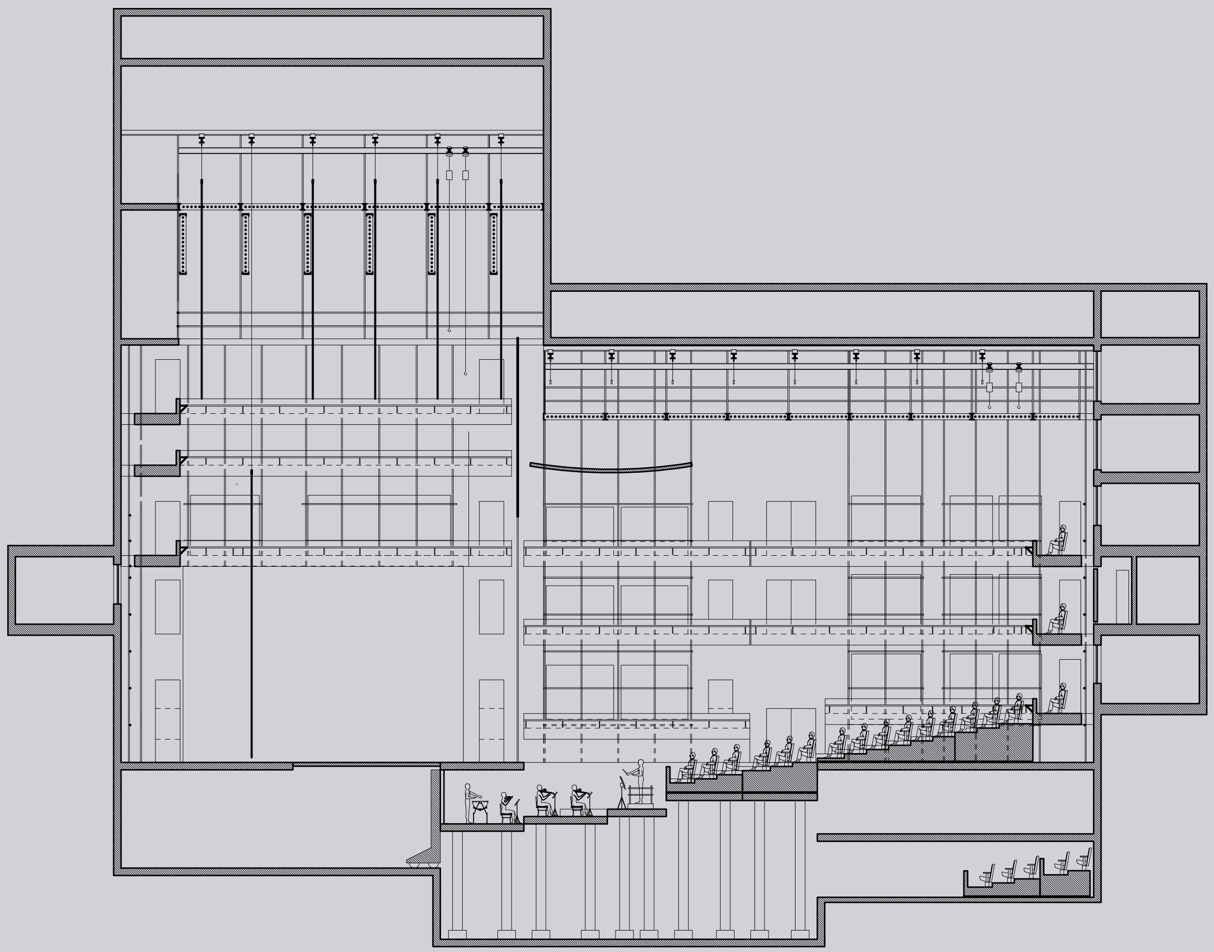


Fig 28. Orchestra pit section – Option 1 (large stage, reduced seat count)

The Lifts and a Removable Portal (see Section 7.4.1.5.7) will be designed to change the location, characteristics (open / partially covered) and size of the pit depending on the needs of the production and must allow at a minimum for the orchestra pit configurations shown in Figures 27–30.

7.4.1.5.2.1 Orchestra Pit Configurations (cont'd)

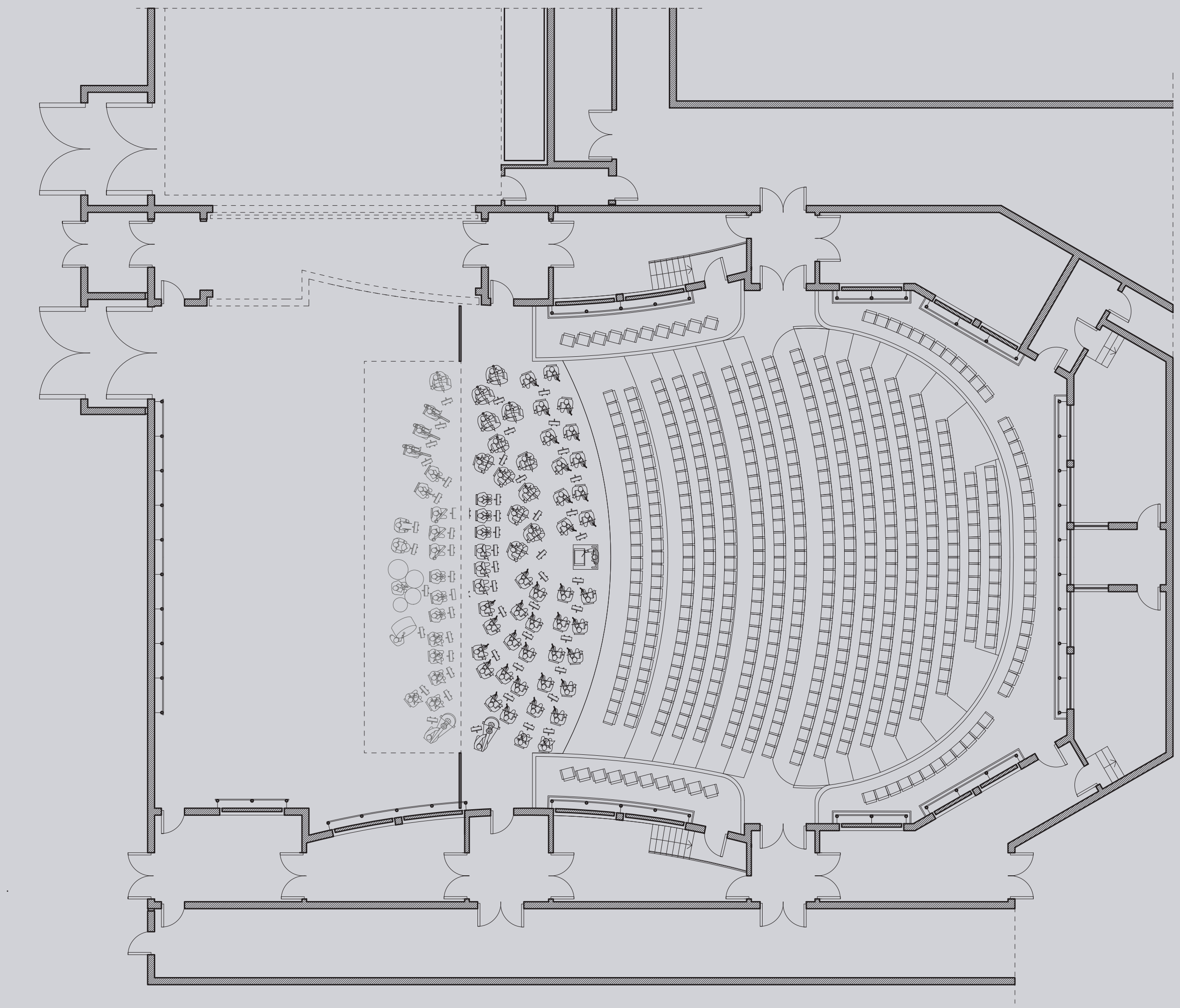


Fig 29. Orchestra pit plan – Option 2 (small stage, more seat count)

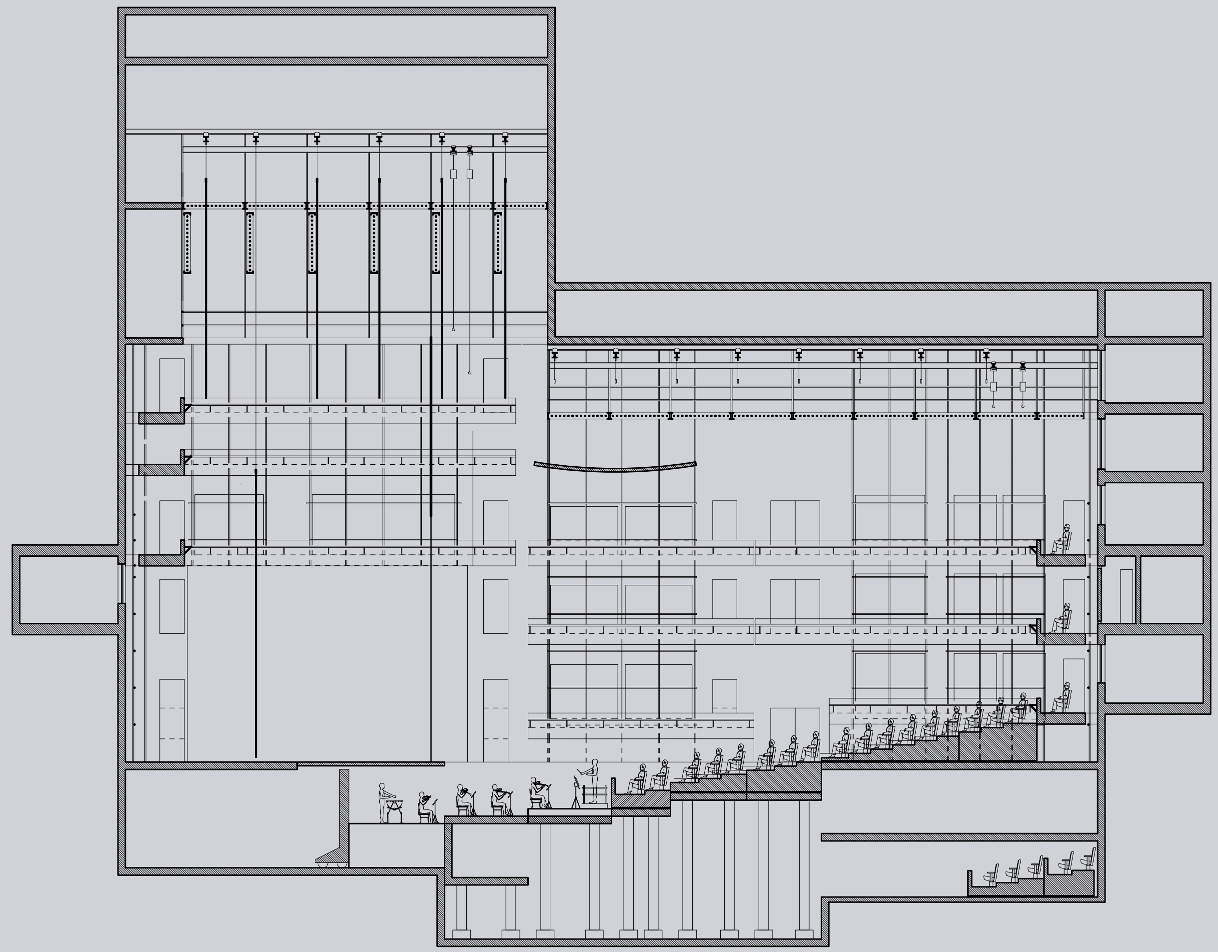


Fig 30. Orchestra pit section – Option 2 (small stage, more seat count)

7.4.1.5.2.2 Seating Wagons

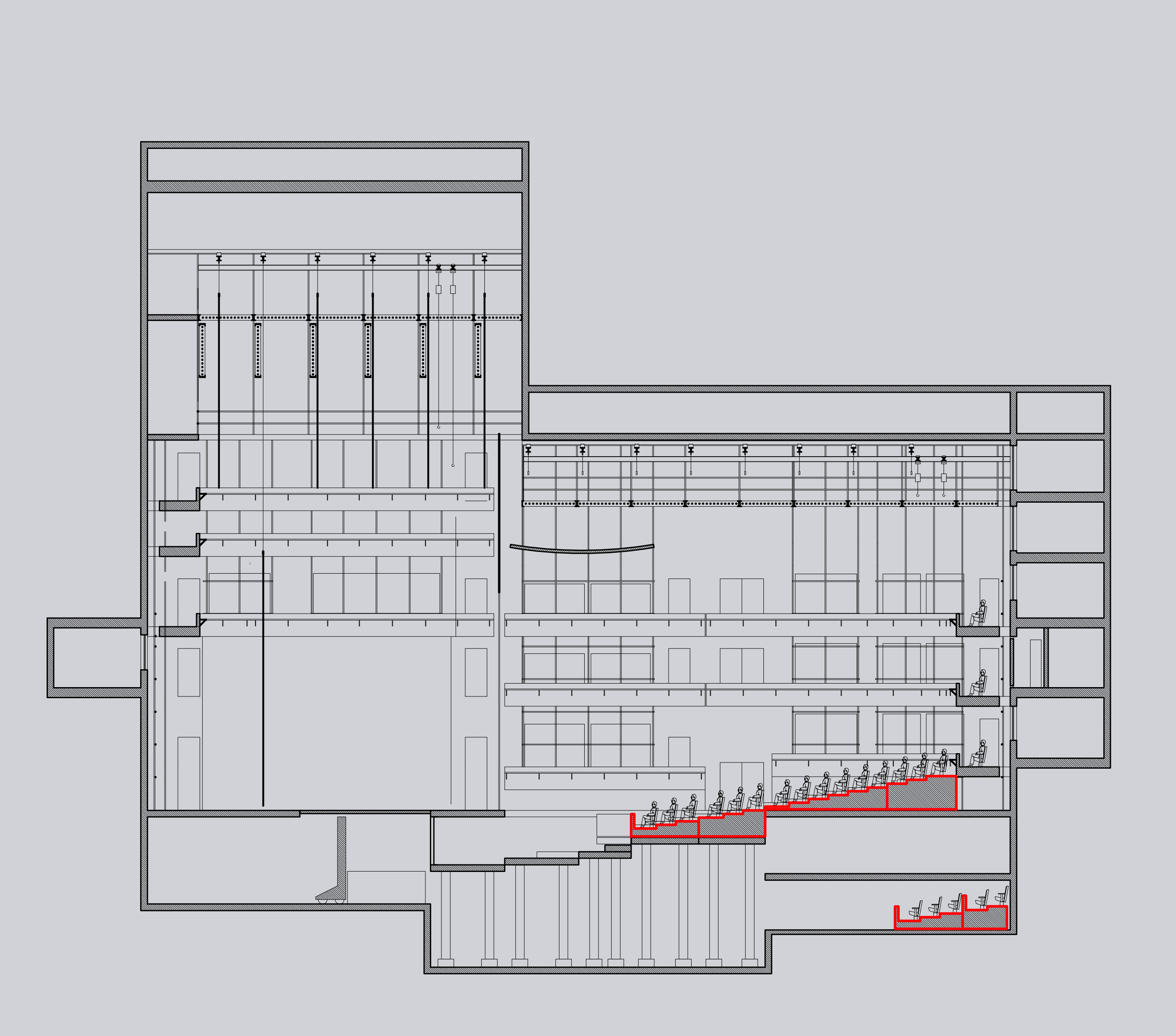


Fig 31. Seating Wagons

Seven groups of Seating Wagons will be designed to allow for an arrangement of a raked proscenium configuration (with and without orchestra pit). The wagons must be able to be moved around freely to create different experimental configurations. The Seating Wagons will be stored in dedicated spaces below the stage floor level of the Large Venue.

7.4.1.5.3 Windows

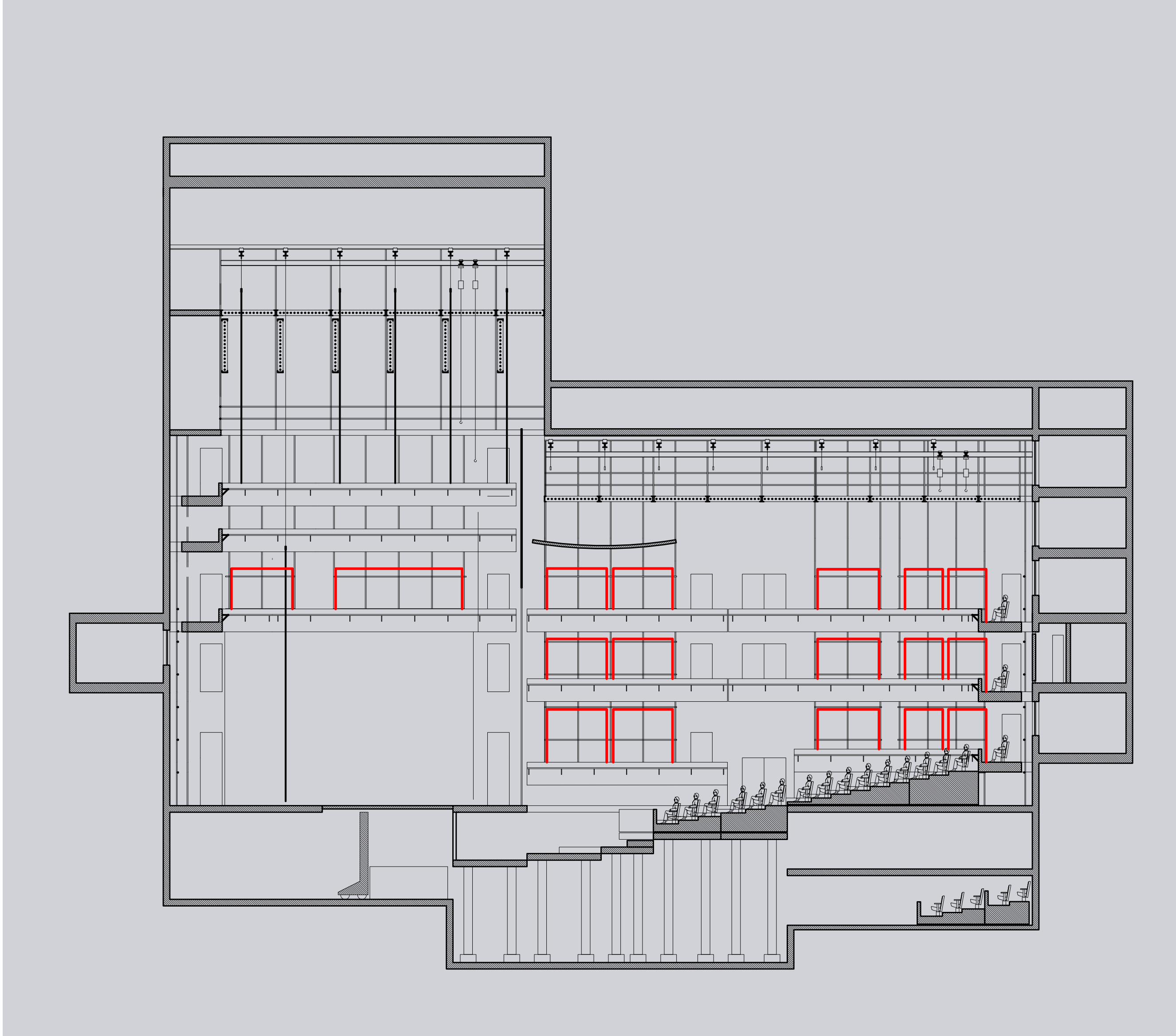


Fig 32. Windows on perimeter walls

The walls of the Large Venue will have openings (Windows) to the Side Circulation Areas that can be filled with props, actors, musicians or audience. Windows are arranged on all levels of the Large Venue and will cover no less than 80% of the total linear dimension of Windows shown on drawings in Appendix A. These openings will be 2.4m tall and will be no less than 1.5m wide. Openings can either be left open or be closed. Closure panels will be provided as well as safety railings, which can be used interchangeably as needed. The closure panels (which will be in up to three pieces per Window) will be able to be safely manipulated by two technical staff members.

7.4.1.5.4 Acoustic Banners and Curtains

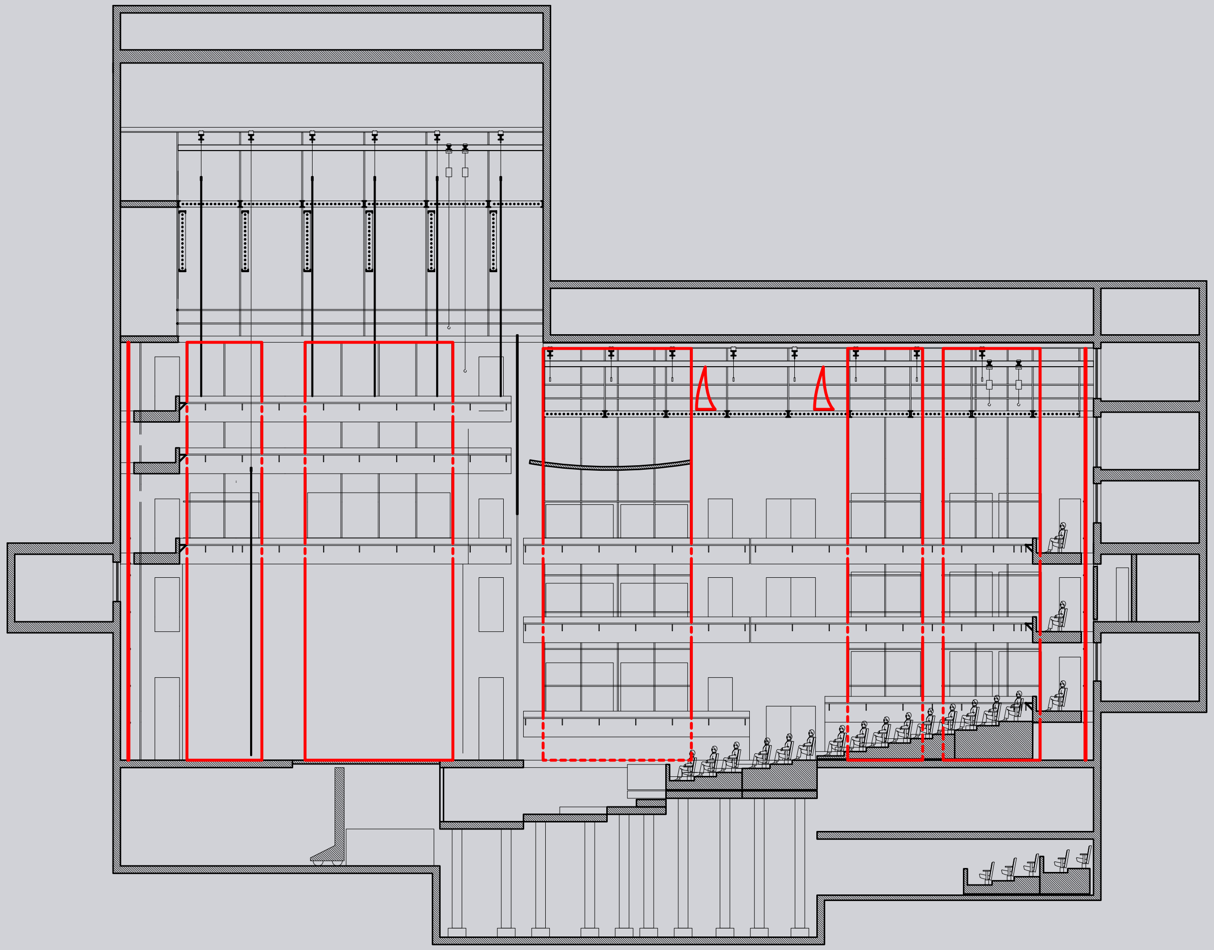


Fig 33. Acoustic Banners and Curtains – Longitudinal section

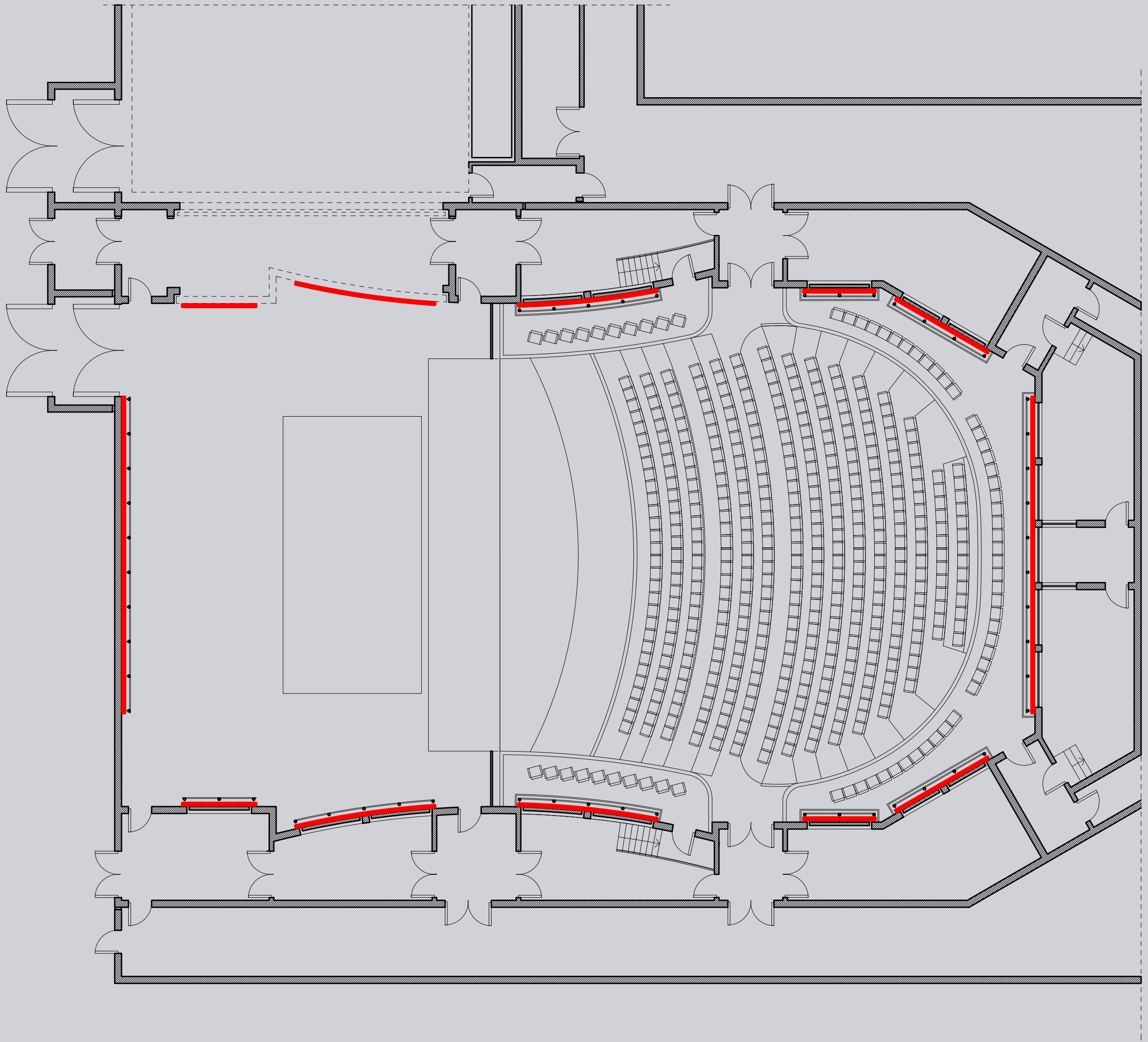


Fig 34. Acoustic Banners – Plan

Motorised sound-absorbing Acoustic Banners and Curtains will be used to control the reverberation and loudness of the Large Venue. Permanently mounted vertically moving banners will deploy in the space between the Windows and pipe grid and will store above the lower wire-rope grid level when not deployed. Two additional transverse Curtains above the wire-rope grid in the lower technical zone will provide additional absorption in the upper volume of the room. Additional demountable banners will be mountable on the lighting pipe on the underside of the lowest Moving Balcony. Multiple settings of deployment will allow to fine-tune the acoustics to various uses.

7.4.1.5.5 Tip-and-Fly Forestage Reflector

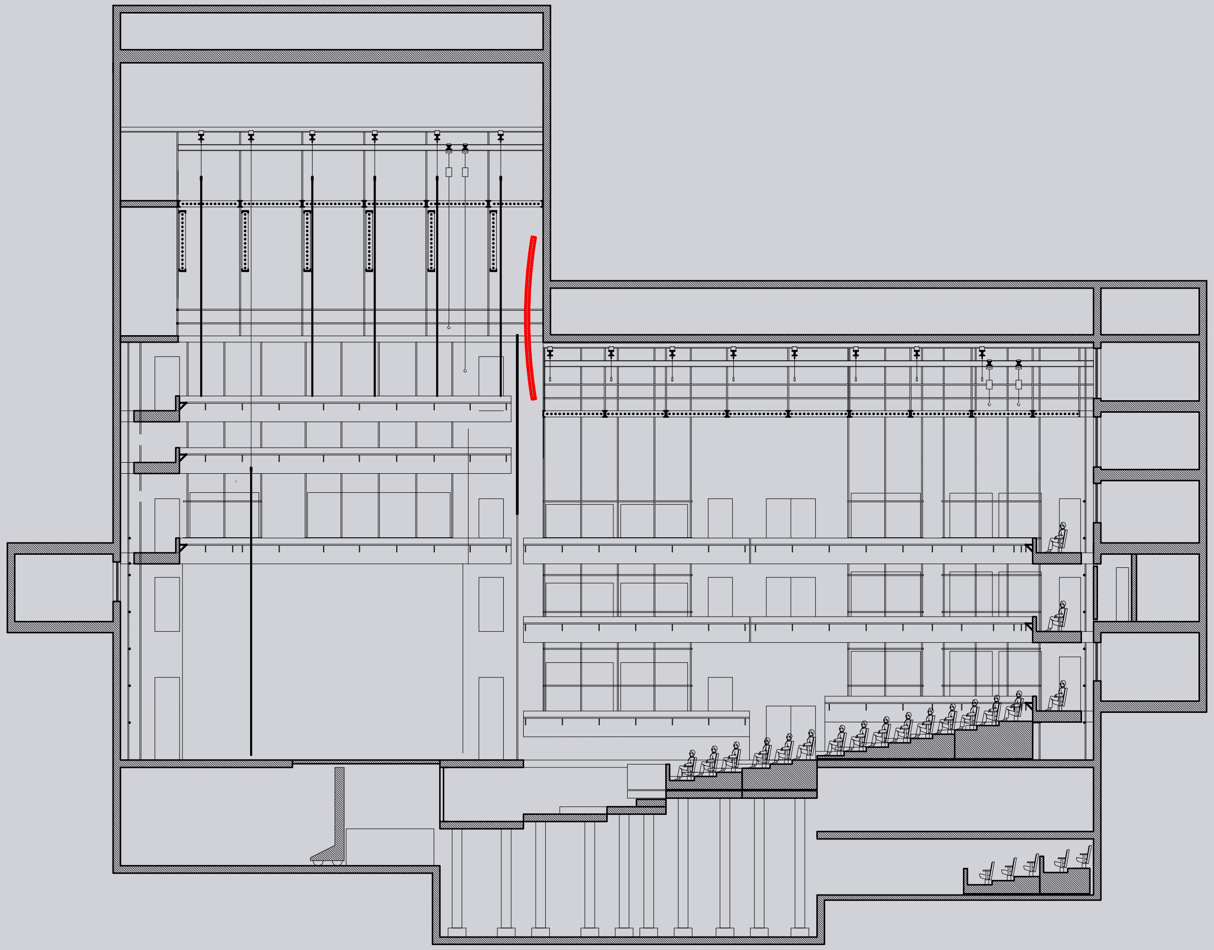


Fig 35. Tip-and-Fly Forestage Reflector – Stored

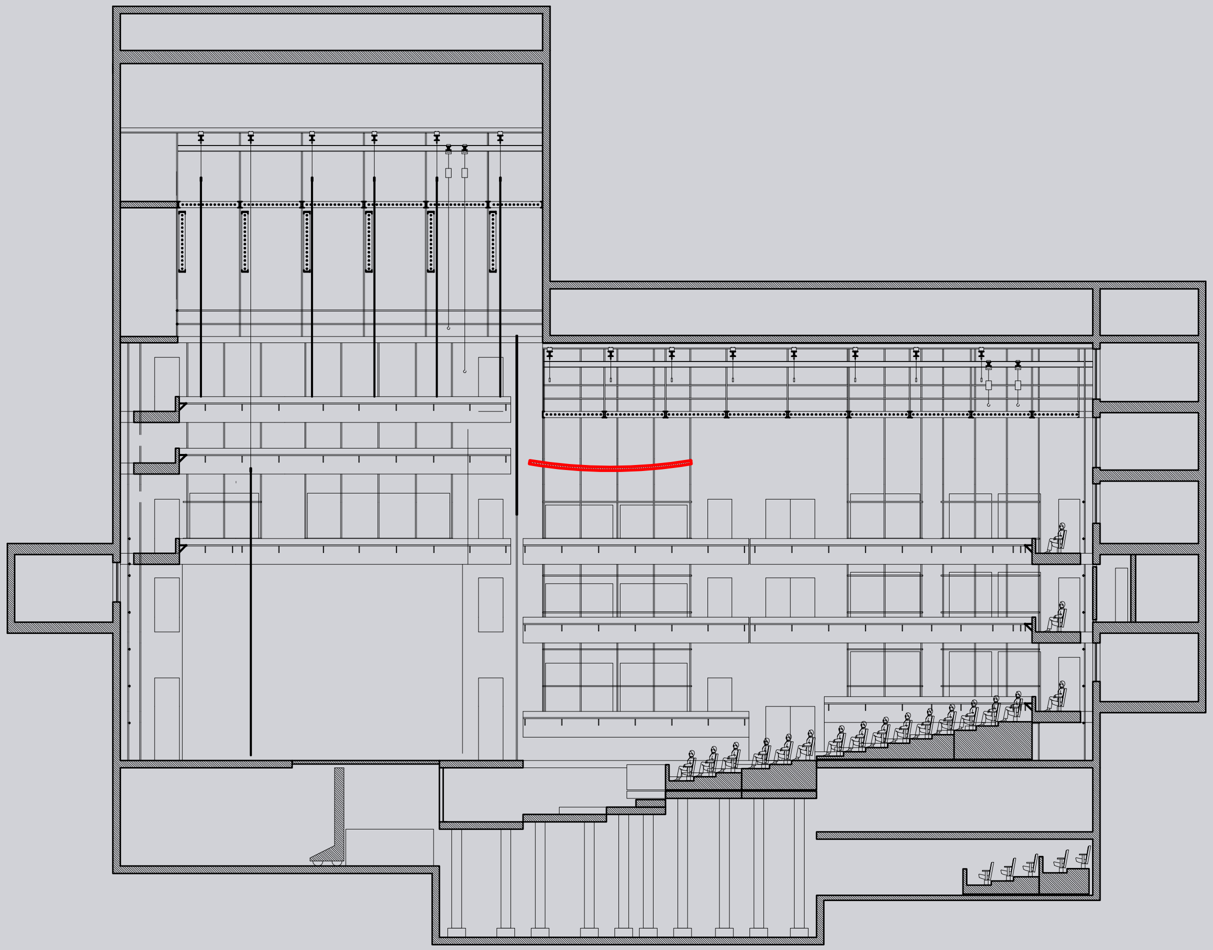


Fig 36. Tip-and-Fly Forestage Reflector – Deployed

A large acoustical reflector (Tip-and-Fly Forestage Reflector) will be deployed over the orchestra pit area in proscenium configurations (opera and theatre/dance) to shape the natural acoustics environment appropriately.

7.4.1.5.6 Tip-and-Fly Grid Ceiling

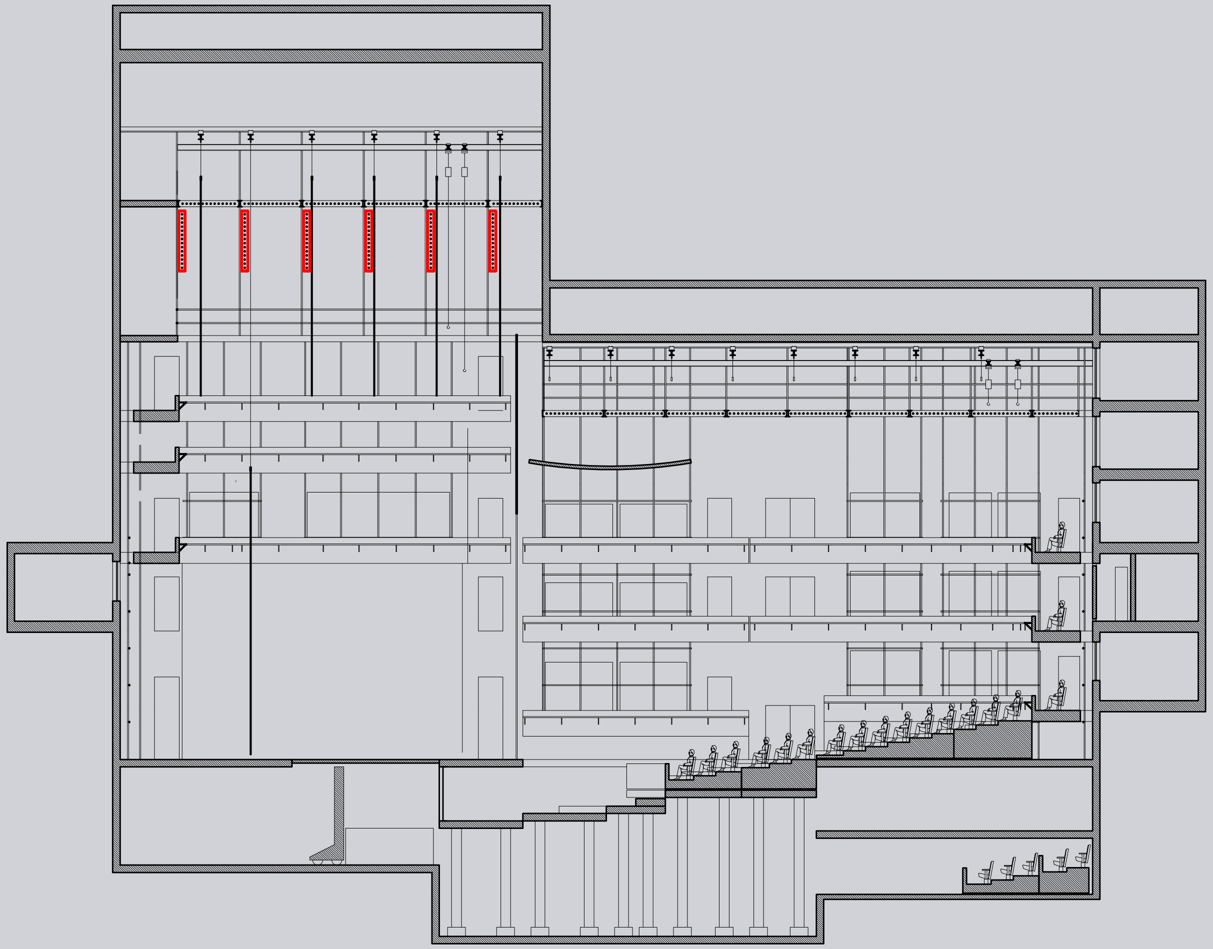


Fig 37. Tip-and-Fly Grid Ceiling– Stored

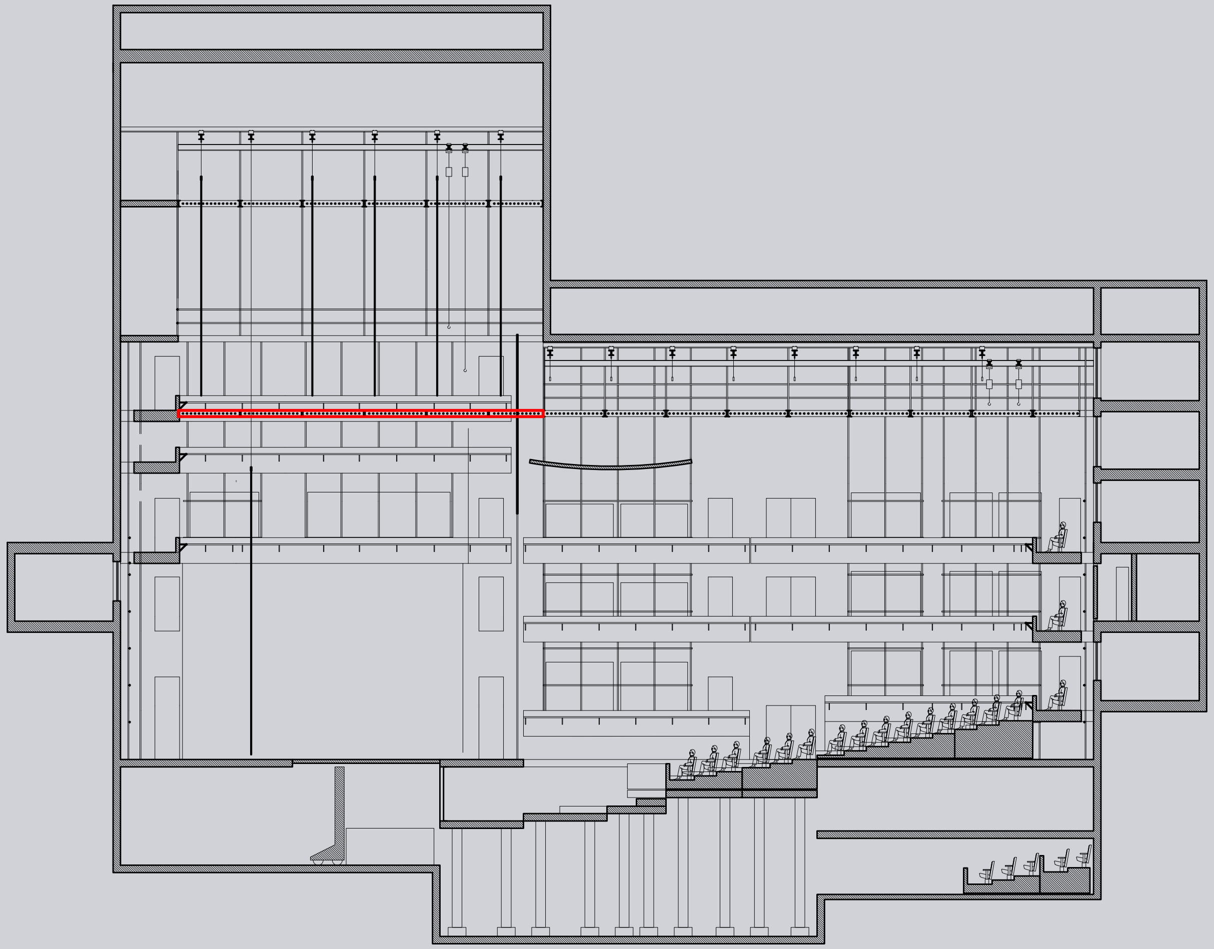


Fig 38. Tip-and-Fly Grid Ceiling – Deployed

A series of wire-grid ceiling elements will be installed which must be able to be lowered and tipped to create a continuous wire-grid surface in open configuration. This Tip-and-Fly Grid Ceiling will create a visually continuous ceiling surface with the wire-rope grid of the lower technical zone.

7.4.1.5.7 Removable Portal

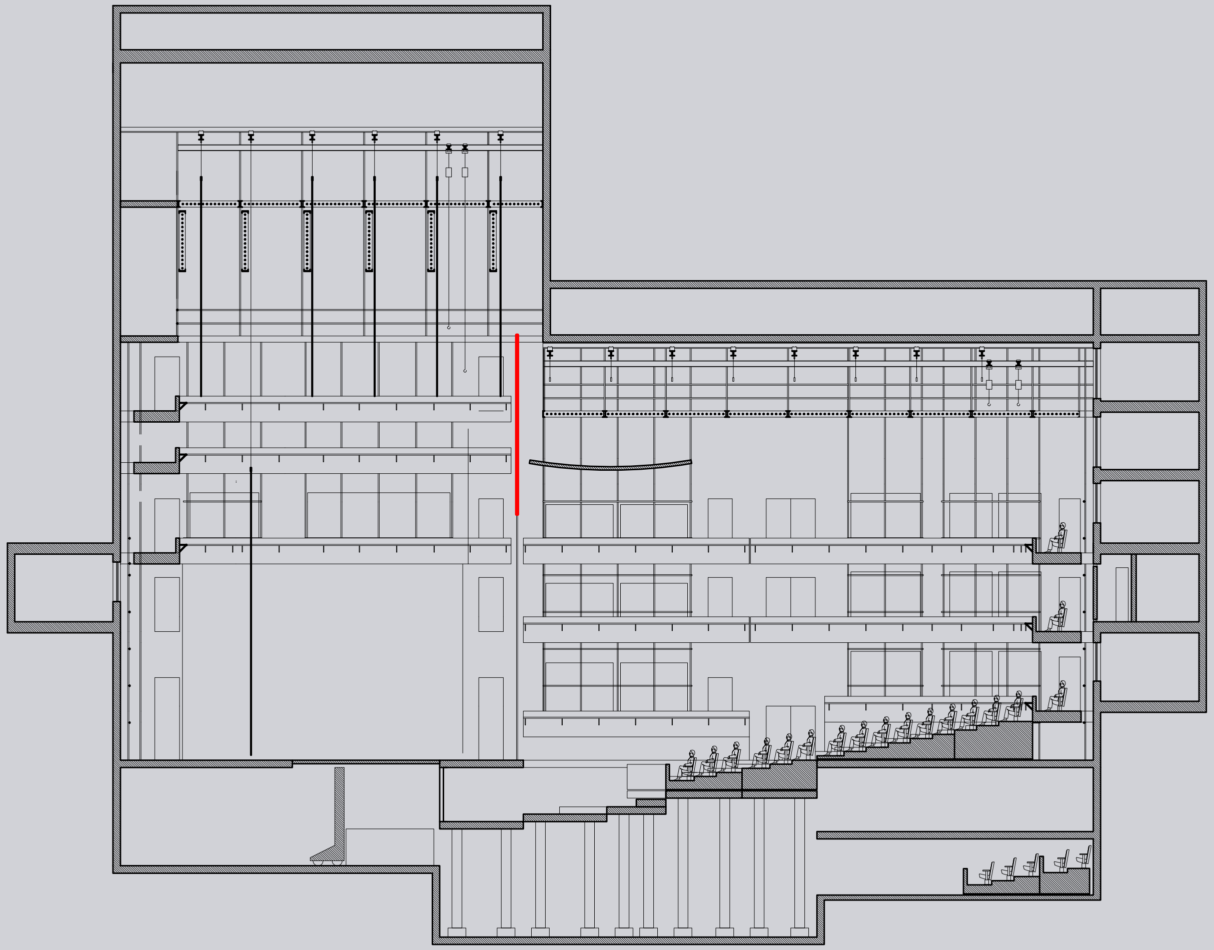


Fig 39. Removable portal – Longitudinal section

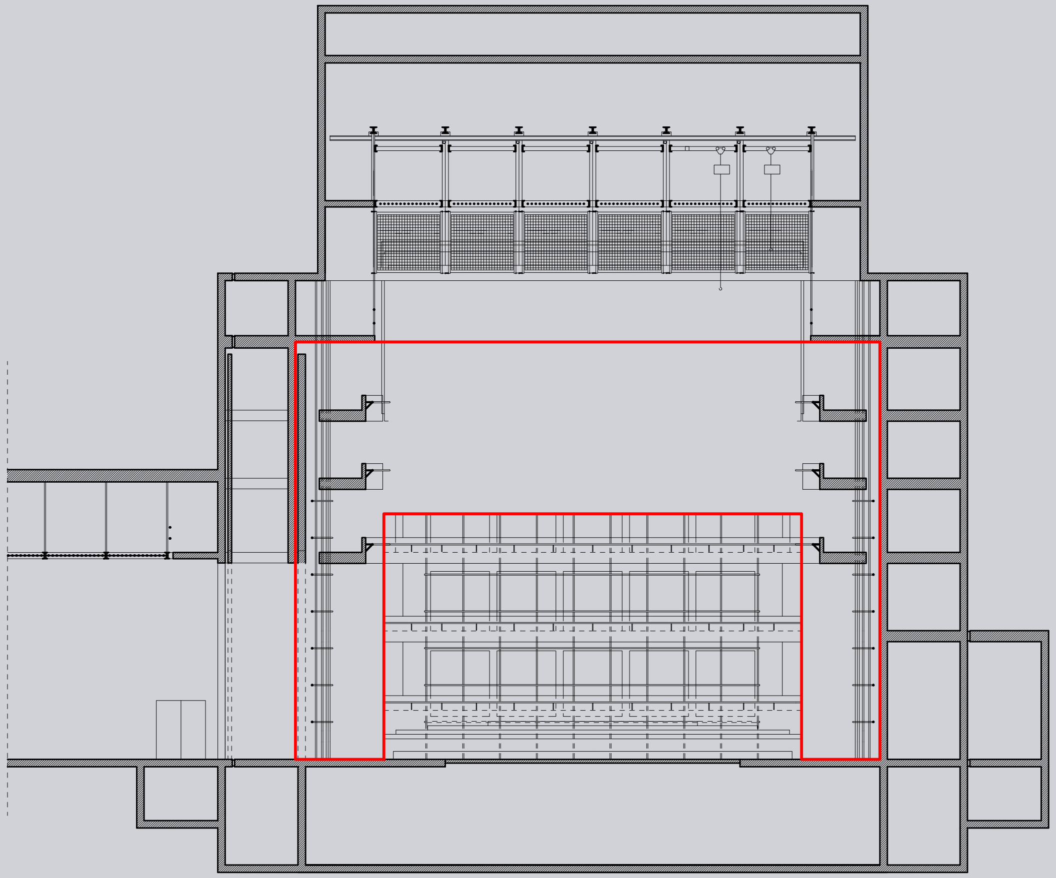


Fig 40. Removable portal – Cross section

A Removable Portal for the proscenium will be used as the primary element that separates the stage area from the audience area in proscenium theatre configurations. The portal will be stored in the upper technical zone when the Venue is used in open configurations. In small stage (largest seat count) proscenium configuration, the portal will be half deployed to mask architectural elements. In other stage configurations, the portal will be removed.

7.4.1.5.8 Trap Floor

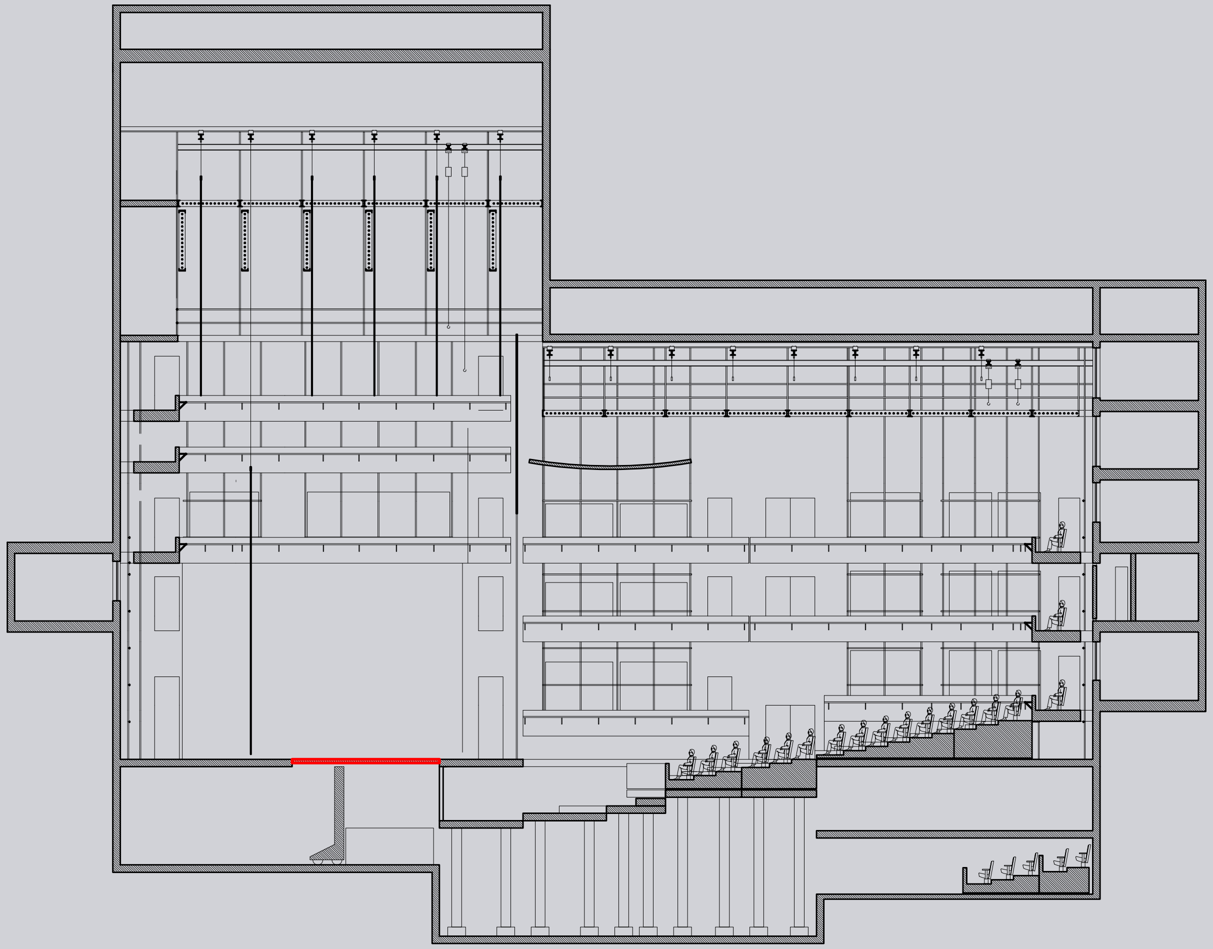


Fig 41. Trap Floor

A trapped area in the stage (positioned appropriately for proscenium configurations) will be designed to allow effects to be created where artists, scenery and props appear from below the stage. This Trap Floor will be above the trap room at basement level, and may be also used as an open connection to the trap room.

7.4.1.5.9 Demountable Wall Pipe Grids

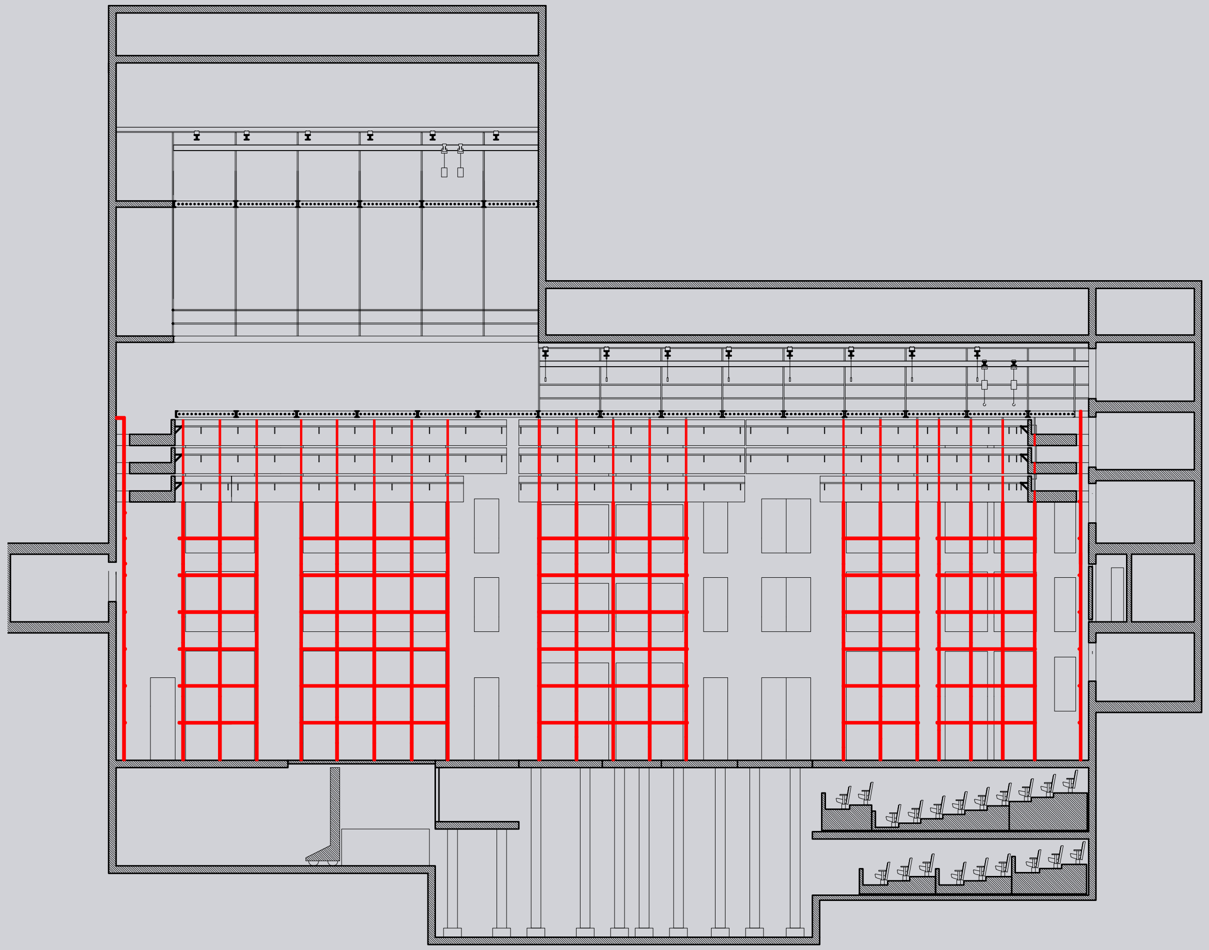


Fig 42. Demountable Wall Pipe Grids

A system of demountable pipes must be provided (Demountable Wall Pipe Grids). These pipes will be designed to be attached to wall surfaces to serve as accommodation for any production related scenery or technical equipment.

Individual pipes will be designed to be able to be quickly demounted or mounted as required for each performance.

7.4.1.5.10 Guillotine Doors

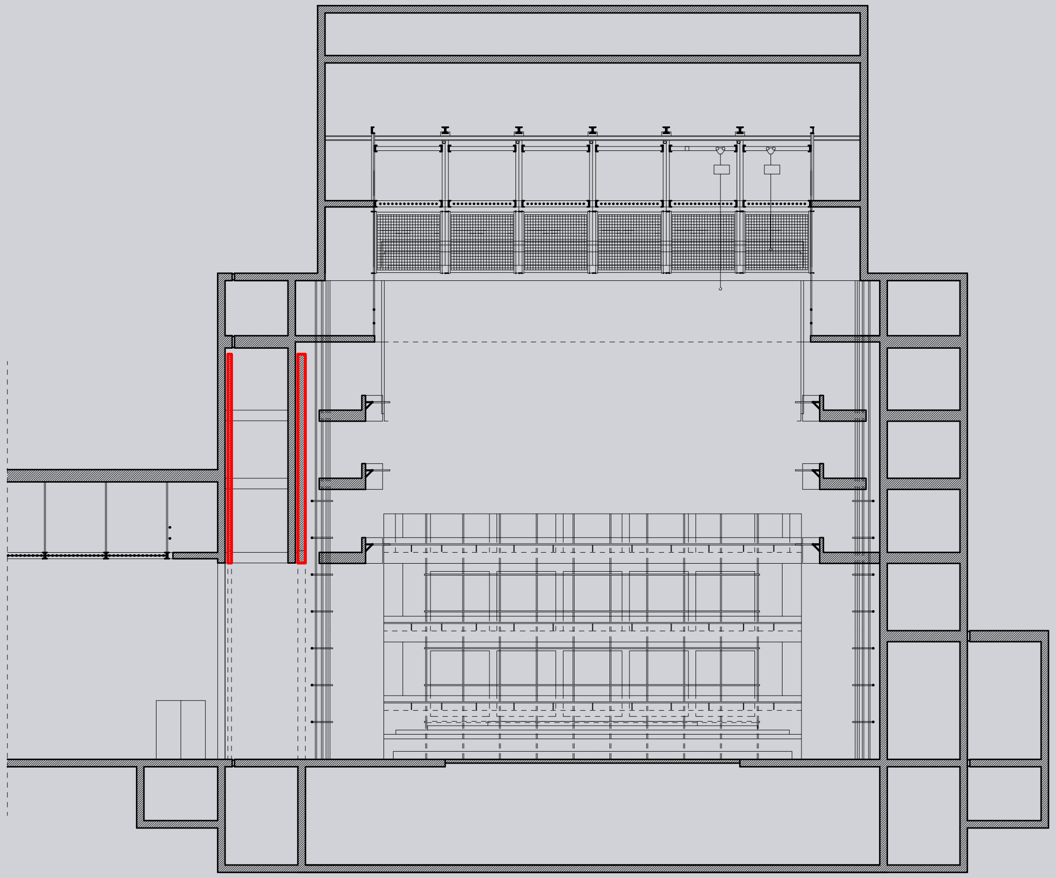


Fig 43. Guillotine Doors

A pair of massive vertically moving Guillotine Doors will be designed to create a direct connection between the Large Venue and Small Venue so that the Small Venue can be used as follows:

- part of a single performance area with the Large Venue
- side stage or off stage area for the Large Venue
- preparation area for the Large Venue

When closed, pneumatic perimeter seals will ensure that the Large and Small Venues are usable concurrently for different productions without acoustical disturbance. See also Appendix D.

Large Venue Configurations

7.4.1.6 Venue Configurations

A limited number of the many possible configurations of the Large Venue is shown on the following images. The configurations shown here are indicative of only some of the possible arrangements of the variable elements. See also Appendix A for detailed drawings and sections of the Large Venue in various configurations.

The intent of the Technical Concept is to leave as much freedom as possible to the artists to shape the space to accommodate to their needs. For this reason, the configurations shown here are only indicative of some of the possible arrangement of the variable elements.

In all configurations, the Architectural Design will ensure that the character of the room as described in Section 7.4.1.1 will be kept.

7.4.1.6.1 Open Configuration – Flat Floor

The flat floor open configuration for the Large Venue will be as follows:

- Moving Balconies: stored at top of the room
- Seating Wagons: stored under the theatre
- Lifts: at stage level, creating a complete flat floor space
- Tip-and-Fly Forestage Reflector: stored
- Tip-and-Fly Grid Ceiling: deployed
- Windows: closed
- Acoustic Banners and Curtains: deployed or stored
- Trap Floor: closed
- Removable Portal: stored
- Guillotine Doors: open or closed

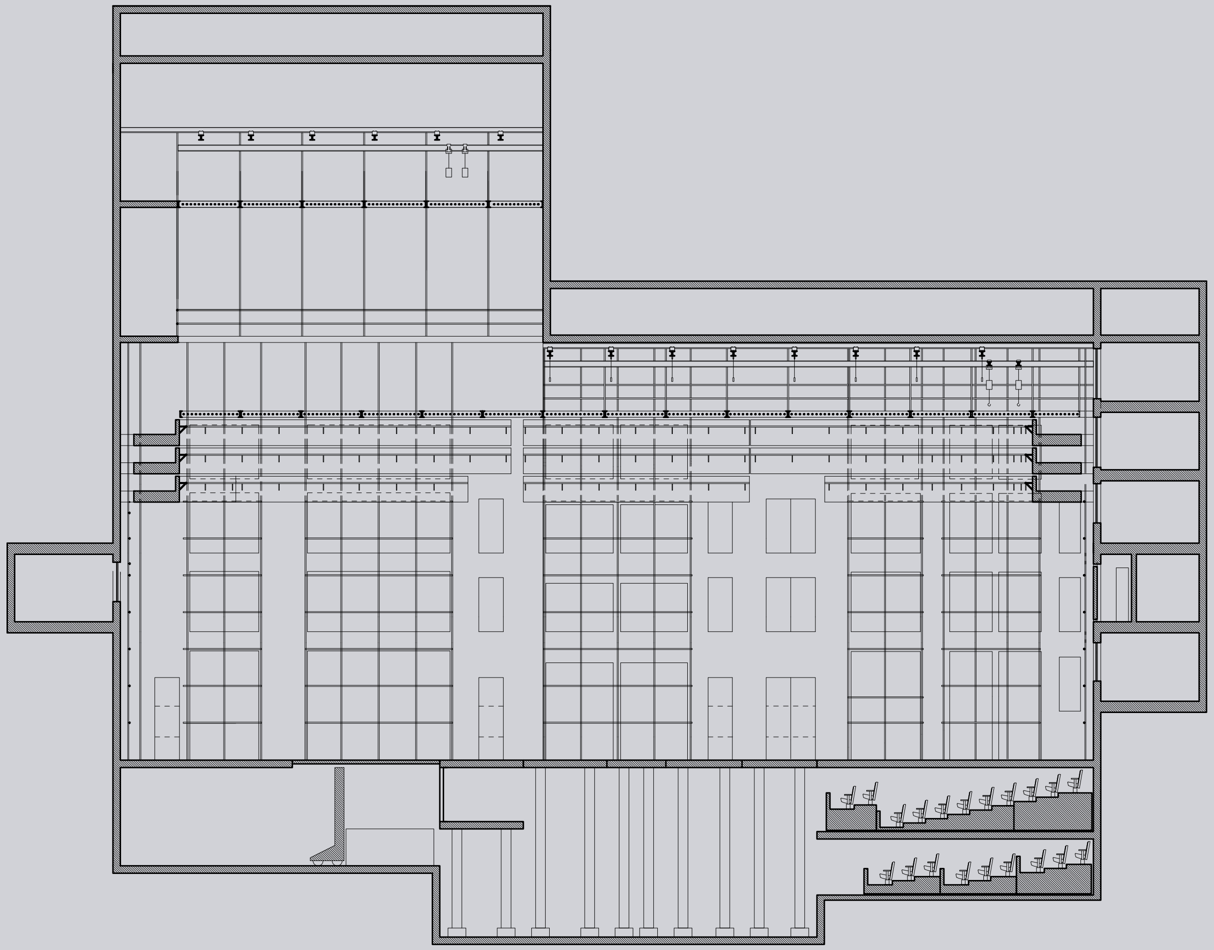


Fig 44. Open configuration – flat floor

7.4.1.6.2 Open Configuration – Surround

The surround open configuration for the Large Venue will be as follows:

- Moving Balconies: in position on all four sides
- Seating Wagons: stored under the theatre
- Lifts: at stage level, creating a complete flat floor space
- Tip-and-Fly Forestage Reflector: stored
- Tip-and-Fly Grid Ceiling: deployed
- Windows: closed
- Acoustic Banners and Curtains: deployed or stored
- Trap Floor: closed
- Removable Portal: stored
- Guillotine Doors: open or closed

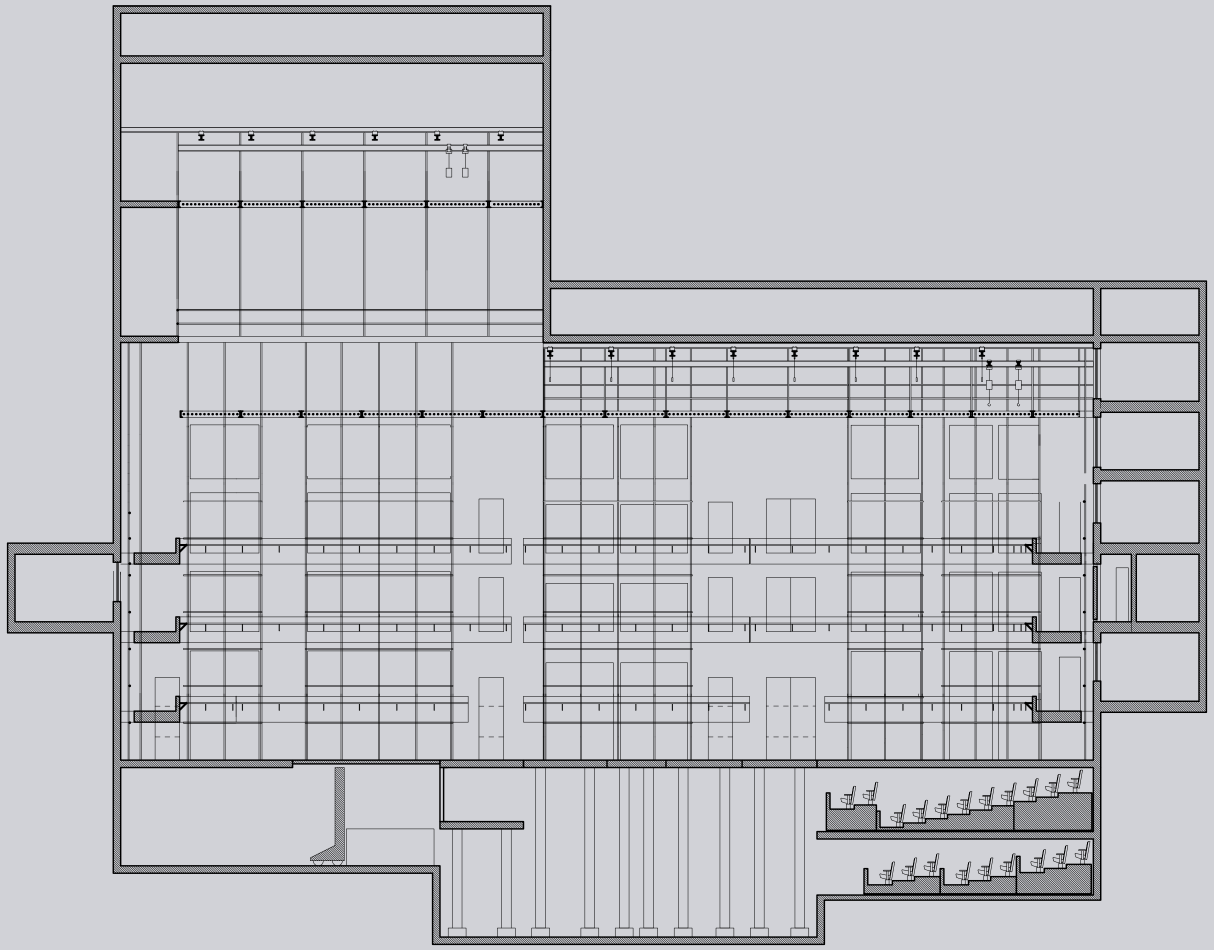


Fig 45. Open configuration – surround

7.4.1.6.3 Proscenium Configuration – Opera

The opera proscenium configuration for the Large Venue will be as follows:

- Moving Balconies: in position, creating a parterre and two balconies at audience end only; stored at stage end
- Seating Wagons: in position, creating a raked seating area and an orchestra pit
- Lifts: at multiple levels, allowing to create an orchestra pit, seating rake and elevated stage area
- Tip-and-Fly Forestage Reflector: deployed
- Tip-and-Fly Grid Ceiling: stored
- Windows: closed
- Acoustic Banners and Curtains: deployed or stored
- Trap Floor: closed/open as needed
- Removable Portal: deployed
- Guillotine Doors: open or closed

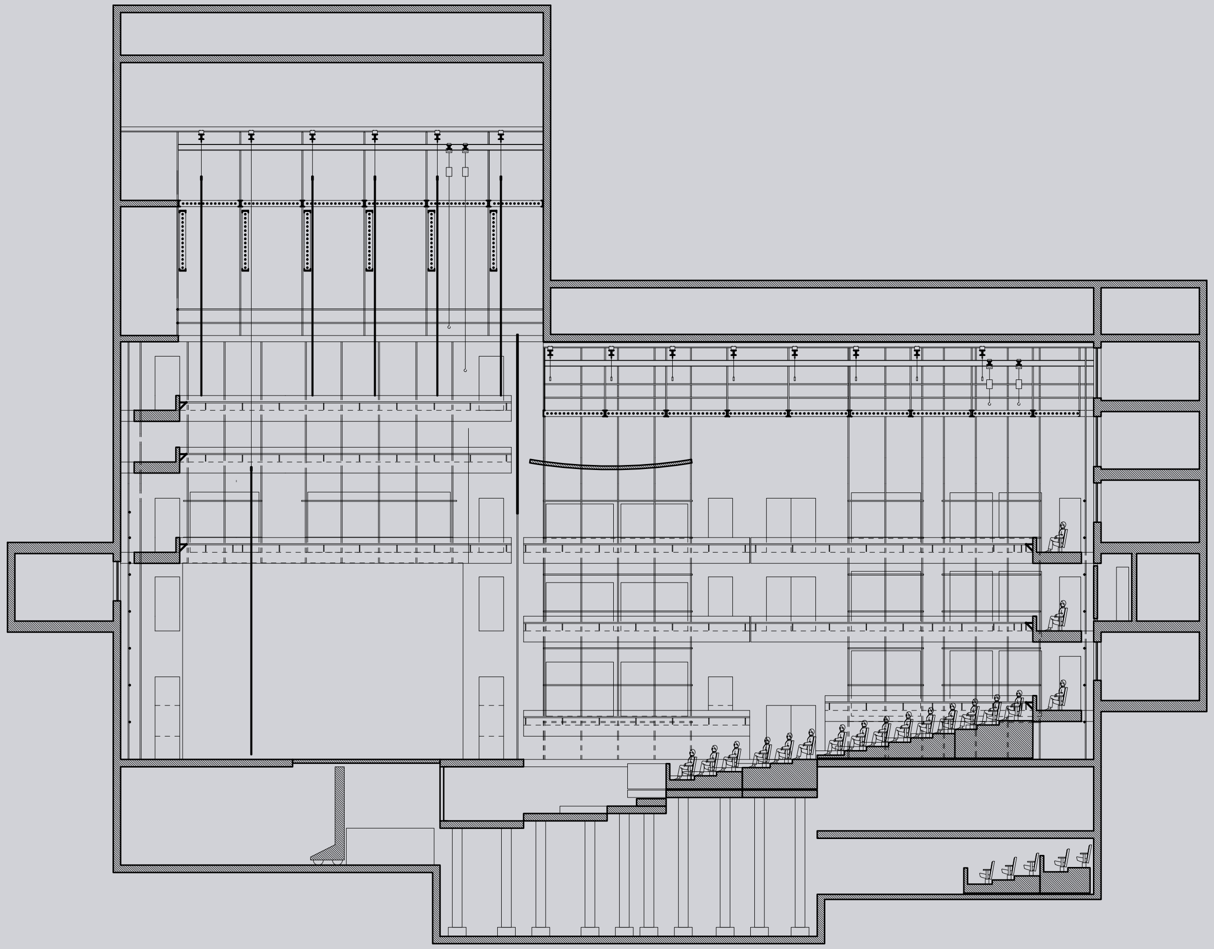


Fig 46. Proscenium configuration – opera

7.4.1.6.4 Proscenium Configuration – Theatre and Dance

The theatre and dance proscenium configuration for the Large Venue will be as follows:

- Moving Balconies: in position, creating a parterre and two balconies at audience end only; stored at stage end
- Seating Wagons: in position, creating a raked seating area (no orchestra pit)
- Lifts: at multiple levels, allowing to create an orchestra pit, seating rake and elevated stage area
- Tip-and-Fly Forestage Reflector: deployed
- Tip-and-Fly Grid Ceiling: stored
- Windows: closed
- Acoustic Banners and Curtains: deployed or stored
- Trap Floor: closed/open as needed
- Removable Portal: deployed
- Guillotine Doors: open or closed

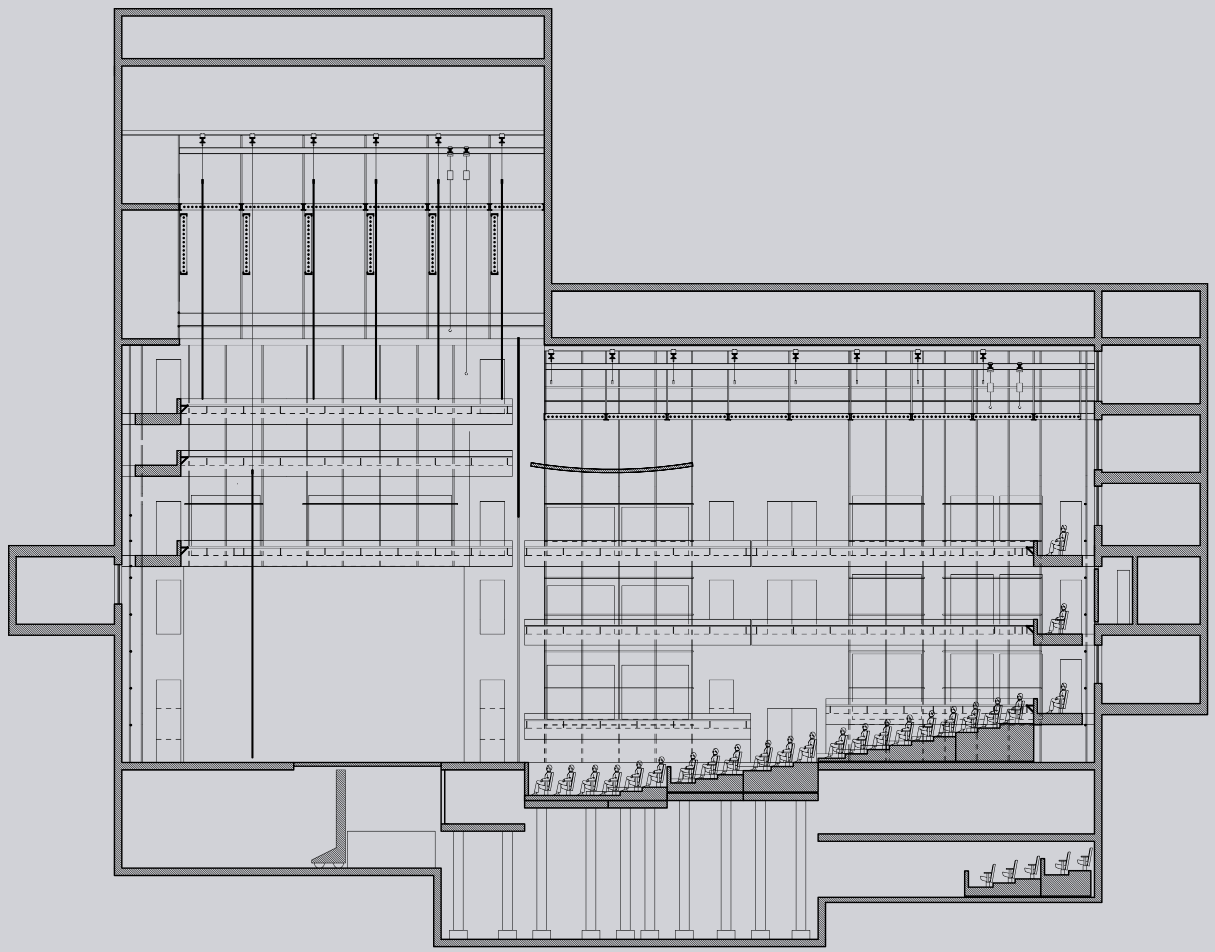


Fig 47. Proscenium configuration – theatre and dance

Large Venue Acoustics Requirements

7.4.1.7 Acoustics Requirements

The Large Venue must be designed to have a world-class level of acoustics.

To achieve this world-class expectation, background noise must be kept to an absolute minimum — N-1 requirement. All building systems serving the Large Venue including mechanical, electrical, plumbing, lighting and fire/life safety systems must be at or below this level. The requirement to achieve this N-1 requirement and how it is achieved, is discussed in Section 7.6.2.

The Large Venue must meet world-class quality expectations for room acoustics for a variety of different performance types. To achieve this, the basic architecture of the room will be designed to support sound propagation throughout the hall. The finishes must meet stringent acoustical requirements as outlined in this section. Required adjustable acoustical systems are described in Section 7.4.1.7.1.8.

The acoustics requirements for the Large Venue fall under the following categories:

7.4.1.7.1	***Materials and Finishes***
7.4.1.7.1.1	*Floors*
7.4.1.7.1.2	*Interior Walls*
7.4.1.7.1.3	*Windows*
7.4.1.7.1.4	*Outer Walls*
7.4.1.7.1.5	*Ceiling*
7.4.1.7.1.6	*Tip-and-Fly Forestage Reflector*
7.4.1.7.1.7	*Seating*
7.4.1.7.1.8	*Adjustable Acoustic Systems*
7.4.1.7.1.9	*Control Rooms*
7.4.1.7.1.10	*Public Sound- and Light-Lock Vestibules*
7.4.1.7.1.11	*Backstage/Technical Sound- and Light-Lock Vestibules*
7.4.1.7.1.12	*General Notes on Large Venue Finishes*
7.4.1.7.2	***Background Noise***
7.4.1.7.3	***Sound and Vibration Isolation***
7.4.1.7.3.1	*Walls*
7.4.1.7.3.2	*Roof*
7.4.1.7.3.3	*Acoustical Joints*

7.4.1.7.1 Materials and Finishes

The careful selection of both substrate and finish materials is closely tied to the room acoustics performance of the Large Venue. A variety of acoustically appropriate options for each surface in the Large Venue is described below. Selection of materials, assembly and finish treatment must be reviewed and approved for compliance with the functional and acoustic requirements in this section.

Massive wall and ceiling materials will be provided to preserve low frequency sound and provide warmth of tone. Warmth is a characteristic closely related to the strength of low frequency sound, which is an important characteristic for the Large Venue. A variety of acoustically appropriate options for each surface in the Large Venue is described below. Lightweight or resonating materials that could potentially ring, rattle or otherwise make noise must be avoided.

7.4.1.7.1.1 Floors

The floor will be 26mm tongue and groove wood boards directly adhered to plywood substrate (or equivalent) with a minimum surface density of 35kg/m^2 on top of 38mm sleepers with their top surface

100mm above the concrete slab. Seating Wagons and the floors of the Moving Balconies will be finished with the same 26mm tongue and groove wood boards adhered to a substrate to achieve similar minimum surface density and designed to avoid footfall noise.

Absolutely no carpeting or other sound-absorbing floor finish is acceptable anywhere within the Large Venue.

7.4.1.7.1.2 Interior Walls

The inner wall will be made of concrete or masonry of a minimum of 150mm thickness. All surfaces will be hard and sound reflective. It is necessary that a portion of the surfaces feature various scales of texturing, or roughness, in order to provide appropriate acoustical diffusion, but without surface porosity. Polished glass, polished stone, polished concrete, glazed brick and large areas of smooth wood panelling or sheet metal without surface dimension/differentiation must be avoided.

Some options for acoustically appropriate wall finishes include the following:

- texture applied directly to concrete or masonry
- sealed/painted split-face concrete block
- sealed rough-surface brick bonded directly to concrete or masonry
- concrete block sealed with a skim-coat of plaster with some wood detailing, provided the wood is directly bonded to the wall substrate without airspaces

The wall texture and materiality will be aesthetically uniform across the entire wall surface of the Large Venue when seen in open configurations.

The wall surfaces of the upper volume of the Large Venue (from 17m to underside of the ceiling) will be covered with 50mm thick sound absorbing material.

7.4.1.7.1.3 Windows

A series of openings in the interior walls of the Large Venue (Windows) will allow direct connections to the Side Circulation Areas behind. These spaces can function as technical control areas, seating areas for audience, performer spaces or access ways as desired.

Closure panels for these openings will have a minimum acoustical mass of 35kg/m^2.[6] A full perimeter sound seal will be provided between the panels and the window frame, as well as between any adjacent panels to ensure acoustical separation to the Venue when the doors are closed. A minimum 0.75m by 0.75m view port will be provided at each closure to allow projection from these spaces into the room when needed. This port will be covered when not used with a panel that will create the appearance of a continuous architectural surface (from inside the Large Venue) with a minimum mass of 12kg/m^2, matching the appearance of the rest of the closure. Glass for all view ports will be tempered, low iron, Q2 quality float glass with a minimum thickness of 18mm. All panels will be secured when in position such that there will be no movement and no noise. Removal of the panels will not require tools or special equipment and feature captive hardware.

Removable safety railings will be designed to avoid ringing and rattling.

7.4.1.7.1.4 Outer Walls

The outer wall will be made of concrete or masonry of

6 When closed, the cumulative acoustical isolation must be designed to achieve N-1 level within the Large Venue

The Large Venue is to have a world-class level of acoustics. To achieve this world-class expectation, background noise must be kept to an absolute minimum.

a minimum of 300mm thickness.[7] This wall combined with the interior walls form the acoustical envelope of the Large Venue and will protect the space from outside noise.

7.4.1.7.1.5 Ceiling

The ceiling of the Large Venue will be made of concrete, supported from the lower cord of the roof structure. The ceiling over the upper technical zone will be covered with 50mm thick sound absorbing panels.

The ceiling over the lower technical zone will be painted concrete (hard and sound reflective) and will not be covered with sound absorbing treatment.

7.4.1.7.1.6 Tip-and-Fly Forestage Reflector

The Tip-and-Fly Forestage Reflector must be constructed of sufficiently massive and dense materials to reflect sound effectively at all frequencies. Surface density of each continuous horizontal segment must be 50kg/m² and composed of solid or built-up laminated wood, or approved alternate material of equal surface density. The exposed canopy framing must not contain exposed lightweight steel stud framing or channels.

The finish surface of the reflector may be paint, or wood. Any applied veneer finish must be bonded completely over 100% of the canopy surface. Air pockets, voids, or any hairline delamination of materials are not acceptable.

7.4.1.7.1.7 Seating

Upholstered seating for fixed seats must be designed with the minimum absorption coefficients (unoccupied) as follows:

	Octave Band Centre Frequency (Hz)					
	125	250	500	1000	2000	4000
Absorption Coefficient Fixed Seats (unoccupied)	0.4	0.6	0.7	0.8	0.8	0.7

7.4.1.7.1.8 Adjustable Acoustic Systems

A series of motorised Acoustic Banners surround the hall (for fixed banner locations see Appendix A) and are utilised to adjust the acoustic environment of the hall. The banners will be made of inherently flame retardant velour or wool serge. The functionality of this system is described further in Section 7.4.1.10.7.

The banners (fixed and demountable together) will cover a minimum of 60% of the total wall surface of the Venue below 17m.

Each banner unit will be composed two layers of cloth, separated by an airspace of no less than 100mm. Banner material will have minimum absorption coefficients as follows:

	Octave Band Centre Frequency (Hz)					
	125	250	500	1000	2000	4000
Absorption Coefficient Acoustical Banners (per unit of two layers)	0.3	0.6	0.9	0.9	0.9	0.9

A minimum of two full-height transverse Curtains above the Tip-and-Fly Grid Ceiling in the lower technical zone will provide additional absorption in the upper volume of the room. Each Curtain will be composed of two layers of minimum 600g/m² inherently flame retardant cotton velour or wool serge both layers 100% fullness.

7.4.1.7.1.9 Control Rooms

Control rooms will have sound-absorbing treatments. Fabric-covered glass-fibre on walls, acoustic ceiling tile or perforated drywall on ceilings and carpeted floor will be provided. Dark colours will be used.

Control room windows will be double glazed (12mm laminated glass + 10mm laminated glass) with minimum 150mm airspace between panes. An operable sound isolating window is required for sound control rooms.

Glass for all followspot and projection booth windows will be tempered, low iron, Q2 quality float glass with a minimum thickness of 18mm set at an angle to reduce glare and reflections.

7 It is assumed that any outer wall that is a façade wall will also have a resilient mass layer.

7.4.1.7.1.10 Public Sound- and Light-Lock Vestibules

Sound- and light-lock vestibules are essential for all entrances to and exits from Performance and Rehearsal Spaces. These vestibules provide an appropriate sound (and light) isolation buffer between the performance/rehearsal venue and its surrounding areas.

A sound- and light-lock vestibule must consist of two sets of doors with at least 2m separation, forming a small vestibule. All walls forming a sound- and light-lock vestibule will extend from floor slab to ceiling slab, and must be sealed airtight to all surrounding construction. Sound- and light-lock vestibules will incorporate 65mm thick solid wood doors fitted properly in grout-filled frames with full perimeter sound gaskets. There will be no overlap between doors so that either door can be opened at all times.

Where a sound- and light-lock vestibule penetrates a fire-rated wall to the Large or Small Venues, it will be designed so that the fire barrier incorporates the outer door of the vestibule. Any required panic hardware will be located on the outer door. The inner door will have no operable latch, panic hardware or any other noise generating mechanism; just a push plate/pull handle and closer that are co-ordinated with sound seals. All latches and panic hardware must be kept out of performance space.

The surfaces within the sound- and light-lock vestibule must be sound-absorbing and also light absorptive. Recommended characteristics include the following:

- a dark colour acoustical tile ceiling
- a sound absorptive (yet durable) finish on the walls
- carpeting on the floor

7.4.1.7.1.11 Backstage/Technical Sound- and Light-Lock Vestibules

Backstage sound- and light-lock vestibules will have sound-absorbing treatments but will consider the functional use of these spaces. Acoustic materials on the walls will be protected from accidental damage as large objects are passed through these areas. Perforated metal-covered glass fibre on walls, suspended lay-in acoustical tile on ceilings and hard and durable floor surface are typical. Dark colours will be provided.

7.4.1.7.1.12 General Notes on Large Venue Finishes

Significant glass surfaces are not appropriate for the elevated acoustics requirements of the Large Venue; Smooth glass surfaces will colour the sound in an undesirable way and must be avoided, except for control room windows. Balcony front railings must not be made of glass in the Large Venue.

7.4.1.7.2 Background Noise

Quiet is defined as the absence of noise. Quiet in the Large Venue is essential for excellent acoustics. Quiet in the performance environment creates a special atmosphere, one in which performers and audiences are bound by a common focus: the performance. Quiet translates into an air of expectancy and an aura of quality for both audience and performers.

Noise is defined as unwanted sound. During a performance, any sound not produced by the performer is, therefore, noise. Unless background noise is reduced to appropriate levels, all of the other design work and money spent to achieve good acoustics will be in vain. Very low background noise levels are vital for the following:

- maximizing the clarity and richness of the sound
- providing ease of concentration and communication among performers
- maximizing the audible dynamic range
- maximizing the length and apparent loudness of the reverberant sound as it dies away

The background noise level must meet the most stringent criteria: the threshold of hearing (silence), which is designated here as N-1. The permissible noise levels in dB inside the hall which must be designed to are listed in the table below.

	Octave Band Centre Frequency (Hz)								
	31	63	125	250	500	1K	2K	4K	8K
N-1	57	36	22	13	8	5	3	3	3

7.4.1.7.3 Sound and Vibration Isolation

The following will be used for sound and vibration isolation.

7.4.1.7.3.1 Walls

A double wall construction is recommended around the Venue to isolate it from exterior noises.

Walls (in areas without internal circulation spaces around the Large Venue) will include stone (or other massive) cladding resiliently attached to the concrete outer wall (minimum thickness of 300mm) with a resiliently mounted drywall partition on the inside (minimum of two layers of drywall and insulation in the airspace) or a construction with an equivalent acoustical performance.

7.4.1.7.3.2 Roof

The roof of the Large Venue will be made of two layers of concrete, supported from the upper and lower cord of the roof structure (creating an interstitial attic space between these two layers of concrete). The upper slab will have a minimum thickness of 200mm which will carry a green roof to attenuate rain noise. The lower slab will have a minimum thickness of 150mm. Any penetrations through the lower slab will be sealed to prevent sound leakage. Alternative constructions with equivalent acoustical performance will be acceptable subject to review.

7.4.1.7.3.3 Acoustical Joints

An acoustical isolation joint will be provided around the Large Venue so as to protect the Venue from vibration sources. It is recommended that an additional acoustical isolation joint be provided between the loading dock and the rest of the building. See Figures 48–50 for minimal requirements.

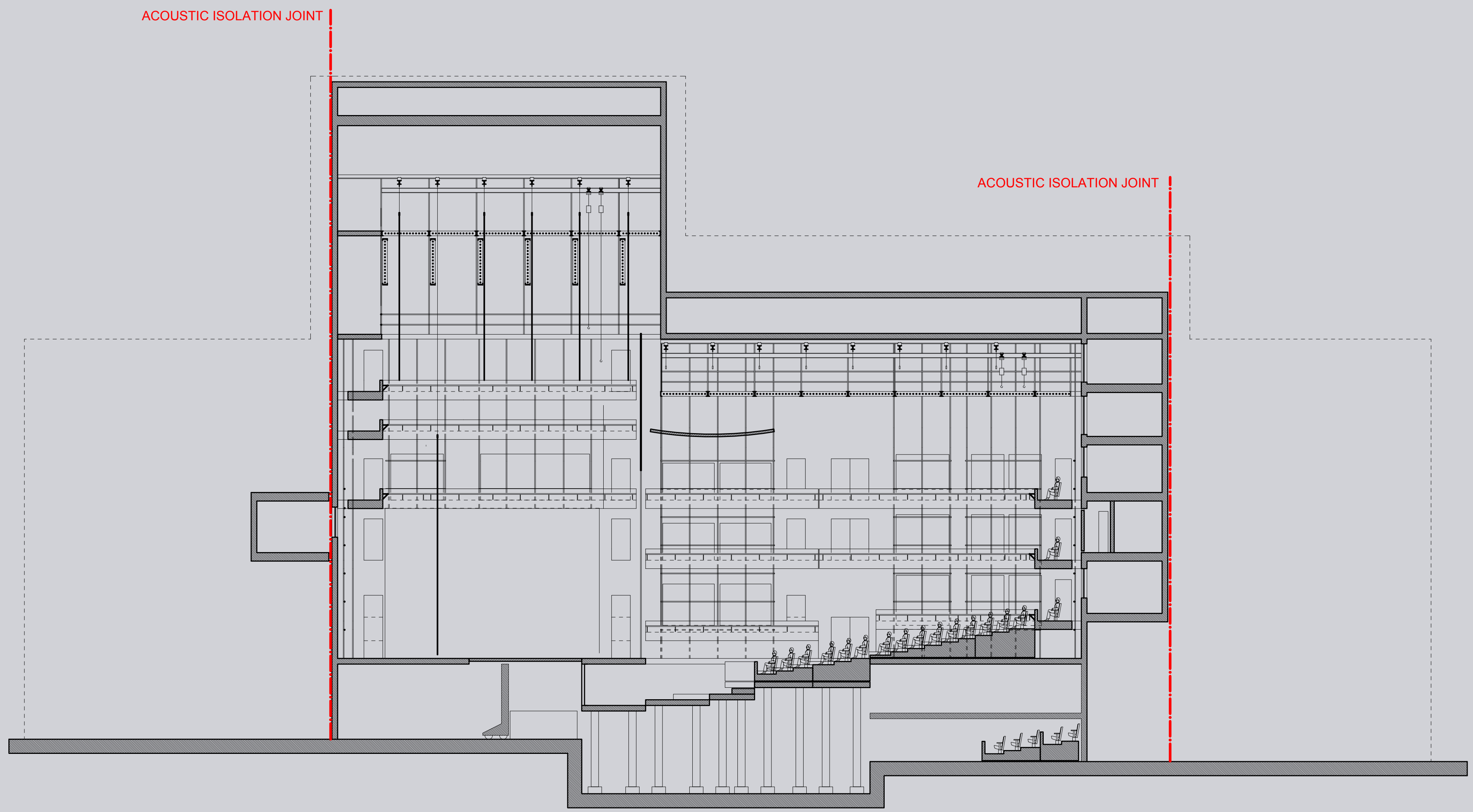


Fig 48. Acoustic isolation joint concept – longitudinal section

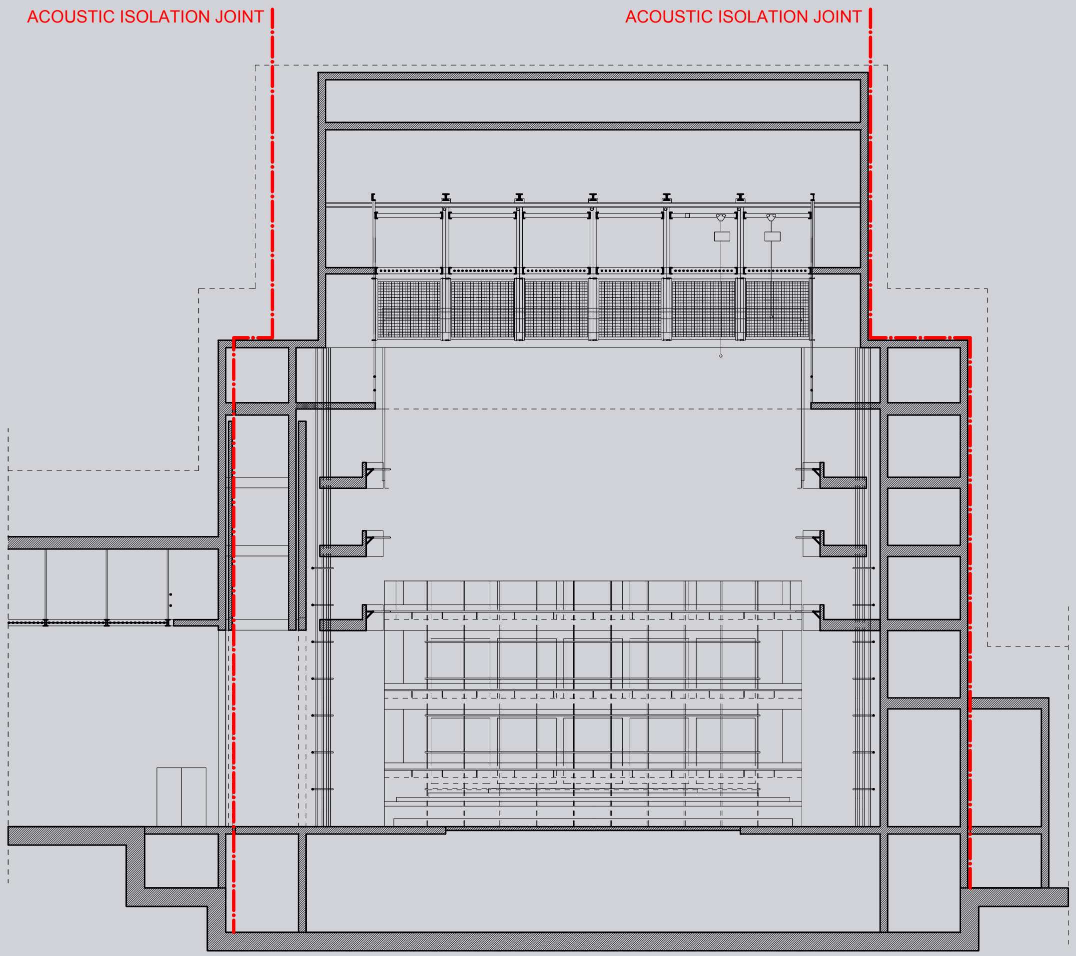


Fig 49. Acoustic isolation joint concept – transverse section

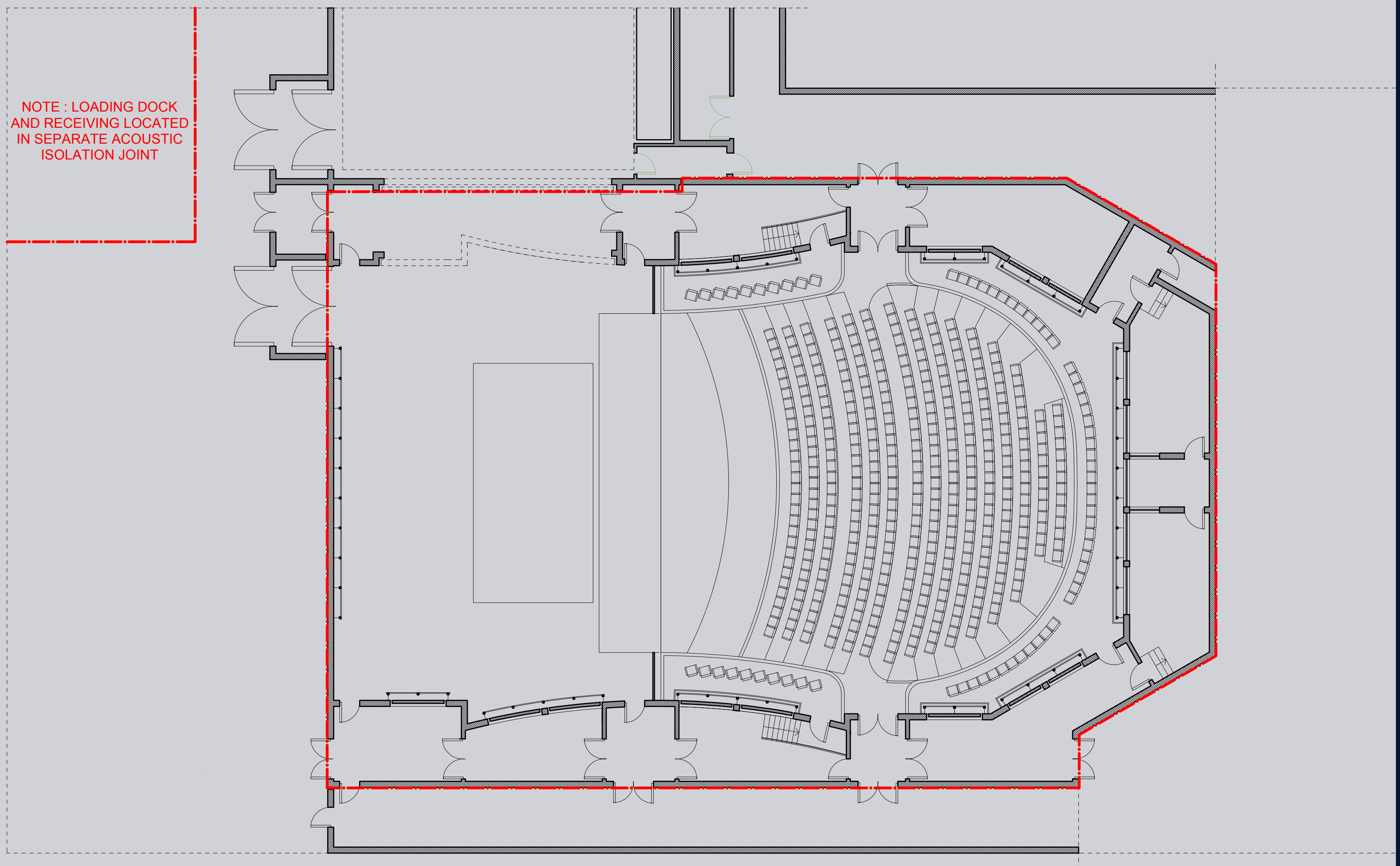
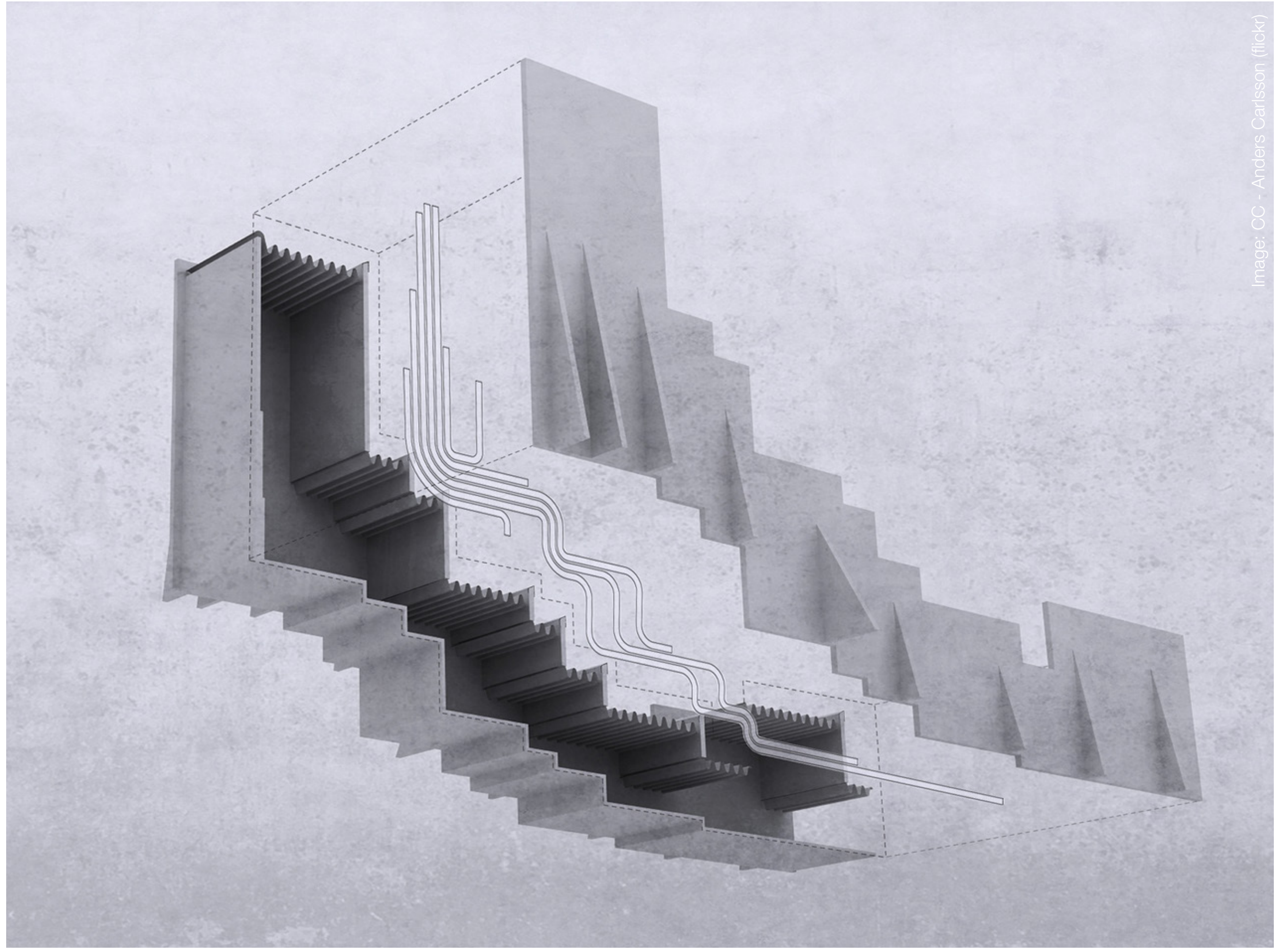


Fig 50. Acoustic isolation joint concept – plan



Large Venue Structural and Mechanical Requirements

7.4.1.8 Structural Requirements

The building structure must be designed to accommodate the loads of the performance equipment systems (see Section 7.4.1.10) in addition to any standard load requirements for theatres.

See also Section 7.4.1.7.3.3 regarding acoustical isolation joints.

7.4.1.9 Mechanical Systems Requirements

Mechanical systems will be designed to meet the background noise requirement of N-1.

Due to the inherent flexibility of the space, an overhead constant-air-volume heating, ventilation and air-conditioning (HVAC) system is recommended for the Large Venue. Supply ductwork (adequately insulated to prevent break-in noise) will run over the concrete ceiling of the space with as few penetrations as possible to supply air from above within the limitations of the background noise requirement. These penetrations will have to be carefully sealed to prevent noise leakage into the hall.

Large Venue Specialised Performance Equipment Systems and Technical Spaces

7.4.1.10 Specialised Performance Equipment Systems and Technical Spaces

The technical areas and systems are described below. For further detail on technical systems see Appendix D.

7.4.1.10.1 Overhead Technical Zone

The overhead technical zone is the technical work space above the floor of the theatre. This technical zone for the Large Venue will comprise two separate sections: an upper technical zone above the audience area in proscenium configurations and a lower technical zone above the stage area in proscenium configurations.

The technical zone is where all the overhead rigging equipment systems are located. It is also a platform for the mounting of temporary performance lighting, for audiovisual equipment such as loudspeakers, and for architectural lighting.

The technical zone will be within the same acoustic volume of the audience and performance areas, and is visible from them.

The components of the technical zone will include the following:

- a walkable surface for the technical crew, allowing them to access rigging, lighting, and audiovisual equipment located there, called a tensioned wire-rope grid – This includes a lower steel structure to support the walkable surface, with horizontal beams and purlins, and vertical hangers that connect the surface to the building structure. This area includes gridwells — clear zones in the structure to allow unobstructed pass-through of vertical rigging liftlines.
- an upper steel structure to support motorised rigging equipment and movable rigging elements, such as the rigging gantry system

7.4.1.10.1.1 Technical Access Zones

The following systems of the technical zone are part of the technical access zones:

- the tensioned wire-rope grid system – The wire-rope grid is a series of pre-tensioned, framed modules with wire rope in an open basket weave. The modules will be suspended over the whole performance area (upper and lower technical zones). The wire-rope grid modules will provide a surface for technical personnel to walk and work on while accessing rigging and electrical equipment.
- operating gallery – This gallery is metal-framed and decked catwalks below the grid on the walls of the upper technical zone. The topmost-retracted Moving Balcony in this area will also be able to be used as a second operating gallery.

7.4.1.10.1.2 Overhead Rigging Systems

The following systems of the technical zone are used for rigging of scenery, audiovisual equipment and lighting and will be considered in the design:

- rigging systems – The lineset rigging hoists on the large gantries will allow the theatre to be used in a traditional proscenium configuration. The small gantry rigging system will allow flexible rigging for non-traditional configurations. The combination of these systems will create a rigging system with excellent flexibility to host a very wide variety of productions.
  - A small rigging gantry system will be located

at the overhead technical grid, above the wire-rope grid surface, used for single point rigging applications (spotline) with equipment from either the motorised point hoist (spotline) or the motorised chain hoist systems.
  - A large rigging gantry system will be located at the overhead technical grid, above the wire-rope grid surface and the small rigging gantry zone; it is the support backbone for the motorised lineset hoist system.
  - Motorised lineset rigging hoists will be used as the primary system for suspending scenery, masking, lighting instruments and other similar production elements above the performance area.
  - The motorised point hoist rigging ("motorised spotline rigging") system will be for the accommodation of production elements such as chandeliers, requiring a single liftline, or scenic or lighting elements, requiring multiple liftlines that are oriented other than parallel to the proscenium.
  - Motorised cable reels or cable windlasses are a component part of the rigging system and will be used throughout the technical grid zone in order to safely manage the electrical power and signal cabling associated with motorised rigging systems.
- Removable Portal – A traditional proscenium theatre has a fixed architectural wall structure that visually obscures the upper technical zone from audiences in the audience area in proscenium configurations. In the Large Venue, as a flexible performance space, it must be possible to remove or reposition this proscenium wall to meet the performance requirements of specific productions. To accommodate this requirement, the Removable Portal will be a soft wall system, made of fabric.
- Tip-and-Fly Grid Ceiling – In order to establish a visually continuous appearance in the Large Venue when in a non-proscenium mode, a decorative, tip-and-fly grid ceiling system will be deployed.
- cinema screen masking – Horizontal and vertical masking will allow film image formats to be adjusted for various events. The masking will be constructed of matte black fabric, which is connected to a light aluminium framing system to keep the fabric taut.
- fire safety curtain – If a rated fire safety curtain is required to separate the upper technical zone from the lower technical zone, it will be installed as part of the specialised performance equipment systems. Its primary purpose is to prevent the spread of smoke and flame between the two zones in the event of a fire.

7.4.1.10.2 Stage Level Systems

The following systems will be part of the stage level systems:

- modular stage traps – Located within the stage area of the Large Venue, the traps will be demountable floor modules. Traps will be removed to allow access to the trap room below the main stage area, either to remove or store equipment, or to accommodate special effects for a specific performance.
- Single-Deck Lifts – The Single-Deck Lifts are motor-driven platform lifts, which will permit rearrangement of the forestage / audience seating / orchestra pit relationship in conjunction with associated Seating Wagons.
- Double-Deck Lift – The Double-Deck Lift (Doppelgänger) will be used to establish an orchestra pit setting, in a similar fashion as the single-deck extension/reduction lifts. The addition of the second deck level will allow the lower deck to be used as an orchestra pit with a stage overhang, when the proscenium wall is in position to establish the full stage setting.

7.4.1.10.3 Moving Balcony System

The moving balcony system will consist of individually moving units on three levels for audience seating. The Moving Balconies will be able to be raised and lowered in multiple configurations.

Moving Balconies will be designed to allow chairs to be kept on the balconies without adjustment when raised to storage position. Acoustic Banners deployed behind the balconies together with the chairs will provide additional low frequency absorption in the room when in stored configuration.

The balcony design requires special attention. Balcony fronts will be solid and sound-reflecting (minimum surface mass $25kg/m^2$) and will be shaped to disperse sound and avoid focusing and echoes from sound system. The underside of the Moving Balconies will include a 300mm deep soffit located approximately 500mm away from the balcony fronts.[8] This soffit will follow the shape of the perimeter walls (instead of following the shape of the balcony fronts). The underside surface of the Moving Balcony will have a minimum surface mass of $25kg/m^2$. All balcony materials will be selected and specified to prevent

8 The soffit will be no smaller than 400mm for 90% of the linear length of the surface.

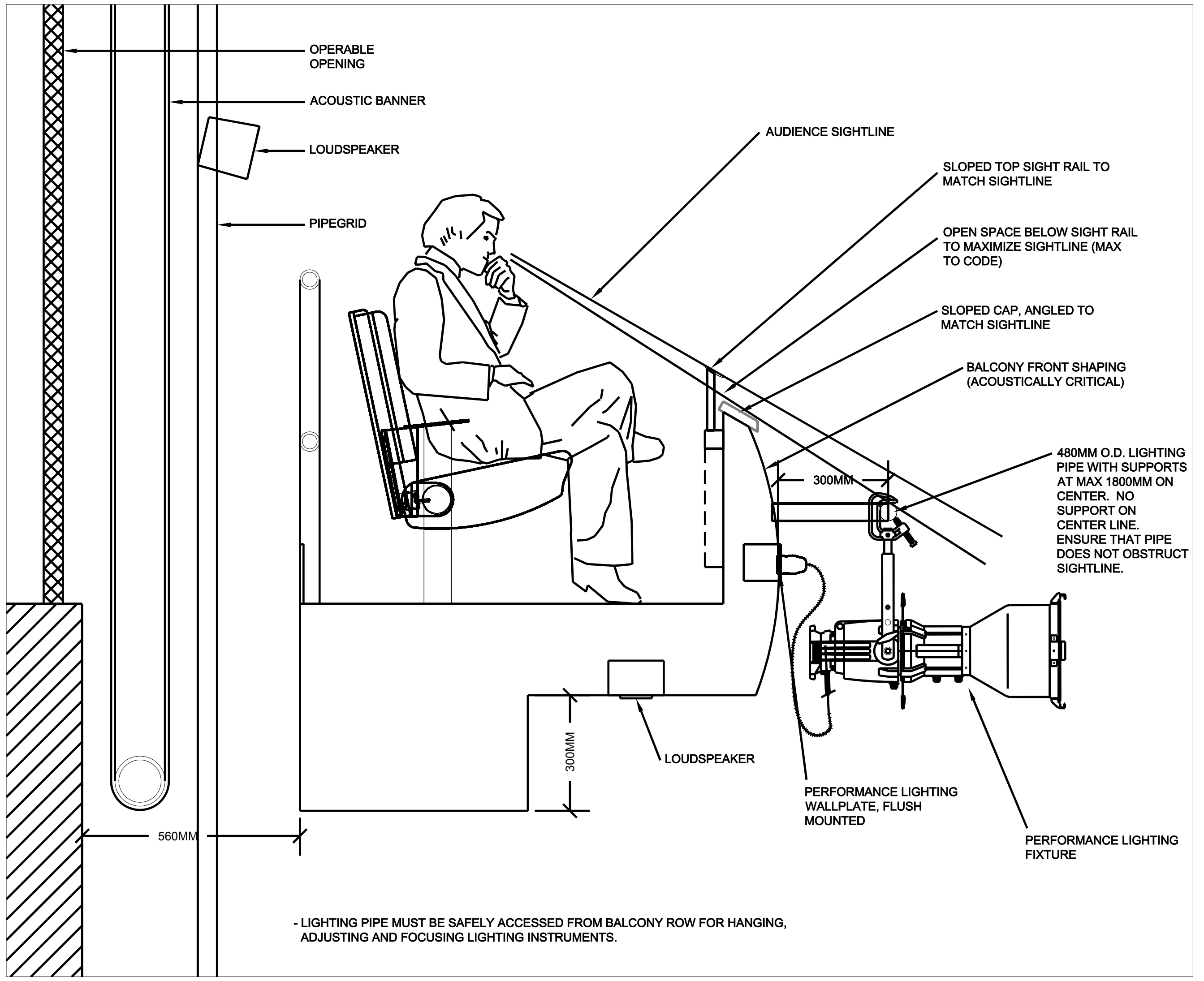


Fig 51. Balcony detail showing balcony front, banner, Windows, soffit and performance equipment

rattle and ringing and to avoid footfall noise (note also that carpeting is not allowed within the Large Venue).

The balcony structure will be designed by a structural engineer to local code requirements. In addition to code required loadings, the engineer will consider occupant-induced vibrations and design the Moving Balconies to ensure both comfort and safety of occupants. The IStructE "Dynamic Performance Requirements for Permanent Grandstands Subject to Crowd Action" is a commonly used reference and will be the basis in evaluating the dynamic performance of balconies and stands for occupant-induced vibrations.

The balcony and railing at certain locations must support production lighting fixtures and distribution. The balcony and railing also have a very large impact on sightlines and audience comfort. Since the balconies move, these elements must be designed to achieve a level of safety appropriate for a theatrical/ audience environment.

The balcony rail must be designed carefully to balance audience comfort and sightlines. The Moving Balconies in the Large Venue will be designed with only single row of chairs at each level. The structural engineer will ensure that the balcony feels comfortably solid and safe, with seated or standing/dancing audience.

The balcony rail height will be designed to a total height of 775mm[9] above the finished floor of the balcony. The railing will be designed with 625mm of solid surface with 150mm of open rail system on the top. The shaping of all of these elements must be

9 Subject to approval by Lucerne Authorities

carefully designed to enhance sightlines as well as audience comfort.

The solid surfaces of the balcony railings will need special attention regarding comfort and acoustics. The front surfaces must be designed to be acoustically reflective for natural acoustics, but carefully shaped to avoid focusing with amplified sound.[10] The back side of the balcony fronts facing the audience must be designed to be durable as audience crossing their legs will leave marks on the surface if it is not durable. It is recommended that the surface be a dark colour to hide these marks. The design must incorporate a toe space or reveal to allow audience to sit as close to the rail as possible.

All of the top surfaces of the balconies' and railings' shapes and thickness will be designed with sightlines in mind. The solid portion will be designed at no more than 150mm wide. The top of the solid rail will have a slope from the audience down to the stage of no less than 30 degrees. The top open rail will be steel bar stock 25mm wide and 6mm thick and also angled at no less than 30degrees. The uprights that will hold up the top rail from the solid balcony front will be minimised in both dimension and number to lessen their impact on the sightlines. These will need to be carefully designed by a structural engineer to local codes.

The balcony front will [11]see typical loads for theatres. The following issues must be considered:

- the lateral forces that people will impart onto the rails
- rhythmic dancing by audience or artists in the balconies
- production lighting instruments hanging on the lighting positions on the balcony fronts
- additional loads from the balcony railing used to attach scenery or decoration as each balcony can be either an audience areas, an artist area or a technical operations area

The balcony railing will be a location for production lighting. The balcony must be designed to accommodate these lighting fixtures. It is recommended that a standard 48.3mm round pipe located approximately 450mm away from the balcony face be used, low enough so they do not interfere with the sightlines from either behind the railing or from underneath on the level below. The accommodation will be carefully located so that technicians can reach them to focus, change gels, adjust shutters or change fixtures. Sometimes depending on their locations, a platform or standing bars must be provided so that the technicians can stand close to the fixtures to adjust them. They will have to be able to go up and over the railing and stand on the platforms. These platforms will need to be able to hold one technician at weight determined by local codes. The lighting pipe positions will be designed to take 68kg/m as these production light fixtures can be set 450mm on centre for the entire length of the pipe. The lowest balcony will also be designed with a lighting position underneath it or on it underside. This pipe will see the same loading as described above. It will be accessed via a ladder or man lift from below. The lighting positions will need to have plug in points for both power and data control. These will need to be designed discretely as these are located very close to audience. They may be covered or hidden, but when they are in use they will need to be able to manage the cables that will be connected to the lighting fixtures.

A pipe will also be required on the underside of the Moving Balconies to accommodate additional production lighting, scenic elements and demountable banner units. Power and signal connections for these systems will be provided in proximity.

The Moving Balconies will be able to be raised and lowered in multiple configurations. See Appendix D for details of motorisation, control and accommodation.

Each balcony unit will have a permanent lighting railing for hanging performance lighting instruments. Receptacles for power and signal connections to performance lighting and performance audiovisual systems equipment will be integrated into each balcony unit.

The movement of each balcony unit will be semi-independent: while each balcony unit has its own drive motors, and can be independently moved, the movement of any one balcony will be limited by the stack of balcony units above or below it. The motor of each drive unit will power a toothed drive gear wheel which engages with a toothed drive rack which is mounted to a structural column. As the gear wheel turns, it climbs up or down the rack. The motors on each balcony frame will be electronically synchronised so that they move simultaneously.

7.4.1.10.4 Tip-and-Fly Forestage Reflector

The Tip-and-Fly Forestage Reflector will comprise a large, heavy, moveable acoustical reflector positioned above the forestage area (in proscenium mode) and extending over the first few rows of the audience. The height of the reflector will be adjustable and may be set at a variety of heights depending upon what is being performed. The reflector may be lifted into a vertical storage position under the upper technical zone when not in use.

7.4.1.10.5 Guillotine Doors

Two acoustical Guillotine Doors will separate the Large from the Small Venues. These doors will slide vertically and store overhead when opened. Each one of these doors will be acoustically rated and have a minimum rating of Rw 60.

7.4.1.10.6 Demountable Wall Pipe Grids

A system of demountable pipes will be provided. These pipes will be designed to be attached to wall surfaces to serve as accommodation for any production related scenery or technical equipment.

The pipes will be in front of the permanent acoustic banner zone around the entire periphery of the Large Venue from the floor up to 14m. Primary vertical pipes will be semi-permanent and located on either side of the Acoustic Banners and spaced between 2m and 3.5m on centre. A gap of at least 100mm will be maintained between the edge of the Acoustic Banner and each primary vertical pipe. Horizontal pipes (which shall be attached to the primary vertical pipes) will be able to span between the primary vertical pipes. Sufficient horizontal pipes will be provided to place a horizontal pipe every 1.5m on centre. Secondary vertical pipes will also be provided which can be attached to the horizontal pipes. Sufficient secondary vertical pipes will be provided so that there is one set of secondary vertical pipes between the primary vertical pipes reaching from the stage floor to 14m.

These Demountable Wall Pipe Grids will, when attached, be designed to take 68kg/m as these lighting fixtures can be set 450mm on centre for the entire length of each pipe. Each pipe will be a 48.3mm diameter lighting pipe.

Each horizontal and secondary vertical pipe will be able to be mounted individually or individually removed without compromising the functionality of the remaining pipes. No single pipe will exceed a weight that can be safely manipulated by theatre technicians according to local workplace safety regulations.

7.4.1.10.7 Adjustable Acoustics Systems

A system of permanent motorised sound-absorbing Acoustic Banners will be installed around the theatre as shown on drawings in Appendix A and Figures 33 and 34. Additional demountable motorised Acoustic Banners will be able to be mounted on the lighting pipe on the underside of the lowest Moving Balcony. All banners will, when fully extended, effectively cover the entire height of the Large Venue from floor level (maximum 500mm off of the floor to within 500mm of the 17m clear height of the Venue for the permanent banners, and the full possible height under the lowest Moving Balcony in storage position for the demountable banners).

Two lines of motorised Curtains in the lower technical zone will provide adjustable absorption at a high level in the room. These elements are above the tension wire grid and will deploy transversally.

7.4.1.10.8 Audience Seating

Seats are an integral part of the quality of audience experience in the Venue and are specialty items that must be procured from specialised auditorium seating manufacturers in order to meet the complex requirements in durability, audience comfort, auditorium acoustics and visual aesthetics.

Certain seats will have operational requirements. Some seats will be demountable to accommodate temporary scenic elements, camera positions, etc. Demountable chairs will be able to be demounted without special tools and will feature captive hardware. In the Large Venue, the fixed seats will be of steel and wood construction, with an upholstered seat cushion, and an upholstered back cushion. Seat bottoms and seat backs will not be upholstered. All fixed seats will have automatic seat bottom raising mechanisms, and, as appropriate, aisle letter markers, seat number markers, aisle lights, and donor plaques.

10 Detailed shaping to be confirmed during the Architectural Design process.

11 The pipe must not be located too far away to allow safe operational usage nor too close to inhibit mounting of production lighting units.

Loose chairs will be provided for Moving Balcony seating areas. These formal loose chairs will be chosen so as to co-ordinate with the fixed seating to meet the same requirements of room acoustics, durability, audience comfort and visual aesthetics. They will be upholstered and finished in a similar manner as the fixed seats.

7.4.1.10.9 Production Sound System

Performances in the Large Venue will require varying sound system configurations depending on production requirements. State-of-the-art production sound systems will be provided to support the following program requirements:

- a house announcement audio system to support unamplified events
- a performance audio system for events requiring speech and/or music amplification
- a spatial audio system to support performances with sound sources moving in three dimensions around the room
- an active architecture system to extend room reverberation and control the distribution of early sound energy in the room

Sound system equipment will either be hung from overhead, temporarily installed on a balcony, used from inside a Window, integrated into the lift design, or deployed on the floor.

Equipment and infrastructure to support high-quality audio recording and broadcast will also be integrated into the design of the Large Venue, with live audio signals routed from the Large Venue to the broadcast/recording room.

Control and technical spaces associated with these systems will be as follows:

- sound control rooms distributed around the periphery of the Large Venue
- potential use of all window positions as temporary control locations
- potential use of all Moving Balconies as temporary control locations
- broadcast control / recording room (shared)
- electrical room – sound system amplifiers (shared with Small Venue)

7.4.1.10.10 Projection

Events in the Large Venue will, from time to time, require video projection. A projector will be installed permanently in the central projection booth facing the stage in proscenium mode. Additionally, it will be possible to install projectors inside the other projection booths, as well as behind view ports provided in all window closure panels around the room. These would be used, for example, for performances with projection mapping on the walls.

Glass for all projection windows will be tempered, low iron, Q2 quality float glass with a minimum thickness of 18mm set at an angle to reduce glare and reflections.

7.4.1.10.11 HD Video Capture

Accommodation for permanently installed, remote control pan-tilt-zoom cameras will be located at several positions throughout the Large Venue. The accommodation for these cameras will allow the capture of web-broadcast level quality video to be used for internet streaming as well as for archival recordings. Additionally, the accommodation for these cameras will be designed such that they will not generate disturbing noise in the context of the background noise level of the Venue.

The control and technical space associated with these systems will be the broadcast control / recording room (shared).

7.4.1.10.12 Production Lighting System

The Large Venue will have extensive accommodation for production lighting system infrastructure and equipment to support the needs of all performance types.

In a venue with flexible programming and both resident and visiting companies, as is the case here, the theatrical lighting system infrastructure design will focus on providing maximum flexibility for the lighting designers, within the normal range of practice for each art form.

At the same time, the system will also support the establishment of standard lighting positions and pre-sets so that groups with less sophisticated needs can be accommodated with a minimum of effort.

The production lighting system will also include the following subsystems:

- dimming systems – The performance dimming and control equipment will consist of dimmer/relay racks, control wiring and devices, and branch circuit wiring, distribution, and connection devices.
- house lighting – House lighting (dimmed general illumination, architectural lighting and installed audience lighting in the Venue) will be designed by the architect, electrical engineer or architectural lighting designer. House lighting in the Venue will be connected to the performance dimming and control systems to achieve an integrated system.
- work lighting – This includes fixtures used to illuminate the theatre seating, floor, stage, grid and support areas during maintenance and non-production periods.
- running lights – Running light fixtures will consist of blue LED fixtures that provide visibility in the technical support and work areas during performances, without casting light onto the stage or into the audience.

Production lighting equipment positions will be incorporated in the design that includes the following:

- positions incorporated in the Moving Balconies (see Section 7.4.1.10.3)
- Demountable Wall Pipe Grids (see Section 7.4.1.10.6)

Large Venue Control Spaces and Technical Circulation

7.4.1.11 Control Spaces

There will be a number of control rooms around the Large Venue including sound, lighting, video, production and broadcast control rooms and a followspot room. The finishes in these rooms will be as follows:

- walls – glass-fibre or mineral wool panels covered with black perforated metal panels
- ceiling – black acoustical ceiling tile
- floor – carpet on computer raised floor in control rooms, hard floor finish in followspot room
- Glass for all followspot and projection booth windows will be tempered, low iron, Q2 quality float glass with a minimum thickness of 18mm set at an angle to reduce glare and reflections.
- Windows for other rooms will be double glazed (12mm + 10mm) with minimum 150mm airspace between panes; operable window is required for sound control room.
- lighting – fluorescent work lighting and dimmable adjustable task lighting over control desk areas
- All window positions will also be usable as control positions for sound, light and video, with the closure panel closed or open (through the view port).

Theatre machinery in the Large Venue (Moving Balconies, Lifts, Seating Wagons, rigging and adjustable acoustics) will be controlled by a mobile master stage machinery control system with plug in points located at the periphery of the Large Venue (at least six locations). The system will also be equipped with a wireless remote control unit.

7.4.1.12 Large Venue Technical Circulation

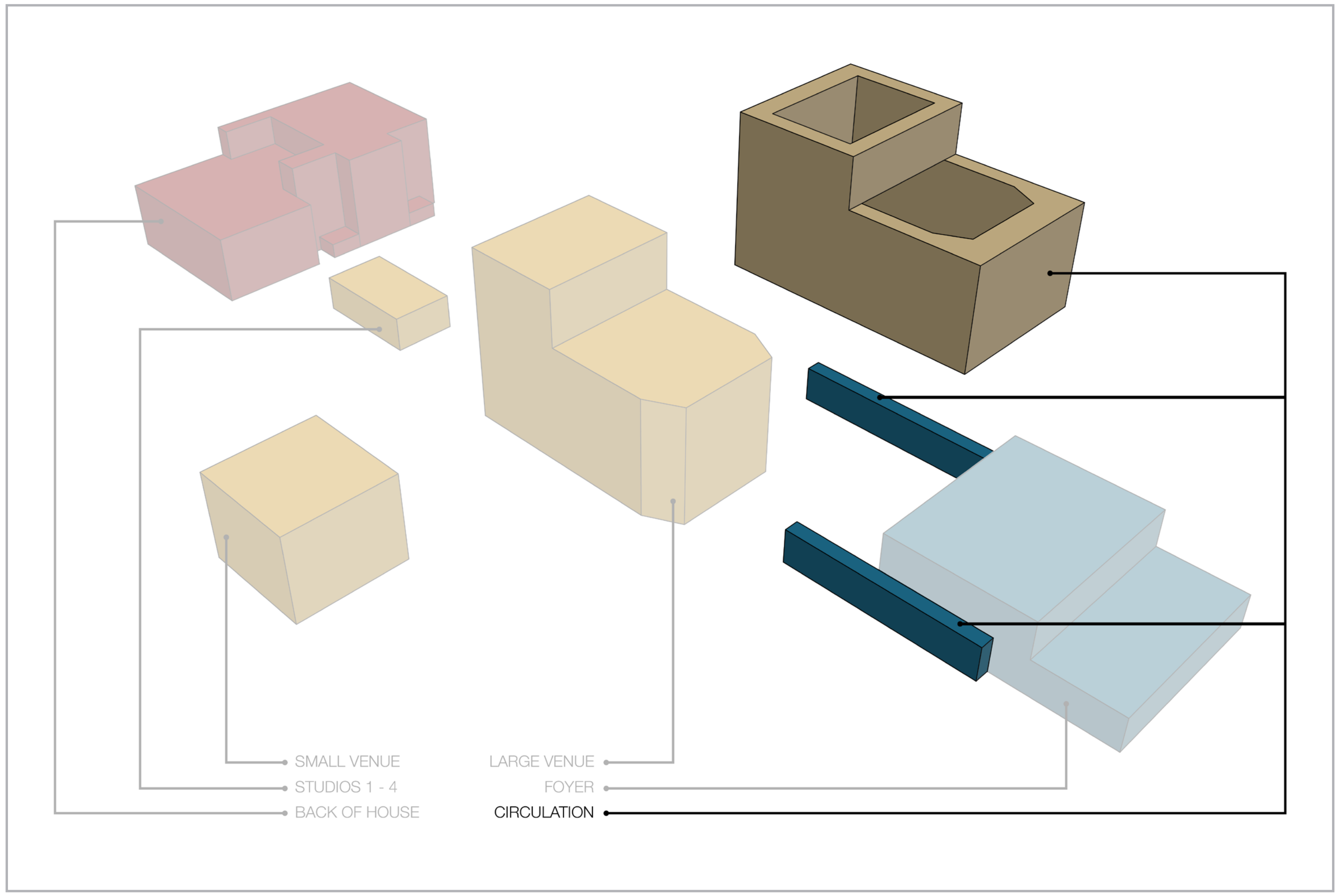
All Side Circulation Areas around the Large Venue will also be used as technical circulation. Top (technical working level) and bottom (trap room) levels of Side Circulation Areas will be used exclusively as technical circulation.

The design will ensure that technical circulation paths connect the side circulation zones with control rooms on each level without exiting to the foyer areas. Back of House circulation will also connect technical circulation passages in a step- and obstruction-free manner. All connection points of the technical circulation with the Back of House and the foyer will be through an appropriately sized sound- and light-lock vestibule.

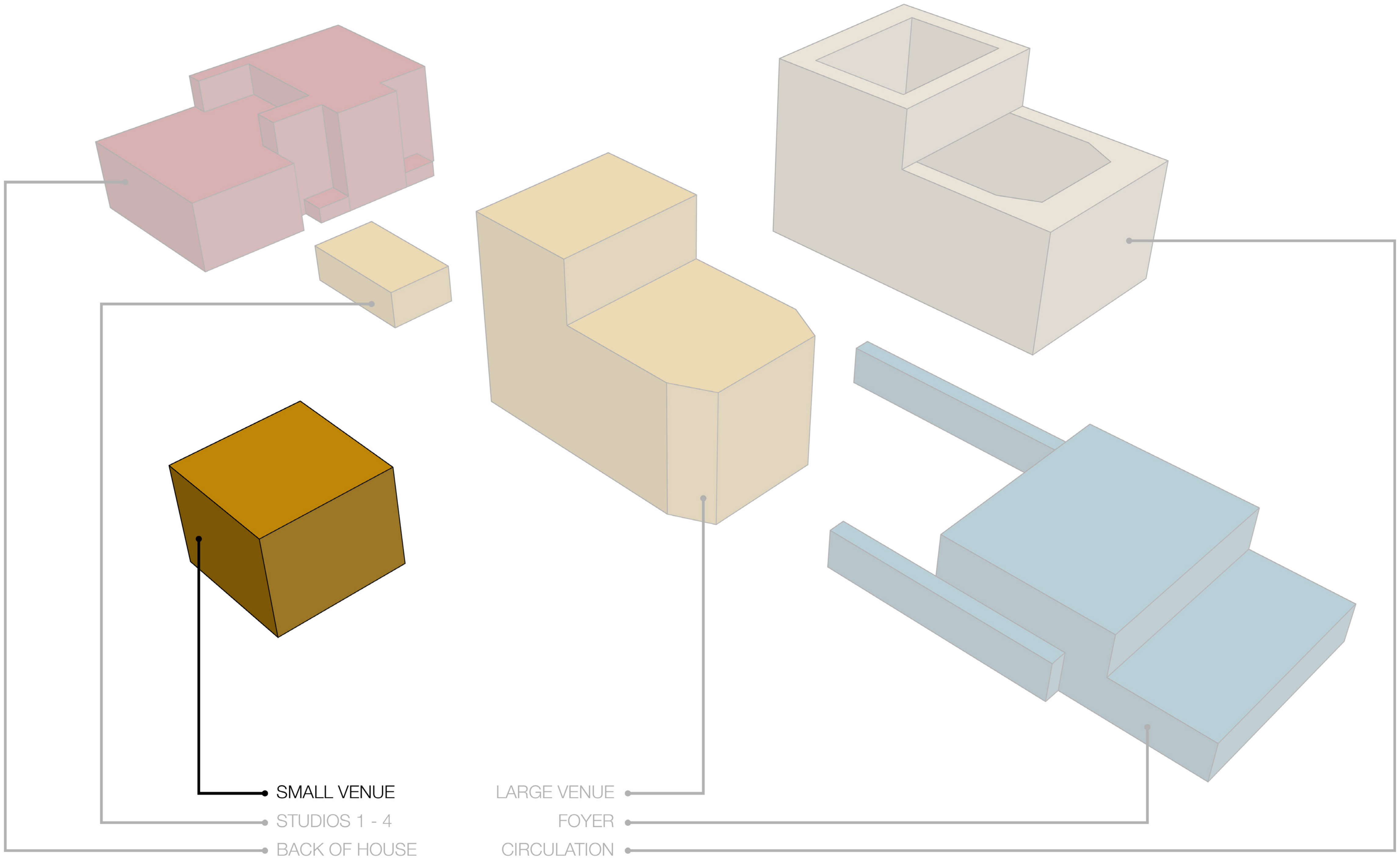
A large (4m by 4m) load-in door will be provided onto the stage end to facilitate easy load-in and load-out of shows. Direct connection[12] will be provided to the loading dock, to allow for quick and easy transport of large items from the loading docks to the stage.

Two large Guillotine Doors separating the Large Venue and the Small Venue will also allow easy movement of scenery and equipment between these spaces. This will allow the Small Venue to function efficiently as a side stage for the Large Venue, as well as a rehearsal and preparation space.

12 The design of this connection will also take into consideration the acoustical isolation requirements.


SMALL VENUE
STUDIOS 1 - 4
BACK OF HOUSE
LARGE VENUE
FOYER
CIRCULATION

7.4.2 Small Venue



7.4.2 Small Venue

The Small Venue will be a flat-floor room with a balcony at the rear of the Venue (where the control rooms are located). This balcony will be sized to overhang the main floor as little as possible, carry a maximum of one row of seats and be used for technical functions. Retractable seating will be stored underneath this ledge. See Appendix B for Technical Concept drawings of this space.

The Small Venue can function as either a standalone theatre performance space, a rehearsal venue or as a side stage of the Large Venue when large connecting Guillotine Doors are opened.

This section gives greater detail on the following topics relating to the Small Venue:

7.4.2.1 Architectural Character

The Small Venue will be designed to be an intimate space that audiences can be close to performers. It will have a personality that incites artists to respond. The Small Venue will also have an architectural identity that is different from the Large Venue but that will be compatible if a production makes use of the Large and Small Venues in a connected manner.

The designers must avoid any light-reflecting surfaces so that reflections from production lighting systems do not unintentionally distract audiences from the performance. Finishes and colour will be selected to ensure that, when artistically desired, the entire Small Venue can disappear.

It is recommended that consideration be given to creating opportunities for visual or physical connections with the foyer or directly with the outside. Because the Venues have stringent requirements with regard to noise isolation, connections or openings must be able to be closed mechanically, and when closed, achieve the noise isolation requirements, as well as be able to achieve a complete blackout condition.

7.4.2.2 Architectural Lighting

Architectural lighting for the Small Venue will be designed to emphasize the intimacy of the space and yet be flexible enough to allow for multiple configurations. Flexibility will exist in the layers of architectural lighting through dimming and thoughtful placement of architectural light fixtures. The architectural lighting will have multiple layers of light for the different functions that include the following:

- venue wall and accent layers
- acoustic element layers
- built in aisle lighting as part of the deployable seating
- ambient lighting for the seating areas

Performances may take place in many different lighting conditions and the design will allow the Small Venue to be configured for completely dark rehearsal and performance conditions so that the production lighting designer can work without conflict with the architectural lighting design. The architectural lighting design for the Small Venue must consider the following:

- The design of the circulation lighting will be planned so that in fully dark conditions they provide safe circulation conditions and will include seat end panel units, step edge lighting, and other measures as necessary. At the same time, they will be designed so as to not distract audiences or artists. Exit signs will also be planned to avoid being a distraction; there will be no lights from detectors, electronic card readers, alarms units, etc. (except in an emergency).
- The architectural lighting design will take into consideration the different likely configurations and types of usage and include specific lighting conditions for each. Performances taking place in full-light and bright lighting conditions will also be anticipated.
- Architectural lighting systems will also include a low energy work light system which will also be

used for cleaning and other non-performance or event operations.
- The design of the architectural lighting system will ensure that the background noise level goal will not be compromised when the architectural lighting is used.
- Accessibility to the architectural lighting fixtures will be considered for long term maintenance.

Sound- and light-lock vestibules will incorporate shielded down lights and low level circulation lighting. The architectural lighting designer will ensure that when sound- and light-lock vestibule doors are opened into the Small Venue, there will be no light spillage disturbing audience or artists.

Small Venue Acoustics Requirements

7.4.2.3 Acoustics Requirements

The background noise requirement of the Small Venue will be preferred noise criterion (PNC) 15. All building systems serving the Small Venue including mechanical, electrical, plumbing, lighting and fire/life safety systems must be at or below this level.

The requirement to achieve this PNC-15 requirements and how it is achieved is discussed in Section 7.6.2.

The acoustics of the Small Venue will be optimized for speech, amplified speech, rehearsals, some music and multi-media performances. To achieve this, the room finishes must be carefully selected to support these uses. Architectural accommodation for future installation of Acoustic Banners will be integrated in the design to broaden the possible range of usage.

The following areas will be discussed:

7.4.2.3.1	***Materials and Finishes***
7.4.2.3.2	***Background Noise***
7.4.2.3.3	***Sound and Vibration Isolation***

7.4.2.3.1 Materials and Finishes

The careful selection of both substrate and finish materials is closely tied to the room acoustics performance of the Small Venue. A variety of acoustically appropriate options for each surface in the Small Venue is described below. Selection of materials, assembly and finish treatment must be reviewed and approved for compliance with the functional and acoustic requirements in this section.

7.4.2.3.1.1 Floors

The floor will be a sprung wood floor. Carpeting or other sound-absorbing floor finish is not acceptable within the Small Venue.

7.4.2.3.1.2 Walls

The lower portion of the surfaces in this room (from 0 to 3m above finished floor) will be hard and sound reflective and feature various scales of texturing, or roughness, in order to provide appropriate acoustical diffusion. In these areas, materials will provide roughness for sound diffusion, but without surface porosity. Polished glass, polished stone, polished concrete, glazed brick and large areas of smooth wood panelling or sheet metal without surface dimension/ differentiation must be avoided. Options for acoustically appropriate wall finishes will include the following:

- texture applied directly to concrete or masonry
- sealed/painted split-face concrete block
- sealed rough-surface brick bonded directly to concrete or masonry
- some wood detailing, provided the wood is directly bonded to the wall substrate without airspaces

The upper portion of the wall surfaces in this room (from 3m above finished floor to ceiling) will be a combination of sound diffusing and sound absorbing surfaces in order to control liveness in the space.

7.4.2.3.1.3 Ceiling

The ceiling will have absorptive material covering 50% of the total surface area of the ceiling. The absorptive material will be spread around in an even chequerboard pattern.

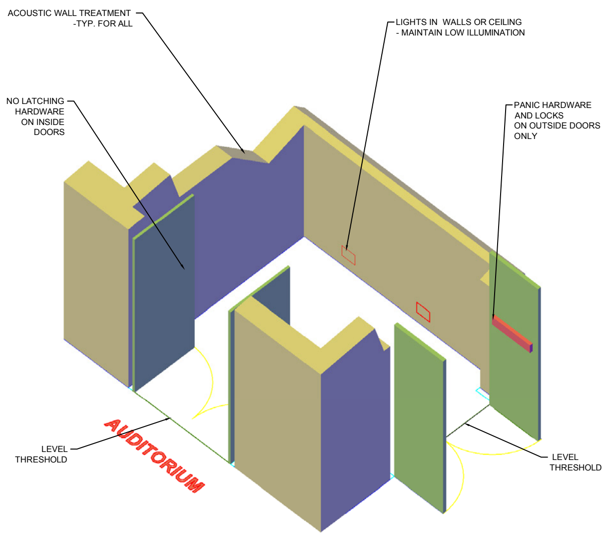
7.4.2.3.1.4 Control Rooms

Control rooms will have sound-absorbing treatments. Fabric-covered glass-fibre on walls, acoustic ceiling tile or perforated drywall on ceilings and carpeted floor will be provided. Dark colours will be used.

Windows will be double glazed (12mm + 10mm) with minimum 150mm airspace between panes. An operable sound isolating window will be required for the sound control room.

7.4.2.3.1.5 Public Sound- and Light-Lock Vestibules

Sound- and light-lock vestibules are essential for all entrances to and exits from Performance and Rehearsal Spaces. These vestibules will provide an



appropriate sound (and light) isolation buffer between the Small Venue and its surrounding areas.

A sound- and light-lock vestibule must consist of two sets of doors with at least 2m separation, forming a small vestibule. All walls forming a sound- and light-lock vestibule will extend from floor slab to ceiling slab, and must be sealed airtight to all surrounding construction. Typical sound- and light-lock vestibules will incorporate 65mm thick solid wood doors fitted properly in grout-filled frames with full perimeter sound gaskets. There will be no overlap between doors so that either door can be opened at all times.

Where a sound- and light-lock vestibule penetrates a fire-rated wall to the Small Venue, it will be designed so that the fire barrier incorporates the outer door of the vestibule. Any required panic hardware will be located on the outer door. The inner door will have no operable latch, panic hardware or any other noise generating mechanism; just a push plate/pull handle and closer that are co-ordinated with sound seals. All latches and panic hardware must be kept out of performance space.

The surfaces within the sound- and light-lock vestibule must be sound-absorbing and also light absorptive. Recommended characteristics include the following:

- a dark colour acoustical tile ceiling
- a sound absorptive (yet durable) finish on the walls
- carpeting on the floor

7.4.2.3.1.6 Backstage/Technical Sound- and Light-Lock Vestibules

Backstage sound- and light-lock vestibules will have sound-absorbing treatments but will consider the functional use of these spaces. Acoustic materials on the walls will be protected from accidental damage as large objects are passed through these areas. Perforated metal-covered glass fibre on walls, suspended lay-in acoustical tile on ceilings and hard and durable floor surface are typical. Dark colours will be used.

7.4.2.3.1.7 General Notes on Small Venue Finishes

Significant glass surfaces are not appropriate for the elevated acoustics requirements of the Small Venue. Smooth glass surfaces will colour the sound in an undesirable way and will be avoided, except for control room windows. Balcony front railings must not be made of glass in the Small Venue.

7.4.2.3.2 Background Noise

Quiet is defined as the absence of noise. Quiet in the Small Venue is necessary for excellent acoustics. Quiet in the performance environment creates a special atmosphere, one in which performers and audiences are bound by a common focus: the performance. Quiet translates into an air of expectancy and an aura of quality for both audience and performers.

Noise is defined as unwanted sound. During a performance, any sound not produced by the performer is, therefore, noise. Unless background noise is reduced to appropriate levels, all of the other design work and money spent to achieve good acoustics will be in vain. Very low background noise levels are vital to

- maximize the clarity and richness of the sound
- provide ease of concentration and communication among performers
- maximize the audible dynamic range
- maximize the length and apparent loudness of the reverberant sound as it dies away

The background noise requirement for the Small Venue will be PNC-15. The permissible noise levels in dB inside the hall which must be designed to are listed in the table below (see also Section 7.6.2):

	Octave Band Centre Frequency (Hz)								
	31	63	125	250	500	1K	2K	4K	8K
PNC-15	58	43	35	28	21	15	10	8	8

7.4.2.3.3 Sound and Vibration Isolation

The following will be used for sound and vibration isolation:

7.4.2.3.3.1 Walls

A double wall construction is recommended around the Small Venue to isolate it from exterior noises.

The walls will include a concrete wall of a minimum thickness of 300mm with a resiliently mounted partition on the inside with a minimum of two layers of drywall and insulation in the airspace or a construction with an equivalent acoustical performance.

7.4.2.3.3.2 Roof

The roof will be made of two layers of concrete, supported from the upper and lower cord of the roof structure (creating an interstitial attic space between these two layers of concrete). The upper slab will have a minimum thickness of 200mm and a green roof above designed to attenuate rain noise. The lower slab will have a minimum thickness of 150mm. Any penetrations through the lower slab will be sealed to prevent sound leakage. Alternative construction with equivalent acoustical performance will be acceptable subject to review.

7.4.2.3.3.3 Acoustical Joints

An acoustical isolation joint will be provided between the Small Venue and the Large Venue so to ensure that simultaneous rehearsals and performances can take place without acoustical disruption. It is recommended that an additional acoustical isolation joint will be provided between the loading docks and the rest of the Facility. See Figures 48 through 50.

7.4.2.4 Structural Requirements

The building structure must be designed to accommodate the loads of the performance equipment systems (see Section 7.4.2.6) in addition to standard load requirements for theatres. See also Section 7.4.2.3.3.3 regarding acoustical isolation joints.

7.4.2.5 Mechanical Systems Requirements

Mechanical systems will be designed to meet the background noise requirement of PNC-15. See Section 7.4.2.3.2 and Section 7.6.2.

Due to the inherent flexibility of the space, an overhead constant air volume HVAC system is recommended for the Small Venue. Supply ductwork (adequately insulated to prevent break-in noise) will run over the Tip-and-Fly Grid Ceiling of the space with a few limited penetrations to supply air from above. A mechanical engineer will study best locations for return slots.

Small Venue Specialised Performance Equipment Systems and Technical Spaces

7.4.2.6 Specialised Performance Equipment Systems and Technical Spaces

The technical areas and systems are described below. They are as follows:

7.4.2.6.1	*Tensioned Wire-Rope Grid*
7.4.2.6.2	*Adjustable Acoustics System*
7.4.2.6.3	*Retractable Telescopic Risers*
7.4.2.6.4	*Theatre Systems Control*
7.4.2.6.5	*Production Sound System*
7.4.2.6.6	*Projection*
7.4.2.6.7	*HD Video Capture*
7.4.2.6.8	*Production Lighting System*

For further detail on technical systems, see Appendix D.

7.4.2.6.1 Tensioned Wire-Rope Grid

A tensioned wire-rope grid will be provided over the entire room. The wire-rope grid is a series of pre-tensioned, framed modules with wire rope in an open basket weave. The wire-rope grid modules will provide a surface for technical personnel to walk and work on while accessing rigging and electrical equipment.

7.4.2.6.2 Adjustable Acoustics Systems

Accommodation for installation of motorised banners will be included in the design along all wall surfaces as shown on drawings in Appendix B.

7.4.2.6.3 Retractable Telescopic Risers

Retractable telescopic risers — sized for individual seats — will be provided. The risers will be designed to meet the Moving Balcony so that the raked seating area can be accessed from the balcony as well as from the main floor level. All telescopic seating riser systems will be in sections to allow for multiple configurations. Loose, ganged and anchored seats will be placed on the telescopic risers.

The balcony will have a permanent safety railing with removable panels to connect with circulation aisles on the retractable telescopic risers when appropriate.

7.4.2.6.4 Theatre Systems Control

Theatre machinery in the Small Venue (adjustable acoustics, telescopic seating risers) will be controlled by a mobile master stage machinery control system unit with plug in points located at the periphery of the Small Venue (at least two locations). The system will also be equipped with a wireless remote control unit.

7.4.2.6.5 Production Sound System

A package of loose production audiovisual equipment will serve the needs of the Small Venue in terms of the sound reinforcement, house announcements and high quality audio recording and broadcast.

Sound system equipment will either be hung below the catwalks or deployed on the floor.

Equipment and infrastructure to support high-quality audio recording will also be integrated into the design of the Small Venue.

Control and technical spaces associated with these systems will be as follows:

- control room
- broadcast control / recording room (shared with

- Large Venue)
- electrical room – sound system amplifiers (shared with Large Venue)

Refer to the Sound Video and Communications section of Appendix D for further details.

7.4.2.6.6 Projection

Events in the Small Venue will, from time to time, require video projection. Projection equipment from the loose equipment stock will be installed in the projection booth located at the balcony level when needed. Glass for the projection window will be tempered, low iron, Q2 quality float glass with a minimum thickness of 18mm set at an angle to reduce glare and reflections.

Balcony and wall design will accommodate additional temporary video projection locations.

The control and technical space associated with these systems is the control room.

7.4.2.6.7 HD Video Capture

The broadcast control / recording room will have mobile HD broadcast video recording equipment that

can be deployed in the Small Venue (and around the Facility) as required. The accommodation for these cameras will allow the capture of web-broadcast level quality video to be used for internet streaming as well as for archival recordings. The video infrastructure will be designed such that video signals captured in real time in the Small Venue can be routed to other locations via the broadcast control / recording room.

The control and technical space associated with these systems is the broadcast control / recording room (shared with Large Venue).

7.4.2.6.8 Production Lighting System

The Small Venue will also have extensive accommodation for production lighting system infrastructure and equipment to support the needs of production.

In a venue with flexible programming and both resident and visiting companies, as is the case here, the theatrical lighting system infrastructure design will focus on providing maximum flexibility for the lighting designers, within the normal range of practice for each art form.

At the same time, the system will also support the establishment of standard lighting positions and pre-sets so that groups with less sophisticated needs can be accommodated with a minimum of effort.

The production lighting system will also include the following subsystems:

- dimming systems – The performance dimming and control equipment will consist of dimmer/relay racks, control wiring and devices, and branch circuit wiring, distribution and connection devices.
- house lighting (dimmed general illumination, architectural lighting and installed audience lighting in the Small Venue) – House lighting will be designed by the architect, electrical engineer or architectural lighting designer. House lighting in the Small Venue will be connected to the performance dimming and control systems to achieve an integrated system.
- work lighting – Work lighting will include fixtures used to illuminate the theatre seating, floor, stage, grid and support areas during maintenance and non-production periods.
- running lights – Running light fixtures will consist of blue LED fixtures that provide visibility in the technical support and work areas during performances, without casting light onto the stage or into the audience.

Production lighting equipment positions will be distributed throughout the room.

Control and technical spaces associated with these systems will be as follows:

- control room
- electrical room – dimmers (shared with Large Venue)

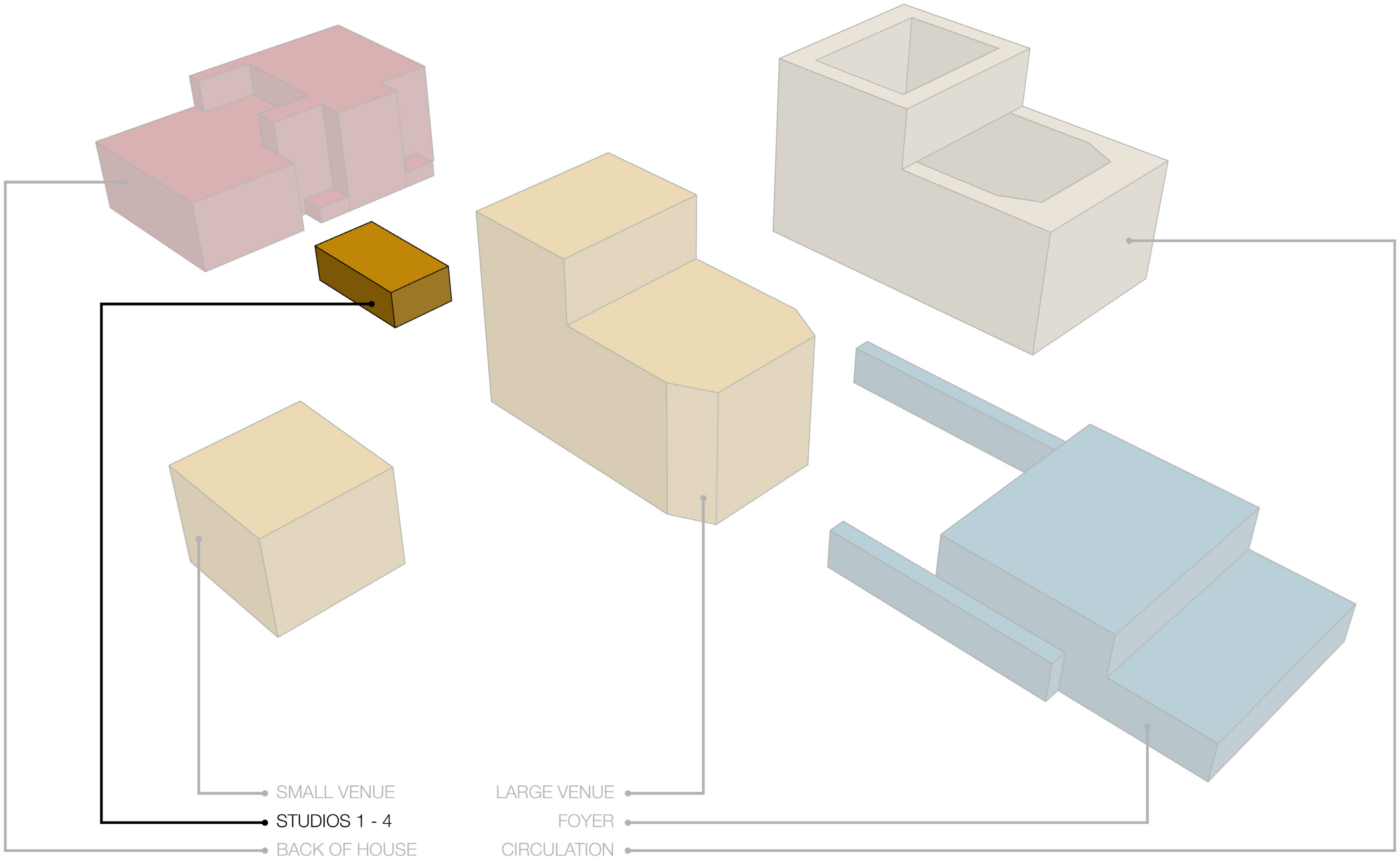
7.4.2.7 Small Venue Technical Circulation

Two entrances from Back of House circulation (through sound- and light-lock vestibules) will be provided into the Small Venue. Large (4m by 4m) load-in doors will be provided onto the stage end to facilitate easy load-in and load-out of shows. Back of House circulation from the loading docks will connect the Small Venue, to allow for quick and easy transport of large items from the loading docks to the stage.

Control rooms will be accessed from the balcony.

Two large Guillotine Doors separating the Large Venue and the Small Venue will allow easy movement of scenery and equipment between these spaces. This will allow the Small Venue to function efficiently as a side stage for the Large Venue, as well as a rehearsal and preparation space.

7.4.3 Studios


SMALL VENUE
STUDIOS 1 - 4
BACK OF HOUSE
LARGE VENUE
FOYER
CIRCULATION

7.4.3 Studios

Studios will comprise four flat floor rooms, equipped with mobile furniture, make-up counters, etc. that can be used as group dressing rooms as well. One of these rooms (Studio 1) will have a pipe grid for use as spatial audio rehearsal room. See also Appendix D.

The remainder of this section explores other details of the Studios:

7.4.3.1 Architectural Character

The Studios will be designed to be comfortable and inviting spaces with natural light. Scenic views are desirable. Blackout systems will allow these rooms to be used in complete darkness when necessary.

Studios will be proportioned to be comfortable when divided with conference room style dividers.

7.4.3.2 Acoustics Requirements

The background noise requirement of these spaces will be PNC-25. All systems in the Small Venue including mechanical, electrical, plumbing, lighting and fire/life safety systems must be at or below this level.

Studio 1 will be designed to accommodate amplified rehearsals and performances.

Studios 2, 3 and 4 will be designed to support unamplified speech and events with moderate music accompaniment. Studio 2 will have acoustic draperies to reduce reverberant levels when desired. Studios 3 and 4 will have accommodation for future installation of acoustic draperies.

7.4.3.2.1 Materials and Finishes

A variety of acoustically appropriate options for each surface in each of the Studios is described below.

7.4.3.2.1.1 Floors

All Studios will have sprung wood floors. Selection of wood species, substrate, assembly and finish treatment must be reviewed and approved for acoustics and functional impact.

Carpeting or other sound-absorbing floor finish is not acceptable within these spaces.

7.4.3.2.1.2 Walls

Walls of Studio 1 will have sound absorbing materials with fabric material surface covering 90% of the total surface area. Walls of Studio 2, will have walk-draw Curtains in front of perimeter walls.

Four flat floor rooms, equipped with mobile furniture, make-up counters, etc. that can be used as group dressing rooms as well. One of these rooms (Studio 1) will have a pipe grid for use as a wave-field synthesis rehearsal room.

Walls of Studio 3 and 4 will have sound absorbing materials with fabric material surface covering 50% of the total surface area, evenly distributed throughout the rooms.

7.4.3.2.1.3 Ceiling

Studio 1 will have a suspended lay-in acoustical tile ceiling (100% of the total surface area will be sound-absorbing).

Studio 2, 3 and 4 will have a suspended lay-in acoustical tile ceiling (50% of the total surface area will be sound absorbing, in an even chequerboard pattern).

The ceiling of Studios 2, 3 and 4 will have sound absorbing materials covering a minimum of 50% of the total surface area in an even chequerboard pattern.

7.4.3.2.2 Background Noise

The background noise requirement for the Studios will be PNC-25. The permissible noise levels in dB inside these rooms will be as follows:

	Octave Band Centre Frequency (Hz)								
	31	63	125	250	500	1K	2K	4K	8K
PNC-25	60	49	43	37	31	25	20	18	18

7.4.3.2.3 Sound and Vibration Isolation

The strategies for sound and vibration isolation are described in Section 7.6.2.

7.4.3.3 Structural Requirements

The building structure must be designed to accommodate the loads of the performance equipment systems (see Section 7.4.3.5).

7.4.3.4 Mechanical Systems Requirements

Mechanical systems will be designed to meet the background noise requirement of PNC-25.

Due to the inherent flexibility of the space, an overhead constant air volume HVAC system is recommended for the Studios.

7.4.3.5 Specialised Performance Equipment Systems and Technical Spaces

The technical areas and systems are described below. For further detail on technical systems see Appendix D.

7.4.3.5.1 Pipe Grid and Pipe Rails

Studio 1 will have a pipe grid used to hold lights, speakers or scenic elements.

Studios 2–4 will have structural loading capacity for later accommodation of pipe rails.

7.4.3.5.2 Production Sound System

Equipment from a collection of loose audiovisual equipment will be used to support production sound needs of Studios in terms of performance and recording microphones, as well as loose loudspeakers for stage monitoring during live sound events.

A spatial audio system that enables sound scene creation with full bandwidth audio sources moving in three dimensions around the room will be provided in Studio 1. The Studio 1 system will be designed to be a smaller scale composition platform for 3D sound pieces destined to be played the Large Venue. The system will also function as a standalone system to support small scale live theatrical, dance or musical performance, as well as temporary sound art installations.

7.4.3.5.3 Projection

Equipment from a collection of loose audiovisual equipment is intended to support video projection needs of Studios.

7.4.3.5.4 HD Video Capture

A fixed position pan-tilt-zoom camera will be provided in Studio 1 to capture video for broadcast, monitoring and recording. The broadcast control / recording room will have mobile HD broadcast video recording equipment that can be deployed in the Studios as required. The accommodation for these cameras will allow the capture of web-broadcast level quality video to be used for internet streaming as well as for archival recordings.

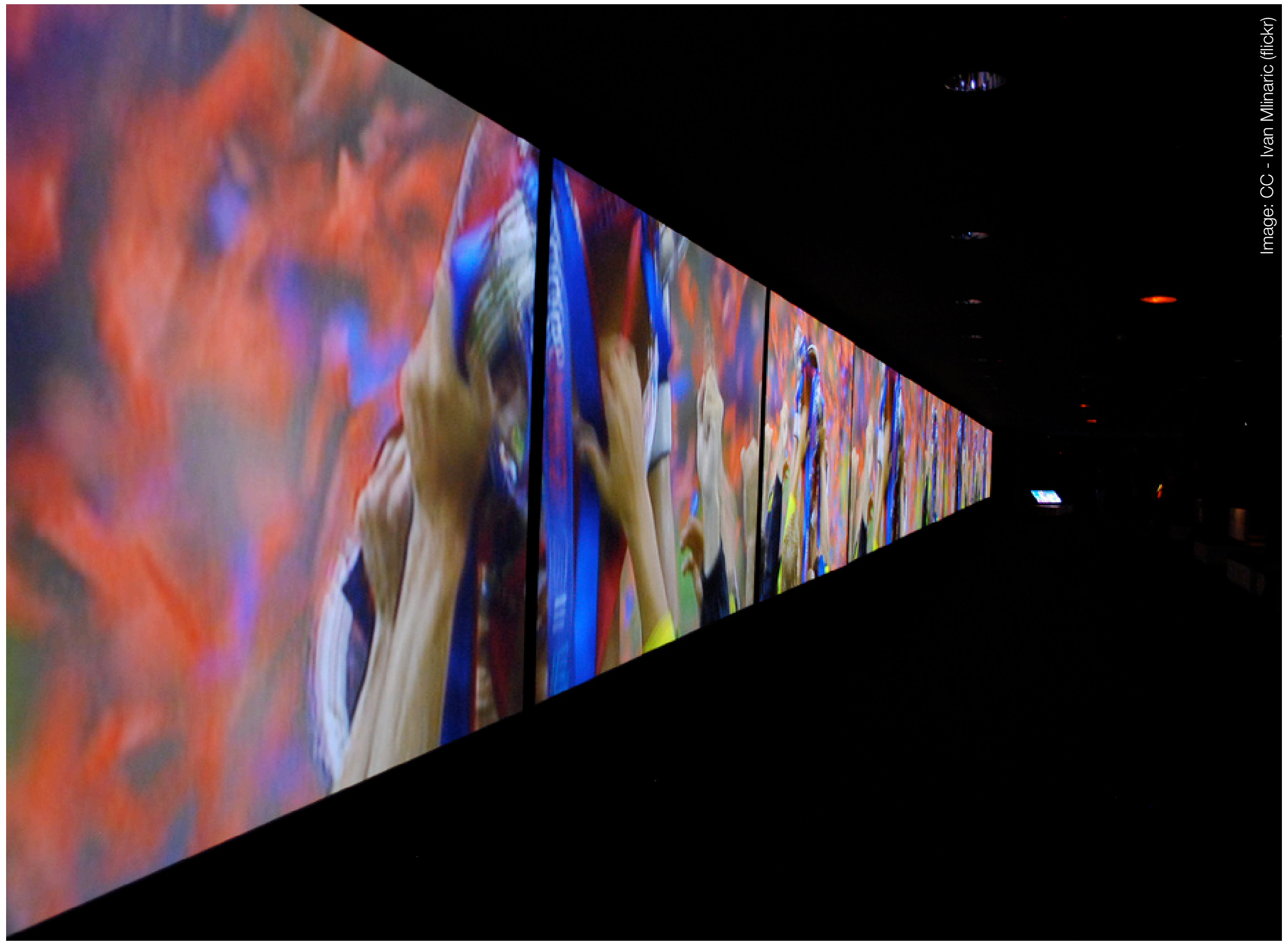
Tie lines will be provided back to the broadcast control / recording room for inter-room connectivity and recording purposes.

7.4.3.5.5 Production Lighting System

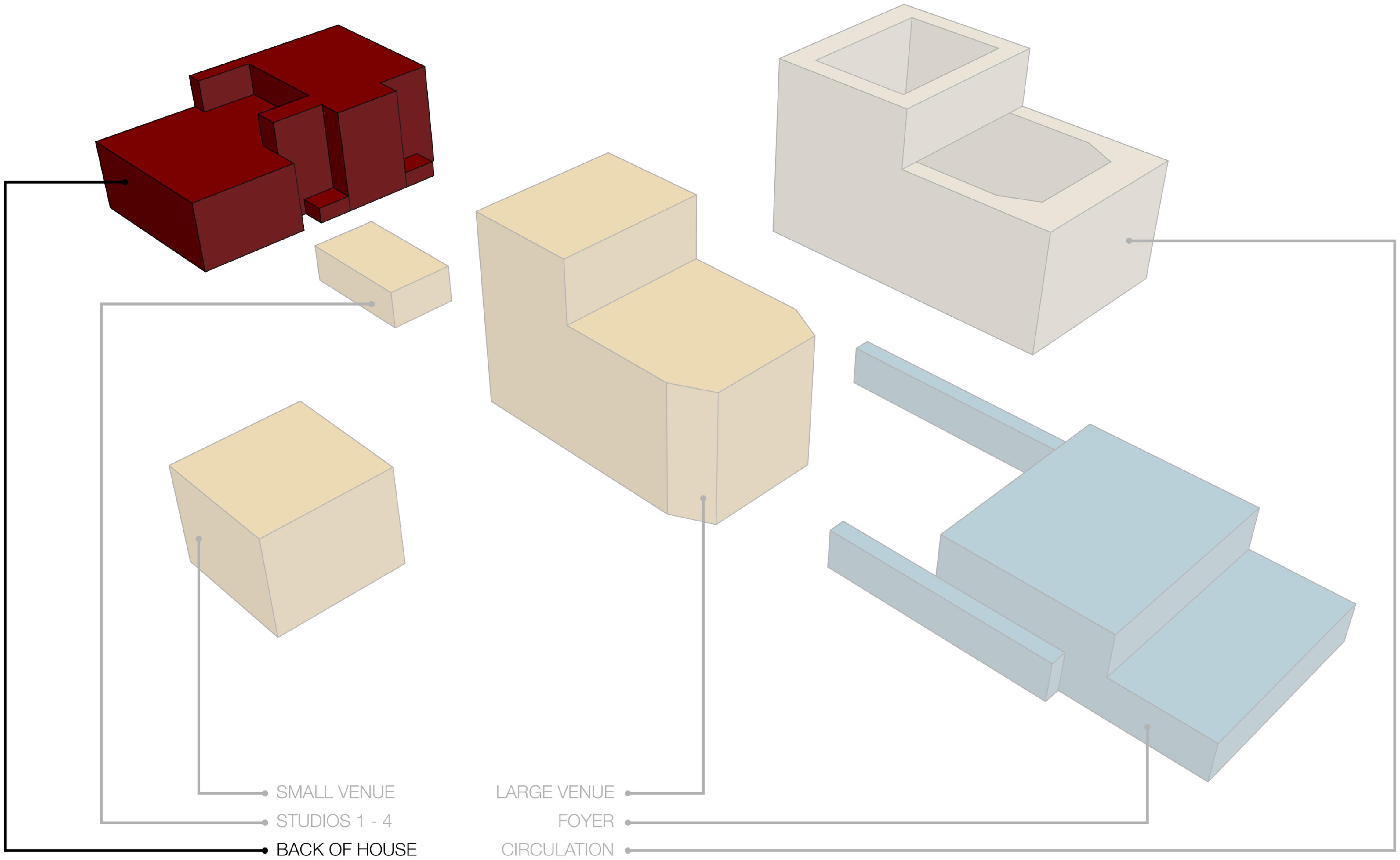
Studio 1 will also have accommodation for production lighting system infrastructure and equipment to support the needs of production.

A pipe grid will be provided in Studio 1 to allow production lighting equipment to be hung in the room.

Studios 2, 3 and 4 will be connected to production lighting system infrastructure.



7.5 Back of House



7.5 Back of House

The Back of House space consists of two sub-categories:

7.5.1	Artist Support Spaces
7.5.2	Technical Support Spaces

7.5.1 Artist Support Spaces

The artist support spaces are as follows:

7.5.1.1 Principal Dressing Rooms – Single

The principal dressing rooms – single will be used primarily as a dressing room for individual artists.

Each dressing room will also be designed to accommodate individual practice of vocal and instrumental soloists and be accessed directly from Back of House circulation. One of the principal dressing rooms will also have a direct connection with the conductor's rehearsal space. The connection to the conductor's rehearsal space will be designed to be acoustically isolated allowing for simultaneous usage as practice spaces without mutual disturbance.

Finishes typical for this type of space include a wood floor with area rugs, gypsum board walls with a system of movable acoustically absorbing panels on tracks and a ceiling with a combination of acoustically absorbing and diffusing elements on the ceiling.

7.5.1.2 Principal Dressing Rooms – Quad

The principal dressing rooms – quad will each be used primarily as a dressing room for four artists. Each dressing room will also be designed to accommodate individual practice of vocal and instrumental soloists and be accessed directly from Back of House circulation.

Finishes typical for this type of space include a wood floor with area rugs, gypsum board walls with a system of movable acoustically absorbing panels on tracks and a ceiling with a combination of acoustically absorbing and diffusing elements on the ceiling.

7.5.1.3 Make-up Room

The make-up room will be located in close proximity to the principal dressing rooms and the stage and will be used for artist make-up and wig before and during performances. The room will feature at least eight make-up stations, two sinks and storage areas.

Finishes typical for this type of space include a linoleum (or other durable and easily cleanable) floor and acoustical tile ceiling.

7.5.1.4 Conductor's Room

The conductor's dressing room should be located within one floor of the stage with close proximity to vertical circulation linking to both the stage and the orchestra pit levels.

The conductor's dressing room will be a relaxing, quiet and elegant space with two external connections:

- one directly to Back of House circulation
- one to the conductor's rehearsal space

The connection to the conductor's rehearsal space will be designed to be acoustically isolated allowing for simultaneous usage as practice spaces without mutual disturbance.

The conductor's dressing room will be acoustically designed to be able to be used for instrumental practice by individual musicians.

The room should have sufficient acoustically absorbing finishes to make this a comfortable space. Finishes typical for this type of space include a carpeted floor and an acoustical tile ceiling.

7.5.1.5 Conductor's Rehearsal Space

The conductor's rehearsal space will be used primarily as a rehearsal space and will accommodate a concert grand piano. Rehearsals are expected to include solo and group vocal soloists with piano accompaniment, as well as solo instrumental artists with piano accompaniment.

The rehearsal space will have direct, sound-isolated connections to the conductor's dressing room and one of the principal dressing rooms, as well as direct step- and obstruction-free access from Back of House circulation and the loading dock.

Finishes must be carefully selected to support the acoustic requirement of this space. Finishes typical for this type of space include a wood floor with area rugs, gypsum board walls with a system of movable acoustically absorbing panels on tracks and a ceiling

Image: CC -Luci Correia (flickr)

with a combination of acoustically absorbing and diffusing elements on the ceiling.

7.5.1.6 Lounge (Greenroom), Warming Kitchen and External Smoking Area

The Back of House spaces of the Facility will include a Lounge designed to accommodate up to 103 artists. This will be designed as a relaxing space with natural light, allowing artists to use the space for small group discussions, work sessions and individual study.

At the same time, it will be able to be used to accommodate catering needs of the artists of a large production in an efficient manner. A connected warming kitchen will facilitate food service at these times.

Finishes typical for this type of space include a wood floor, walls with a system of movable acoustically absorbing panels on tracks and an acoustical tile ceiling.

The space will have direct access to an external smoking area within a secure Back of House environment.

7.5.2 Technical Support Spaces

Technical support spaces are described below. For further detail on technical systems see Appendix D.

7.5.2.1 Broadcast Control / Recording Control Room

The broadcast control / recording room is a large room for audio/video broadcast, sound recording, and sound and video editing, adjacent to a small recording booth and a dedicated audiovisual electrical room to house equipment.

Windows and doors of this room shall be acoustically rated and have a minimum rating of Rw 55.

The broadcast control / recording room will be designed to be the hub of interconnectivity between spaces with centralised recording and monitoring capabilities. This space will also be usable for sound and video editing.

Finishes must be carefully selected to support the acoustic requirement of this space. Finishes typical for this type of space include a wood floor with area rugs, gypsum board walls with diffusive and absorptive panels on tracks and a ceiling with a combination of acoustically absorbing and diffusing elements on the ceiling.

7.5.2.2 Recording Booth

The recording booth will have direct visual connection to the broadcast control / recording control room. Windows and doors of this room shall be acoustically rated and have a minimum rating of Rw 55.

This room will also be usable as a practice room. Finishes must be carefully selected to support the acoustic requirement of this space. Finishes typical for this type of space include a wood floor with area rugs, gypsum board walls with diffusive and absorptive panels on tracks and a ceiling with a combination of acoustically absorbing and diffusing elements on the ceiling.

7.5.2.3 Office Areas

The Facility will include different office areas, as specified in the Schedule of Accommodations (Appendix C). Many spaces are defined as open office style clusters to maximize flexibility of usage. Designers must ensure that there is appropriate circulation paths (universal access) into office areas from the artist/staff entrance. There will also be security controllable access (universal access) from the office areas into artist/technical areas and the Front of House.

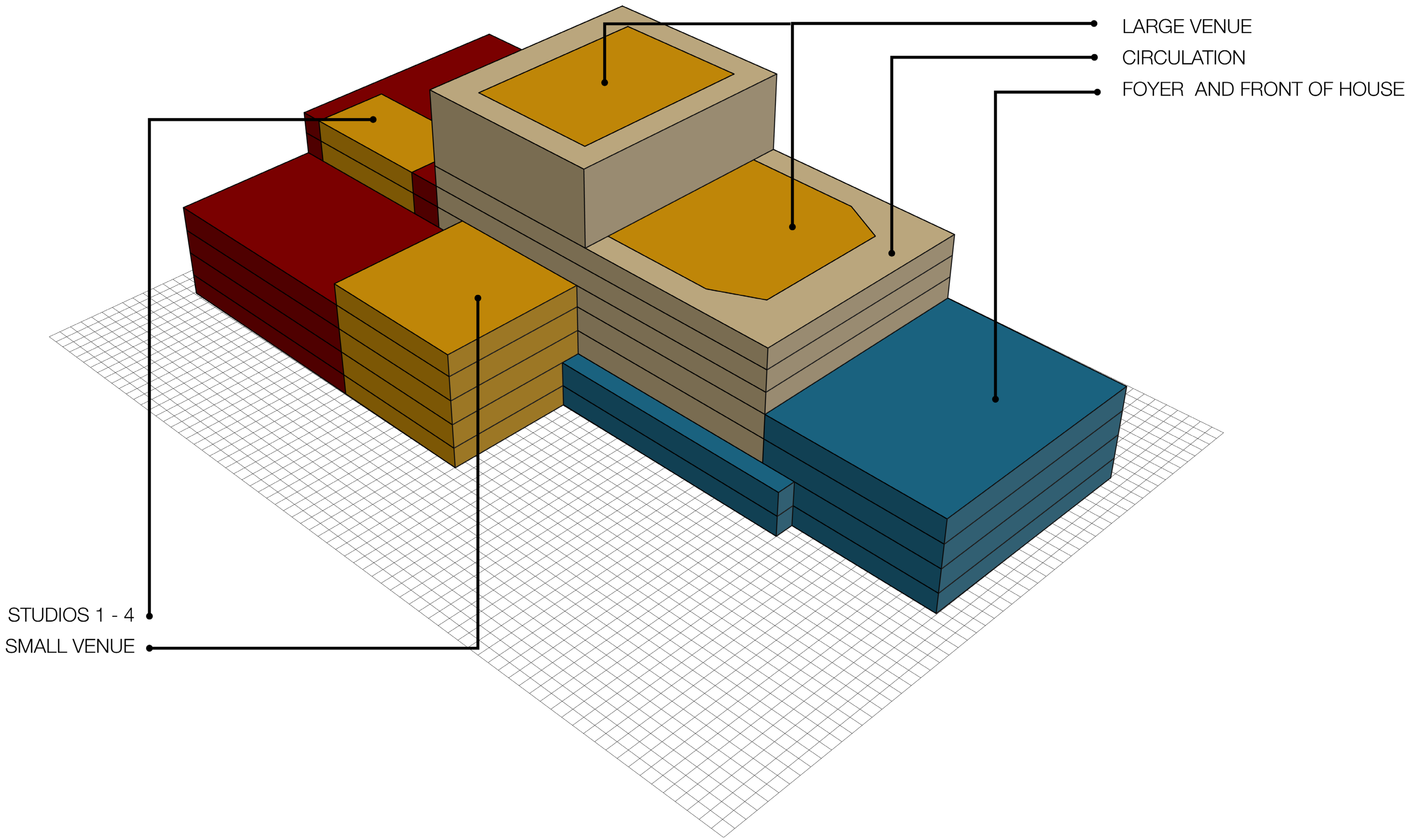
All offices should have sufficient acoustically absorbing finishes to make them pleasant work environments. Finishes typical for this type of space include a carpet tile floor and an acoustical tile ceiling.

7.5.2.4 Production Office

An external production office area has been included to accommodate the production teams of non-resident productions, whether they be from one of the principal stakeholder groups, or from a visiting production.

Offices should have sufficient acoustically absorbing finishes to make them pleasant work environments. Finishes typical for this type of space include a carpet tile floor and an acoustical tile ceiling.

7.6 Facility-wide Requirements



7.6 Facility-wide Requirements

The following section describes requirements which apply to the entire Facility.

7.6.1	Specialised Performance Equipments Systems Infrastructure
7.6.2	Control of Noise and Vibration
7.6.3	Accessibility
7.6.4	Sustainability
7.6.5	Smart Building Technology and Facility Operations and Maintenance
7.6.6	Asset Management Best Practice
7.6.7	Security
7.6.8	Fire/Life Safety

7.6.1 Specialised Performance Equipment Systems Infrastructure

The specialised performance equipment systems planned for this Facility include systems and systems infrastructure that shall support intra-venue and inter-venue activities.

The production communication systems of this Venue shall include professional quality cabled and wireless production intercom systems, an audio program/ paging system, a lobby paging and audience recall system, and production video systems.

The production intercom system will allow designers and stage managers the means to convey technical and cueing information to technicians and to each other during set-ups, rehearsals and performances. It shall also allow communication between house management personnel and production personnel as well as communication between Venues.

The audio program monitor system will provide a means for staff, technicians and performers to listen to rehearsals or performances occurring in a Venue via ceiling loudspeakers located in the dressing rooms, backstage technical support areas, control rooms and offices.

The lobby paging and audience recall system will allow house management personnel to initiate pages and sound recall chimes in the lobbies, lounges and other public spaces. The production video system will also be designed to distribute signals to video monitors throughout the backstage and technical support areas of all Venues from permanent and portable cameras located in the audience chamber and backstage areas. Additionally, video signals will be distributed to video monitors in public areas to provide late-comer video as well as digital signage.

Refer to the Sound Video and Communications section of Appendix D for further details.

Details of the following topics are discussed below:

7.6.1.1 Cable Pass System	
7.6.1.2 Technical/Performance Power	

7.6.1.1 Cable Pass System

While the performance equipment systems built into the Facility will accommodate the needs of most productions, some users may wish to augment the house systems with their own, more familiar equipment, or they may bring in temporary systems packaged for their productions.

Operation of such portable equipment will require a network of empty physical pathways, knows as the cable pass system. This system shall accommodate the deployment of temporary, portable cables by users of the Venues such as broadcasters, film crews or recording entities. The network of pathways shall include acoustically isolated/fire-rated penetrations in walls, floors and ceilings; cable hooks; and cable trays; and shall connect most technical, performance and public spaces with the loading dock and remote broadcast truck parking position to allow outside presenters and house technical staff to use supplementary equipment and equipment systems. Supplementary show power company switches. Use of the cable pass system will help ensure that temporary cabling not compromise the acoustics isolation of the Venues, their fire protection strategy or create unsafe circulation conditions. Temporary cables will be used in addition to the production audiovisual systems, or production lighting systems wiring, or for outsourced broadcast or recording purposes. See also Temporary Cable Management in Appendix D.

7.6.1.2 Technical/Performance Power

The building power infrastructure must be designed to accommodate the anticipated maximum electrical load requirements of the performance equipment systems.

The total maximum power requirement will be determined by applying specific diversity factors to the total (theoretical) connected load of all the equipment within each performance equipment group (theatre equipment, production lighting, and production sound, video and communications systems) and by determining probable peak and average electrical demand requirements for performance and non-performance scenarios. While the resulting total power requirement will be appreciably lower than the theoretical total connected load, it must be noted that the technical power needs for the New Theatre will be greater than the typical electrical loads seen in a traditional theatre.

The total maximum power provision must take into consideration productions that make full use of all of the artistic and technical potential of the Performance and Rehearsal Spaces simultaneously. In the Large Venue, this will include but will not be limited to productions that make use of the entire venue floor area as the performance area with dynamic multi-axis theatrical equipment usage under bright production light and/or broadcast conditions.

For example, many productions will require multiple projectors, in multiple locations around the main space, to operate simultaneously. Because of the broadcast capabilities, the performance lighting will also exceed standard theatre lighting electrical loads. The transformable nature of this Facility will also contribute to the electrical demand that must be carefully calculated to accommodate the worst case scenario: multiple systems operating at the same time at maximum capacity.

7.6.1.2.1 Company Switches

Company switches (or broadcast supply panel) are a power source for temporary performance equipment. The project will include company switches in various locations for specific requirements. The location, system voltage and amperage requirements of each company switch will be determined to best meet the expected usage of the Venue.

Company switches are often located in loading docks, backstage, galleries or individual electrical closets. They are often meant to provide extra power to items like portable dimmer racks, automation equipment, and audiovisual amplifiers and loudspeakers. Bringing additional power into a space for a temporary event will inform the ultimate layout of the cable pass system and better instruct the mechanical engineer in how to balance the airflow in the space if it were to have additional equipment knowing the potential for addition heat and electricity in the space.

7.6.1.2.2 Isolated Ground Power for Production Audio System

An isolated ground power system will provide clean technical power for all audio systems. An isolated ground transformer will be needed to support this power system.

7.6.1.2.3 Power Requirements for Production Lighting Systems

The acoustical requirements for the Venues in the Facility require particular care to ensure that the production lighting systems can operate quietly. A harmonic mitigating transformer or K-13 rated transformer will be required for all production lighting systems.

7.6.2 Control of Noise and Vibration

The degree of noise control materials and methods used to properly attenuate noise produced by the air delivery systems will depend on a number of factors, but among the most important is the length of acoustically lined duct between the fan and the nearest terminal in the noise-critical space. Significant savings can be achieved if the system is laid out so that there are no particularly short duct lengths. It is therefore recommended that air handling units serving noise-critical spaces be located as remote from the spaces they serve as possible to facilitate these long duct runs.

A combination of vibration isolators, duct silencers, insulated acoustical plenums, insulated fan casings, and careful duct routing will also be used to attenuate the noise from these systems. Details of the following topics are discussed in the following sections:

7.6.2.1 Background Noise

Background noise requirements for all spaces are shown in Appendix C.

7.6.2.2 Mechanical System Noise

To keep airborne and structure-borne noise out of noise-critical areas, major mechanical and electrical equipment should be centralised in locations remote from noise-critical spaces.

A structurally separate physical plant should house the heaviest and noisiest equipment, such as chillers, pumps and large fans. This physical plant should also be planned to house major electrical equipment such as distribution switchgear and transformers. All this equipment should be located at or below grade.

Secondary mechanical and electrical plant rooms should be minimised in quantity, located remote from noise-critical areas, and should only contain fan units (not contain large vibrating machinery such as chillers, large pumps or large transformers). Isolating construction of walls and slabs will depend largely on the location of these spaces, so it is recommended to keep these areas remote from sensitive areas, surrounded by similar spaces where noisy activities occur, and on or below grade where possible to avoid expensive sound isolating constructions.
Walls of mechanical and electrical rooms should be constructed of slotted block or solid block with inner wall surfaces covered with mineral or glass fibre insulation (50% coverage).

Mechanical and electrical duct shafts and duct zones can be used as acoustical buffer zones around the mechanical equipment room. Each duct or shaft that penetrates the plant room enclosure must be sealed appropriately.

Doors to and from plant rooms should lead only to acoustically non-critical building areas. In some special cases sound locks or specially rated acoustical doors may be required at access doors to the plant rooms.

Sound absorbing material should be applied to the walls and ceiling of the mechanical equipment room to control reverberant noise build-up. The area to be covered should be about 50% of the ceiling and wall areas. The sound absorbing material should be not less than 50mm 45kg/m³ density glass fibre board.

Fresh air intakes and exhaust air discharges should be located away from noise sensitive outdoor areas or locations where noise can re-enter the Facility through walls, windows, doors or vents.

A combination of vibration isolators, duct silencers, insulated acoustical plenums, insulated fan casings, and careful duct routing will also be used to attenuate the noise from all mechanical systems.

7.6.2.2.1 Acoustical Duct Lining

Mineral wool or glass fibre duct lining insulation (density 48kg/m³) with integral protective facing will need to be installed in all ductwork systems serving noise-critical spaces.

Acoustical duct lining insulation typically should be 50mm thick installed in all ductwork serving noise critical areas. Final lining requirements will be developed when duct layout and equipment selections have been made. Additional thermal insulation is not usually required for acoustically lined ducts.

7.6.2.2.2 Acoustical Plenums and Duct Silencers

Control of low-frequency fan noise is often best achieved through a combination of duct silencers and acoustical plenums. Plenums can be built on site from concrete, block or prefabricated insulated steel panels. Assume all acoustical plenums will be internally lined with duct liner insulation (100mm thick, typical).

For initial pricing, planning and mechanical room layout assume that each of the supply and return systems serving any space with a noise criteria of less than PNC-20 will require a plenum on the order of 2m × 3m × 4m.

Duct silencers may be required for noise attenuation when the noise reduction from acoustically lined duct is not sufficient. For initial pricing, planning, and layout, assume that each supply and return system for spaces with criteria of PNC-15 or less will each need a 3m long silencer. Each system serving spaces with criteria of PNC-20 will require a 2m silencer, and each system serving spaces with criteria between PNC-20 and PNC-30 will require a 1m silencer.

It is recommended to install silencers where the ducts exit the mechanical plant room. The heavier gauge steel from which silencers are built acts to reduce mechanical room noise break-out. Also, regenerated noise from silencers, even when the silencers are correctly located, means that they should be located as far from the terminals as possible.

7.6.2.2.3 Duct Materials and Duct Geometry

Rectangular sheet metal duct should be used for most applications. Avoid duct dimensions with aspect ratios exceeding 4:1, as they have a tendency to drum.

If exposed ductwork is required inside a noise-critical space (quiet or noisy), use internally lined circular duct, since this shape allows less noise to break into or out of the duct. Circular ducts must not be used for general use since they do not attenuate low frequencies sufficiently Transitions in duct geometry should be gradual; none greater than 1 in 7.

7.6.2.2.4 Duct Elbows

Use full radius elbows in systems serving noise-critical spaces in order to minimize generation of noise caused by turbulent airflow. Where full radius elbows are not possible, small radius elbows are still preferable to mitred elbows. Do not use turning vanes, except where required within the mechanical room as they generate noise.

7.6.2.2.5 Routing of Ducts and Pipes

Routing of ducts and pipes should be carefully considered early in the design. Service penetrations in sound isolating constructions must be avoided wherever possible. Ducts and pipes should not enter noise critical spaces directly from another occupied program space, but rather from an enclosed, quiet duct space or shaft.

Ductwork serving noise-critical spaces must not be routed through noisy spaces or through other noise-critical spaces. Noise can enter the duct in one space and be transmitted down the duct to another.

7.6.2.2.6 Piping and Noise-Critical Spaces

Hot water, chilled water, domestic water, steam, sanitary or roof drain piping should in general not be run within or through noise-critical spaces. Hot water and steam pipes can generate noise as the pipes expand and contract in the pipe clamps and as valves constrict the flow. Pipes connected to pumps will vibrate and radiate low frequency pump noise as well as flow noise. Such vibration can easily be transmitted through the building structure.

Flow noise can be a problem in all pipes, including domestic hot and cold water and must be contained. To minimise flow noise it is recommended to size pipes for a maximum velocity of 1.2m/s for pipes 50mm in diameter or less and 3m/s for larger pipe sizes using a pressure drop limitation of 400 Pa/m. Flow noise and vibration can also be introduced by turbulent flow, sharp pressure losses and trapped air. Care should be taken to avoid these conditions.

Sprinkler pipes pose no acoustical problem in quiet spaces, but the points where they penetrate the envelope of any noise-critical space must be carefully sealed.

Roof drain pipes transmit noise from outside and also radiate flow noise in storms. For this reason, all rainwater drainage pipes must be routed outside of noise critical spaces. The specific routing of rainwater drainage shall be subject to review.

7.6.2.2.7 Control of Air Flow Noise

Noise is generated by the flow of air through or past diffusers, grilles, dampers, turning vanes and duct fittings. The sound power generated at any one location depends on both the air velocity and the local geometry. The greater the air turbulence, the greater the sound power generated; higher velocities in the presence of local obstructions result in greater turbulence and therefore higher noise levels.

7.6.2.2.8 General Air Velocity Guidelines

The air velocity guidelines below are recommended for the design of the air distribution systems throughout the Facility.

Guidelines for Supply Air Velocity in m/s					
Location	Design Noise Goal for Space				
	N-1	PNC-15	PNC-20	PNC-25	PNC-30
at terminal outlet	1.25	1.5	1.75	2.1	2.5
to 7 diameters	1.5	1.8	2.1	2.5	3.0
main header ducts in space	2.5	3.0	3.5	4.25	5.0
outside room	4.0	4.8	5.6	6.8	8.0
in plant room	5.0	6.0	7.0	8.5	9.0

7.6.2.3 External Sources of Noise/Vibration

To mitigate external sources of noise and vibration, the Facility must be designed to isolate noise and vibration.

7.6.2.3.1 Noise Isolation

An outdoor airborne study was carried out at the site and no significant constant noise sources were observed. The primary outdoor noise sources taken into consideration are intermittent sources such as thunder and sirens.

The Architectural Design Team will be responsible for designing the Facility to meet the background noise levels indicated above. The technical solutions in this document are minimum requirements.

Additional noise measurements will be taken on site to confirm or modify isolation build-ups as necessary to meet those goals. The noise levels in the table below or the L1 levels measured by the Architectural Design Team on site during a period of 24 hours, whichever is greater (at every octave band centre frequency), must be used by the Architectural Design Team to confirm or modify isolation build-ups as necessary to meet the background noise criteria.

	Octave Band Centre Frequency (Hz)								
	31	63	125	250	500	1K	2K	4K	8K
L_1 (dB)	99	99	98	94	89	85	78	70	59

To isolate noise critical spaces from sources of noise and vibration, the following general guidelines will be observed:

- Wherever possible, Performance and Rehearsal Spaces will be surrounded, both vertically and horizontally, by quiet program spaces such as foyers, lobbies, offices, storage spaces, and backstage areas so their exposure to the exterior environment is minimised.
- Place no mechanical or large electrical equipment in these surrounding rooms.
- Do not attach plumbing fixtures and pipes to the walls, floor or ceilings of any performance or rehearsal space.
- Locate the noisiest spaces farthest from the performance spaces.
- Avoid locating lavatories directly adjacent to the performance or rehearsal spaces. Noise from flushing toilets must be isolated from these spaces by a buffer zone, such as a corridor, and if possible, separated from the performance spaces by the acoustical isolation joint.
- Drinking fountains with integral refrigeration equipment will not be mounted on walls common to noise-critical spaces. Vibration isolation of the cooler will be necessary for drinking fountains, depending on wall type and location.
- Massive walls, ceiling, and floors will surround the performance spaces to provide the necessary acoustical isolation against exterior and interior noises.
- Structural discontinuities (acoustical isolation joints) will be integrated around the loading dock (and mechanical electrical room) and the Large Venue.

Sound- and light-lock vestibules are essential for all entrances to and exits from Performance and Rehearsal Spaces. Sound- and light-lock vestibules provide an appropriate sound (and light) isolation buffer between the performance/rehearsal venue and its surrounding areas.

7.6.2.3.2 Vibration Isolation

Although environmental site ground-borne vibration testing has not been undertaken yet, experience from the neighbouring KKL indicates that the Venue in the New Theatre Lucerne will not require significant vibration mitigating measures from environmental sources.

There is a lake water pumping station close to the site. Vibration measurements shall be taken on site to confirm whether vibration mitigating measures should be taken to reduce the impact of the pumping station or other vibration generating sources.

The Architectural Design Team will be responsible for formally studying the site for the presence of groundborne vibration and determining whether it will create audible noise in the Venue.

An acoustical isolation joint will surround the full perimeter of the Large Venue to isolate it from other performance spaces, the foyer, truck dock and large mechanical equipment. This joint is a complete structural discontinuity and no structural connections are permitted to cross the joint. The joint runs the full height of the building but does not penetrate through the foundation slab. Any services crossing the joint must utilize flexible connections at the point where they cross the joint.

A second acoustical isolation joint has been assumed between the loading dock and the rest of the Facility. The primary mechanical electrical room should be clustered with the loading dock (and therefore on the noisy side of the acoustical isolation joint) so that any vibration from large equipment can be most cost effectively isolated.

7.6.3 Accessibility

All public, artist, office and technical control spaces within these facilities will be accessible for disabled performers, visitors and staff.

Design considerations in addition to building code requirements to ensure that this is the case will include the following:

- special access for disabled visitor transport to pick-up and drop off area(s)
- step-less access from the exterior to all public spaces, artist and office spaces
- automated door access for key doorways
- assistive listening and tactile signage in all public, staff and artist circulation areas
- elevators and chair lifts (if any) to be self-operating with tactile signage and assistive listening systems for independent and discreet use
- box office / information service area designed for disabled patron usage
- wheelchair accessible toilets distributed throughout the Facility for public, artist and staff areas.
- wheelchair seating areas (with companion seating) distributed in every significant section of the performance chamber in accordance with International Building Code standards[13]
- assistive listening systems infrastructure in each Venue for hearing impaired patrons
- surtitling (captioning) systems and infrastructure for sign language for hearing impaired
- wheelchair access to at least one principal dressing room – single, and one principal dressing room – quad with mobility impaired access toilet and shower
- audio alert systems throughout the Facility with visual elements

7.6.4 Sustainability

The Facility's design will meet relevant energy and sustainability codes in order to reduce its impact on the environment while maintaining high levels of indoor environmental quality for occupants. These codes include Swiss Society of Engineers and Architects (SIA) 180, SIA 380, SIA 382 and SIA 384. The design will also follow the requirements established in the cantonal energy implementation guides known as "Vollzugshilfen der Konferenz Kantonaler Energiedirektoren".

Consideration should be given by the Architectural Design Team to the following strategies which can be implemented to achieve energy and sustainability goals beyond what is required by code:

- renewable energy systems such as solar photovoltaics and solar thermal heating
- rainwater harvesting and greywater reuse systems
- vegetated roofs and walls
- double skin façade
- daylight harvesting and shading
- thermal massing
- high performance and environmentally preferable building products (eg, insulation, adhesives, sealants, interior finishes, furniture)
- automated waste collection system

13. International Building Code requirements or Swiss Building Code, whichever is more stringent

A potential aspirational goal is to design the Facility to meet the requirements of the Minergie Standard, which is a popular voluntary building standard in Switzerland. The Minergie Standard has several certification levels with differing requirements for the building envelope, ventilation systems, thermal comfort, overall energy use, indoor environmental quality, materials, and embodied energy. The design could also aim for DGNB certification, which is a holistic sustainable building certification scheme based in Germany that can be applied internationally. The DGNB certification scheme includes sustainability criteria related to the environment, economy, socio-cultural aspects, technology, process work flows and site characteristics.

7.6.5 Smart Building Technology and Facility Operations and Maintenance

Smart building technology can be leveraged in the operations of performing arts facilities in a number of different ways, which include enhancement in the following areas:

- visitor physical and online experience
- marketing
- signage and way finding
- productivity and efficiency of operations
- improved Hard FM and Soft FM systems integrated with intelligent data, sensors and visualisation tools
- video projections onto façades
- large scale audio visual events
- access for patrons to car parking and catering
- efficient asset management
- assistive systems for disabled patrons
- enhanced content information through mobile devices
- internet access for artistic and educational users
- end to end supply chain integration

It is recommended that the Architectural Design Team consider an integrated approach of the following systems:

- value creating collaboration through the entire life-cycle of the Facility, underpinned by the creation, collation and exchange of shared 3D models and intelligent, structured data attached to them
- a combination of data about the physical assets created and structured according to its use and re-use through all stages of the Design and Construction Phases providing maximum benefits to the owners and operators of the Facility
- a fully integrated asset information system, providing a single source of truth of information enabling intelligent decision making for the short term operational purposes and the long term strategic planning
- best practice asset management approach enabling implementing ISO55000 Asset Management ensuring a whole-life thinking is embedded into the Design and Construction Phases
- building management system to provide building services control and monitoring (air-conditioning, architectural lighting, fault reporting) integrated with the 3D model, intelligent data and visualisation tools
- architectural lighting control systems as well as shade control in appropriate areas
- physical security systems including video surveillance, access control, guard patrol monitoring, and barrier/bollard operation
- public safety systems / fire alarm / fire protection
- voice communication systems
- public address and paging systems
- a converged IP network
- structured cabling system, including fibre optic and copper cabling

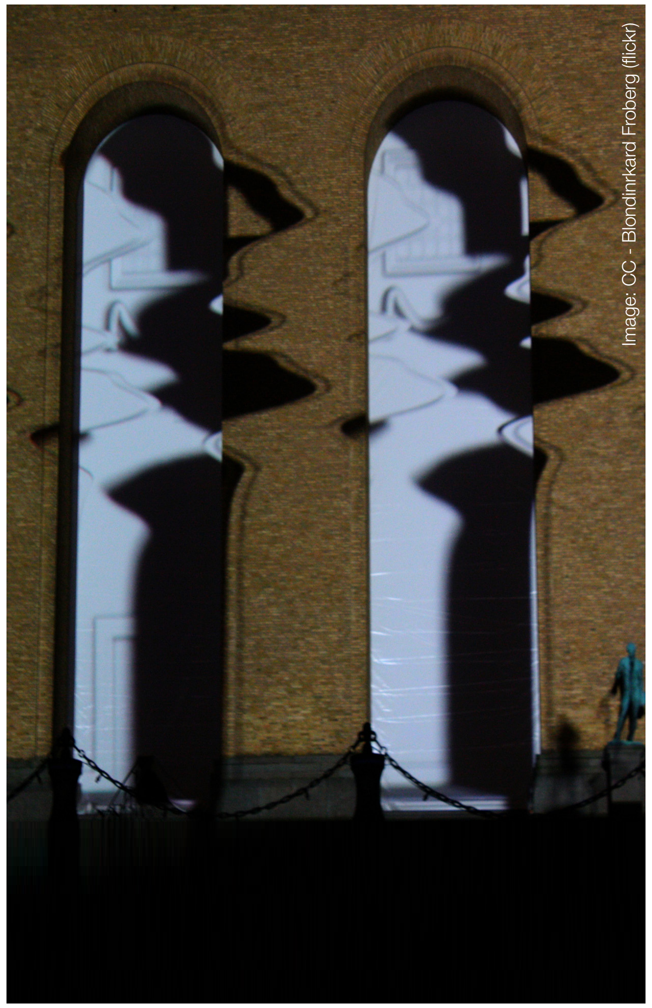
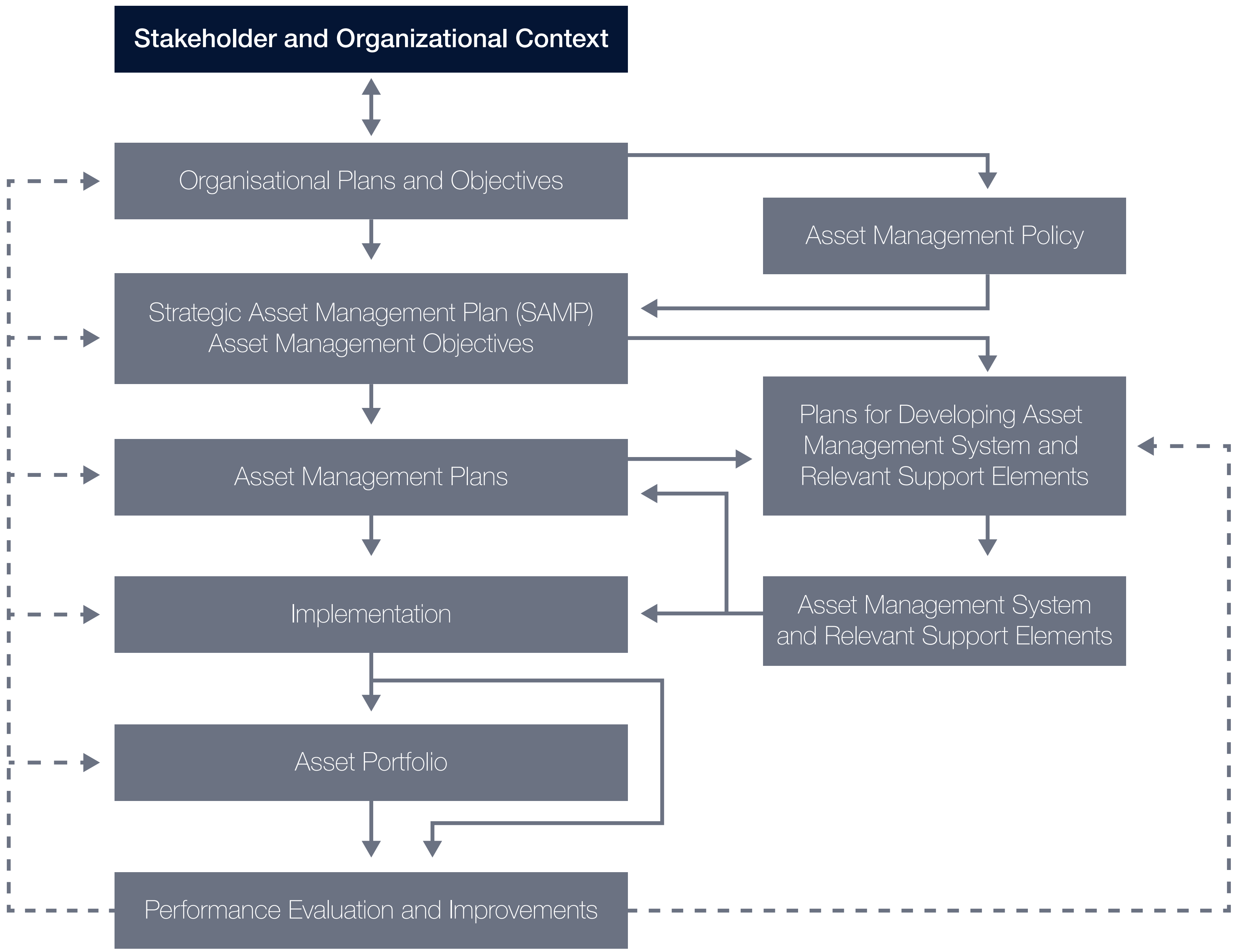


Image: CC - Blondinrikard Froberg (flickr)



- operation and maintenance radio-frequency walkie-talkie system
- non-production audiovisual systems, including digital signage and way finding, video walls, as well as program displays outside venues

7.6.6 Asset Management Best Practice

A robust, strategic and best practice approach to asset management at the New Theatre Lucerne is going to be essential to meet the challenges of today and the future of theatres in the region. The new greenfield development must be seen as an opportunity to take a new approach to the management of the Facility, with the reduction of energy and operating costs whilst excellent patron and artists experience key to the theatre complex's future sustainability. The investors will have an expectation of best practice in the creation, operation and maintenance of the 'Lucerne Experience'.

An asset management system of excellence needs to be established for the New Theatre Lucerne to enhance its level of maturity and demonstrated effectiveness for its stakeholders (investors, theatre companies and patrons) and key competition. The asset management system will be defined by a set of guiding principles and the achievement of maximum value from the management of assets, in line with the objectives and operating context of the New Theatre Lucerne. This approach will require a governance, set of processes, technology and culture to achieve a strategic and holistic asset management approach for the new theatre complex.

The asset management system at the New Theatre is depicted in the diagram below and highlights the overarching influence of the theatre's business and stakeholder context on the management of assets.

Best practice asset management will be a key element to the New Theatre Lucerne achieving its vision and objectives to achieve the 'Lucerne Experience'. The New Theatre Lucerne has the opportunity to make the theatre surpass current asset management best practice by striving for an enterprise wide culture and supporting a road map to excellence. Embedding a holistic approach to asset management will require a collaborative approach between all key project stakeholders from the outset. The asset management approach will drive holistic thinking around assets that exist to provide value to the New Theatre Lucerne, artists and patrons. Asset Management will focus less on the physical asset, and more on the value that the asset can provide the theatre. The value can be tangible, non-tangible, financial or non-financial.

7.6.7 Security

The New Theatre will be designed to be a secure and safe environment for working artists, staff and for audiences and casual visitors.

The design of the Facility will consider the following:

- the expected character and usage of the foyer as a gathering space for the arts community and relevant general public
- the expected permeability of the foyer from 9am until after performances
- a ticket control strategy to determine where patron tickets will be collected and consequently what parts of the Facility are secured and unsecured and at what times
- the need to ensure secure Back of House spaces to create a safe environment for artists and staff free from disturbance by the public
- the need to ensure secure technical areas which keep artists, audiences and general staff from dangerous equipment
- the need to secure expensive equipment
- that some spaces act as controlled crossover spaces between being the public area and the Back of House space; these should be securable from both sides
- appropriate electronic monitoring of spaces
- electronic key card access

The design of the Facility will consider the access requirements indicated in Appendix C.

7.6.8 Fire/Life Safety

In addition to meeting all fire/life safety requirements defined by code, the design of the New Theatre will incorporate the following:

- staged fire alarm systems in performance areas so that audible alarms are activated either after visual confirmation of an incident or after a delay
- performance areas with both heat- and smoke-activated detectors; the smoke-activated detectors must be able to be overridden for performance pyrotechnics
- theatre technical electrical rooms equipped with a gaseous clean agent fire suppression system or equivalent to prevent damage to the electronics

The Technical Concept assumes that a fire curtain will not be necessary for this hybrid Venue. This will be subject to formal review and discussion with the Lucerne Authorities during design. If a fire curtain is necessary, the Architectural Design Team is encouraged to consider a Zetex type brailed curtain system.

Facility Description | **Appendices**

ARUP

Appendix A | Large Venue Drawings

A1 Introduction

This appendix includes annotated drawings of two of the many possible configurations of the Large Venue of the New Theatre Lucerne. These are as follows:

- open configuration – flat floor
- proscenium configuration – opera

Two additional configurations (open configuration – surround, and proscenium configuration – theatre/dance) are also shown in the summary page. No detailed drawings are provided for these two options.

The drawings in this section will be the basis of the Architectural Design of the Large Venue, and the incorporation, without compromise to functionality, of the technical concepts illustrated here into the Architectural Design is a compliance requirement. Drawings illustrate design intent and indicate an absolute functional and acoustical requirement but assume that the precise shaping is open to change depending on the Architectural Design.

These technical concepts include:

- approach to transformability and incorporation of associated characteristics/equipment/systems
- distribution of audience
- sightlines
- acoustics-related shaping and geometries
- accommodation of specialised performance equipment systems
- approach to circulation
- alignment with Small Venue and Guillotine Doors

Numbers and subdivision of components and specific dimensions are recommendations and will be open for adaptation, except as otherwise specified in the Facility Description, provided the functional, acoustical and experiential characteristics as outlined in Chapter 1 are maintained.

Theatre Layout (745 Seats)

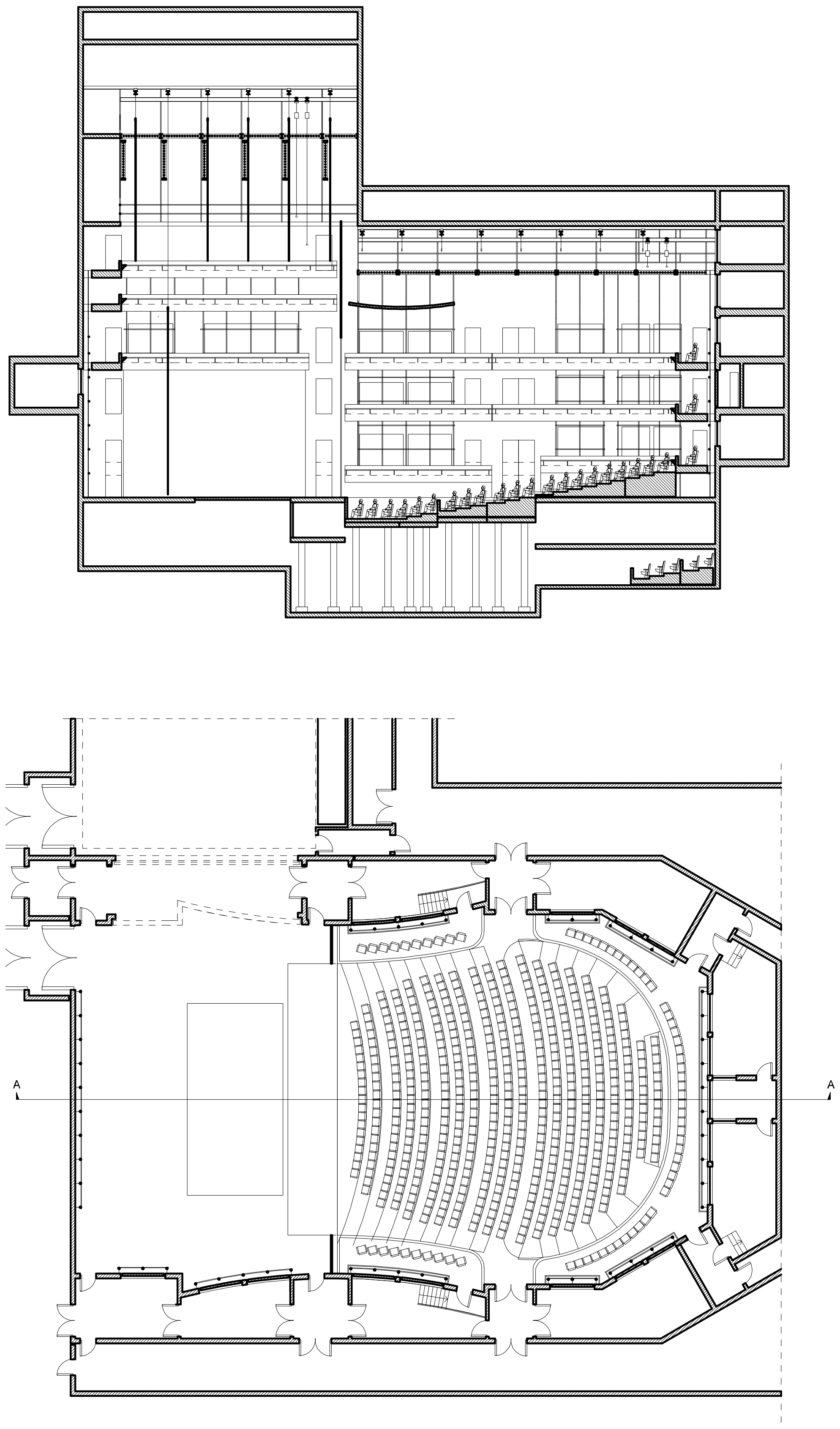


Fig 1. Theatre Layout: Section at top and plan at bottom

Opera Layout (620-678 Seats)

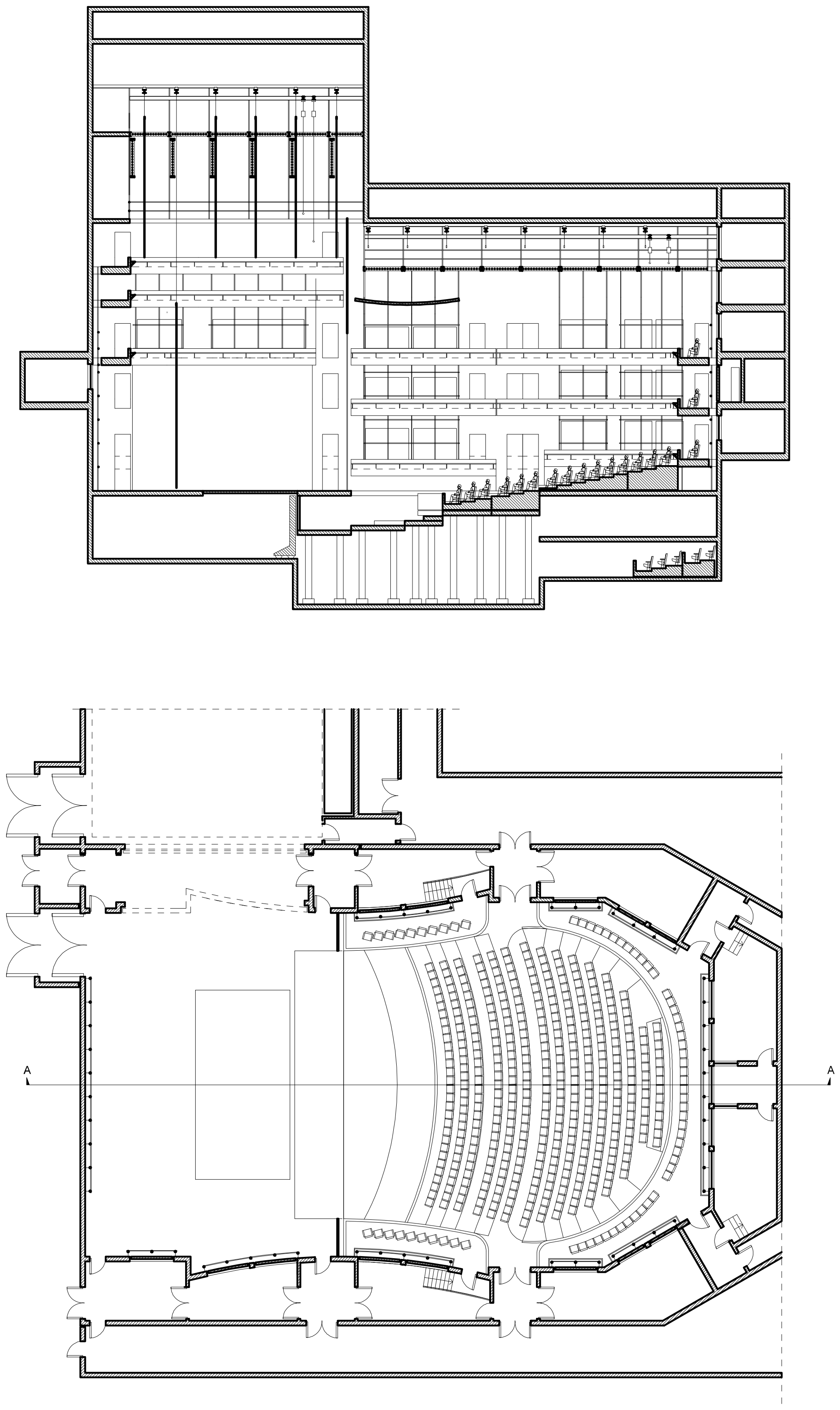


Fig 2. Opera Layout: Section at top and plan at bottom

Flat Floor Layout 0-1000 Seats)

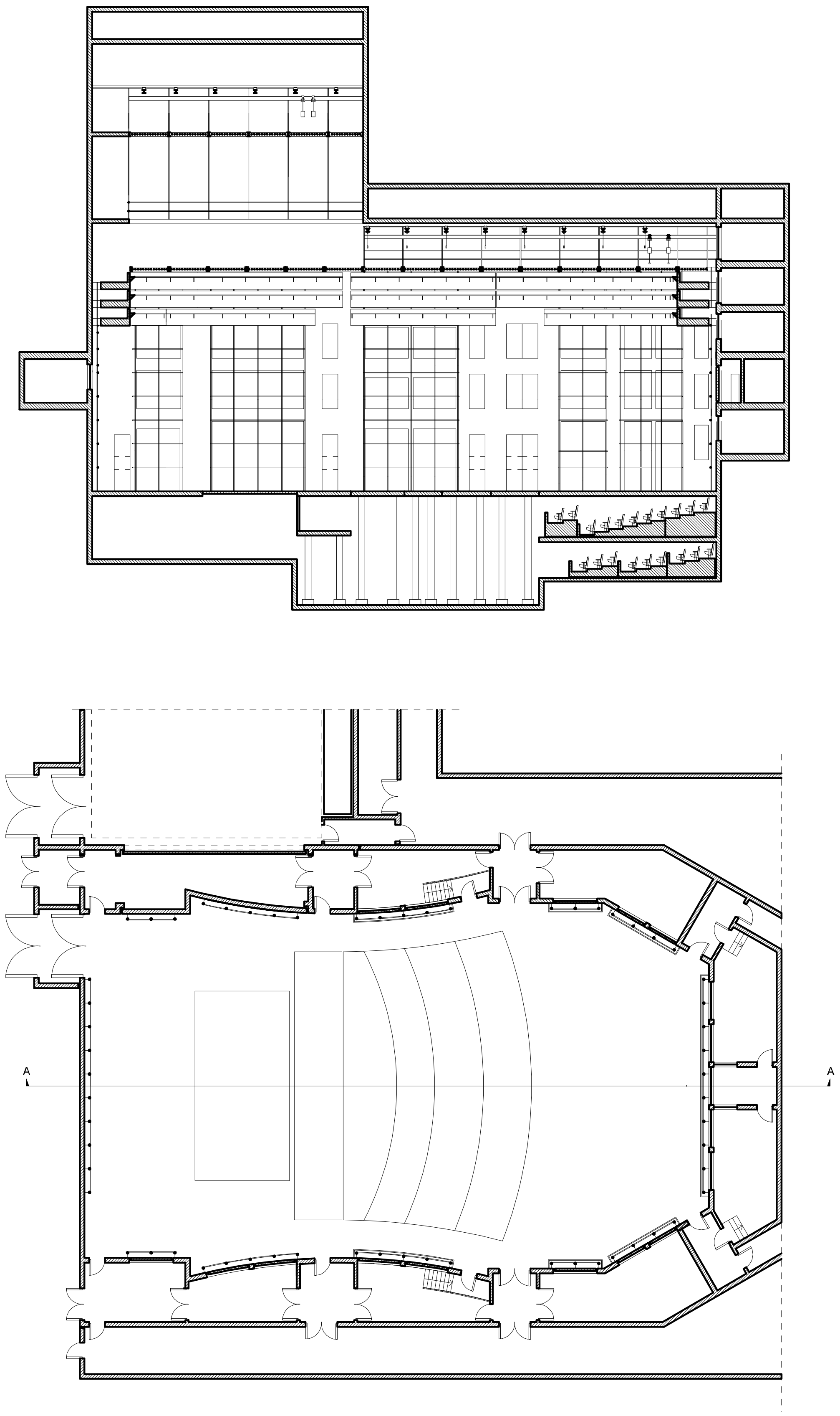


Fig 3. Flat Floor Layout: Section at top and plan at bottom

Flat Floor Surround Layout (372-1,154 Seats)

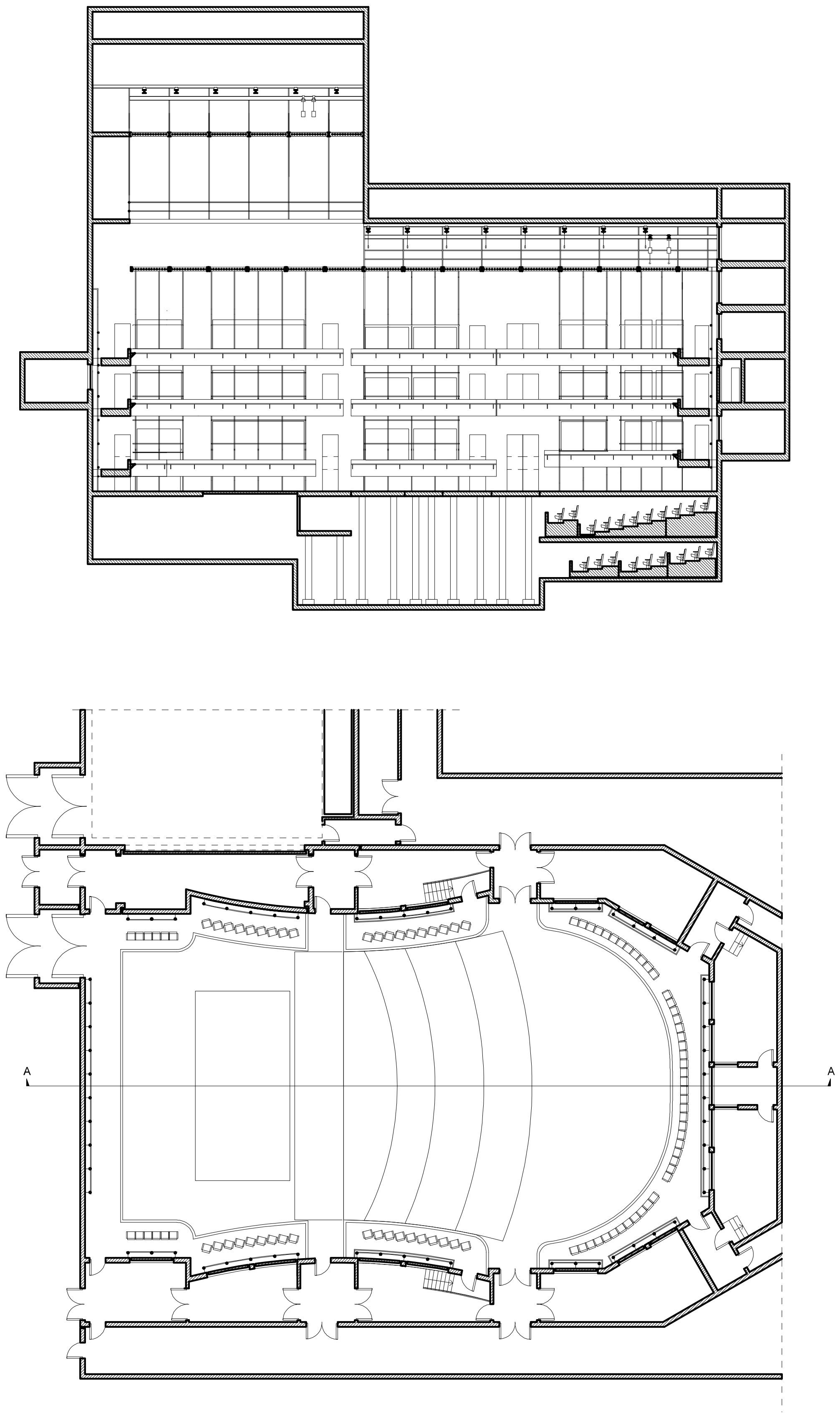
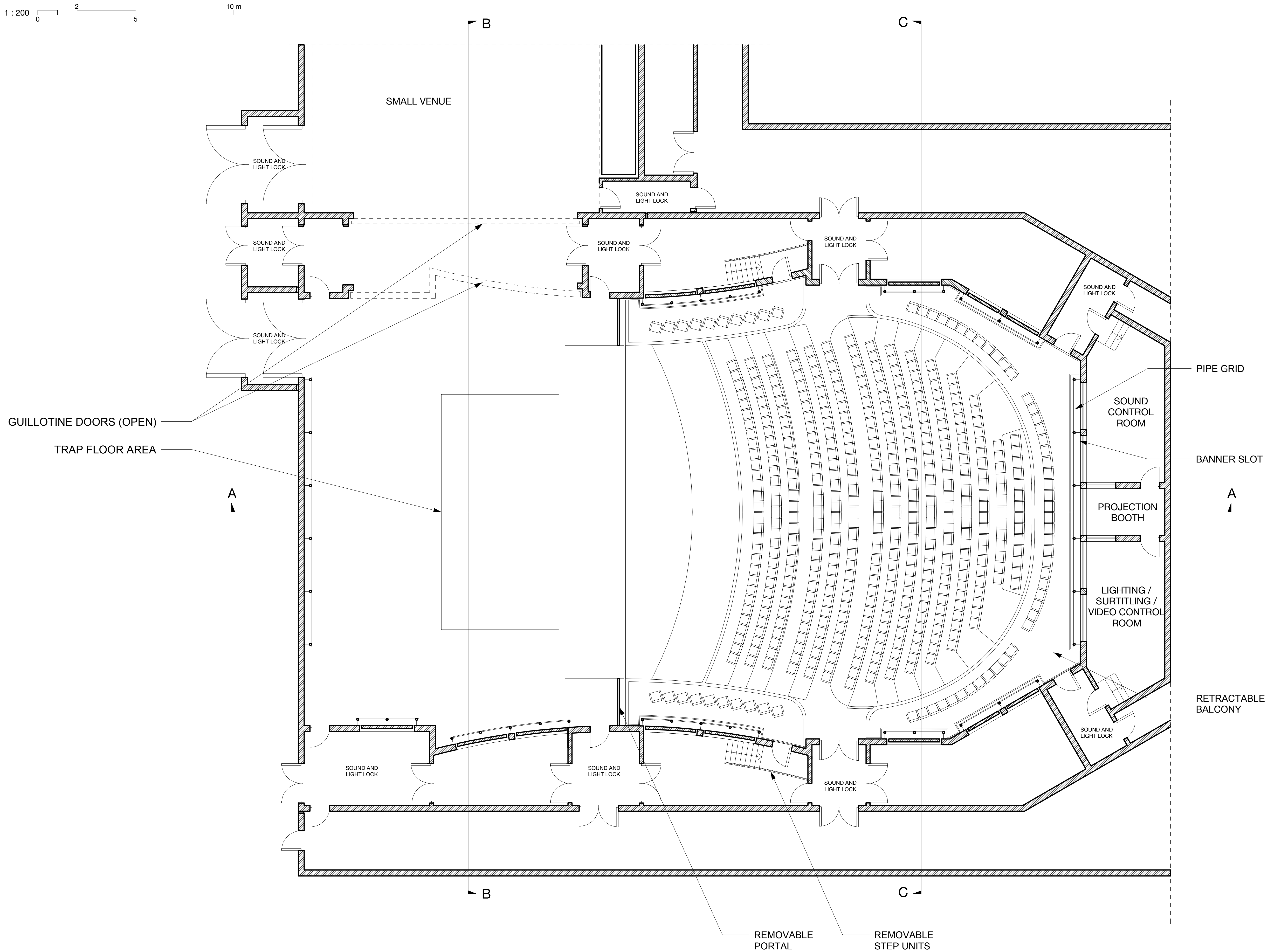


Fig 4. Flat Floor Surround Layout: Section at top and plan at bottom

Fig 5.

Proscenium | Orchestra Level



Proscenium | Level 1

Fig 6.

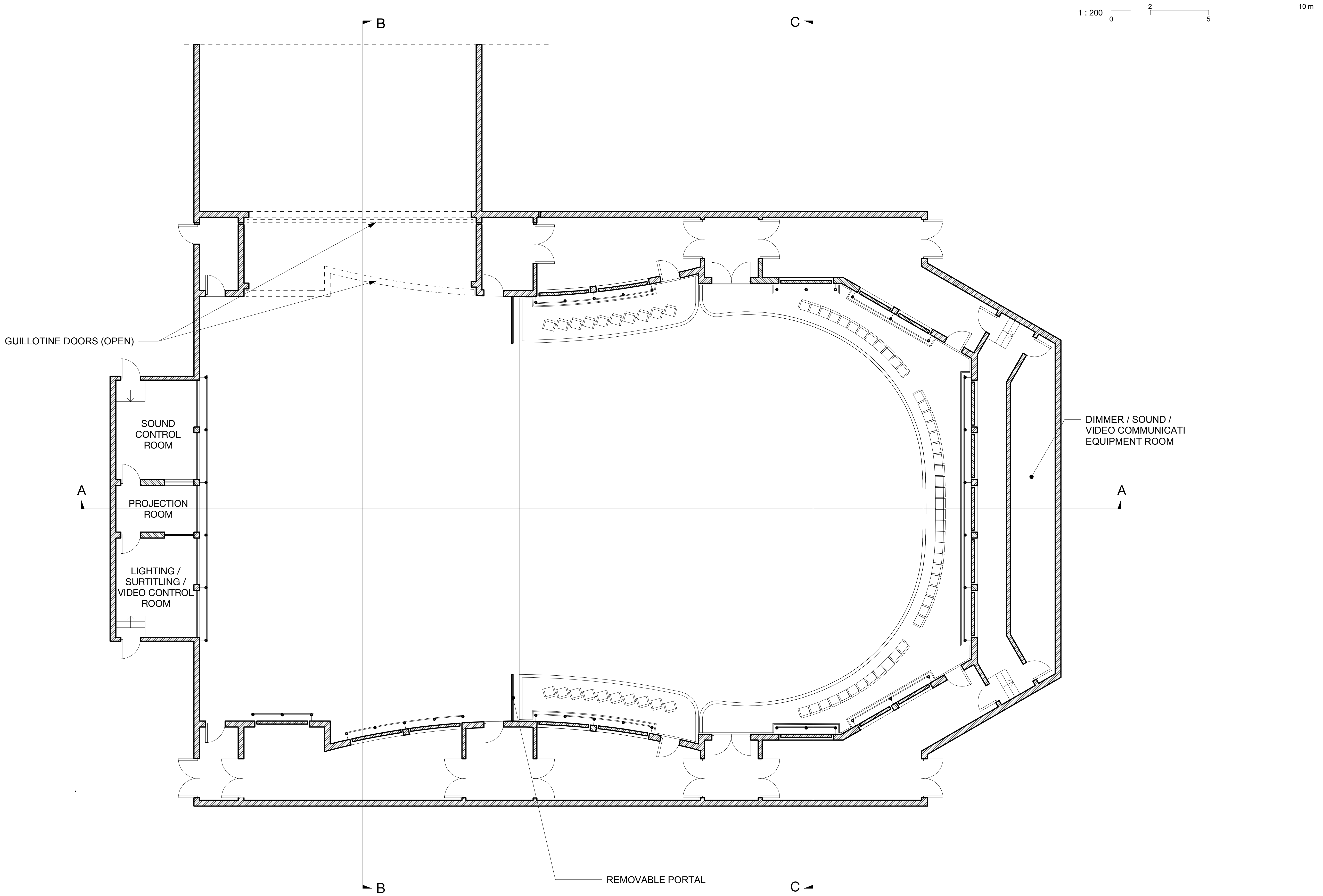
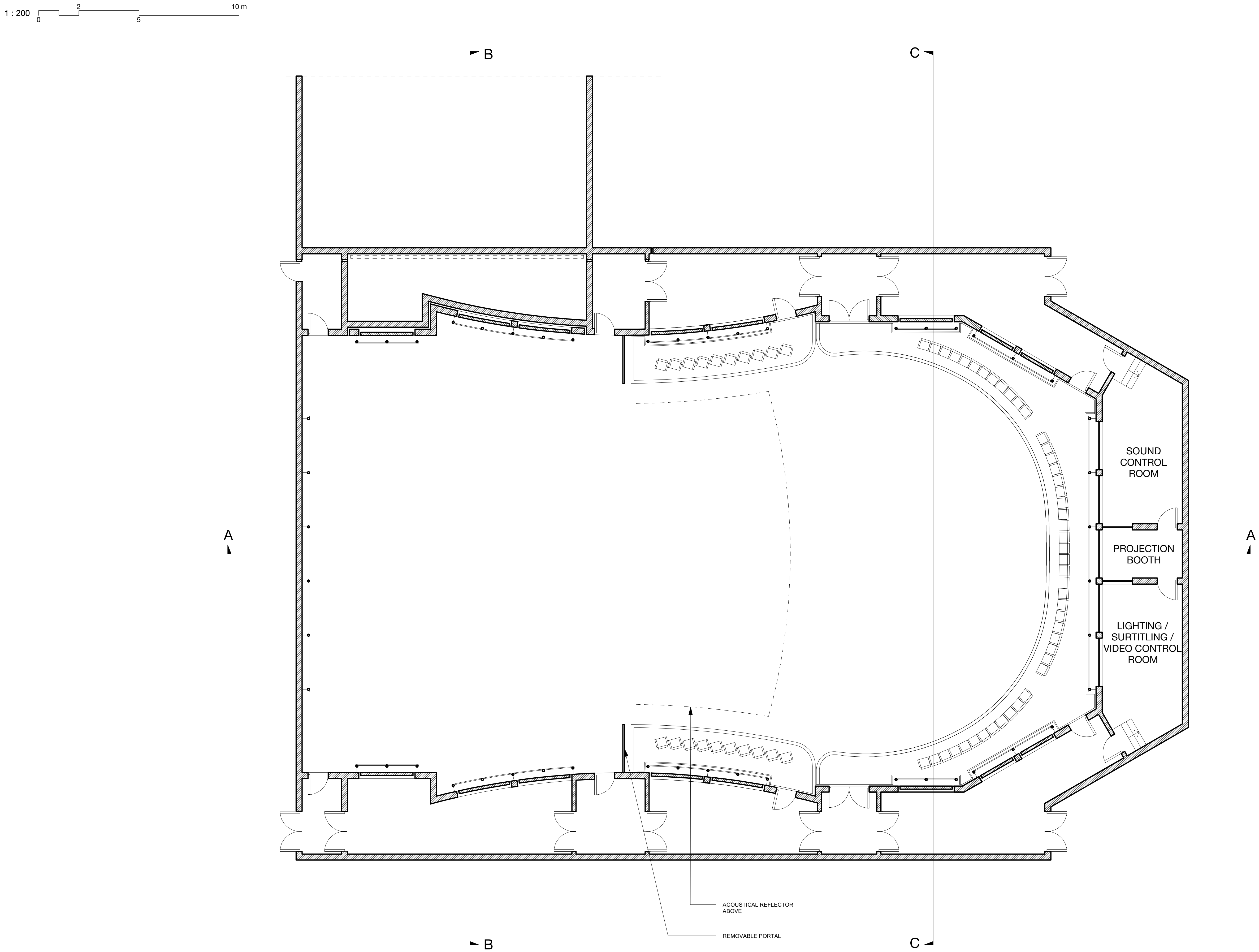


Fig 7. **Proscenium | Level 2**



Proscenium | Grid Level 1

Fig 8.

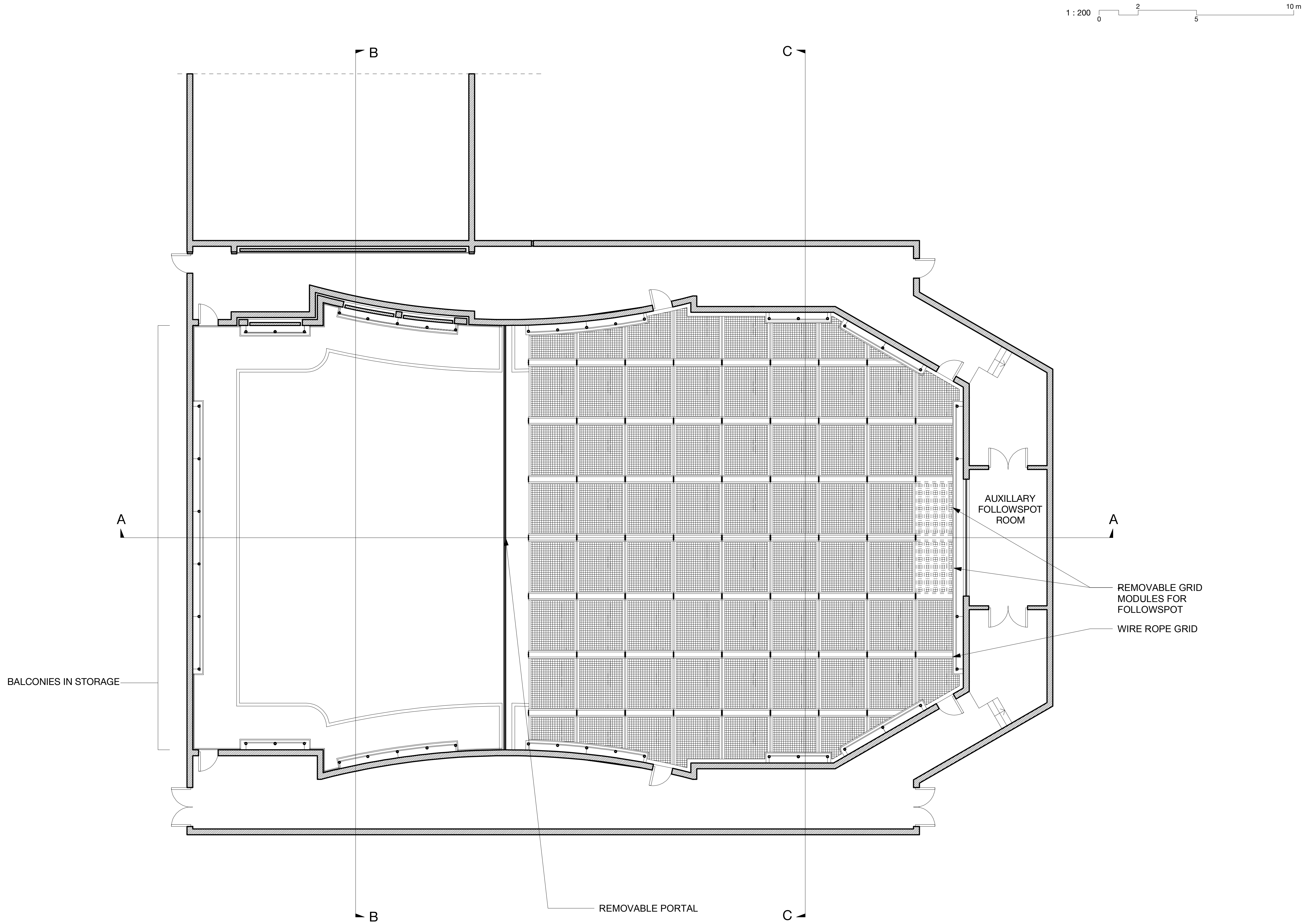
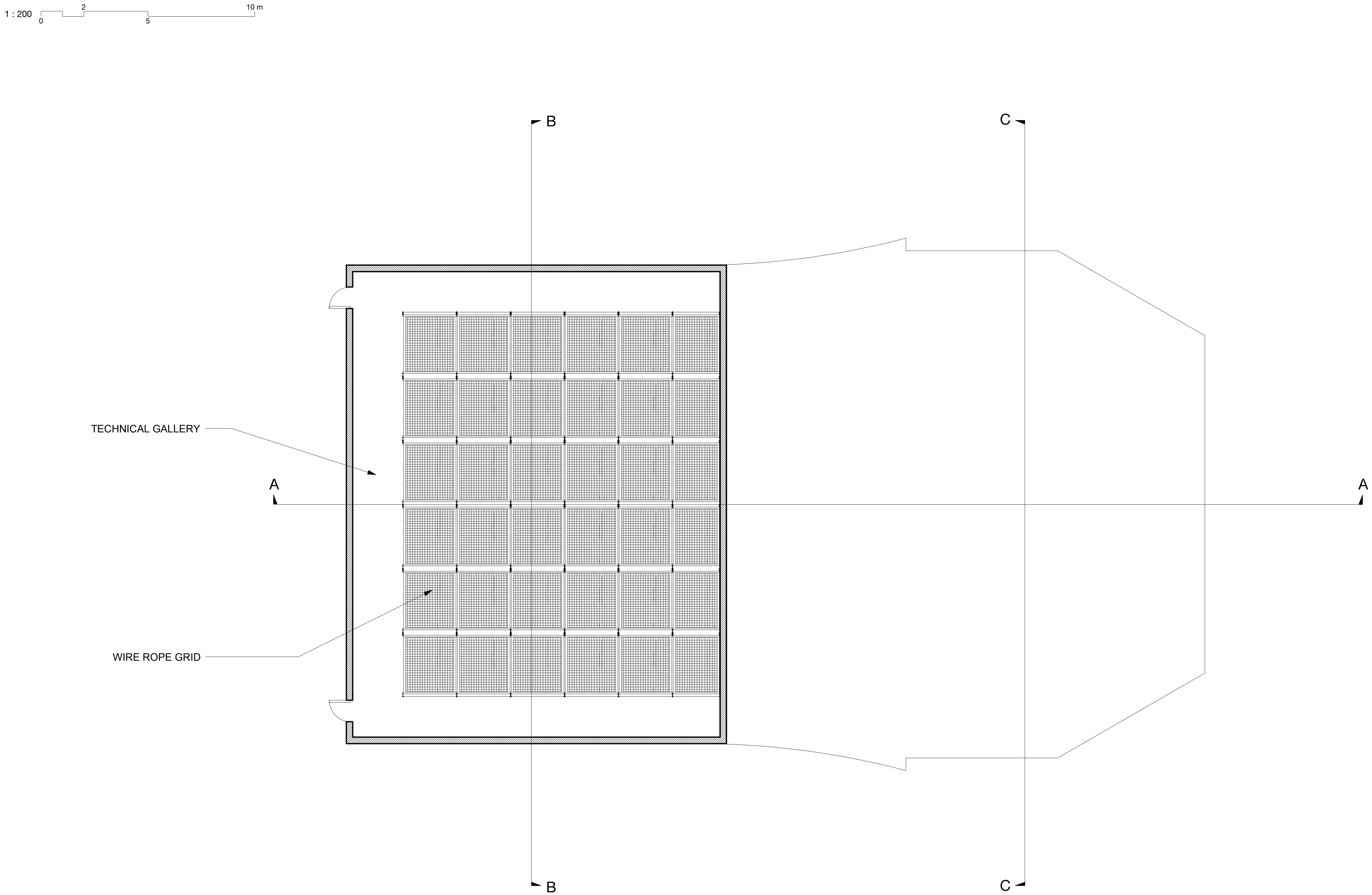


Fig 9. **Proscenium | Grid Level 2**



Proscenium | Section A-A

Fig 10.

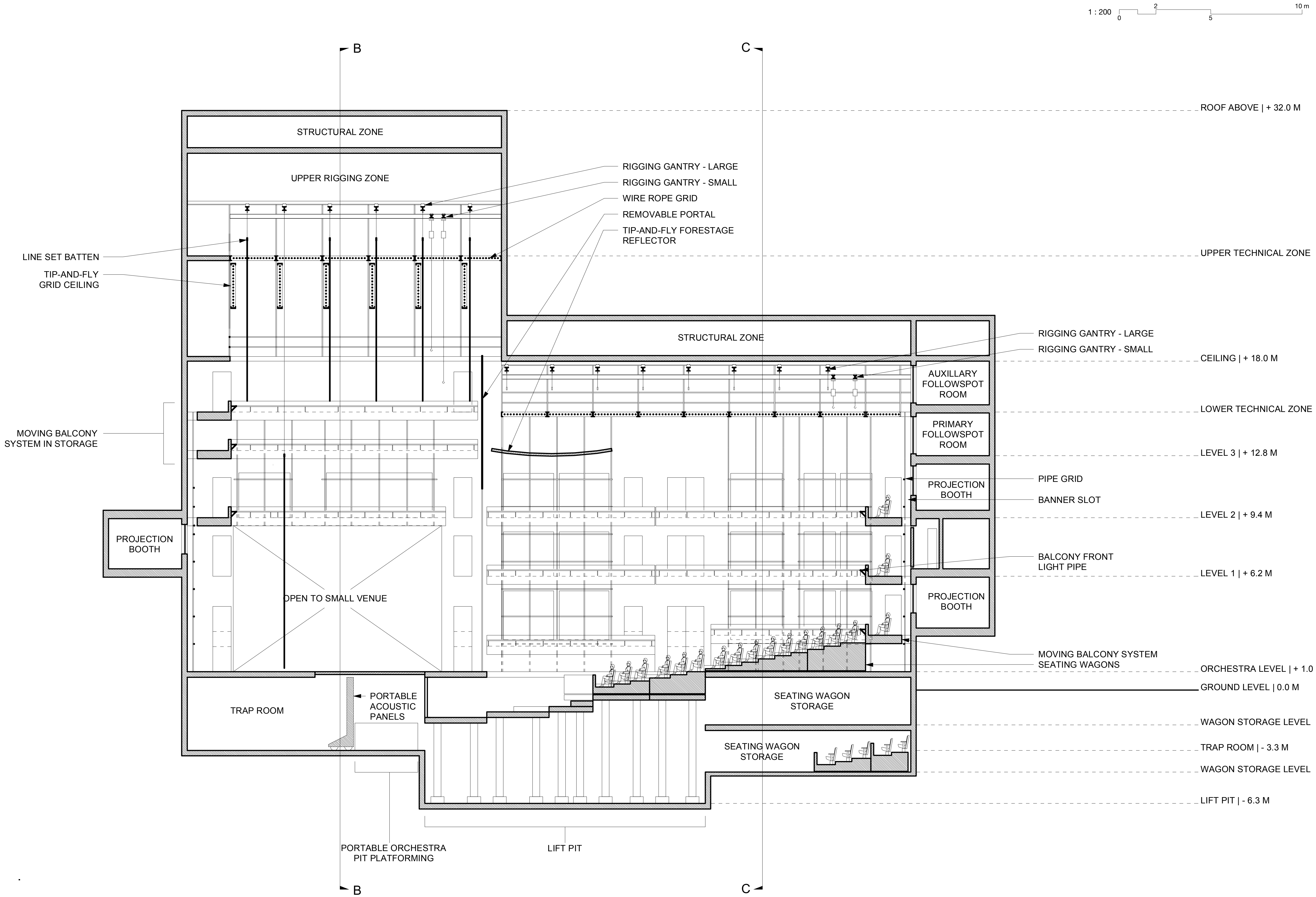
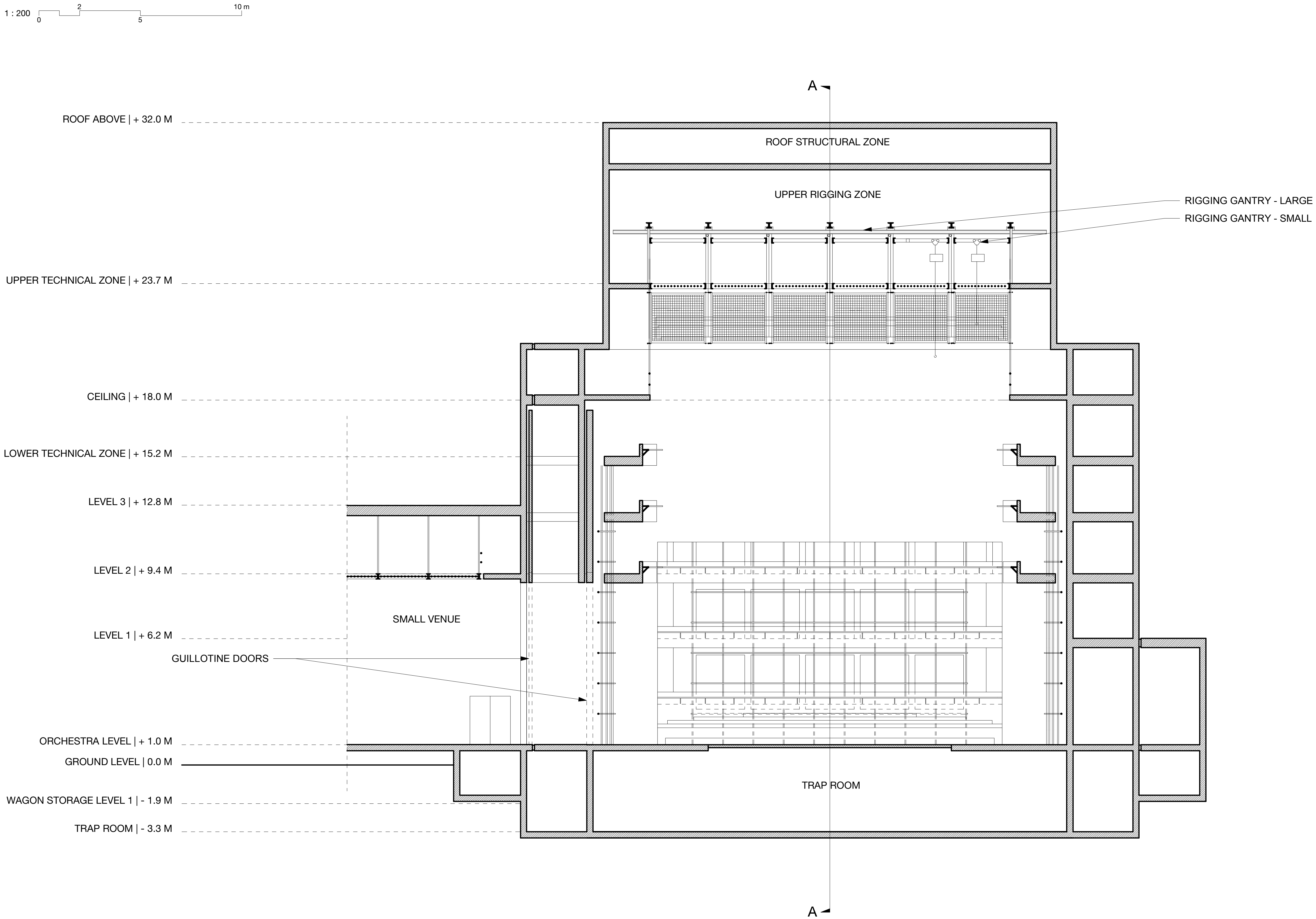


Fig 11. **Proscenium | Section B-B**



Proscenium | Section C-C

Fig 12.

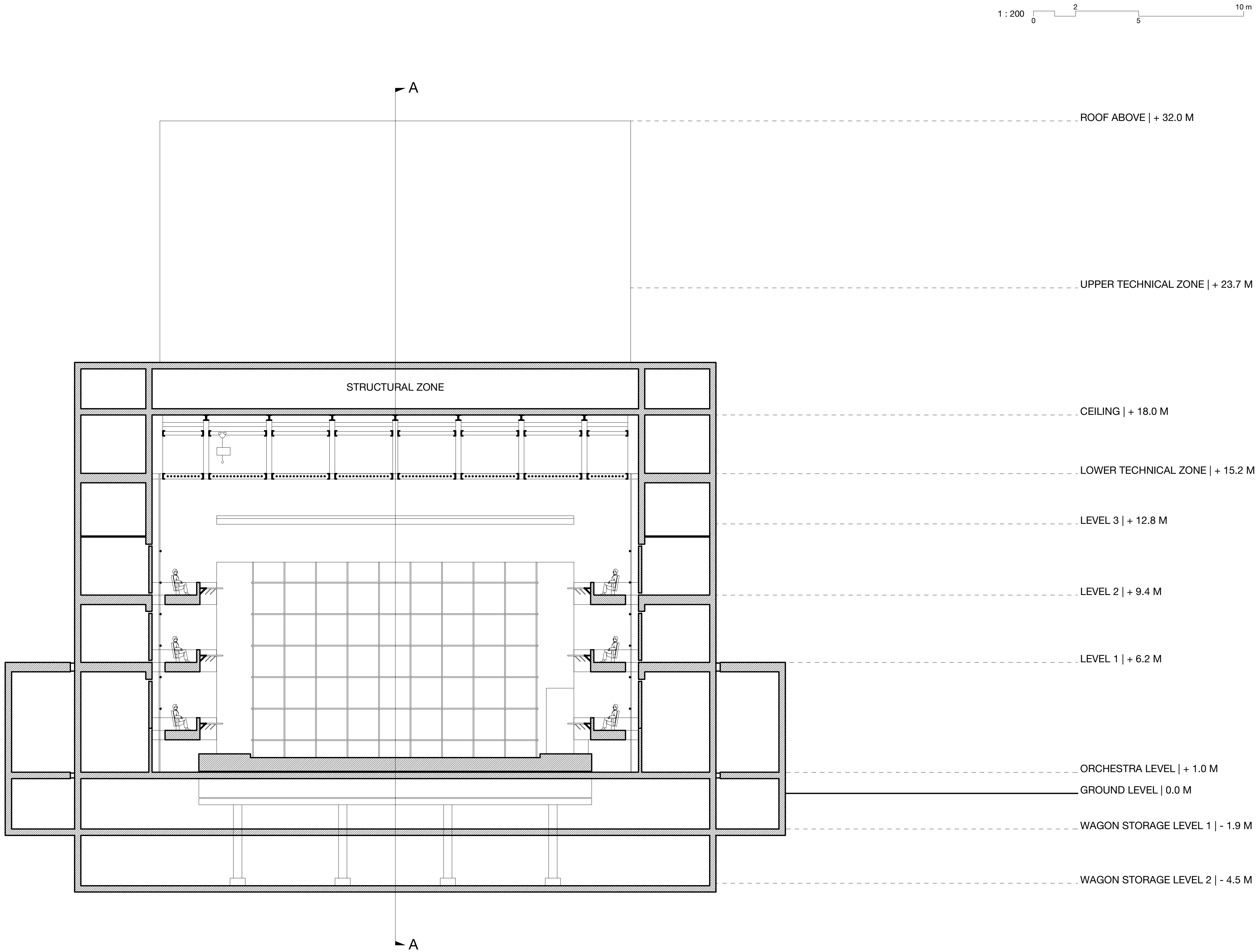
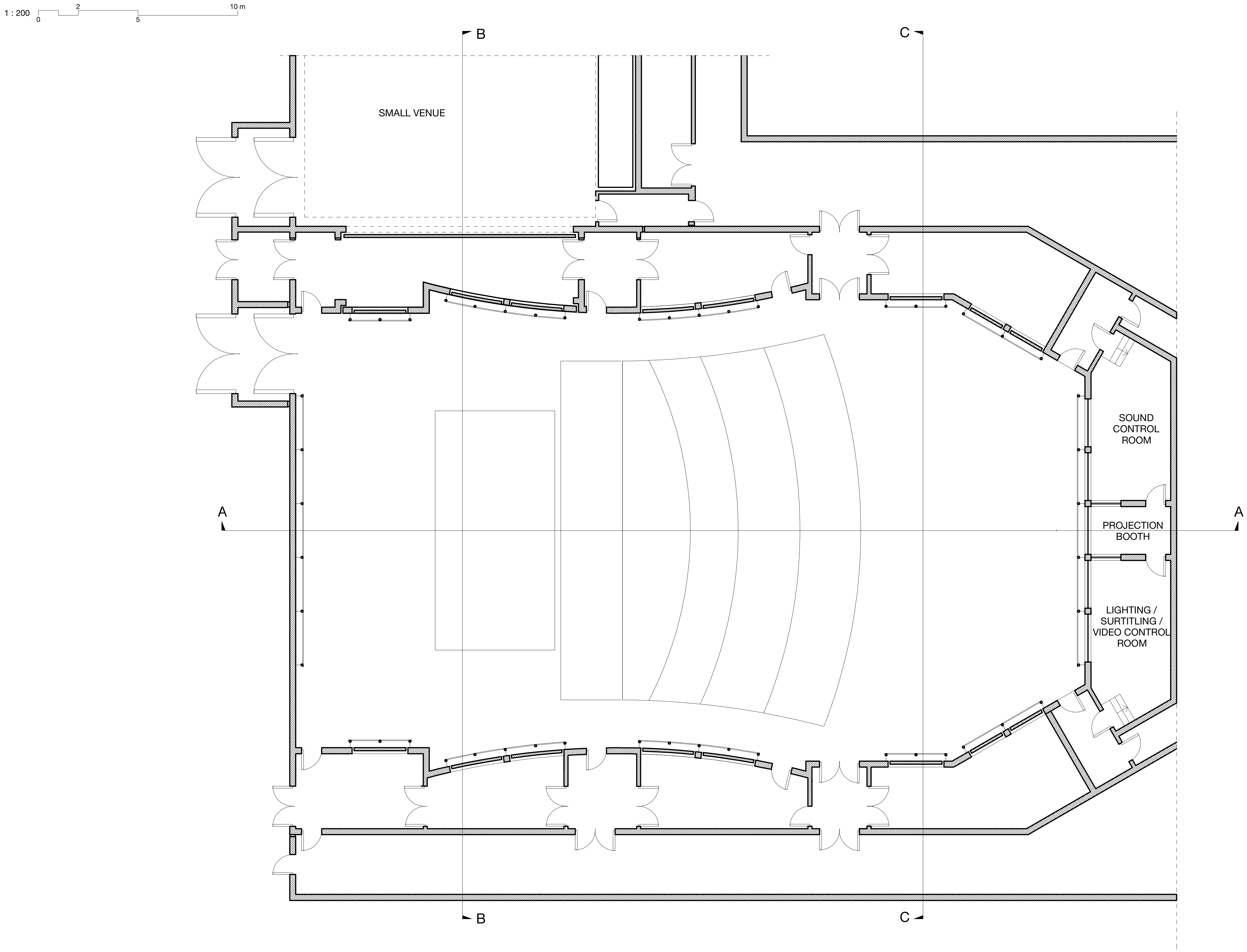


Fig 13. **Flat Floor | Orchestra Level**



Flat Floor | Level 1

Fig 14.

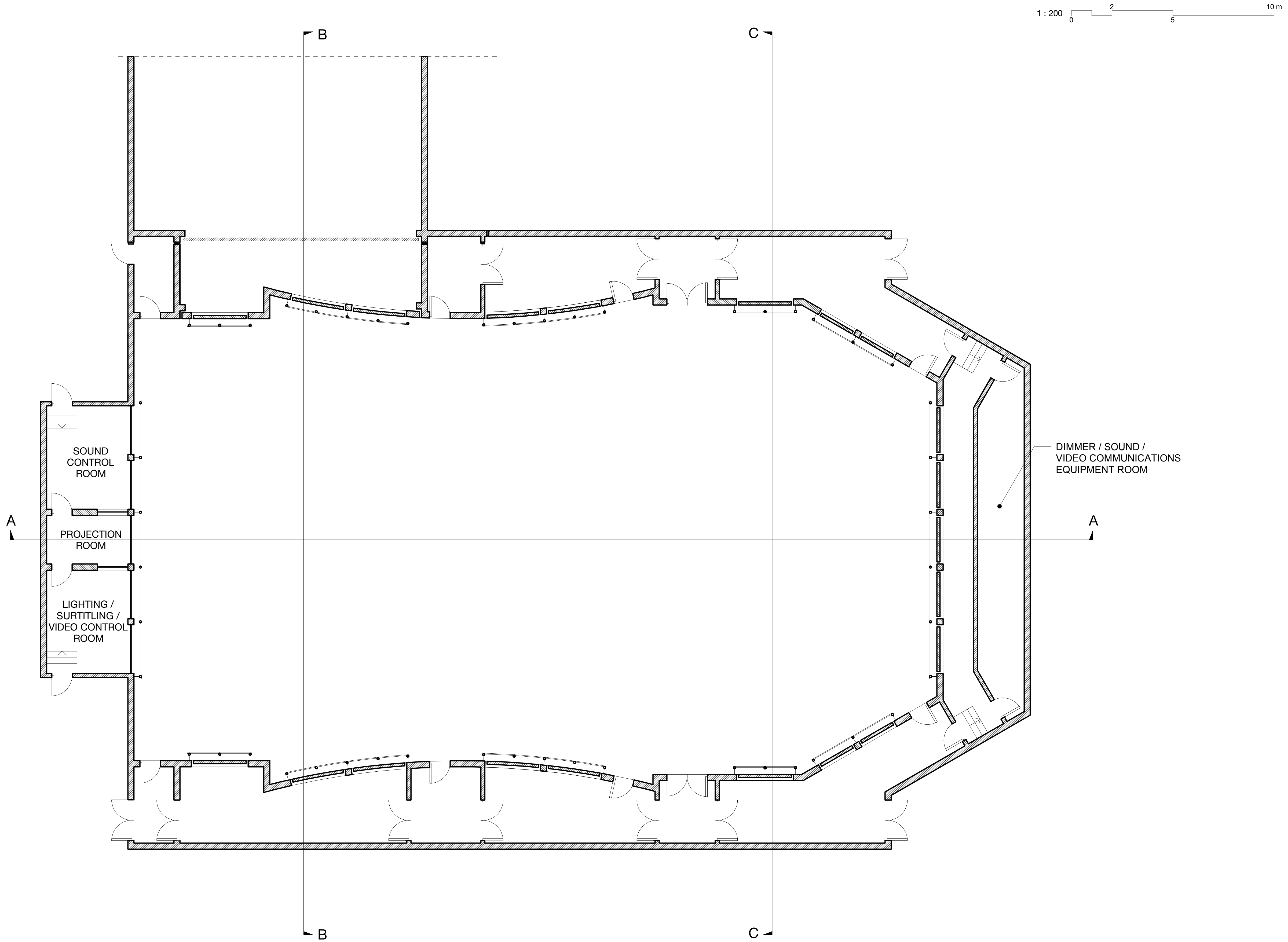
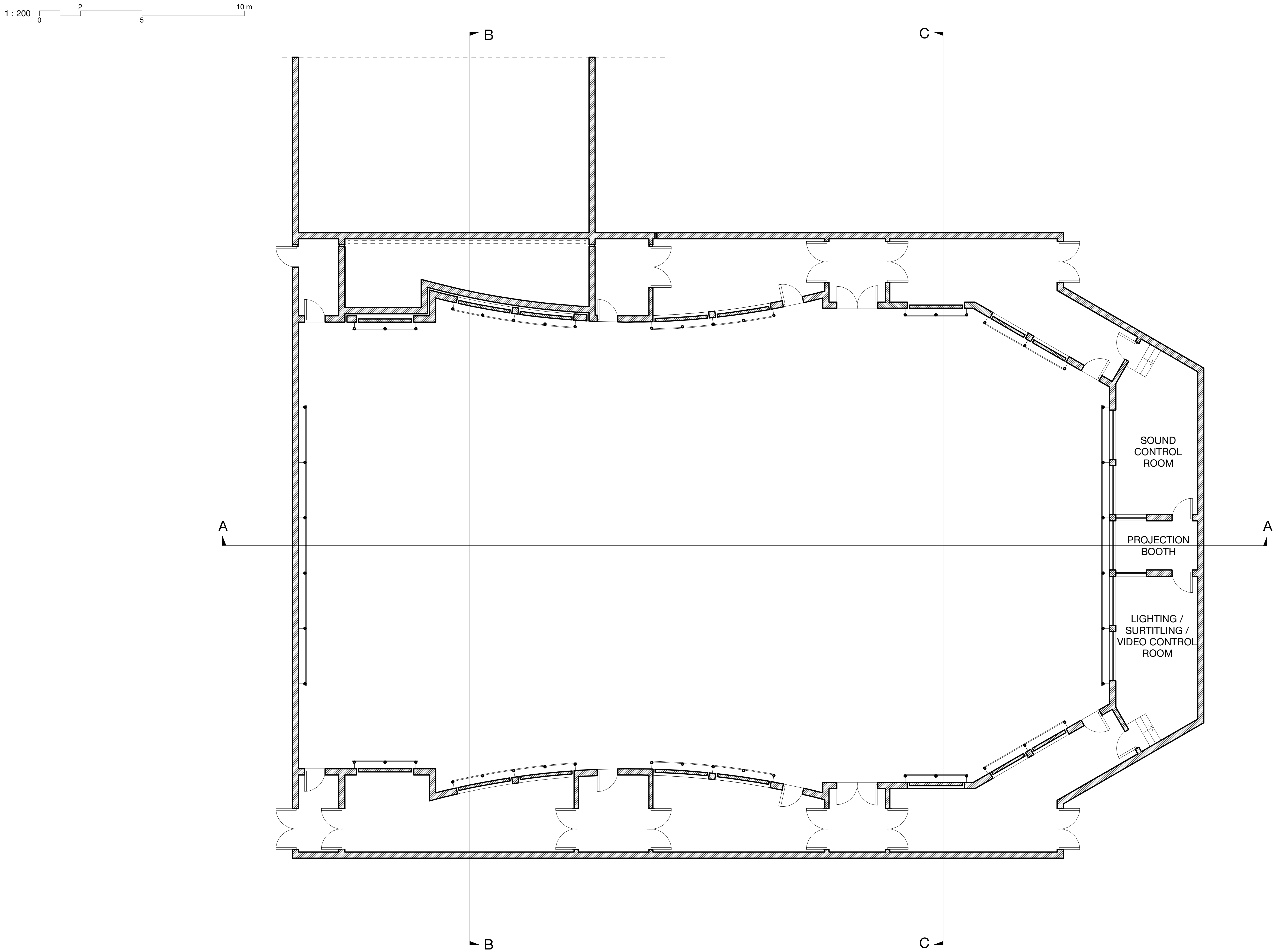


Fig 15. **Flat Floor | Level 2**



Flat Floor | Grid Level 1

Fig 16.

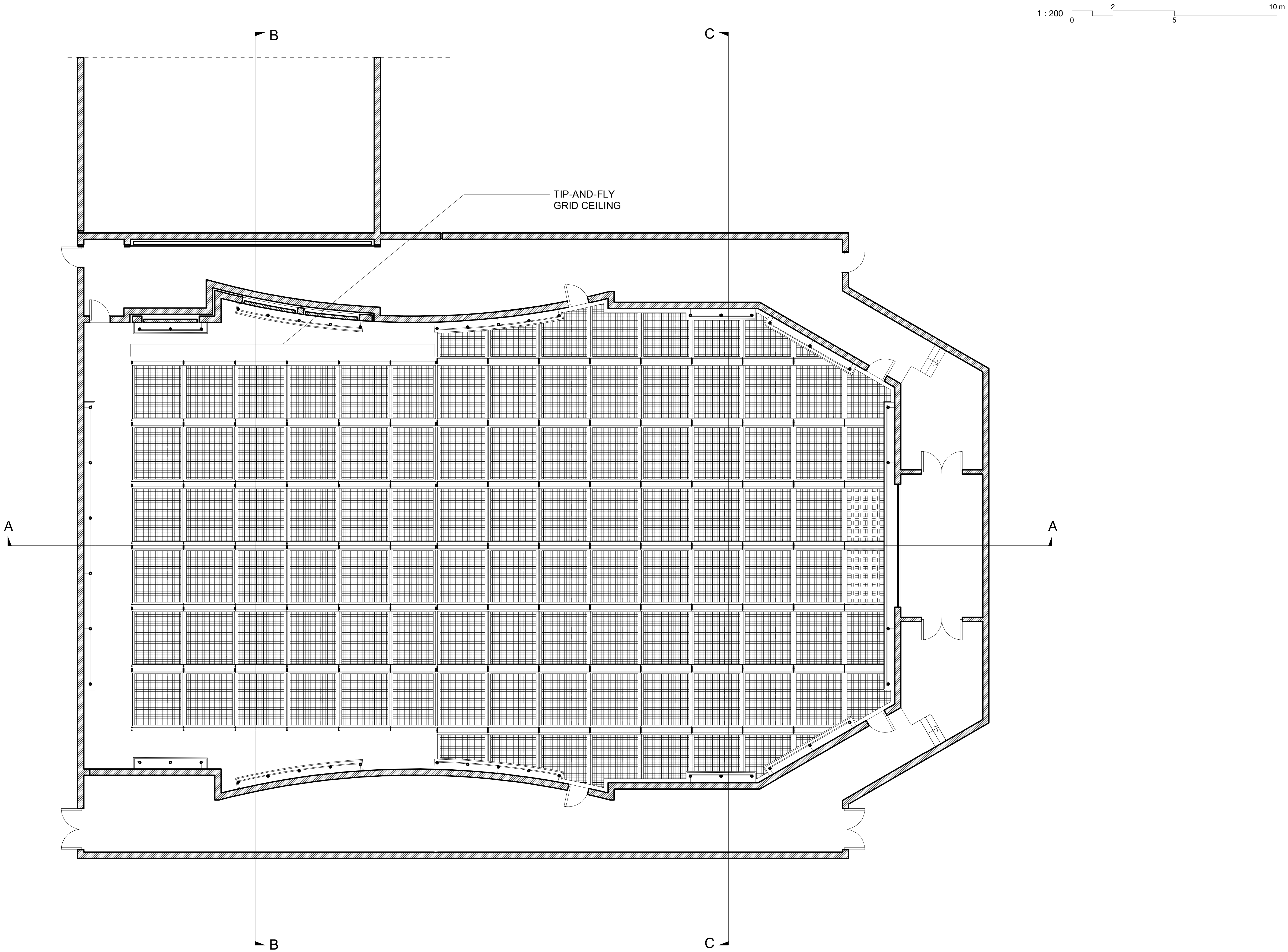
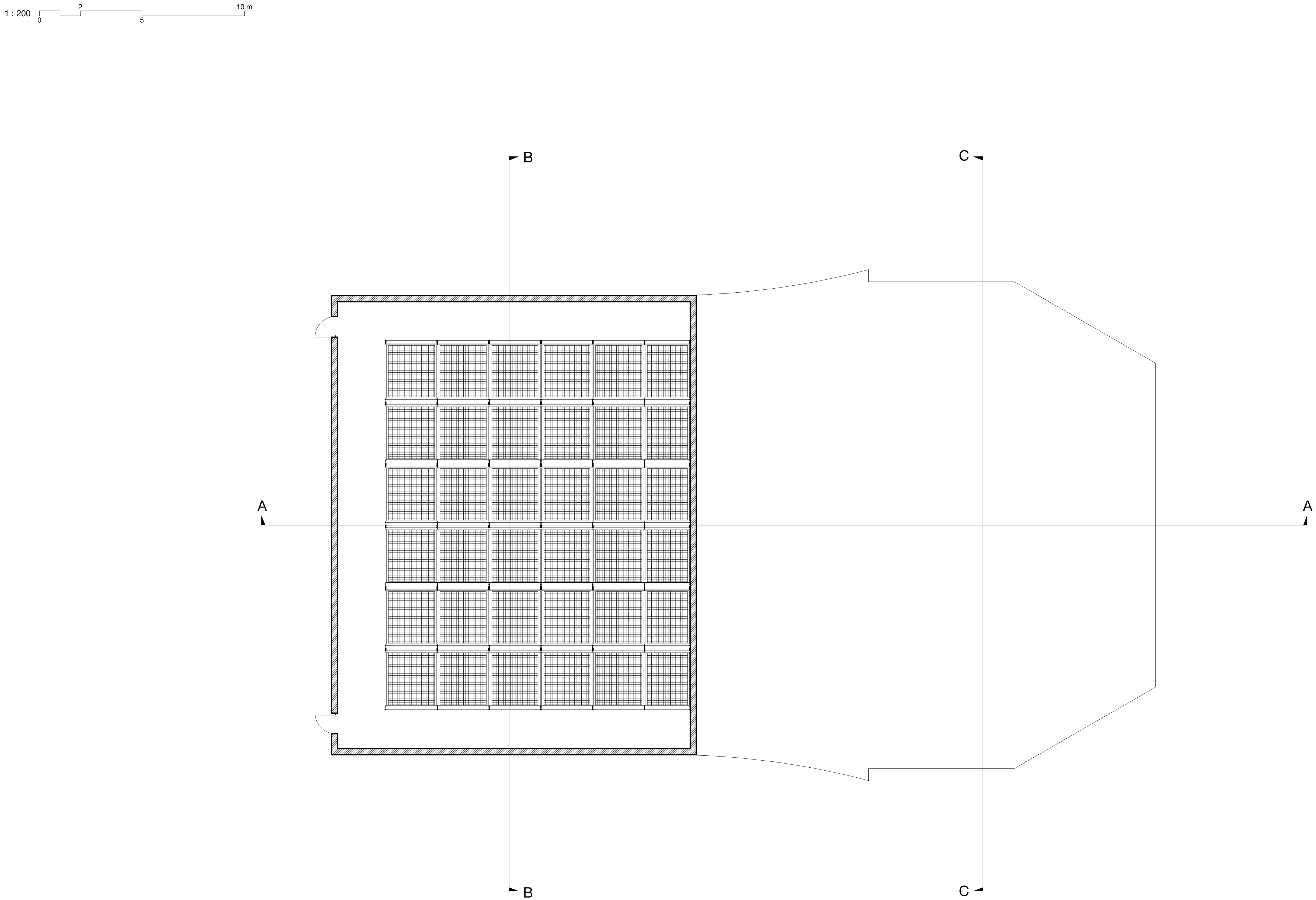


Fig 17.

Flat Floor | Grid Level 2



Flat Floor | Section A-A

Fig 18.

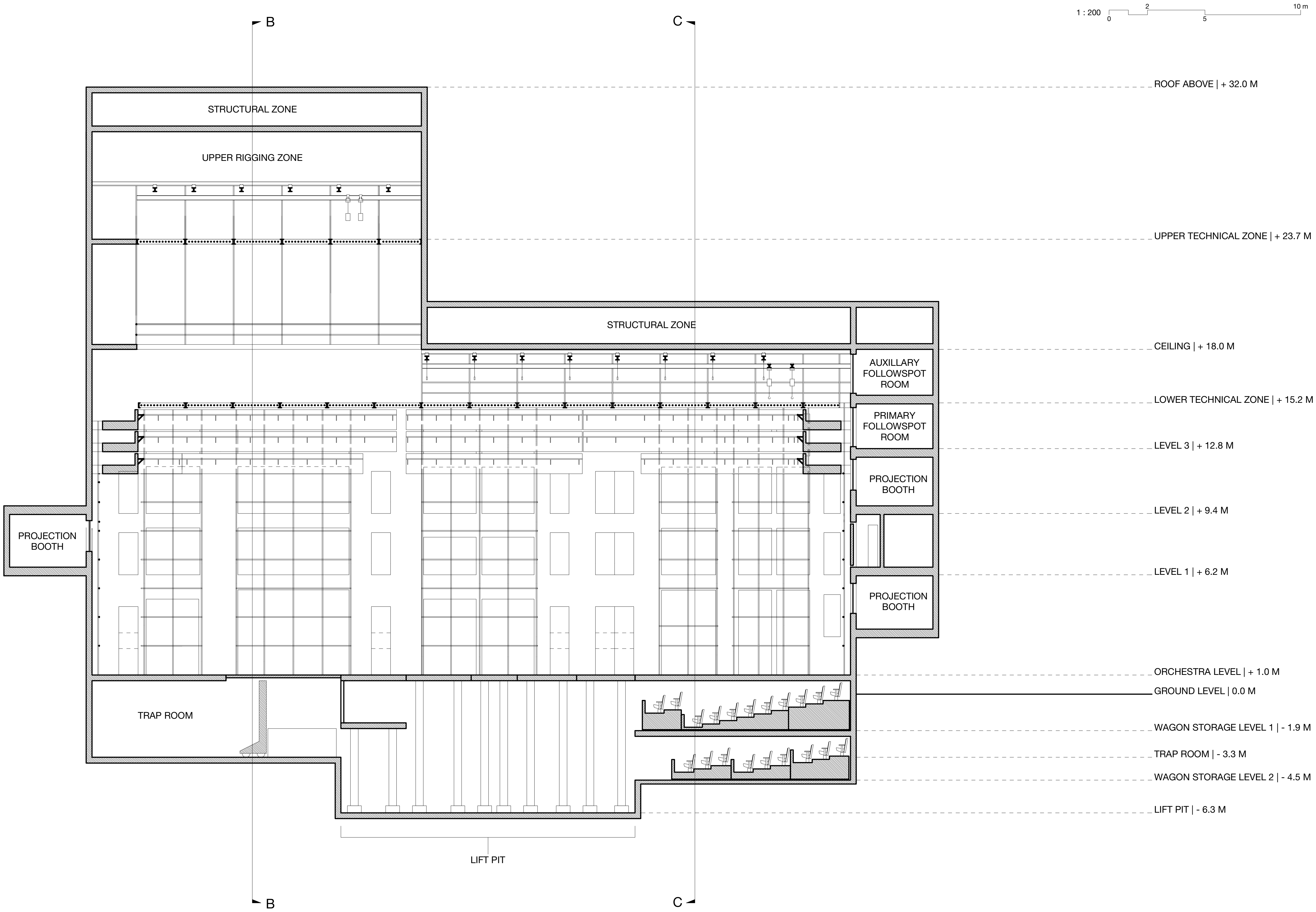
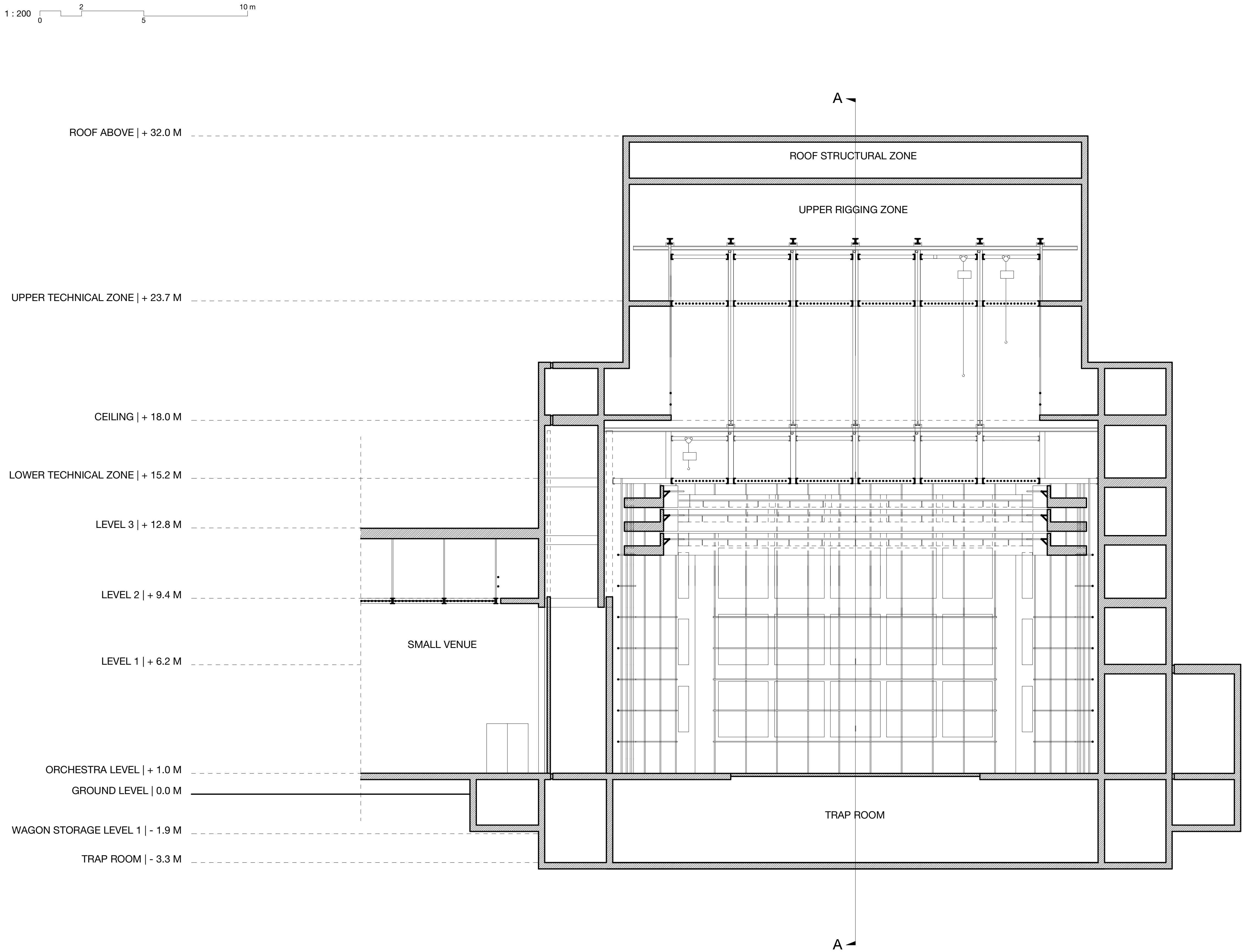
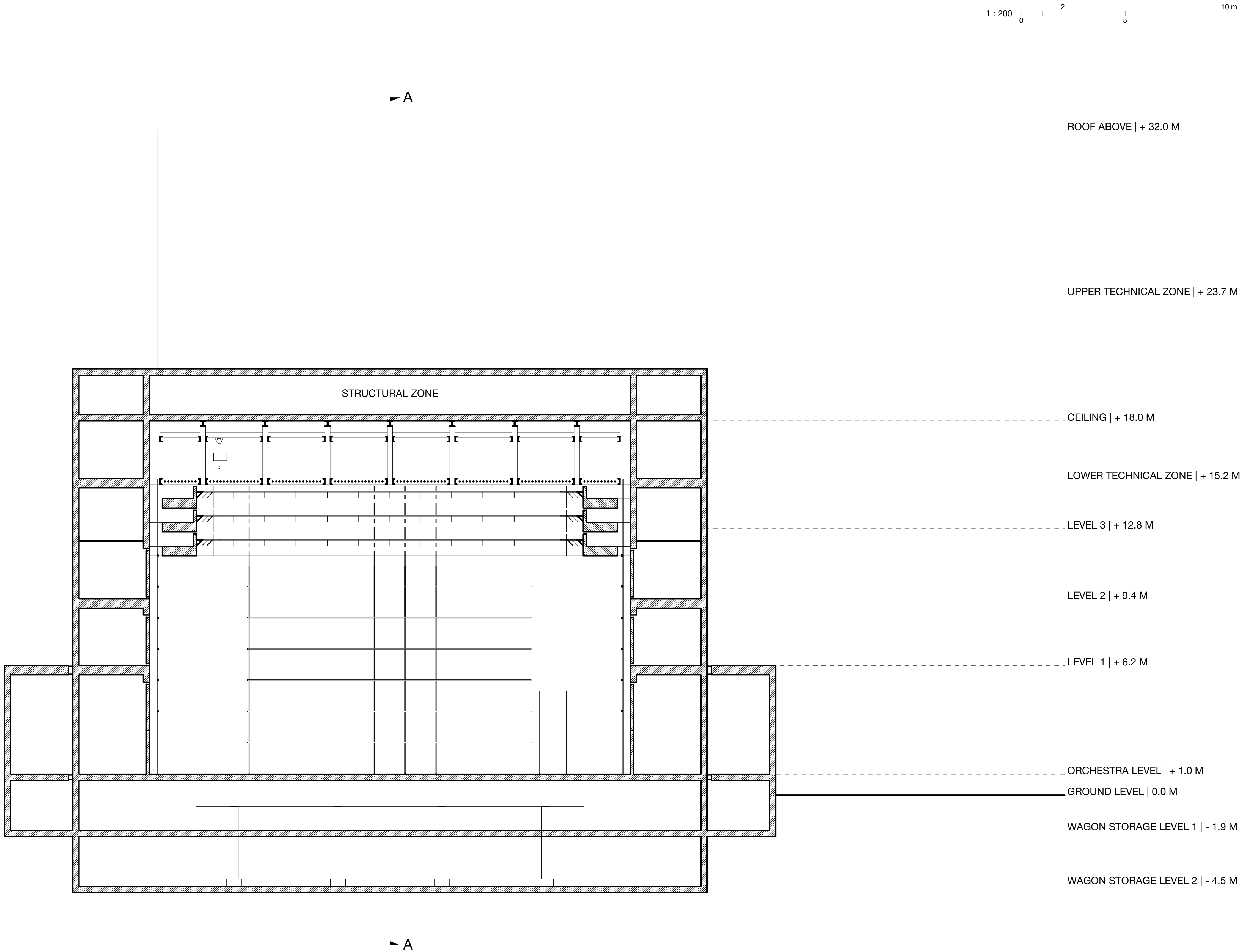


Fig 19. **Flat Floor | Section B-B**



Flat Floor | Section C-C

Fig 20.



Appendix B | Small Venue Drawings

B1 Introduction

This appendix includes drawings of two of the possible configurations for the Small Venue of the New Theatre Lucerne:

- flat floor configuration
- end stage configuration

The drawings in this section shall be the basis of the Architectural Design of the Small Venue, and the incorporation, without compromise to functionality, of the technical concepts illustrated here into the Architectural Design is a compliance requirement. Drawings illustrate design intent and indicate an absolute functional and acoustical requirement but assume that the precise shaping is open to change depending on the Architectural Design.

These technical concepts include the following:

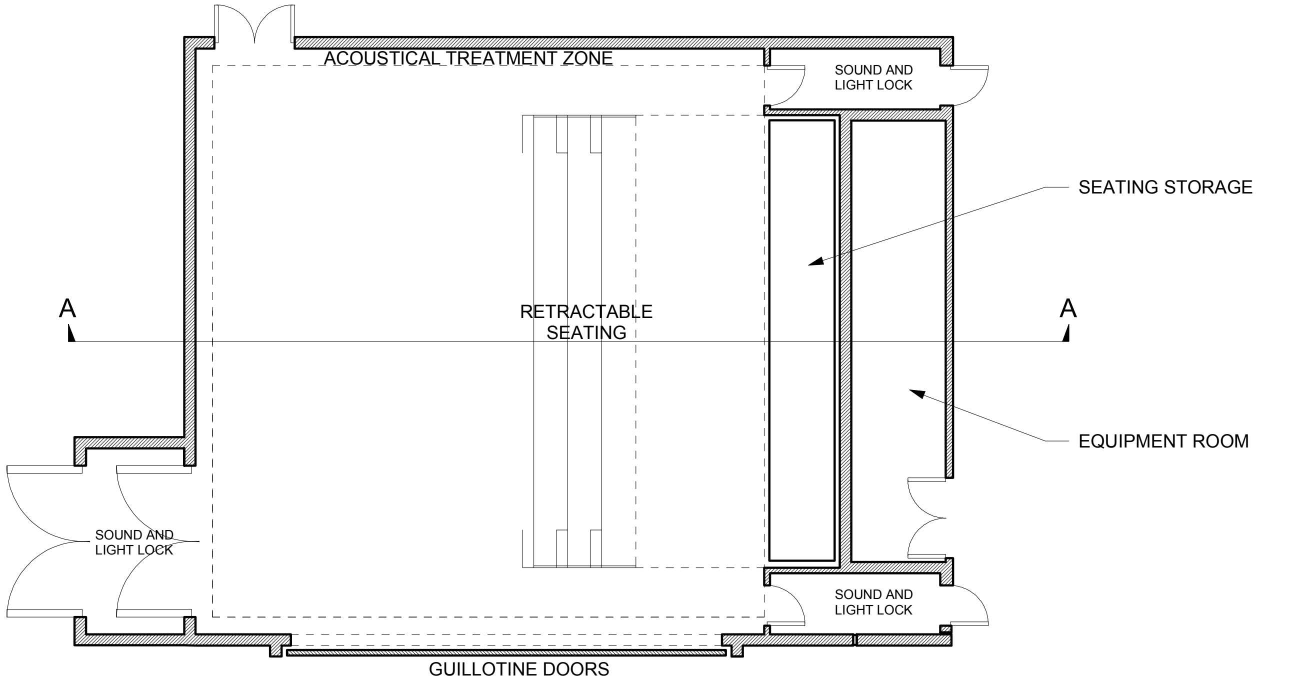
- approach to transformability and incorporation of associated characteristics/equipment/systems
- distribution of audience
- sightlines
- alignment with the Large Venue and Guillotine Doors
- accommodation of specialised performance equipment systems
- approach to circulation

Numbers and subdivision of components and specific dimensions are recommendations and will be open for adaptation, except as otherwise specified in the Facility Description, provided the functional, acoustical and experiential characteristics as outlined in Chapter 1 are maintained.

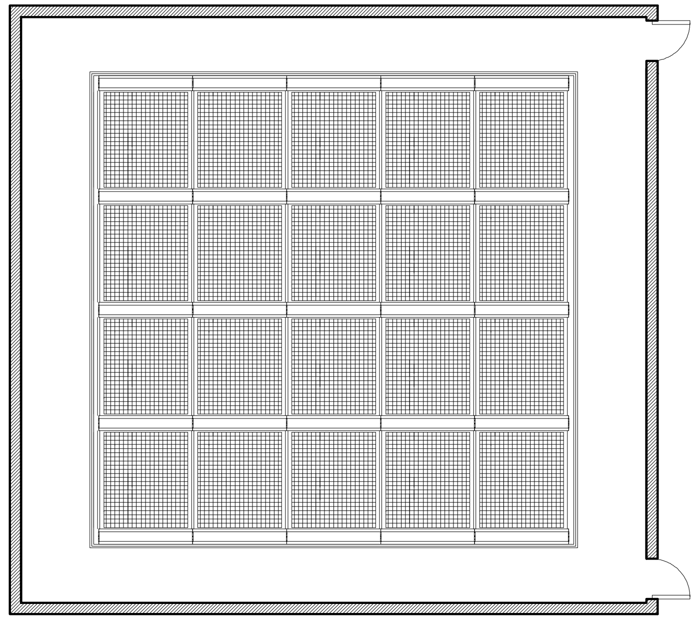
Fig 1.

Small Venue | End Stage Configuration (209 Seats)

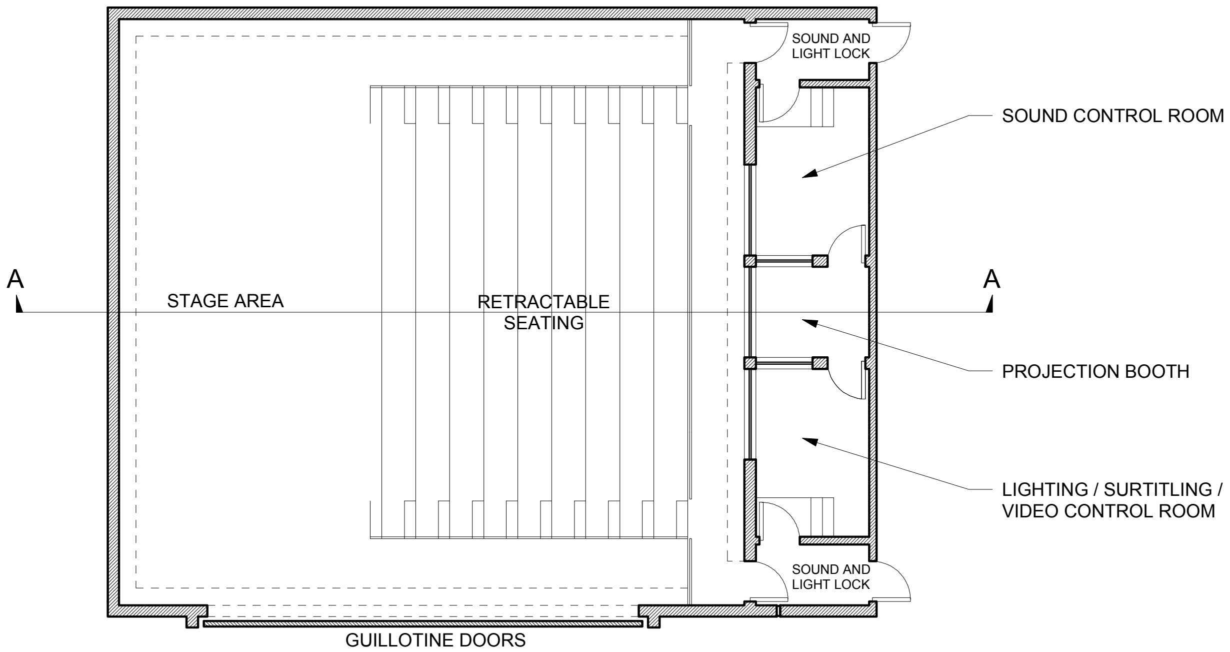
1 : 200 0 2 5 10 m



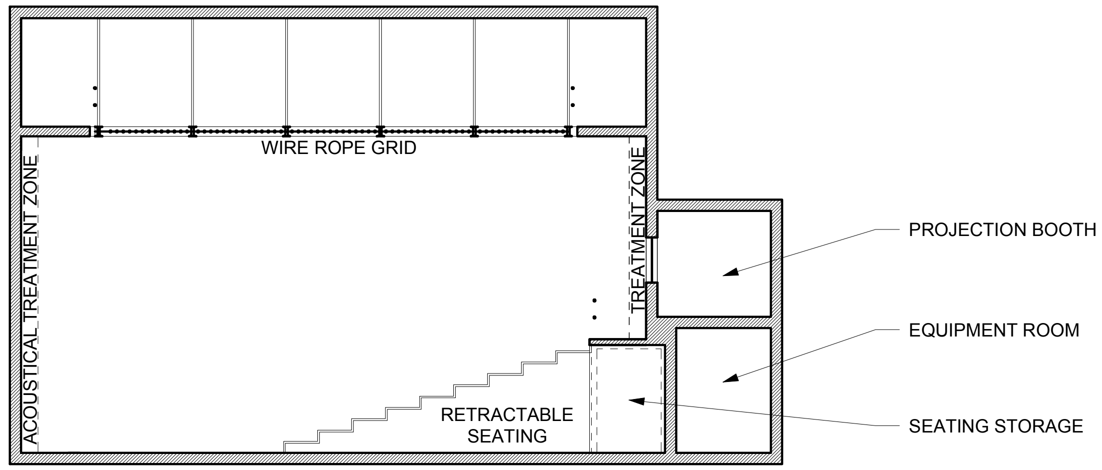
STAGE LEVEL PLAN



WIRE ROPE GRID PLAN



SECOND LEVEL PLAN

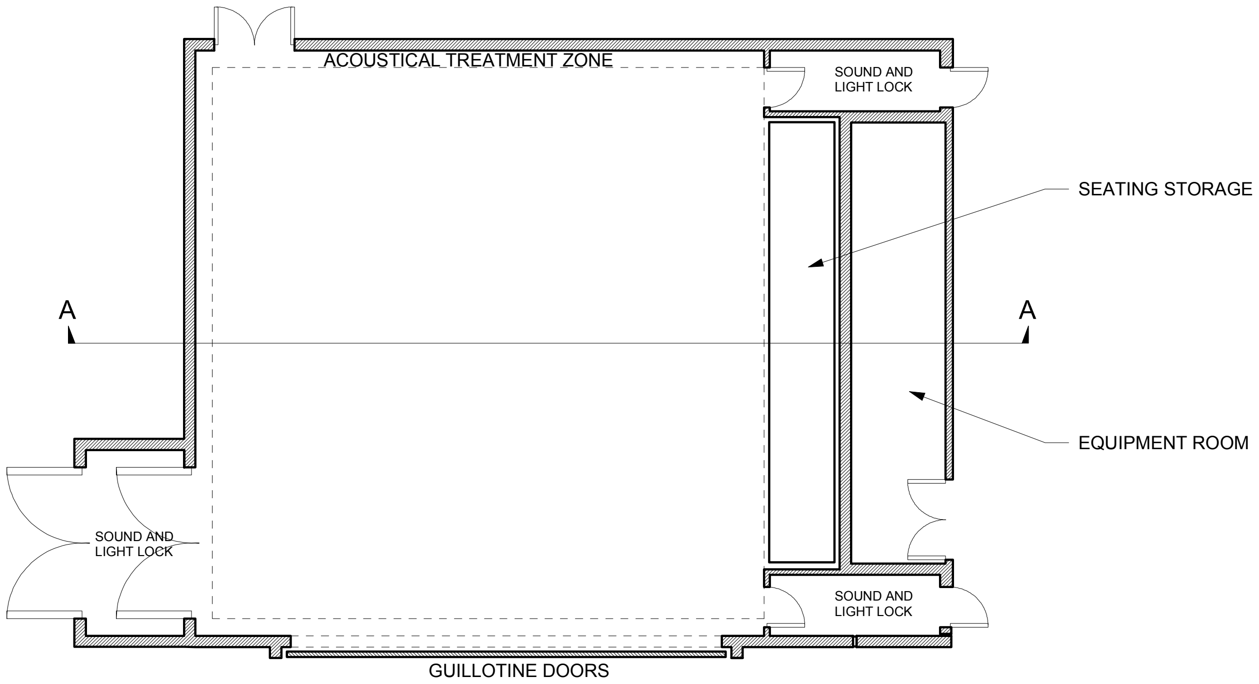


SECTION A-A

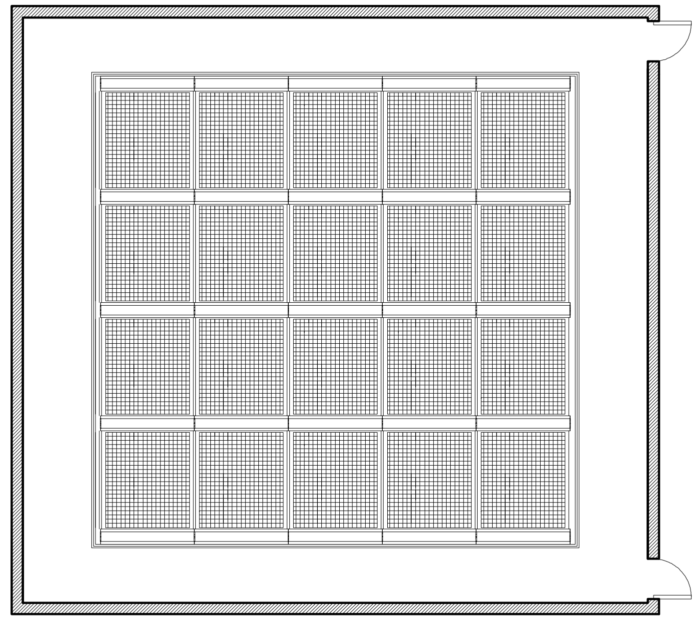
Small Venue | Flat Floor Configuration (0-220 Seats)

Fig 2.

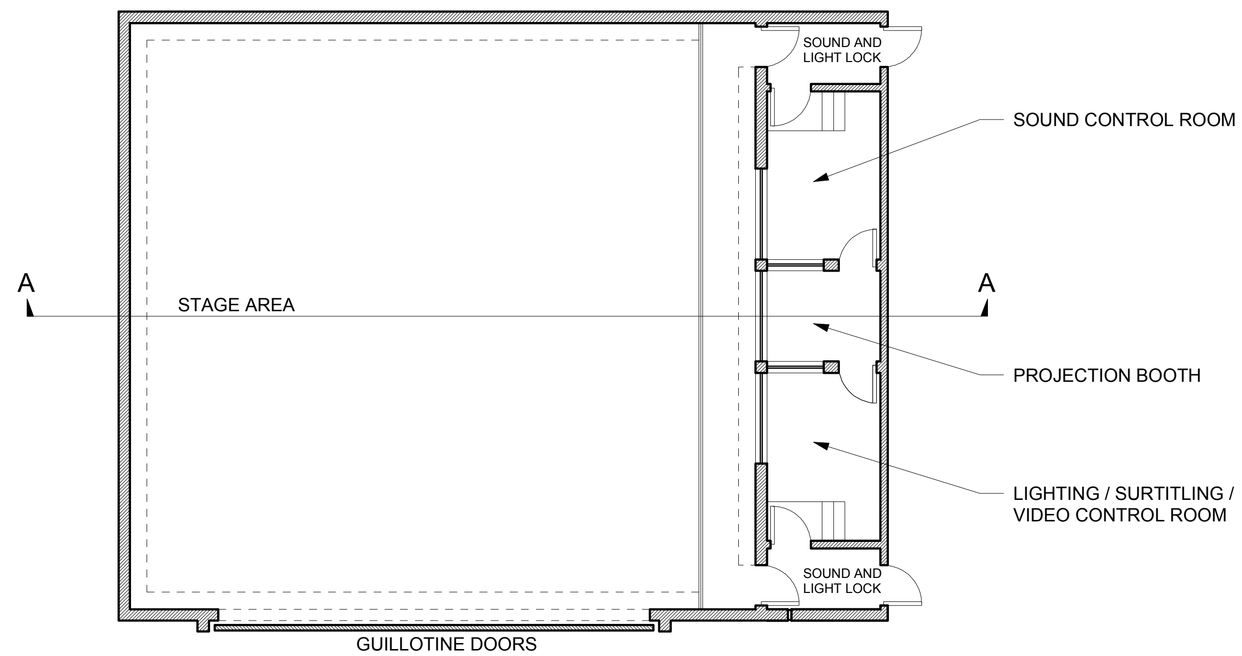
1 : 200 0 2 5 10 m



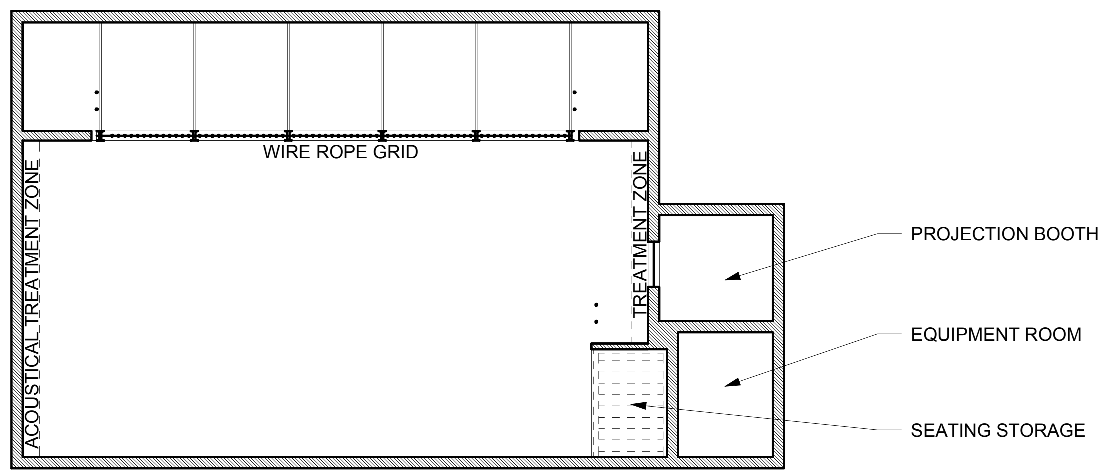
STAGE LEVEL PLAN



WIRE ROPE GRID PLAN



SECOND LEVEL PLAN



SECTION A-A

Appendix C | Schedule of Accommodations

C1 Introduction

This appendix includes the detailed Schedule of Accommodations of all the spaces of the New Theatre Lucerne. Note the following:

- All listed spaces are required for compliance.
- All floor areas (net square meters) are subject to the functionality of the space (described in the Facility Description) which shall be an overriding requirement. If the Architectural Design or other factors result in geometries or adjacencies that require the net floor area to be increased in order to maintain functionality, then the increased floor area will be a compliance requirement.

Unless specifically indicated, the colours in the compliance requirement column mean the following:

amber	*minimum net area requirement*
blue	*absolute net area requirement*
green	*approximate net area requirement (+/-10% variation is possible depending on design)*

Table 1. Compliance requirement scale

Clear height is an absolute requirement unless otherwise approved. Critical length and critical width are minimum requirements.

C2 Security Levels

The different security levels are as follows:

public	*access to general public spaces only*
restricted public	*access to controlled public and performance spaces (such as the Venue) and restricted public spaces (such as spaces for VIP receptions)*
artist	*access to public spaces and artist spaces*
casual staff	*access to public spaces and casual staff spaces*
staff	*access to public spaces, restricted public spaces, artist spaces, casual staff spaces and staff spaces*
technical staff	*access to public and restricted public spaces, artist spaces, casual staff spaces, staff spaces and technical staff spaces*
building security	*access to all spaces*

Table 2. Security level rating scale

Summary of Spaces

#	Space Name	Net Area (Carpet) Total (m^2)
1.0	Exterior of building	0
2.0	Foyer	1,376
3.0	Large Venue	2,385
4.0	Small Venue	314
5.0	Large Venue technical support	276
6.0	Large Venue storage	368
7.0	Studios	520
8.0	Artist support spaces	431
9.0	Venue management	202
10.0	Technical offices and staff support	206
11.0	Workshops	110
12.0	Make-up and wig workshop and laundry	111
13.0	Artist/staff entrance	37
14.0	Loading dock and receiving	199
15.0	Building operations	153
16.0	Circulation	0
	SUBTOTAL	**6,688m^2**

Table 3. Summary of spaces

1.0 | Exterior of Building

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
1.1	Outdoor gathering space												Public
1.2	Large-scale illuminated signage				*	For consideration only	*	*	*	*			Public
1.3	Digital poster frames				*		*	*	*	*			Public
1.4	Public taxi drop-off / pick-up zone						*	*	*	*	Arrival area		Public
1.5	Drop-off / pick-up location for mobility-impaired				*	Consider whether same drop-off can be used for taxi and mobility impaired	*	*	*	*	Arrival area		Public
1.7	Drop-off area for buses				*		*	*	*	*	Arrival area		Public
1.8	Short term parking for VIP artist limousine				*		*	*	*	*	Artist entrance		Staff
1.9	Additional parking for trucks and miscellaneous delivery vehicles				*	Immediately adjacent to cable pass network access point	*	*	*	*			Technical staff
1.10	Parking for broadcast and recording remote vehicles				*		*	*	*	*	Loading dock and receiving area		Technical staff
1.11	Bicycle stands				*								Public
Notes	Access to Front of House and backstage for:				*		*	*	*	*			
	* Temporary parking location for ambulances				*		*	*	*	*	Close to first aid room		
	Access to backstage loading dock for:				*		*	*	*	*			
	* 2 performance-related trucks	2			*	Should be weather-mitigated area (not necessarily indoors but under cover); assume 16.5m articulated trucks	*	*	*	*			
	* 1 catering truck / delivery van (not located near performance loading dock)	1			*	Should be weather-mitigated area (not necessarily indoors but under cover)	*	*	*	*			
	* 1 garbage truck	1			*		*	*	*	*			
	SUBTOTAL				**0.0m²**								

Table 4. Exterior of building

2.0 | Foyer

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m^2)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
2.1	Weather vestibule	2	*	*	24.0		*	*	*	*			Public
2.2	Foyer	1	Based on seat count of Large Venue and Small Venue	*	720.0	Primarily near stage level of Large and Small Venue. Secondary areas near Large and Small Venue balconies, Studios. Includes poster and promotional brochure display areas, indoor art/educational/ information/exhibition and display areas, queuing areas, latecomer's area(s) with TV and audio monitors, ticket control stations, and program niches	*	*	*	PNC-30	Foyer spaces, venue audience entry points, arrival area, back of house circulation, media/guest reception rooms		Public
2.3	Event area	1	50	50	*	100m^2 included in foyer area at grade -1 or grade +2. Assumes 15m^2 for a stage, 50m^2 for seating, and 35m^2 tech support	*	20	5	PNC-30			Public
2.4	Box office / information service area	3	1	3	9.0	3 computer stations (including one station designed for mobility impaired customers) at 1.5m wide and 2m deep. Does not include queuing area. Plan for lowered ceiling or acoustical "cloud" in this area	2.5	4.5	2	PNC-30	Open to foyer in location clearly visible from principal entrance(s)		Staff
2.5	Box office work area	1	4	4	20.0	Does not include circulation	2.5	5	4	PNC-30	Box office service area		Staff
2.6	Box office manager's office	1	1	1	8.0	Includes secure inner rooms with safe	2.5	4	2	PNC-30	Box office service area		Staff
2.7	Box office storage	1	*	*	10.0		2.5	*	*	*	Box office service area		Staff
2.8	House manager's office	1	2	2	16.0	Includes area for 1 assistant	2.5	4	4	PNC-30	Arrival point and foyer		Staff
2.9	Coat and bag check	1	Based on 900 person capacity	*	83.3	Based on 10m^2 per 108 coats at 900 audience. May also be used as storage space / distribution point for assistive listening system headset distribution/collection. Includes area for 0.75m deep counter and internal circulation. Does not include queuing area	2.5	7	12	PNC-30	Open window to the foyer in a highly visible position near arrival area		Casual staff
2.10	Café	*	Based on 700 person capacity	20	138.4	Assume 38.4m^2 area for counter service (or equivalent) for 480 persons (60% of capacity of large performance space in proscenium configuration) with 30 sec. per transaction, 15 minute intervals and 2.4m^2 per person served. Does not include audience queuing area. Net area includes 100m^2 for upstairs expansion/rentable area	2.5	16	2.4	PNC-30	Integrated with foyer		Public

2.0 | Foyer (Cont'd)

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
2.11	Outdoor terrace	*	*	50	*	Not included in net area total	*	*	*	*	Upper café area		Public
2.12	Café kitchen	1	*	*	50.0	Requires electrical infrastructure for kitchen, plumbing for dishwashing; grease trap; glassware racks; general storage. Must be located outside of acoustical joint of performance spaces. 10m² of the space is required to store empty bottles	2.5	*	*	*	Café		Casual staff
2.13	Café storage	1	*	*	10.0	Must be located outside of acoustical joint of performance spaces	2.5	*	*	*	Café kitchen		Casual staff
2.14	Retail	1	*	*	50.0	Could be childcare facility. Includes storage. May include toilet facility	2.5	*	*	PNC-30	Outside and foyer		Public
2.15	ATM niche	*	*	*	*	Includes station so patrons can recharge their mobile phones	*	*	*	PNC-30	Arrival point		Public
2.16	Public toilets	*	Based on 900 person capacity	*	144.0	"Fixture Count: 32 total Women's basins: 22 Men's basins: 3 Men's urinals: 7 Number of sinks is equal to number of fixtures per room"	2.5	*	*	PNC-40	Foyer		Public
2.17	Casual Front of House staff locker area	1	16	16	19.2	Lockers and benches, for men and women. Minimum 2 basins with mirrors, no toilets or shower	2.5	*	*	PNC-40			Casual staff
2.18	First aid rooms	1	*	*	14.0	With obstruction free access from performance areas and foyer	2.5	*	*	PNC-30	Temporary ambulance parking location		Staff
2.19	First aid rooms toilets	1	1	1	5.0	Handicap accessible	2.5	*	*	PNC-40			Staff
2.20	Staff toilets	1	1	1	5.0	Unisex and handicap accessible. Distributed throughout foyer levels for easy access for usher staff	2.5	*	*	PNC-40			Staff
2.21	Foyer general storage	1	*	*	30.0	Storage for Tensator barriers, carpet runners, posters, folding tables and chairs, etc.	2.5	*	*	*			Staff
2.22	Electrical room - foyer technical storage	1	*	*	20.0	Storage for audio visual and other technical equipment, including permanent audiovisual rack for foyer and outdoor projection seating area needs	2.75	2.7	2.7	*			
	SUBTOTAL				**1,375.9m²**								

Table 5. Foyer

3.0 | Large Venue

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
3.1	Audience seating area (in proscenium configuration)	1	700	700	700.0	Audience seating distributed over flat floor area and seating galleries. Total 17m to underside of hard ceiling	17	23.2	23	N1	Foyer and performance area, control rooms		Public
3.2	Lower technical zone wire-rope grid and perimeter catwalk	*	*	*	*	Clear height of wire-rope grid area to underside of building structure is 3m. Included in gross	3	*	*	N1	Operating gallery		Technical staff
3.3	Public sound and light locks	*	*	*	*	Area included in Front of House circulation	2.5	*	*	PNC-15	Foyer and audience seating area		Public
3.4	Performance area (in proscenium configuration)	*	*	*	390.0	"17m + 2.4m + 2.4m width and 14m + 2.4m depth. Clear height of wire-rope grid area to underside of building structure is 6m 10m high Removable Portal opening Minimum clear of 22.5m to underside of wire-rope grid. 3m clear height working area. Allow 3m for rigging structure. Total 28.5m to underside of building structure"	28	16.4	24	N1	Audience seating area, assembly area and Back of House circulation		Technical staff and artist
3.5	Upper technical zone	*	*	*	*	Included in gross	3	*	*	N1	Performance area		Technical staff and artist
3.6	Technical galleries	*	*	*	*	2m wide on 3 levels, on 3 sides of the room. 312m² included in gross	3	*	2	N1	Back of House circulation, stairs, and elevator		Technical staff
3.7	Primary followspot booth	1	*	*	23.0	Full-time sound-isolated booth for followspots	3	4.5	*	PNC-30	Audience seating area		Technical staff
3.8	Auxiliary followspot booth	2	*	*	16.0	Auxiliary locations for followspots to be operated from opposite sides of the performance space when the hall is not in proscenium mode	3	4.5	*	PNC-30	Audience seating area		Technical staff
3.9	Trap room	1	*	*	72.0	Forestage and audience area lift pit accessed through this space	4	6	12	N1	Performance area		Technical staff
3.10	Forestage lift 1	1	*	*	*	As per drawings	*	3.4	*	N1			Technical staff, artist and restricted public
3.11	Forestage lift 2	1	*	*	*	As per drawings	*	2.2	*	N1			Technical staff, artist and restricted public

3.0 | Large Venue (Cont'd)

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
3.12	Audience area lift 1	1	*	*	*	As per drawings	*	3.4	*	N1			Technical staff, artist and restricted public
3.13	Audience area lift 2	1	*	*	*	As per drawings	*	3.4	*	N1			Technical staff, artist and restricted public
3.14	Lift pit	1	*	*	304.0	At 1.5m depth below trap room level. Ensure access when lifts are at trap room level	1.5	*	*	N1			Technical staff
3.15	Seating wagon storage	1	*	*	580.0	Stores all wagons from forestage lifts, audience seating lifts, and parterre seating. Organized on two levels below audience area. Upper level steel structure only with catwalks for accessibility	2	*	*	N1	Lifts		Technical staff
3.16	Machine room (rigging)	2	*	*	300.0	Room includes a 3m² sound lock vestibule	3	21	4	PNC-40	Upper technical zone		Technical staff
3.17	Personnel performance area sound and light locks	4	*	*	*	Area included in Back of House circulation	2.5	*	*	PNC-15	Back of House circulation		Technical staff and artist
3.18	Trap-room-level sound and light locks	4	*	*	*	Area included in Back of House circulation	2.5	*	*	PNC-15	Back of House circulation		Technical staff and artist
3.19	Load-in performance area sound and light locks	2	*	*	*	Area included in Back of House circulation	3	*	*	PNC-15	Back of House circulation		Technical staff
	SUBTOTAL				**2,385m²**								

Table 6. Large Venue

4.0 | Small Venue

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m^2)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
4.1	Small Venue	1	*	*	232.5	"14m + 0.75m + 0.75m width and 14m + 1m depth. 11.5m wide x 8m high door opening; Minimum clear height of 8.5m to underside of wire-rope grid level. Total clear height of 11.5m to underside of structure"	11.5	15	15.5	PNC-15	Control rooms, Back of House circulation		Technical staff, artist and restricted public
4.2	Niche for retractable seating risers	1	*	*	24.8	12m wide by 1.5m deep	*	2	12	PNC-15	Small Venue		Public
4.3	Electrical rooms - dimmer	1	*	*	14.0		2.75	*	2.8	PNC-40			Technical staff
4.4	Lighting control room	1	*	*	14.0		2.5	*	*	PNC-15	Small Venue		Technical staff
4.5	Sound control room	1	*	*	14.0		2.5	*	*	PNC-15	Small Venue		
4.6	Public sound and light locks	2	*	*	*	Area included in Front of House circulation	2.5	*	*	PNC-15			Public
4.7	Wire-Rope Grid	1	*	*	*	Minimum clear height of area to underside of building structure is 2.5m	2.5	*	*	PNC-15			
4.8	Personnel performance area sound and light locks	2	*	*	*	Area included in Back of House circulation	2.5	*	*	PNC-15			Artist and technical staff
4.9	Off-stage toilets	1	*	*	5.0		2.5	*	*	*			
4.10	Load-in performance area sound and light locks	1	*	*	*	Area included in Back of House circulation	3	*	*	PNC-15			Technical staff
4.11	Small Venue technical storage	1	*	*	10.0	Storage for audiovisual and other technical equipment, including permanent audiovisual rack	2.75	3	3	*			
	SUBTOTAL				**314.3m²**								

Table 7. Small Venue

5.0 | Large Venue Technical Support

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m^2)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
5.1	Electrical room - building-wide sound, video and communications	1	*	*	18.0	At grid level outside Large Venue	2.75	*	2.8	PNC-40			Technical staff
5.2	Electrical rooms - dimmer	1	*	*	14.0	At grid level outside Large Venue	2.75	*	2.8	PNC-40			Technical staff
5.3	Projection booth / electrical room - sound, video communications	4	1	4	40.0	Distributed. Non-operable windows for projection	2.5	2.8	2.8	PNC-30	Clustered with sound control room and lighting / surtitling / video control rooms. Distributed around venue.		Technical staff
5.4	Lighting / surtitling / video control room	3	1	3	42.0	Distributed	2.5	2.8	2.8	PNC-15	Clustered with sound control room and projection booth / electrical room - sound video communications. Distributed around venue.		Technical staff
5.5	Sound control room	3	1	3	42.0	Distributed	2.5	2.8	2.8	N1	Clustered with lighting / surtitling / video control room and projection booth / electrical room - sound video communications. Distributed around venue.		Technical staff
5.6	Production control	2	1	2	28.0	Distributed	2.5	2.8	2.8	PNC-20	Distributed around venue		Technical staff
5.7	Control suite toilets	2	1	2	10.0	Unisex. Located outside of acoustic isolation joint	2.5	*	*	PNC-25	On different levels strategically located near control rooms		Technical staff
5.8	Stage manager's station	*	*	*	*	Area included in performance space	*	*	*	PNC-15	Performance area		Technical staff
5.9	Quick change rooms	2	1	1	12.0	In immediate proximity to stage entrances	2.5	*	*	PNC-20	Performance area		Artist
5.10	Quick change toilets	2	1	1	10.0	In immediate proximity to stage entrances	2.5	*	*	PNC-20	Performance area		Artist
5.11	Broadcast control / recording control room	1	2	2	40.0		2.7	*	*	PNC-15	Clustered with electrical room - broadcast equipment and recording booth		Technical staff
5.12	Electrical room - broadcast equipment	1	1	1	10.0		2.5	*	*	PNC-30	Clustered with broadcast control / sound editing / recording control room		
5.13	Recording booth	1	1	1	10.0	Also usable as a practice room	3.5	*	*	PNC-15	Clustered with broad cast control / sound editing / recording control room and electrical room - broadcast		Technical
	SUBTOTAL				**276.0m^2**								

Table 8. Large Venue technical support

6.0 | Large Venue Storage

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
6.1	Sound, video communications equipment storage	1	*	*	25.0		2.5	*	*	PNC-40			Technical staff
6.2	Lighting equipment storage	1	*	*	37.0		2.5	*	*	PNC-40			Technical staff
6.3	Platform, riser and seating storage	1	*	*	200.0	Provide space for 2 personnel lifts. Assumes door if contiguous with performance space. Requires step-less access to performance area	6	*	*	PNC-40			Technical staff
6.4	Stage-level staging and rigging equipment storage	1	*	*	40.0		6	*	*	PNC-40			Technical staff
6.5	Grid level equipment storage	1	*	*	40.0		2.5	*	*	PNC-30			Technical staff
6.6	Piano storage and maintenance	1	*	*	26.3	Space for 3 pianos - 8.75m² per piano (2.5m x 3.5m) minimum. Temperature and humidity control. Obstruction free access to performance spaces, trap room and foyer. Requires step-less access to stage and orchestra pit	2.5	3.5	7.5	PNC-20			Technical
	SUBTOTAL				**368.3m²**								

Table 9. Large Venue storage

7.0 | Studios

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
7.1	Studios / divisible group dressing rooms	4	40	160	456.0	With mobile clothing racks, mobile furniture, mobile make-up counters, area rugs, floor lamps. Pipe grid in one room for use as wavefield synthesis rehearsal room. All rooms with resilient stage floor type construction and conference room type room dividers. Clustered around shared foyer area with one controlled entrance to Front of House and a separate controlled entrance to the Back of House. No box in box construction needed.	7	9	12.66	PNC-25	Foyer, studios storage room and Back of House circulation		Artist and restricted public
7.2	Toilets	4	*	*	64.0	Includes one standalone handicap toilet with shower, one group of five male toilets, and one group of 10 female toilets. One basin per toilet.	2.5	*	*	PNC-40	Divisible group dressing rooms		Artist and restricted public
	SUBTOTAL				**520.0m²**								

Table 10. Studios

8.0 | Artist Support Spaces

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
8.1	Media / guest reception rooms	1	15	15	30.0		2.5	*	*	PNC-30	Foyer and Back of House circulation		Restricted public
8.2	Principal dressing rooms - single	3	1	3	66.0	Also to be usable as practice rooms. Layout will allow for upright piano	3.5	5	4.4	PNC-20	One room connected to conductor's rehearsal studio. All three dressing rooms on same level		Artist
8.3	Conductor's dressing room	1	1	1	22.0	Located at pit level	3.5	5	4.4	PNC-20	Connected to conductor's rehearsal studio		Artist
8.4	Conductor's rehearsal studio	1	2	2	24.0	With access from conductor's dressing rooms and one of the principal dressing rooms	3.5	6	4	PNC-20	Connected to conductor's dressing room and one principal dressing room - single		Artist
8.5	Principal dressing rooms - quad	2	4	8	44.0	Also to be usable as practice rooms. Layout will allow for upright piano	3.5	5	4.4	PNC-25	Within one floor of other dressing rooms		Artist
8.6	Studios storage room	1			50.0		2.5				Studio		
8.7	Make-up room	1	8	8	32.0		2.5	*	*	PNC-25	Principal dressing rooms		Artist
8.8	Production offices	2	*	*	20.0		2.5	*	*	PNC-30	Large Venue stage		Casual staff
8.9	Lounge (greenroom)	1	103	103	103.0	Capacity for 60% of artists	2.5	*	*	PNC-30	Lounge warming kitchen		Technical staff, artist and restricted public
8.10	Lounge warming kitchen	1	*	*	20.0		2.5	*	*	PNC-35	Lounge (greenroom)		Casual staff
8.11	Exterior smoking area	1	20	20	*	Weather-protected outdoor area connected to lounge with space for 20 persons, as allowable by code	2.5	*	*	*	Lounge (greenroom)		Artist, staff and technical staff
8.12	Road case storage	1	*	*	20.0	At trap room level	2.5	*	*	PNC-40	Trap room		Technical staff
	SUBTOTAL				**431.0m²**								

Table 11. Artist support spaces

9.0 | Venue Management

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
9.1	Director office	1	1	1	20.0		2.5	*	*	PNC-30			Staff
9.2	Director's secretary with reception area	1	1	1	30.0		2.5	*	*	PNC-35			Staff
9.3	Management team office	1	11	11	71.5		2.5	*	*	PNC-35			Staff
9.4	Finance office	1	3	3	30.0		2.5	*	*	PNC-25			Staff
9.5	Conference rooms	1	10	10	30.0		2.5	*	*	PNC-25			Staff
9.6	Plotter, photocopier and storage	1	*	*	10.0		2.5	*	*	PNC-40			Staff
9.7	Staff toilets	2	*	*	10.0	2 unisex, handicapped accessible	2.5	*	*	PNC-40			Staff
	SUBTOTAL				**201.5m²**								

Table 12. Venue management

10.0 | Technical Offices and Staff Support

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
10.1	Technical team office	1	8	8	52.0		2.5	*	*	PNC-35			Technical staff
10.2	Technical director's office	1	1	1	20.0		2.5	*	*	PNC-30			Technical staff
10.3	Conference rooms	1	10	10	30.0		2.5	*	*	PNC-25			Technical staff
10.4	Plotter, photocopier and storage	1	*	*	11.0		2.5	*	*	PNC-40			Technical staff
10.5	Visiting company production space	1	6	6	39.0		2.5	*	*	PNC-30			Technical staff
10.6	Stage crew locker rooms	1	20	20	24.0	Lockers only. Minimum 2 basins with mirrors, no toilets or shower. For men and women	2.5	*	*	PNC-40			Technical staff
10.7	Staff toilets	2	3	6	30.0	"Men: 2 basins, 2 Toilet, 1 shower with dry area and handicap accessibility Women: 2 basin, 1 toilets, 1 showers with dry area and handicap accessibility"	2.5	*	*	PNC-40	Circulation around technical team office		Technical
	SUBTOTAL				**206.0m²**								

Table 13. Technical offices and staff support

11.0 | Workshops

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
11.1	Carpentry workshop	1	3	3	30.0		5	*	*	PNC-45			Technical staff
11.2	Sound equipment workshop	1	*	*	20.0		2.5	*	*	PNC-30			Technical staff
11.3	Lighting workshop	1	*	*	20.0		2.5	*	*	PNC-35			Technical staff
11.4	Props workshop	1	*	*	20.0		2.5	*	*	PNC-35			Technical staff
11.5	Staff toilets	2	*	2	20.0	"Men: 1 basin, 1 Toilet, 1 shower with dry area and handicap accessibility Women: 1 basin, 1 toilet, 1 shower with dry area and handicap accessibility"	2.5	*	*	PNC-40	Circulation around workshops		Technical
	SUBTOTAL				**110.0m²**								

Table 14. Workshops

12.0 | Make-up and Wig Workshop and Laundry

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
12.1	Make-up (and wigs) workshop	1	2	2	36.0	Vented to exterior	2.5	*	*	PNC-40			Technical staff
12.2	Spraying room (wigs)	1	*	*	20.0	Vented to exterior	2.5	*	*	PNC-35			Technical staff
12.3	Make-up and wig storage	1	*	*	25.0		2.5	*	*	PNC-40			Technical staff
12.4	Wardrobe laundry	1	*	*	20.0	Vented to exterior	2.5	*	*	PNC-40			Technical staff
12.5	Staff toilets	2	1	2	10.0		2.5	*	*	PNC-40	Circulation around workshops		Technical
	SUBTOTAL				**111.0m²**								

Table 15. Make-up and wig workshop and laundry

13.0 | Artist/Staff Entrance

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
13.1	Security office	1	2	2	20.0		2.5	*	*	PNC-35	Stage door reception area		Building security and technical staff
13.2	Stage door reception area	1	*	*	12.0	Include weather vestibule. Include security barrier (or controlled door) to Back of House spaces	2.5	*	*	PNC-35	Exterior, Back of House circulation		Artist, restricted public, staff and technical staff
13.3	Staff / visitor toilets	1	1	1	5.0	Handicap accessible. Outside of security zone	2.5	*	*	PNC-40	Stage door reception area		Artist, restricted public, staff and technical staff
	SUBTOTAL				**37.0m²**								

Table 16. Artist/staff entrance

14.0 | Loading Dock and Receiving

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
14.1	Dock manager / security station	1	1	1	4.5		2.5	*	*	PNC-35			Building security and technical staff
14.2	Interior loading zone 1 (performance delivery)	1	*	*	77.4	Loading dock 1.2m above driving surface. Includes berths / dock doors. Include hydraulic dock levellers, articulated flood lamps. Each berth 4.3m wide by 6m deep, minimum (includes dock leveller at 2.4m long). Minimum clear height: 3.8m from deck. (two 16.5m trucks + one delivery van)	3.8	6	12.9	*	Back of House circulation		Technical staff
14.3	Interior loading zone 1 - receiving area	1	*	*	50.0	Minimum clear height: 3.8m	3.8	*	*	*	Loading dock and Back of House circulation		Technical staff
14.4	Holding/receiving lock-up	1	*	*	30.0	Minimum clear height: 3.8m	3.8	*	*	*	Interior loading zone 1 - receiving area		Technical staff
14.5	Freight lift	1	*	*	*	Minimum interior cab dimensions: 6.4m by 3m from lowest pit level to technical grid. Area included in Back of House circulation	*	6.4	3	*			Technical staff

14.0 | Loading Dock and Receiving (Cont'd)

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
14.6	Interior loading zone 2 (catering and other delivery)	1	*	*	12.0	Loading dock 0.6m above driving surface. Provide articulated flood lamps. Berth 3m wide by 4m deep, minimum. Minimum clear height: 2.4m from deck.	2.4	4	3	*	Loading dock and Back of House circulation		Technical staff
14.7	Trash rooms	1	*	*	10.0	With direct opening to driveway for garbage truck access.	*	*	*	*			Staff
14.8	Refrigerated garbage rooms	1	*	*	10.0		*	*	*	*	Refuse truck bay		Staff
14.9	Toilets	1	1	1	5.0	Unisex, mobility-impaired accessible.	2.5	*	*	PNC-40			Technical staff and staff
	SUBTOTAL				**198.9m²**								

Table 17. Loading dock and receiving

15.0 | Building Operations

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
15.1	Facility operations offices	1	5	5	35.0		2.5	*	*	PNC-35			Building security and technical staff
15.2	Fire control gear rooms	*	*	*	30.0		2.5	*	*	*			Building security and technical staff
15.3	Fire team room	1	*	*	20.0	Connected to fire control gear room	2.5	*	*	PNC-30			
15.4	Facility operations storage	*	*	*	50.0		2.5	*	*	*			Building security and technical staff
15.5	Cleaner's rooms	3	*	*	6.0	Three 2m² rooms distributed throughout Facility according to operational requirements	2.5	*	*	*			Building security and technical staff
15.6	Recycling rooms	*	*	*	12.0	One 3m² room per floor	2.5	*	*	*	Refuse truck bay		Staff
15.7	Mechanical, electrical and plumbing rooms	*	*	*	*		*	*	*	*			Building security and technical staff
15.8	Inaccessible space	*	*	*	*	Includes mechanical and electrical duct risers/shafts and poché space	*	*	*	*			Building security and technical staff
15.9	Air plenums	*	*	*	*		*	*	*	PNC-15			Building security and technical staff
	SUBTOTAL				**153.0m²**								

Table 18. Building operations

16.0 | Circulation

#	Space Name	# of Spaces	People per Room	Total # of People	Net Area (Carpet) Total (m²)	Remarks	Clear Height (m)	Critical Length (m)	Critical Width (m)	Background Noise Criteria	Required Adjacency	Compliance Requirement	Security Level
16.1	Public circulation	*	*	*		Included in gross	*	*	*	PNC-35			
16.2	Back of House circulation	*	*	*		Includes technical offices, administrative offices, control rooms, cable pass corridor/tunnel, basement, pit level, performer assembly, loading dock and primary MEP spaces. Secure / no public access. Technical spaces require 2.4m wide corridors (clear). Included in gross	*	*	*	PNC-35			
	SUBTOTAL				**0.0m²**								

Table 19. Circulation

Appendix D | Specialised Performance Equipment Systems

D1 | Introduction

Fig 1. Example performance equipment systems and infrastructure (dimmer, pipe, etc.)

Appendix D serves as an introduction to the performance equipment systems of the New Theatre Lucerne and the accommodations and infrastructure elements within the Facility required to support those systems.

It provides a non-technical, abbreviated explanation of each system, in order to provide a general understanding of the different systems. Graphics and photographs accompany most of the descriptions in order to illustrate the concepts or functions described.

This appendix also includes a detailed equipment list and preliminary budget for the performance equipment systems of the New Theatre Lucerne (Section D-8). The provision of the equipment systems defined in Section D-8 in the base equipment columns is a compliance requirement. Quantities and detailed specification of such equipment is indicative only and will be subject to further specification and detailing closer to the time of procurement.

The New Theatre Lucerne will be equipped with state-of-the-art equipment that will support the range and variety of usage described in Chapter 1: Facility Description. These systems can broadly be categorized as follows:

- theatre equipment systems
- audience seating systems
- production lighting systems
- production audiovisual systems

The success of the Facility will depend, in part, on the proper detailing and specification of these systems and the detailed requirements that will impact functionality, flexibility and artist/audience experience. This appendix outlines key accommodation, infrastructure and control space requirements that will be necessary to achieve the required functionality. This documentation should be read in conjunction with Chapter 1: Facility Description and its other appendices.

D2 | Additional Equipment

Some portions of the performance equipment systems have been deferred for later purchase as detailed in the Performance Equipment List and Budget (Section D-8). Other portions of the performance equipment systems are subject to further study and may not be required (Section D-3.1.3).

The fire / life safety–related equipment will be provided only if and as required by code. If a fire safety curtain is required, it will be procured as part of the performance equipment system to ensure coordination with performance systems.

Infrastructure for the deferred equipment will be provided for as part of construction of the Facility.

The deferral of some systems will require compensatory measures to ensure operational and artistic functionality, including the following significant deferrals:

- Deferral of the Double-Deck or Doppelgänger Lift (section D-4.1.2.3) will require temporary fixed staging with lower orchestra pit deck to be built in place of the deferred lift.
- Deferral of the Guillotine Doors will require in-fill concrete block walls to be provided, as well as a 4m by 4m loading door to be provided within each wall.

The facility design will ensure that all deferred systems and equipment described in the Facility Description can be accommodated at a later point in time. This will apply to the architecture, structural system and building systems design.

All temporary compensatory measures must have the functionality, look, feel and durability of permanent construction within the practical limitations imposed by the requirement that the later integration of the deferred systems will be possible.

Some portions of the performance equipment systems have been deferred for later purchase as detailed in the Performance Equipment List and Budget (Section D-8). This additional purchase may take place before opening or afterwards.

D3 | Accommodations and Infrastructure

D-3.1 Large Venue

In order to appropriately accommodate the expected performance types and support a great deal of flexibility of usage, the Large Venue will be designed and constructed with an emphasis on high-quality accommodations. It will also contain all necessary infrastructure to allow the Large Venue to be used as a recording venue and for film, seminar, lecture and conference events.

The Large Venue will be designed and equipped with a full complement of theatre, lighting, audiovisual and adjustable acoustics systems. These systems will contribute to the goals of first-class acoustics, maximizing audience comfort and cost-effective and efficient operations in the Venue.

D-3.1.1 Overhead Technical Zone

The overhead technical zone is the technical work space above the floor of the Venue. This technical zone for the Large Venue will comprise two separate sections:

- a lower technical zone above the audience area in proscenium configurations
- an upper technical zone above the stage area in proscenium configurations

The overhead technical zone is where all the overhead rigging equipment systems are located. It is also a platform for the mounting of temporary production lighting, for audiovisual equipment such as loudspeakers and for architectural lighting.

The technical zone will be within the same acoustic volume of the audience and performance areas, and will be visible from them.

The components of the technical zone will include the following:

- a walkable surface for the technical crew, allowing them to access rigging, lighting and audiovisual equipment located there (see Section D-3.1.1.1)
- a lower steel structure to support the walkable surface, with horizontal beams and purlins, and vertical hangers that connect the surface to the building structure; includes gridwells – clear zones in the structure to allow unobstructed pass-through of vertical rigging liftlines
- an upper steel structure to support motorized rigging equipment and movable rigging elements, such as the rigging gantry system
- a system of demountable pipes for production lighting and audiovisual equipment that connect horizontally to the hangers, or vertical supports, of the tensioned wire-rope grid
- technical galleries

The technical work zone is typically referred to as a gridiron or grid, as it is organized in a symmetrical pattern. A row of wire-rope grid modules, between the gridwells, is referred to as a bay. Bays extend from stage right to stage left, and are parallel to the

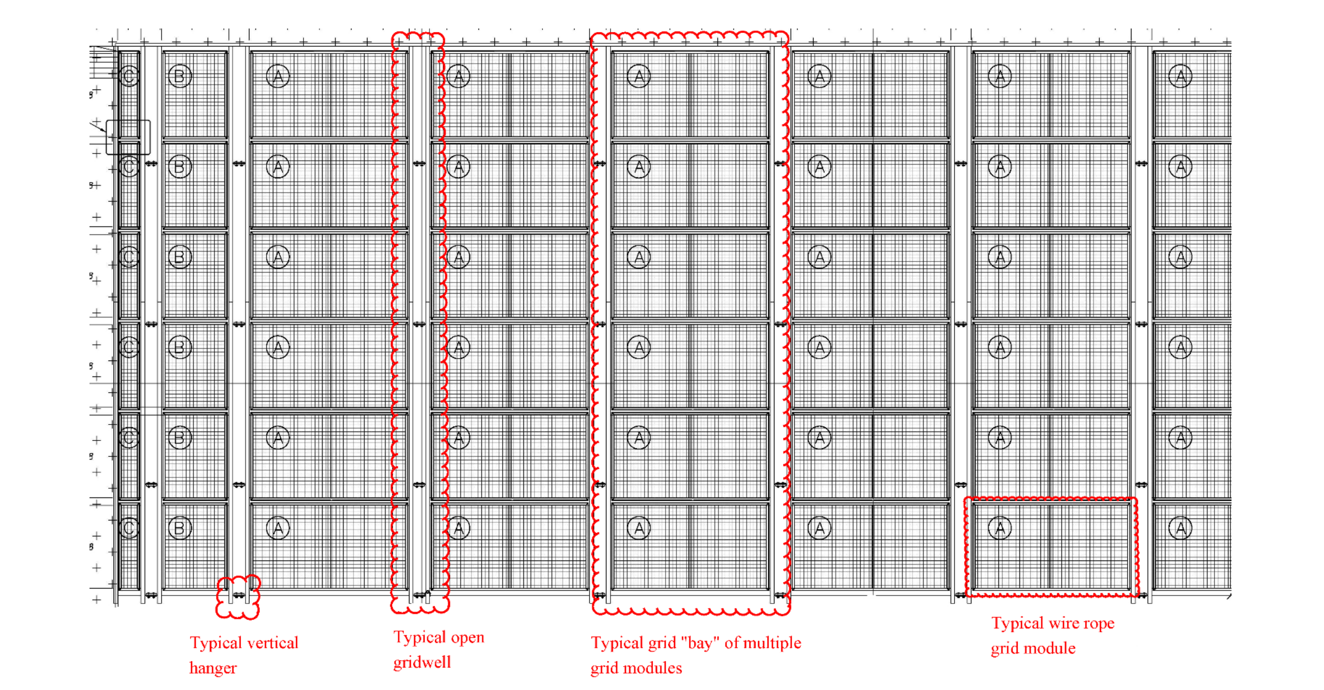


Fig 2. Plan of technical grid at wire-rope grid module (walking surface) level

centreline (long axis) of the Venue plan.

D-3.1.1.1 Tensioned Wire-Rope Grid System

The tensioned wire-rope grid system is a series of pre-tensioned, framed modules with wire rope in an open basket weave. The modules will be suspended over the entire floor area of the Venue. The modules will provide a surface for technical personnel to walk and work on while accessing rigging and electrical equipment, which are above the wire-rope grid level. While similar to a typical proscenium theatre gridiron of steel grating or channel beams, the wire-rope grid is not a rigging platform itself, and cannot be used to mount rigging machinery and hardware. The Architectural Design Team must plan for a live load on the panels of 98kg/m². Each grid module will carry up to four technicians at 115kg each, with a maximum of 12 technicians at the grid level at once.

The modules will be steel-framed and measure approximately 1.75m x 3.0m.[1] The wire grid will be constructed of 3mm aircraft cable on 70mm centres, woven in two directions. Each module will be supported on the grid well structural beams and purlins, which will be connected to the structural framework by vertical hangers and horizontal stiffeners. The modules will be individually removable to allow for specialty rigging applications, when required by specific performance conditions or maintenance needs.

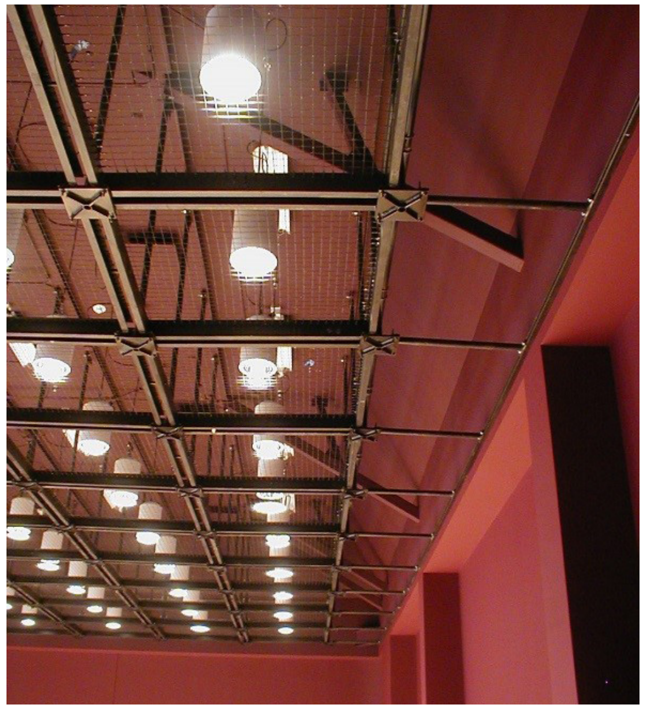


Fig 3. Grid support structure and bracing

D-3.1.1.2 Rigging Gantry Systems

The overhead technical zones of the Large Venue will have two rigging gantry systems in two independent layers:

- The small rigging gantry system forms the lower layer and will be used for spotline rigging operations.
- The large rigging gantry system forms the upper layer and will be used for lineset rigging operations.

The two systems are further described below.

D-3.1.1.2.1 Rigging Gantry System – Small

The small rigging gantries will be located at the overhead technical grid, above the wire-rope grid surface. These gantries will be used for single point rigging applications (spotline) with equipment from either the motorized point hoist or the motorized chain hoist systems. Each unit will be composed of the following:

- dedicated structural beams connected to the structure of the technical grid; these beams, located in each bay, extend across the full depth (upstage to downstage) of the grid
- a short I-beam (gantry) supported on each end by wheeled trolleys, which roll on the flanges of the dedicated steel beams; each trolley can be locked in place with steel pins at regular intervals
- a wheeled trolley on the gantry beam, which can also be locked in place with steel pins at regular intervals; the trolley includes a mounting bracket which can hold a chain hoist or point hoist system spot block

Each grid bay will have several small gantries, and each gantry within a given bay can roll along the entire length of the bay, allowing the gantries to be spread out or concentrated, as per the rigging requirements of specific productions.

The anticipated load capacity for each small gantry is 1,000kg.

1 Final required dimensions will be established based on the Architectural Design to achieve equivalent functionality to the dimensions defined in this document.

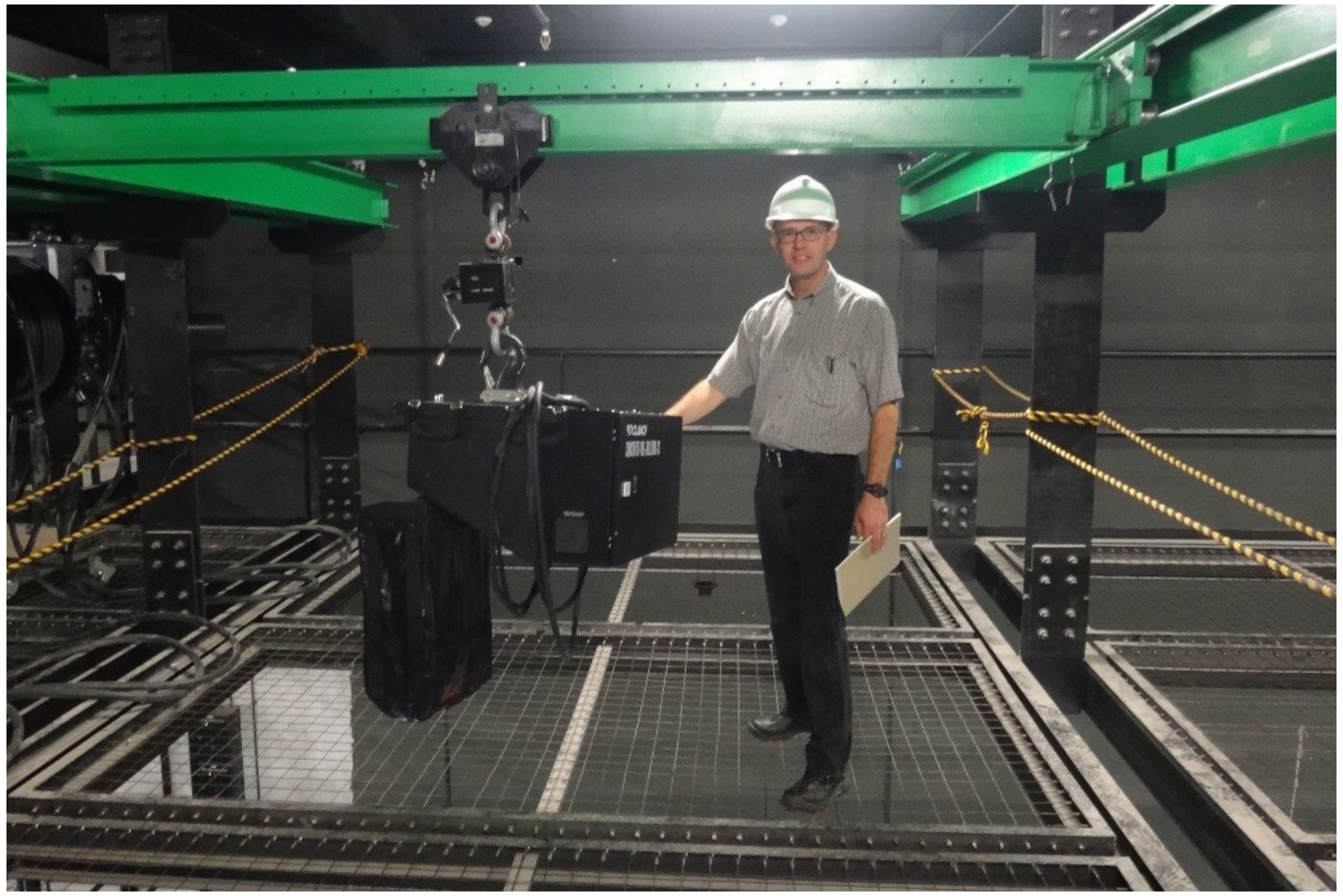


Fig 4. Small gantry (green) with BGV-C1 chain hoist over wire-rope grid surface; open gridwell at right

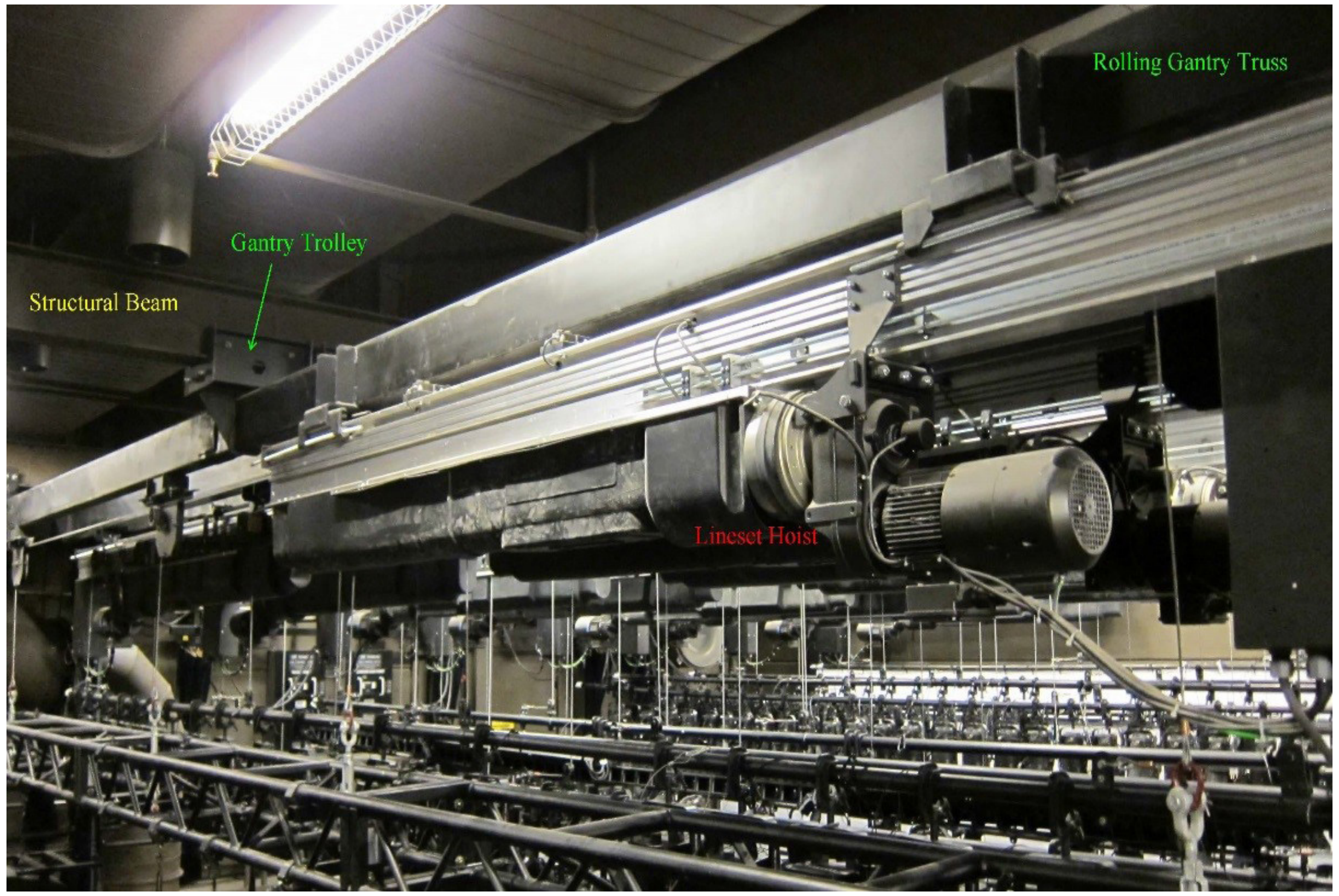


Fig 5. Large rolling gantry with lineset hoist

D-3.1.1.2.2 Rigging Gantry System – Large

The large rigging gantries will be located at the overhead technical grid, above the wire-rope grid surface. These gantries will be used for multiple point rigging applications (lineset rigging) with equipment from the motorized lineset hoist system. Each unit will be composed of the following:

- dedicated structural beams connected to the structure of the technical grid; these beams, located in each bay, extend across the full depth (upstage to downstage) of the grid, across all bays; they are directly above the beams of the small gantry system
- a long I-beam (gantry) supported at regular intervals by wheeled trolleys, which roll on the flanges of the dedicated steel beams; each trolley can be locked in place with steel pins at regular intervals
- a motorized lineset rigging hoist, mounted to the underside of the gantry beam

Each long gantry beam, or truss, will extend across the bays of the grid. Unlike the small gantries, the long gantries have limited travel, as they are captured by the vertical grid hangers which support the entire technical grid system. The sector between each row of grid hangers will hold two to three long gantries depending on the distances between grid hangers in the Architectural Design. The gantries will be able to be concentrated in one location or can be spread out across the sector, as per the rigging requirements of specific productions.

The anticipated load capacity for each large gantry is 1,000kg.

D-3.1.1.3 Operating Gallery

The operating gallery is a metal-framed and decked catwalk below the grid on three of the four walls of the upper technical zone over the stage area in proscenium configuration.

Multipurpose in function, the operating gallery incorporates the following:

- pin rails (with belay pins) for rope rigging functions
- receptacles for production lighting and production audiovisual (lighting circuit receptacles and DMX/Ethernet nodes; loudspeaker, microphone and other audiovisual system receptacles)
- receptacles for master stage machinery control consoles, with mounting pints for the consoles integrated with the gallery infrastructure
- multi-cable distribution (for production lighting) to the motorized linesets
- utility pipes for mounting stage lighting fixtures, incorporated into the safety railings on the stage side of each gallery
- overhead outrigger pipes providing rigging accommodation (for securing multicables and other production lighting cabling)

Fig 6. Technical gallery (stage right)

D-3.1.1.4 Second Operating Gallery

The topmost Moving Balcony on the stage end of the Large Venue will be equipped to function as a second operating gallery when in the stored configuration. Integrated into the Architectural Design of the Moving Balcony, the second operating gallery will be designed as follows:

- demountable theatre operations rail for
  - pin rails (with belay pins) for rope rigging functions
  - attachment of lighting fixtures
  - taking the upward force appropriate for rope rigging functions
- receptacles for production lighting and production audiovisual (lighting circuit receptacles and DMX/Ethernet nodes; loudspeaker, microphone and other audiovisual system receptacles)
- utility pipes for mounting stage lighting fixtures, incorporated into the safety railings on the stage side of each gallery

Fig 7. Stage floor build-up construction

D-3.1.2 Performance and Below Stage Areas

D-3.1.2.1 Performance Area Floor

The flooring for the entire Large Venue (including lift and Trap Floor areas) is considered a performance area. This floor will be a semi-resilient wood floor system built on top of a depressed concrete base slab, poured to a tolerance of not more than +3mm in a 3,050mm radius circle.

The floor system will be composed of 26mm hardwood tongue and groove flooring over plywood subfloor (minimum surface density of 30kg/m²) on top of 38mm sleepers with their top surface 100mm above the concrete slab. Selection of wood species and finish treatment must be reviewed and approved for compliance with acoustic requirements of Chapter 1.

The performance floor will be capable of sustaining a maximum uniformly distributed live load of 735kg/m². The most extreme loads for the stage that must be accommodated will be imposed by small forklifts carrying a maximum load or a movie camera crane. These elements may exert as much as 9.8kN on each wheel with wheels being 1,220mm to 2,135mm apart. As a multi-use venue floor, the floor of the Large Venue will be designed to accommodate a high rate of use.

The flooring of the trap modules of the Trap Floor and the motorized lifts will have a similar construction and accommodate the same loads.

Seating Wagons and Moving Balconies will be also finished in wood with a similar minimum surface density and additionally designed to avoid footfall noise.

D-3.1.2.2 Below Stage Technical Level

The technical area beneath the Venue floor level will be a contiguous space which contains zones serving distinct functions:

- trap room – the area directly below the stage trap module zone, roughly within the centre of the stage area when the Large Venue is in proscenium configuration
- orchestra pit – includes the fixed floor overhang area when in the narrow stage condition, and lower deck level of the Doppelgänger Lift in the large stage condition (see Doppelgänger Lift)
- seating wagon storage – located under the auditorium slab, for the storage of Seating Wagons
- lift machine pits – contain the motorized lift system elements (motors, drive shafts, lift columns) and will be 1.5m below the trap room, orchestra pit and seating wagon storage zones, or the lowest required elevation of the lift table surface[2]

D-3.1.3 Fire / Life Safety–Related Equipment

The following equipment systems may be required depending on the fire code. Their design and integration, if required, will be considered from the point of view of theatre functionality and acoustics.

D-3.1.3.1 Smoke Hatches

At the top of the performance area, a smoke hatch system is required to clear smoke from the technical zone in the event of a fire. The total opening area of the smoke hatches must comply with applicable fire codes.

The smoke hatch system is required to be entirely above the level of the loft beams. It may be formed in the upper technical grid walls or as a structure raised above the roof line.

An alternative solution is to use a standard high-

2 Or as required for accommodation of required equipment systems without compromise to functionality.

transmission smoke vent. In this case the vent will be mounted on the upper technical zone roof slab. In conditions where snow is likely to be experienced, allowances must be made for the snow load. In certain circumstances a mechanical smoke extraction system may be acceptable by code.

The smoke hatch system must provide acoustical isolation equal to the isolation provided by the balance of the roof area.

D-3.1.3.2 Fire Safety Curtain

A rated fire safety curtain (also known as a safety curtain, fire curtain or iron curtain) may be required to separate the performance area from the audience area in proscenium configuration. The primary purpose of this system is to prevent the spread of smoke and flame between the stage and the auditorium in the event of a fire. The fire safety curtain can be one of two types:

- fabric – a fire-resistant fabric (Zetex or Thermotex) curtain rigged at the proscenium arch line; in some cases, a "drencher" system is used with the fabric fire safety curtain in order to prolong the life of the curtain during a fire. The drencher system sprays water onto the fire safety curtain. it may be rigged as one of the following:
  - "braille" or "brail" curtain, a partially steel-framed curtain which folds horizontally to reduce vertical storage space
  - "straight lift" rigid, fully steel-framed (vertical and horizontal framing members) curtain
- steel – traditionally referred to as an "iron curtain", a rigid, steel-framed partition clad in steel sheeting, often with gypsum board as the main insulating material

In the unlikely event of a fire, the fire safety curtain system will automatically engage, triggering the release of the curtain, allowing it to deploy under controlled free-fall. The free-fall descent rate is slow enough to allow any persons in the area time to move out of the curtain zone.

The fire safety curtain will be suspended and raised on wire-rope cables via an electro-hydraulic winch which also acts as a damper. It will be counterbalanced by a counterweight arbour located on one of the upper technical zone walls or by a direct drive unit. The curtain is released in an emergency condition with its descent velocity checked by a hydraulic damper device. Its edges are guided and captured in steel pockets ("smoke pockets") left and right of the opening. These ensure an overlap of the opening under the potential pressure differential of a fire.

Local building codes include figures for air pressure loads on this curtain from the pressure differential. Such lateral loads are transferred through the rigging system and the smoke pockets at the proscenium wall.

Fig 8. Fabric fire safety curtain

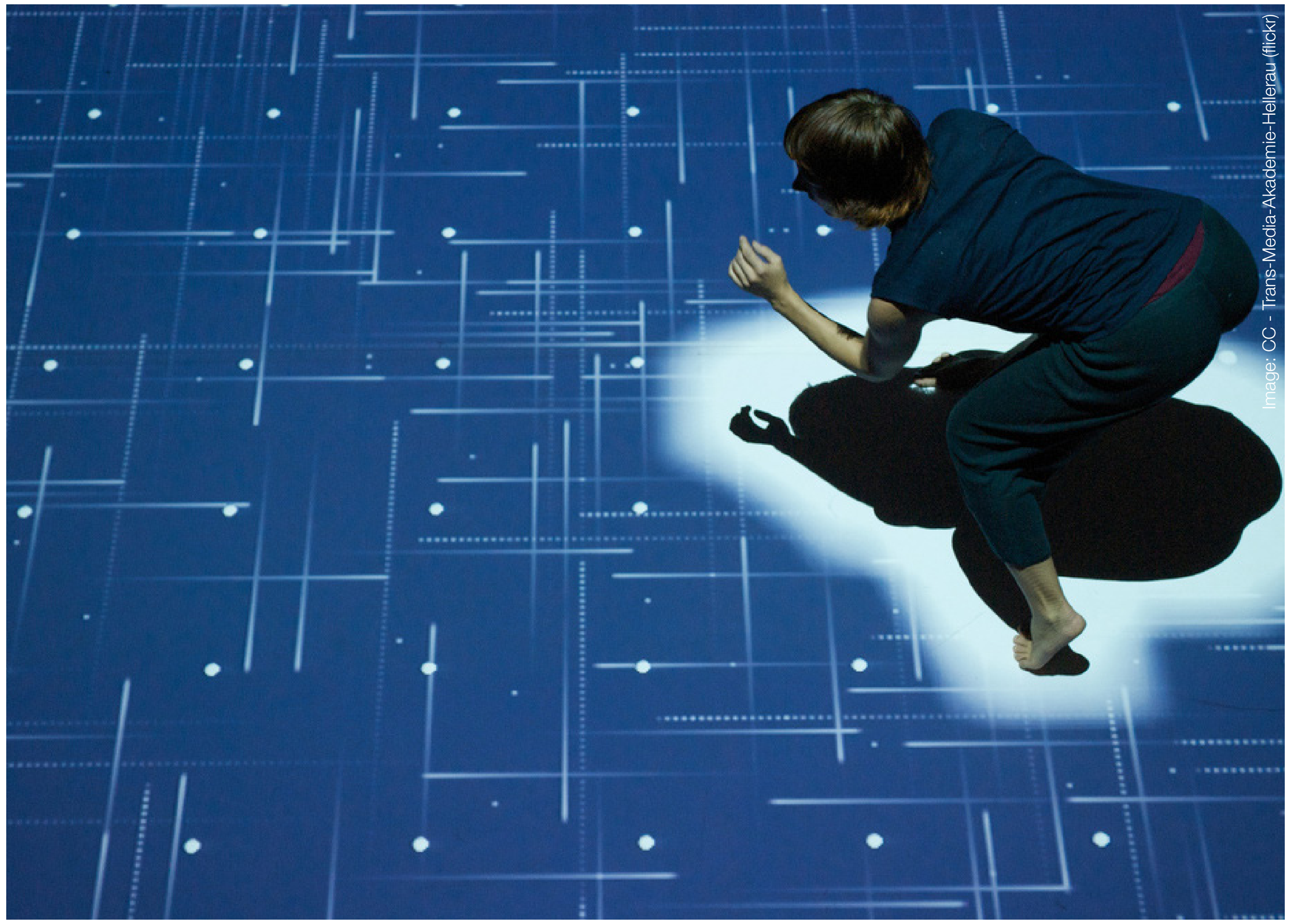


Fig 9. Possible performance or rehearsal use

D-3.2 Small Venue

The Small Venue serves multiple functions as a performance venue, a rehearsal space and as a performance area extension of the Large Venue. The technical accommodations for this space will include the following:

- a tensioned wire-rope grid technical level extending over the floor area
- a system of demountable pipes for production lighting and audiovisual equipment that connect horizontally to the hangers or vertical supports of the tensioned wire-rope grid
- rigging points in the ceiling (accessible from the wire-rope grid) for rehearsal or technical needs
- a combination of load-rated rigging points and strut channels (such as Unistrut or Kindorf) in the walls to hang loudspeakers, video screens, lighting fixtures and other equipment
- a niche to store the motorized telescopic risers when not in use
- balcony railing sections that are demountable to allow access to the telescopic risers

Fig 10. Pipe grid, lighting fixtures and stafe draperies

D-3.3 Studios

The four Studios will be used for small experimental performances, rehearsals and events. They will also be equipped with conference room–style partitions so that they can be used (with mobile furniture) as group dressing rooms. The technical accommodations for these spaces will include the following:

- Studio 1 will be equipped with a pipe grid.
- Studios 2–4 will have loading capacity for future installation of rigging pipes. They will also have architectural accommodation for future installation of Acoustic Banners and Curtains.
- A combination of load-rated rigging points and strut channels (such as Unistrut or Kindorf) will be on the walls of Studio 1 and walls and ceiling of Studios 2–4 to hang loudspeakers, video screens, lighting fixtures and other equipment.

D-3.4 Foyer and Foyer Event Area

The foyer will be used for a variety of activities, from formal dinners and social events to small performances and multimedia presentations. The technical accommodations for this space will include a combination of load-rated rigging points and strut channels (such as Unistrut or Kindorf) in the ceiling to hang loudspeakers, video screens, lighting fixtures and other equipment.

D-3.5 Other Infrastructure Requirements

This section describes infrastructure requirements which go beyond the spaces outlined in the previous sections.

D-3.5.1 Temporary Cable Management

While the performance equipment systems built into the Facility will accommodate most resident groups or outside production companies, some users may wish to augment the house systems with their own more familiar equipment, or they may bring in temporary systems packaged for their productions.

Operation of such portable equipment will require a network of portable cables deployed throughout the Facility that does not compromise either the acoustics isolation system of the Facility, the fire protection strategy or safe movement of artists, audience and staff. The temporary cables will be used in addition to the permanent production audiovisual systems or production lighting systems wiring, or for outsourced broadcast or recording purposes.

The electrical layout will be designed to include a network of pathways to the various locations in the Facility to which access may be required. These pathways will require the following infrastructure:

- empty conduits
- cable hooks
- cable trays
- cable pass-throughs (acoustically sealed wall and slab penetrations)
- cable floor-troughs (with demountable lids)

The Architectural Design Team must ensure that the temporary cable pass system does not compromise fire barriers or acoustical isolation requirements as described in Chapter 1.

Fig 11. Cable passes: empty (left), in use (right)

The temporary cable pass system will connect, at minimum, the following spaces:

- loading dock
- nearest practical point in building façade to broadcast truck location
- nearest practical point in building façade to outdoor projection seating area
- Large Venue house sound mix position
- all Large Venue Windows and Moving Balconies
- Large Venue trap room and pit areas
- all overhead technical areas (Large and Small Venues)
- all control rooms (Large and Small Venues)
- Back of House circulation immediately adjacent to the Small Venue and the Studios
- Studios
- foyer event area

D4 | Theatre Equipment Systems

D-4.1 Large Venue

The following Large Venue theatre equipment systems are explained in greater detail in this section.

D-4.1.1	Overhead Rigging Systems
D-4.1.2	Stage Level Systems
D-4.1.3	Moving Balcony System
D-4.1.4	Adjustable Acoustic Systems
D-4.1.5	Other Venue Equipment

D-4.1.1 Overhead Rigging Systems

D-4.1.1.1 Removable Portal

A traditional proscenium theatre has a fixed architectural wall structure that divides the Venue into two distinct spaces: the auditorium and the stage. The Large Venue, as a flexible performance space, must be able to remove or reposition the proscenium to meet the performance requirements of specific productions. To accommodate this requirement, a soft wall system, made of fabric, will be used to establish a Removable Portal.

The Removable Portal wall will be made of durable ripstop nylon, sail cloth or similar material.

Much like a conventional stage drapery, the fabric portal will be suspended by a lineset rigging batten. When needed, the fabric portal is unfolded on the stage floor, attached to the lineset batten and "flown" up. The fabric will be tensioned by attaching the sides of the fabric to connection points at the Venue side walls and by attaching the bottom of the fabric to connection points in the stage floor. In addition, the proscenium opening within the fabric wall will be stiffened by attaching the fabric edges to a light aluminium frame.

The use of sailing Keder railings and hardware, or similar, will allow fast deployment of the soft wall.

If a proscenium is necessary in any other position, it will be formed out of theatrical draperies.

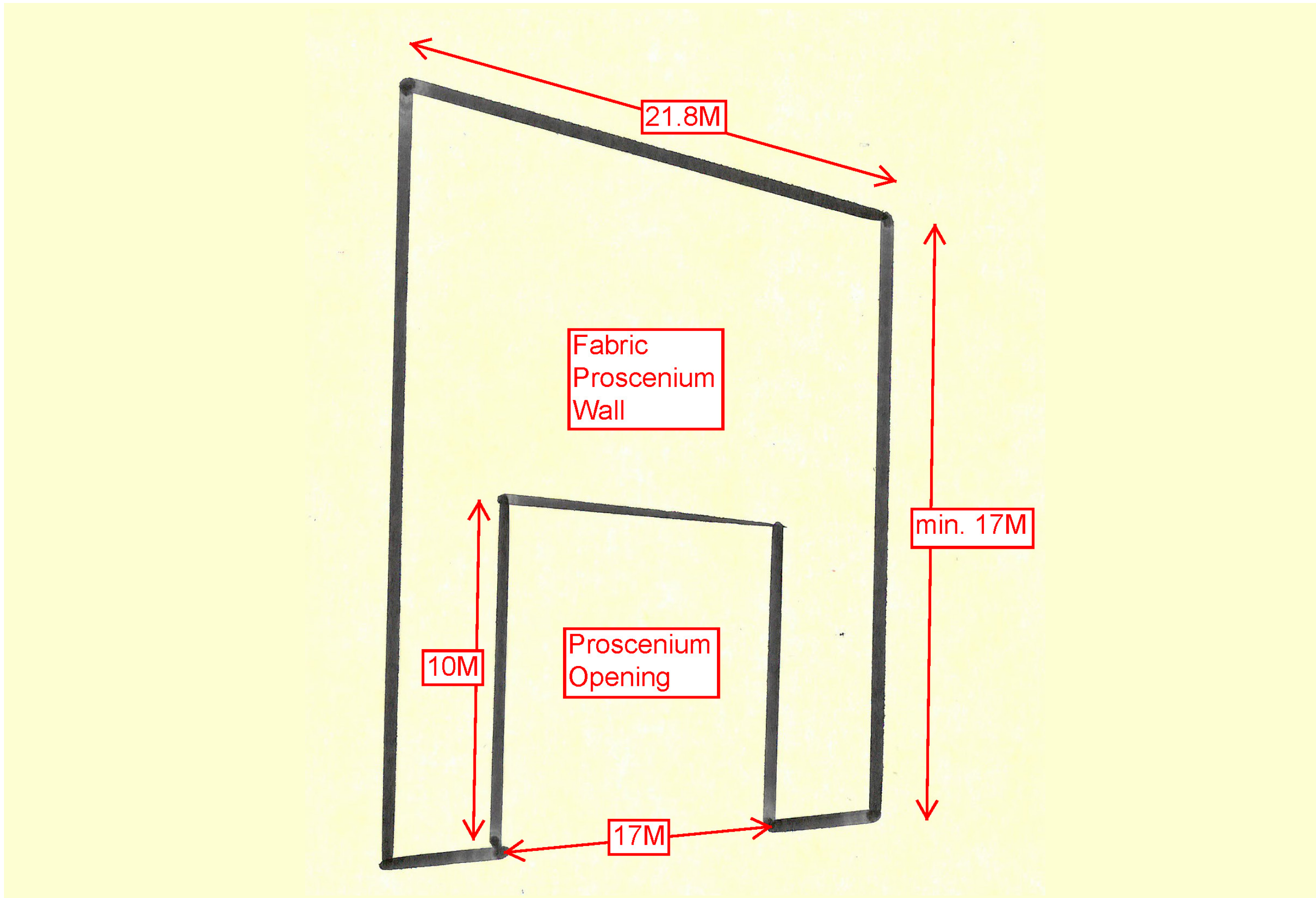


Fig 12. Demountable proscenium wall diagram

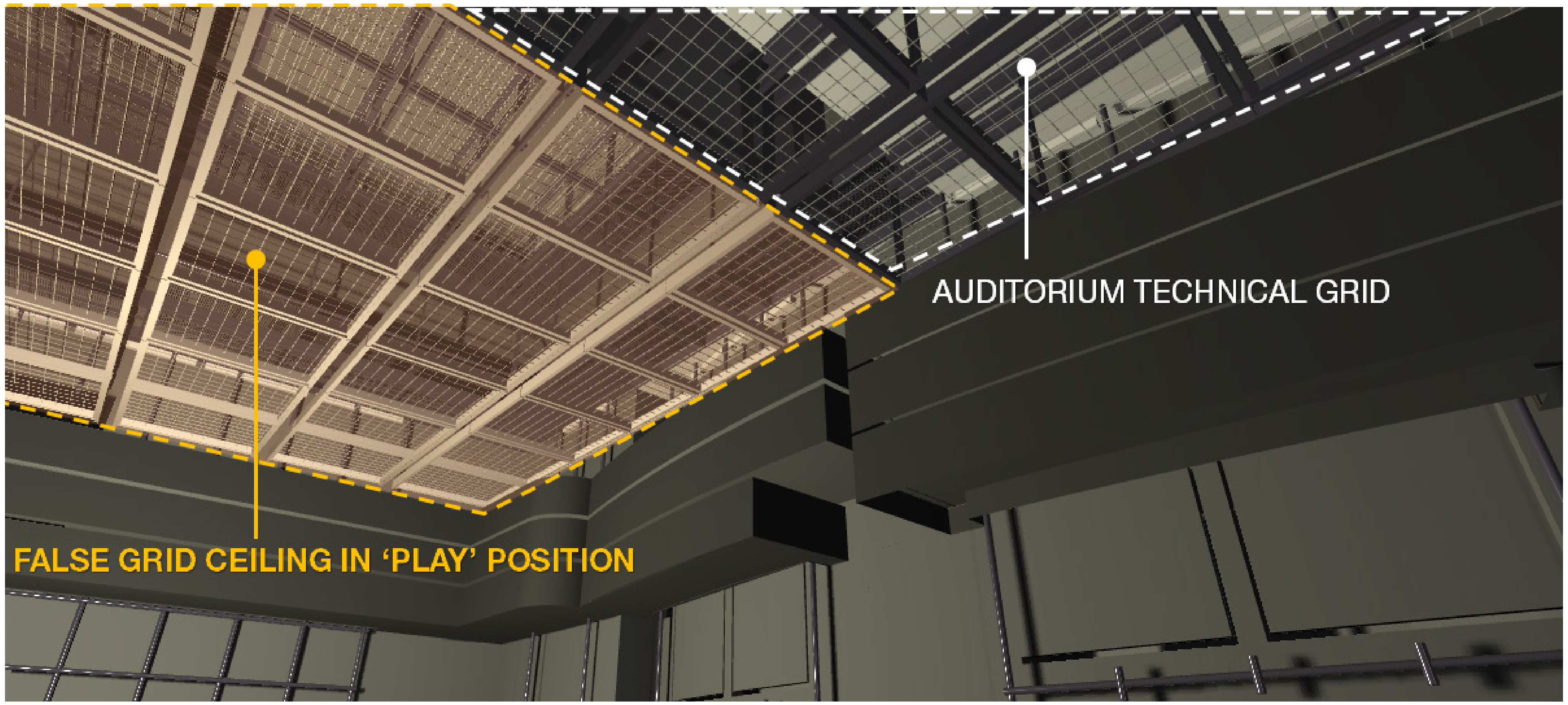


Fig 13. Tip-and-Fly Grid Ceiling in open configuration

D-4.1.1.2 Tip-and-Fly Grid Ceiling

In order to establish a visually symmetrical appearance in the Large Venue when not in open configuration, a decorative, tip-and-fly grid ceiling system will be deployed.

A wire grid ceiling consists of multiple grid panels that can be dismantled and stored on storage carts when not in use. The panels are made of lightweight aluminium framing constructed to look like the working tensioned wire-rope grids at the lower and upper technical levels.

When required, the false grid panels will be assembled in rows (seven rows to match the number of working grid sections in the performance area) and will be attached to the rigging linesets or chain hoists in the technical zone above. The panels will then be rotated to their horizontal "play" position and raised to the same height as the lower technical zone wire-rope grid.

D-4.1.1.3 Motorized Lineset Rigging Hoists

The motorized lineset hoist system is the primary system for suspending scenery, masking, lighting instruments and other similar production elements above the performance area. Each lineset hoist will be mounted on a large gantry truss. Spacing of each lineset will be variable, as the long gantries can be repositioned as needed within their grid sector.

The hoist assembly will comprise a motor, brake, multi-groove drum and local control electronics mounted to a frame in the factory. In the field, the pre-assembled frame and loft blocks will then be mounted to the long gantry truss.

Each lineset hoist unit will have six to seven liftlines (depending on the specific technical engineering solution proposed by the specialised theatre equipment contractor), which will pass through the gridwells of the technical grid. The liftlines will be connected to a ladder batten, situated below the grid level. The ladder batten may be lowered to the stage floor so that theatrical lighting fixtures, stage draperies, audiovisual equipment or scenic elements may be attached to it. The hoists will be variable speed and will be able to carry the anticipated load capacity for each lineset hoist of 1,000kg. The lineset system will be controlled by the master control system.

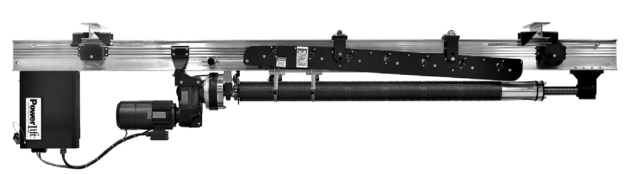


Image: JR Clancy

Fig 14. Beam-mounted motorized lineset hoist

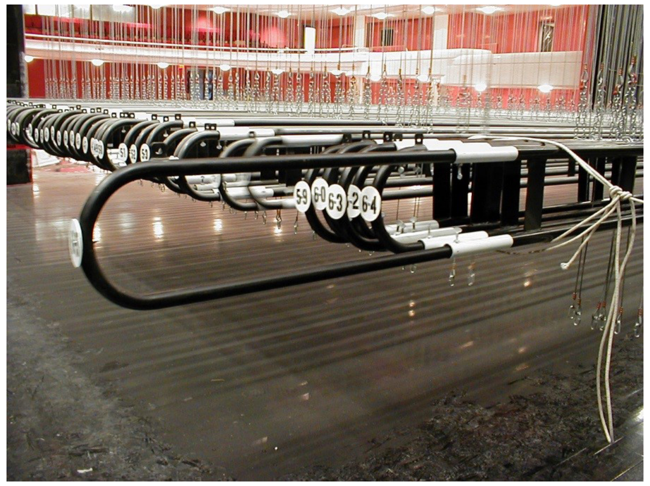


Fig 15. Ladder battens of the lineset rigging system

D-4.1.1.4 Motorized Spotline Rigging

The motorized point hoist rigging (spotline) system will be provided for the accommodation of production elements that are oriented other than parallel to the proscenium, are single line items or have similarly unique needs. Examples of use for point hoist rigging are as follows:

- a chandelier hung over the performance area
- a batten oriented askew to the proscenium line
- a tracked scenery element

The system will consist of a set variable speed electric drum winch motors (hoists) mounted along the upstage wall of the upper technical zone at the grid level. The winch motors will be complemented by a selection of demountable spotblocks (or muleblocks) mounted on small moving gantry beams in the both technical zones that divert the direction of spotline movement in both the horizontal and/or vertical planes. The hoists for the audience area technical zone will be installed in a dedicated winch room located above the audience area.

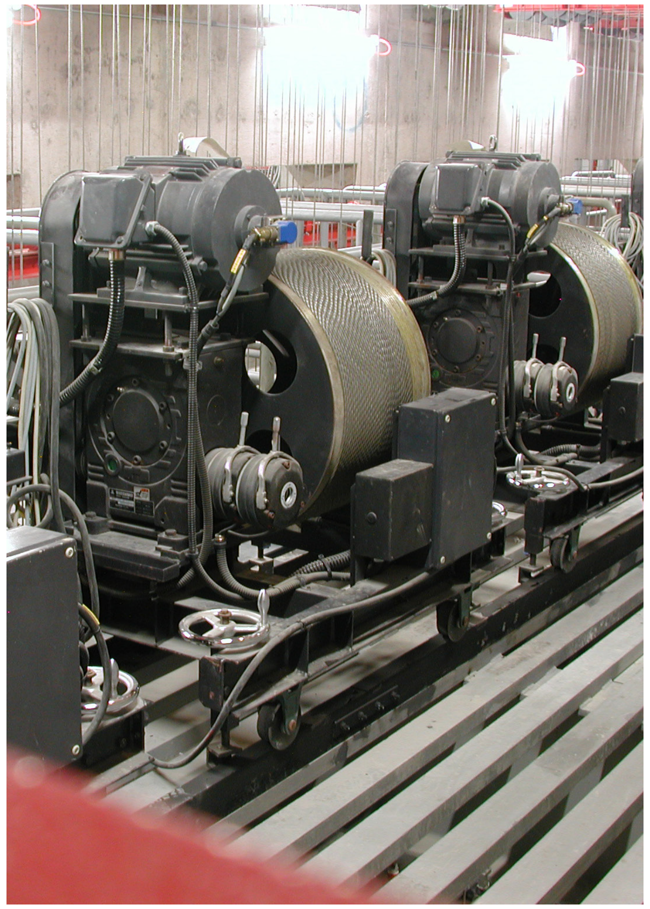


Fig 16. Hoists for spotline rigging

This spotline system will be controlled by the master control system.

D-4.1.1.5 Chain Hoists

Portable, motorized chain hoists will be provided and may be used in a similar fashion as the spotline rigging system. However, as the action of the chain hoists are generally too loud for use during a performance, their primary use will be to raise equipment and scenic

Fig 17. BGV-C1 chain hoists

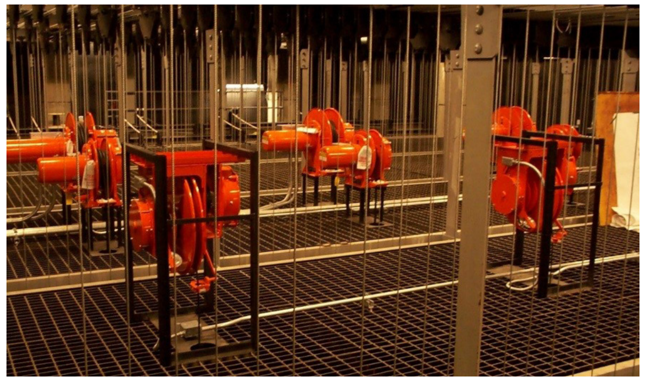


Fig 19. Cable reels (orange) at technical grid

elements to a static, fixed performance position (such as trusses, masking drapery and loudspeakers). Because the chain hoists may be used over the heads of the audience, provided hoists must meet BGV-C1 requirements.

D-4.1.1.6 Cable Reels

A component part of the rigging system, motorized cable reels or cable windlasses will be used throughout the technical grid zone in order to safely manage the electrical power and signal cabling associated with equipment and scenery that will be hoisted by the motorized rigging systems, such as the following:

- loudspeaker arrays
- lighting trusses
- acoustic canopies
- lighting bridges
- chandeliers
- microphones

This list includes both equipment that is procured as part of the construction project as well as temporary equipment and scenic elements that may be brought in for specific productions.

D-4.1.2 Stage Level Systems

D-4.1.2.1 Modular Traps

Located within the main floor of the Large Venue, modular traps will be installed as demountable floor modules. Traps will be able to be removed to allow access to the trap room below the main performance area, either to remove or store equipment, or to accommodate special effects for a specific performance (such as a special lift that allows an actor to rise from below the stage floor as a ghost).

Traps will each be 1.2m by 1.2m in size, and will be constructed of steel framing and a plywood build-up that matches the permanent stage floor. The modules

Fig 18. View of stage traps from trap room

Fig 20. Trap system support steel without trap decks

will each sit atop demountable I-beams that will in turn supported by removable lolly columns. This allows for a variety of open trap layouts, depending on the requirements of a specific production.

The modular traps should be capable of sustaining a maximum uniformly distributed live load of 735kg/m². The most extreme loads for the traps will be imposed by small forklifts carrying a maximum load or a movie camera crane. These elements may exert as much as 9.8kN on each wheel with wheels being 1220mm to 2135mm apart and the system must be designed to carry these loads.

D-4.1.2.2 Single-Deck Lifts

Single-Deck Lifts are motor-driven platform lifts, which will permit rearrangement of the forestage / audience seating / orchestra pit relationship. Used in conjunction with the Seating Wagons, the Lifts will allow the operator to choose among the following configurations:

- stage floor aligned with fixed stage floor
- raised stage floor
- audience seating: Lift(s) at appropriate levels for audience seating with Seating Wagons;
- orchestra pit: Lift(s) at appropriate levels for orchestra pit usage

Since the Large Venue is equipped with multiple Lifts, the operator will further have the option of:

- different stage floor configurations
- different orchestra pit configurations with various use of Seating Wagons

The edges of each Lift, and the audience slab at the lift shaft, will be provided with demountable, architecturally finished railing units that will function as a barrier to prevent the audience from falling into the orchestra pit, and to generally mask the pit orchestra from view (see section D4.1.2.8). All receptacles in the floor for the railings will each be provided with a secure metal cover that can be easily removed by the operator without special tools. The front edge of each lift deck towards the audience area in proscenium configuration will have loudspeaker cavities for demountable front fill loudspeakers.

There will be a complement of pit level technical safety railings (and storage/transport wagons) to provide a barrier against personnel falling into the machinery pits below, when the Lifts are above pit level (see section below).

The Lifts will have a steel structure with a plywood

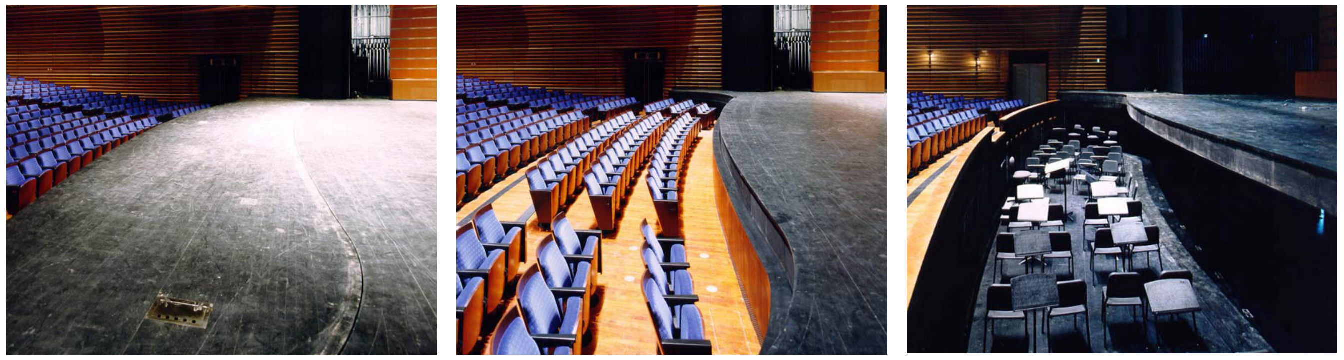


Fig 21. Extension lift at: stage level (left), seating level (middle), orchestra pit level (right)

sub floor on wooden sleepers with finished flooring to match the stage floor construction. The Lifts will be driven by mechanically synchronized self-forming thrust columns. An electric motor will power the columns, through a system of shafting and gearboxes mounted to the concrete floor of the Lifts' machinery pit. Each column will be completely contained within the machinery pit, and will not intrude on areas below. The Lifts will also require limit switches, pinch point tape switches and other sensors, wired to the local motor control panel in accordance with professional theatrical safety standards.

Each Lift will have a shirt or closure board extending down from the lift surface approximately 1.5m. This skirting will form an architecturally finished edge when the Lifts are above the finished floor.

The Lifts are not required to be designed to carry artists while moving.

D-4.1.2.3 Double-Deck Lift

The Double-Deck Lift (Doppelgänger) will be used to establish an orchestra pit setting, in a similar fashion as the single-deck extension/reduction lifts. The addition of the second deck level allows the lower deck to be used as an orchestra pit with a stage overhang, when the proscenium wall is in position to establish the full stage setting.

The Lift will have a steel structure with cantilever to support the upper deck, in order to allow for an open column-free space when the lower deck is in the orchestra pit condition. Each deck will have a plywood sub floor on wooden sleepers with finished flooring to match the stage floor construction. The Lift will be driven by mechanically synchronized self-forming thrust columns. An electric motor will power the columns, through a system of shafting and gearboxes mounted to the concrete floor of the Lift's machinery pit. Each column will be completely contained within the machinery pit, and will not intrude on areas below. The Lift will also require limit switches, pinch point tape switches and other sensors, wired to the local motor control panel in accordance with professional theatrical safety standards.

Fig 22. Doppelgänger Lift as piano lift (during install)

The Double-Deck Lift will not carry Seating Wagons. The Lifts are not required to be designed to carry artists while moving.

This system is currently deferred. The Architectural Design Team will design, in its place, a fixed performance floor built up from the lift pit of the Doppelgänger Lift (with the same characteristics as the performance floor described above) that can be removed and replaced with the Lift at a later date, with a minimum of disruption and cost.

D-4.1.2.4 Seating Wagons

A component part of the adjustable seating system, Seating Wagons are steel structures supporting plywood sub-floors and a finished floor that will match or complement the finished flooring or the permanent

Fig 23. Seating Wagons in storage

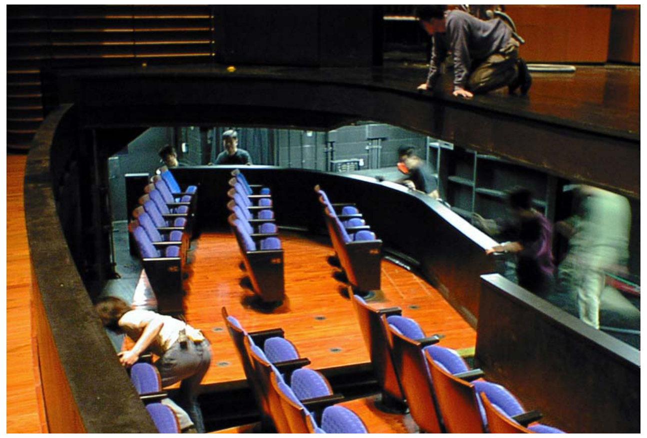


Fig 24. Seating Wagons being installed on the Lift

audience seating. Fixed audience seating will be installed on the finished floor of the Seating Wagons so that when deployed, these removable seating units will appear to be a natural extension of the permanent seating area. The Seating Wagons will have various permanent and demountable railings to provide the appropriate barriers to orchestra pit or lift pit spaces, as the case may be. All receptacles in the finished floor for the railings will each be provided with a secure metal cover that can be easily removed by the operator without special tools.

When not in use, the Seating Wagons will store in the seating wagon storage garage, found on two levels within the below stage technical level. This storage area will have two horizontally travelling rolling partition doors to separate the storage area from neighbouring areas. Smaller Seating Wagons will be equipped with casters for easy movement. Larger Seating Wagon units will be air-castered or motorized. The operator will have the option of deploying Seating Wagons freely to create different seating configurations in addition to their primary play position on the lift platforms. The Architectural Design will incorporate appropriate technical solutions that will ensure that once manoeuvred into play position, they will not shift and become a monolithic element on the lift platform or the Large Venue floor.

Movable step units with demountable hand rails will be provided as part of the Architectural Design.

D-4.1.2.5 Orchestra Pit Safety Net System

The orchestra pit safety net will be able to be deployed over the orchestra pit void space in each standard orchestra pit configuration, which is created when the Lift (or Lifts) is lowered to establish the orchestra pit. The void space, from stage edge to audience safety railing, will be covered by this tensioned fall arrest netting, which will be attached to strong points along the structure of the stage edge slab. The netting may cover the entire void space, or just extend a few feet from the stage edge.

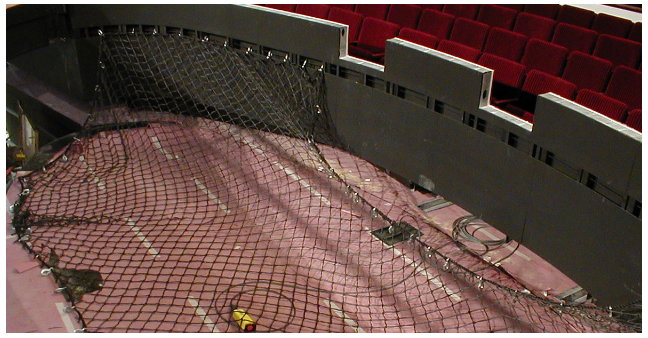


Fig 25. Orchestra pit safety net installation

D-4.1.2.6 Sound House Mix Position

Superior sound system performance requires that the sound operator and the mixing equipment be located within the direct sound-field of the main loudspeaker system in the proscenium configuration. For this reason, the Large Venue will have an area that can be used as a sound house mix position with removable seats on the appropriate Seating Wagon.

For simple sound reinforcement tasks, sound equipment can be set up in the sound control room. The sound control room is necessary due to the noise generated by the mixing equipment during purely acoustic events as well as having the largest possible number of seats available for sale in the Large Venue.

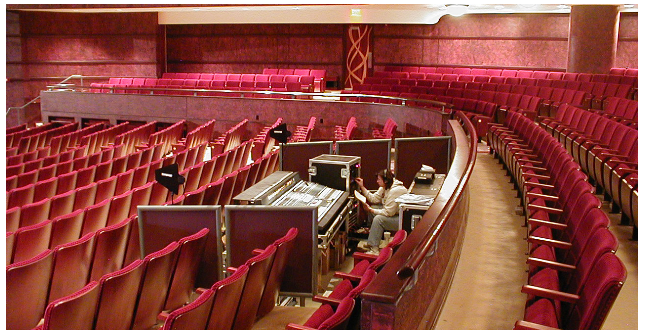


Fig 26. Sound house mix position

D-4.1.2.7 Safety Railings – Technical

Demountable safety railings will be provided in the technical levels of the lift pit / lift shaft area at the following:

- fixed stage level
- orchestra pit / trap level
- seating wagon storage level
- any other possible storage or access positions that open onto the shaft way

The railings will be fabricated of plain steel tube and painted in high-visibility yellow paint. The railing sockets, embedded in the concrete flooring of each technical level, will have interlock switches integrated with the lift control system so that the Lifts cannot travel unless the railings are in position. When not in use, the railings are stored on rolling transport carts, which shall be provided as part of the project.

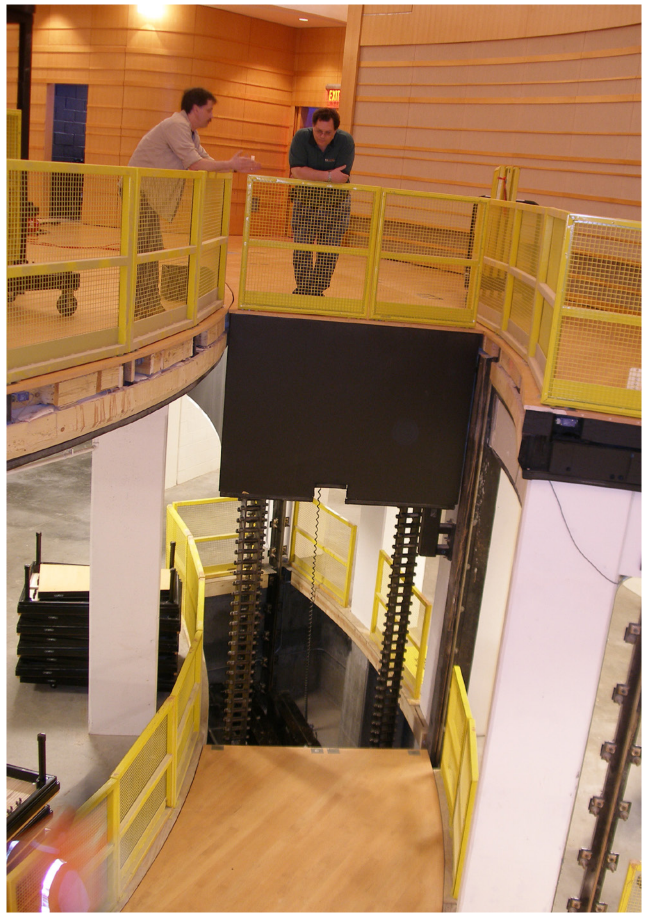


Fig 27. Technical safety railings – high-visibility yellow

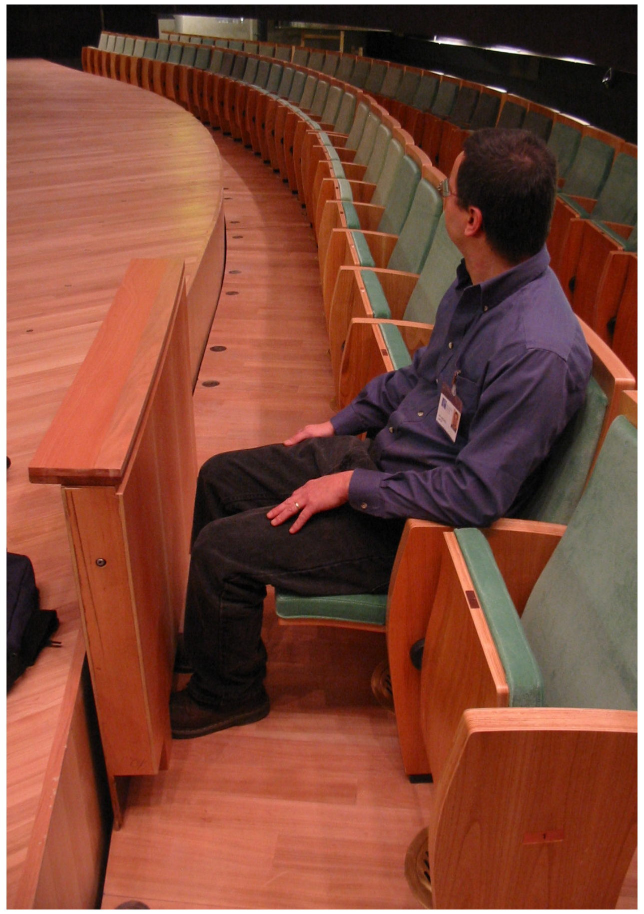


Fig 28. Audience safety railing – single unit lift shaft edge

D-4.1.2.8 Safety Railings – Audience Area

Demountable audience area safety railings will be provided at the stage level, and on the Seating Wagons and lift decks.

The railings are fabricated of plain steel tube and are covered with minimal architectural finishes which shall be selected to allow each railing to be easily movable by one technician. The railing sockets, embedded in the concrete flooring of the audience level slab, and the structure of the Seating Wagons and lift decks, will have interlock switches integrated with the lift control system so that the Lifts cannot travel unless the railings are in position. When not in use, the railings will be stored on rolling transport carts which shall be provided as part of the project.

D-4.1.3 Moving Balcony System

The moving balcony system will consist of approximately 12 individual units of Moving Balconies

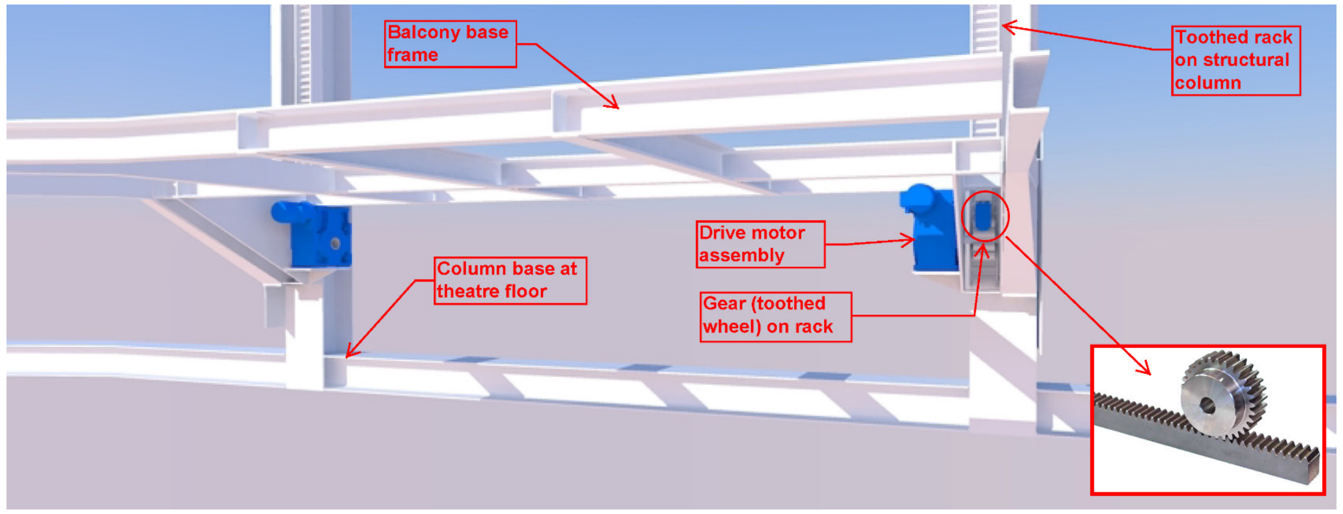


Fig 29. Moving Balcony concept – structural frame with rack and gear drive system

on three levels for audience seating, resulting in approximately four balcony units per level. The number of balconies on each of three levels may be adjusted according to the Architectural Design but will comprise of no less than 10 individual units. The Moving Balconies will be able to be raised and lowered in multiple configurations. Each balcony unit will have a permanent lighting railing for hanging production lighting instruments. Receptacles for power and signal connections to production lighting and audiovisual equipment will be integrated into each balcony unit.

The movement of each balcony unit will be semi-independent: while each balcony unit will have its own drive motors, and will be able to be independently moved, the movement of any one balcony will be limited by the stack of balcony units above or below it.

Each balcony unit will consist of a steel base frame upon which the finishes (flooring, balcony rails, balcony fronts) will be attached. The drive assemblies will be mounted to the underside of the frame.
The motor of each drive unit will power a toothed drive gear wheel which will engage with a toothed drive rack mounted to a structural column. As the gear wheel turns, it will climb up or down the rack. The motors on

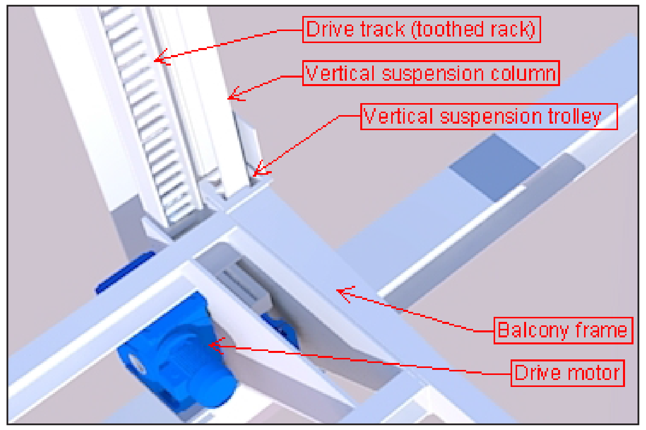


Fig 30. Drive assembly, column w/rack and suspension

each balcony frame will be electronically synchronized so that they move simultaneously.

Each balcony frame will be held to the structural column by a captured guide rail, or suspension column, that runs parallel to the toothed drive racks. A captured rolling guide, or suspension trolley, with metal rollers will wrap around the flange of the I-beam suspension column and will hold the balcony frame to the wall.

The topmost balcony on the stage side in proscenium configuration will have additional accommodation to allow its use as an operating gallery (see above). This system will be controlled by the master control system.

D-4.1.4 Adjustable Acoustic Systems

Adjustable acoustic systems include the retractable Forestage Reflector system and the Acoustic Banners and Curtains.

4.1.4.1 Tip-and-Fly Forestage Reflector

The tip-and-fly forestage reflector system will be comprised of a large, heavy, moveable acoustical reflector positioned above the forestage area (in proscenium mode) and extending over the first few rows of the audience. The height of the reflector will be adjustable and the operators will be able to set it at a variety of heights depending upon what is being performed. The reflector will perform the following functions:

- facilitate communication (ensemble) between musicians on the stage or in the orchestra pit and assist in enabling an appropriate balance between the sections of the orchestra and between orchestra in the pit and performers on stage.
- provide adequate loudness and clarity of sound for the audience in the main seating areas
- contribute to matching the visual and acoustical scale of the room with the scale of the performance
- accommodate and properly locate fixed concert and architectural lighting fixtures for proper lighting levels and angles

The overall range of travel for the reflector units will be from its storage position in the ceiling of the auditorium to just below the proscenium height.

The materials of the reflector surfaces must be

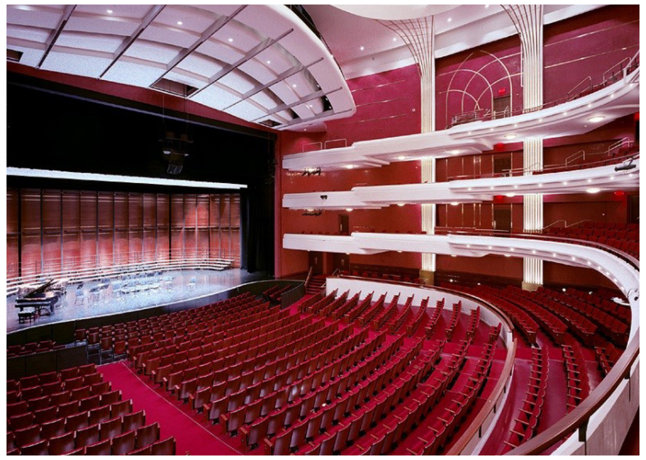


Fig 31. Forestage reflector, in situ (top left corner)

massive in order to efficiently reflect full-frequency sound. Finishes of equivalent mass as wood or plaster surface finish of 100mm thickness will be provided as part of the design. This finish surface is expected to be attached to a steel framing system.

The reflector will be suspended over the stage by a motorized rigging system. This system comprises wire-rope liftlines that pass through the ceiling. Each liftline will be connected to a motorized winch located in the reflector storage space above the Large Venue ceiling.

When not in use, the system will allow the reflector to tip and fly to store vertically in the upper technical zone. This system is controlled by the master control system.

4.1.4.2 Acoustic Banners and Curtains

A system of motorized sound-absorbing Acoustic Banners and Curtains will be installed around the Large Venue. The use of variable absorption in the Venue will permit modification of the natural liveness and clarity within the Venue, allowing for a wide variety of amplified and semi-amplified events, speech events and rehearsals.

The Acoustic Banners and Curtains will be made of sound absorptive fabric. (See also Chapter 1 Section 7.4.1 Acoustics Requirements) They may be of two general types:

- Roller banners: fabric is stored on a rolling tube or tubes
- Stacking banners: fabric is stacked vertical in horizontal bands, similarly to a Roman shade

Banners will be able to be deployed individually or in pre-selected groups (cues) throughout the Large Venue to provide acoustically absorptive materials more centrally located within the reverberant field. When retracted, the banners will store within an enclosure (banner box), either within the soffit or ceiling. At the bottom of the banner is a board or plate that closes off the banner storage box acoustically so that the sound absorptive material no longer impacts the acoustics of the Venue when in retracted position.

Two full-height Curtains will be located above the wire-rope grid in the lower technical zone that will provide additional absorption in the upper volume of the room. Each Curtain shall be composed of two layers of sound absorptive cloth, both layers 100% fullness. These systems will be controlled by the master control system.

Fig 32. Roller banners (left), stacking banners (right)

D-4.1.5 Other Venue Equipment

In addition to the Venue equipment systems detailed above, included below are more in-depth descriptions of some more equipment for the Large Venue.

D-4.1.5.1 Master Control System

All motorized stage machinery will be controlled by a master stage machinery control system at a single Venue systems control point. This cabinet is typically located at stage level, at the downstage right wall of the main performance area in proscenium configuration. Each motor will also be controllable at a local motor control panel located adjacent to each unit for maintenance purposes.

The master stage machinery control system will provide a central computerized controller for all mechanized theatrical equipment systems. It allows the user to set, save and reset configurations of equipment to ensure consistent repeatability of acoustic adjustments.

The architecture of the system must be based upon an Ethernet local area network (LAN) or similar protocol and topology. The LAN will consist of a central file and processing server and a series of nodes, including the motor control panels and the control surfaces (console and pendants).

Through safety interlocks and an emergency stop system, the system will also ensure safety for personnel and equipment.

In addition to the primary control position, there will be a detachable pendant, with a cord long enough for the personnel to stand the centre of the Venue and operate the equipment system elements.

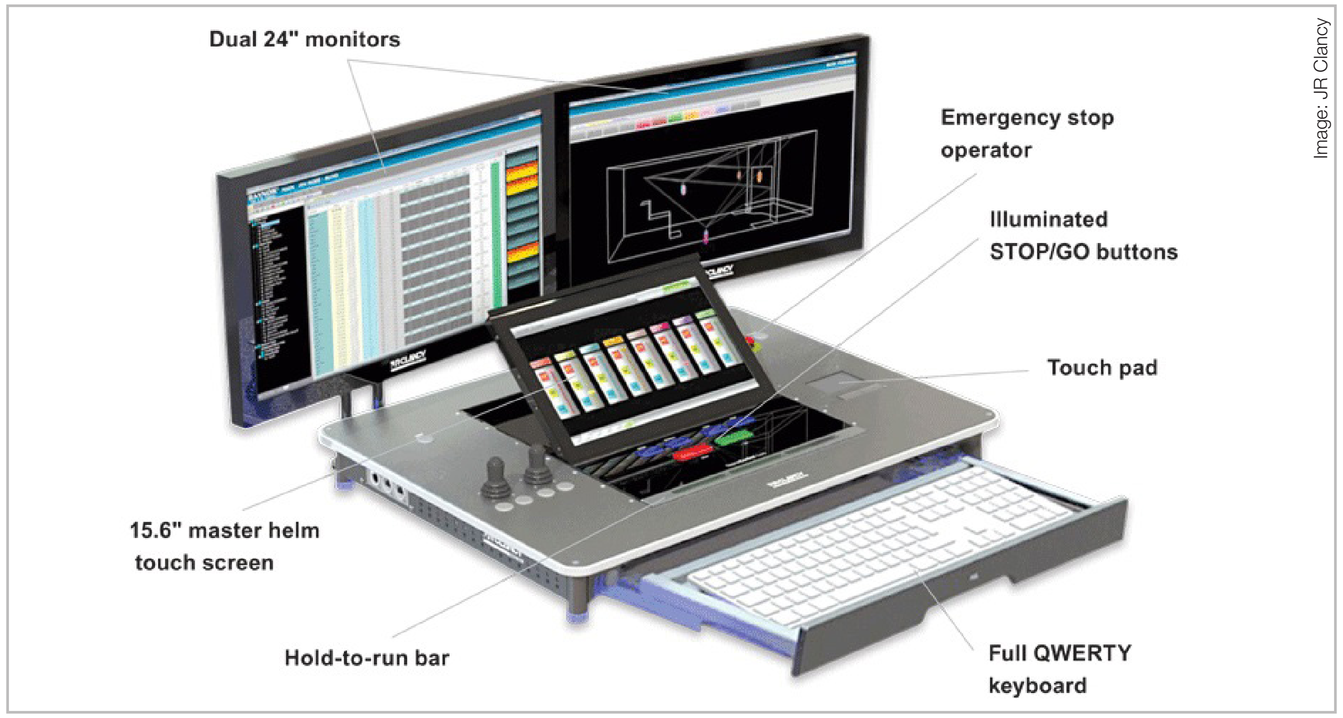


Fig 33. Typical venue equipment systems master control console

D-4.1.5.2 Stage Draperies

Stage draperies are velour fabric panels that are used to frame a theatrical environment or provide a plain backdrop. The Large Venue will be equipped with a full complement of stage draperies tailored for the dimensions of the Venue in different configurations. These will include:

- black velour borders - for horizontal masking of stage lights or scenery;
- black velour legs - used in sets of two for trimming the stage width, and for vertical masking of off-stage areas;
- full stage black velour drops and travellers and two sets of tracks - to mask an entire section of stage vertically and horizontally;
- cycloramas - full stage drops fabricated from translucent plastic projection material, including bounce drops, full stage muslin drops which are used for scenic and lighting effects.
- theatrical scrims - full stage drops fabricated from open weave fabric which can be lighted so as to appear transparent, translucent or opaque, and can be used in conjunction with cycloramas to create a variety of scenic and lighting effects.

All of these soft goods are intended to be tied to lineset battens.

D-4.1.5.3 Grand Drape

The grand drape or house curtain is the main curtain that conceals the stage from, and reveals the stage to, the audience in proscenium configuration. The grand drape will guillotine (move vertically) and travel (move horizontally), both under variable speed, motorized operation. The curtain will be in two panels, constructed from heavy weight fabric, with a light weight liner.

This system will be controlled by the master control system.

D-4.1.5.4 Grand Valance

The grand valance is a piece of drapery hung on a lineset immediately downstage of the grand drape to mask its machinery. It can be adjusted to set the visual height of the stage opening below the removable portal.

D-4.1.5.5 Adjustable Proscenium Header and Legs

Adjustable proscenium draperies allow the proscenium portal to be re-configured from a large proscenium opening to a smaller one, based on production needs of opera, ballet or drama venue.

The adjustable proscenium draperies will include a header to adjust the height of the proscenium opening, and two legs to adjust the width. The draperies will be flat sewn, with no fullness. The fabric is typically fabricated with an inherently flame retardant velour, but may also be made with wool serge.

Fig 34. Fabric adjustable proscenium

The adjustable proscenium draperies will be hung from either the motorized lineset system, or the chain hoist / spotline systems. This system is controlled by the master control system.

D-4.1.5.6 Cinema Screen Masking

Horizontal and vertical masking will allow film image formats to be adjusted for various events. The masking will be constructed of matte black fabric, which is connected to a light aluminium framing system to keep the fabric taut. These frames can be hung on the lineset ladder batten (or from ganged chain hoists) directly in front of cinema screen positions. The horizontal and vertical masking units will be independently rigged in order to allow the greatest flexibility for sizing the cinema screen.

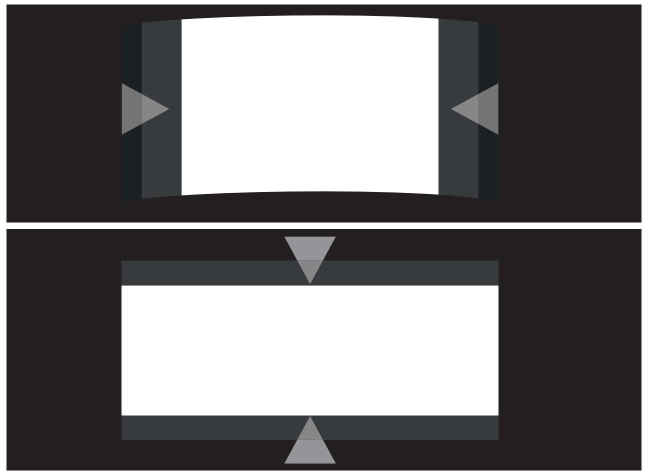


Fig 35. Cinema masking of vertical and horizontal axes

D-4.1.5.7 Sprung Dance Floor Modules and Roll-Out Dance Flooring

The dance floor system will consist of temporary platforms, or modules, especially engineered for dance and dance-like movement. As the fixed stage

Fig 36. Portable sprung dance flooring on storage carts

floor of the Venue will be too hard to dance on if it meets the required load bearing capacity, the dance floor system will be deployed for dance productions. Dance floor platforms utilize special foam blocks to cushion the dancers and performers as they jump and run, protecting their joints and muscles from hard impact injuries. Dance floors are also known as sprung floors.

When required for a dance or movement performance, the dance floor modules will be removed from the storage/transport carts that will be provided as part of the design and assembled on the fixed stage floor.

Once deployed, the dance floor will be covered by rolled vinyl flooring, commonly known as a Marley, to provide a seamless, smooth top surface.

Sufficient dance floor modules and the roll-out dance flooring will be provided to cover a 16m by 16m stage area.

D-4.1.5.8 Orchestra Pit Platforming

A system of portable orchestra pit platforming will be designed to provide flexible staging options for musicians when they perform in the orchestra pit configurations of the Lifts. The system will consist of modular platforms (or risers) that use demountable legging and bracing components. The height of the legs will be adjustable. This will allow for a broad range of layouts, with various shapes and heights. When not in use, the portable orchestra pit platforms, legs, steps, railings and masking pieces will be placed on dedicated carts, which will be provided as part of the project, and the carts will be rolled into storage. The finished flooring of the platforms must be designed to match the flooring of the stage and lift decks.

D-4.1.5.9 Portable Acoustic Panels

A system of portable acoustic panels will be provided for use in the trap room area space behind the orchestra pit. The vertical panels will be used to acoustically adjust the orchestra pit, either by absorbing or reflecting sound energy from the musicians, and, to some degree, closing off the remaining volume of the trap room area. Each portable panel will consist of a frame (of wood, steel or aluminium) with a 50mm plywood core. One side of the panel will be absorptive, with 50mm of fibreglass batting covered in acoustically transparent dark coloured loudspeaker grille cloth. The opposite side of the panel will be the plywood face, stained or sealed to dark colour.

Fig 37. Portable acoustic panels, nested for storage

The panels will be mounted on a rolling steel base frame, with four swivel casters, each one on the end of an outrigger leg. Much like a rolling coat rack, the rolling base frame will be stable and allow for easy manoeuvrability.

These towers will roll on the trap room floor and be designed to be approximately 200mm shorter than the ceiling of the pit area, covering a minimum of 80% of the linear length of the rear of the orchestra pit. The towers must have acoustically absorptive surfaces on one side and reflective surfaces on the other. They may be used in different configurations depending on the repertoire.

D-4.1.5.10 Supplementary Rigging Equipment

Rope rigging will be provided and used for ad hoc manual rigging where counterweight linesets and motorized spotline rigging are inappropriate. The equipment will allow flying of smaller complements of lighting equipment, cable bundles or scenery on single lines, or on linesets of three to five lines. The rope lines are run from the production payload, over demountable blocks which are clamped to the grid wells, and across to headblocks. The lines then run down to the pin rail, where they are tied to belaying pins. Heavier rope sets can be counterweighted with sandbags of various sizes.

D-4.1.5.11 Rolling Lighting Towers

The rolling lighting towers are a flexible means of establishing side light positions at the stage floor

Fig 38. Rolling lighting tower

level. Ten towers will be provided. Each tower will consist of a vertical box truss (box boom) mounted on a castered platform, which will able to be locked in place to secure it from rolling out of position. To further secure the tower, a rope or wire rope will be able to be rigged to the top of the tower to prevent it from tipping over. A fixed ladder will provide safe access for the technicians to each level of the tower.

The tower trusses will be fabricated of round steel tube, sized to accommodate the clamps of standard technical lighting fixtures. Tower height will be between 3m and a maximum of 4m.

D-4.1.5.12 Miscellaneous Backstage Equipment

Supplementary equipment is required to operate a performing arts venue. This miscellaneous backstage equipment includes:

- loose rigging equipment, demountable trusses, demountable truss ladders, pipe, chain, etc.
- power tools, hand tools, and compressed air tools
- dollies, hand trucks, carts and other materials handling equipment
- ladders, personnel lifts, scaffolding
- laundry equipment and other costume maintenance equipment

It is recommended that the project include a selection of equipment that ensures that the Facility can undertake appropriate operations in line with the requirements in Chapter 1 Section 2.1.2 from the outset.

D-4.1.5.13 Company Switch

Temporary performance related equipment will require special power disconnects known as company switches. These specially fabricated disconnects will provide 3-phase, 4 wire with equipment ground conductor, rated at 230/400 volt, fed from dedicated K-Type isolation transformers to prevent interference from other performance and building systems. These specialty disconnects will have capacities at 32, 63, 125, or 250 amp depending on their intended function.

Each company switch will be equipped with: a lockable manual disconnect; 5 full sized bus bars for 3 phases and ground and a double-sized neutral bar. A special female receptacle panel will be specified to allow outside presenters to bring in their own dimming packages and simply plug-in to the company switch. Disconnects, receptacles, and all other components used in every company switch should be in compliance with all applicable codes and regulations. The equipment should include pilot lamps indicating presence of power on each phase and may include a voltmeter for monitoring phase voltage on any phase.

Company switches intended to supply temporary dimming equipment may be supplied at the same elevated voltage as the installed dimming system since both systems have similar characteristics.

The company switches intended for use with portable sound equipment or portable recording and broadcast equipment must be equipped with all of the features noted above, plus an additional insulated bus bar for the “sound system isolated ground”. Within each “sound system company switch”, the three phases must be clearly labelled to match the appropriate single phase feeds to the sound system and the communication system. It is intended that, whenever possible, only the local production sound system or communication system phase will be used. The full three phases are provided to serve touring productions that cannot place all their sound equipment loads onto one phase due to the nature of their portable power distribution system.

The location and capacity of the company switches provided for the project will be determined at a later point in the design process as this will depend on the Architectural Design. The project will include, however, a minimum of twenty company switches of different sizes and capacities (one at the loading dock, one at a point within the building practically nearest the broadcast truck location, nine distributed around the Large Venue on different levels (pit and trap level, stage level, and upper and lower technical zones), three at the Small Venue, two adjacent to the cluster of Studios, two near the foyer event area and two more adjacent to the outdoor seating area) subject to the layout of the Facility.

D-4.1.5.14 Aerial Work Platform, Motorized

Also known as aerial lifts, a personnel lift is a one-person vertical lift platform on wheels. Personnel lifts are commonly used on stage to access equipment or scenery that cannot be reached with a conventional ladder.

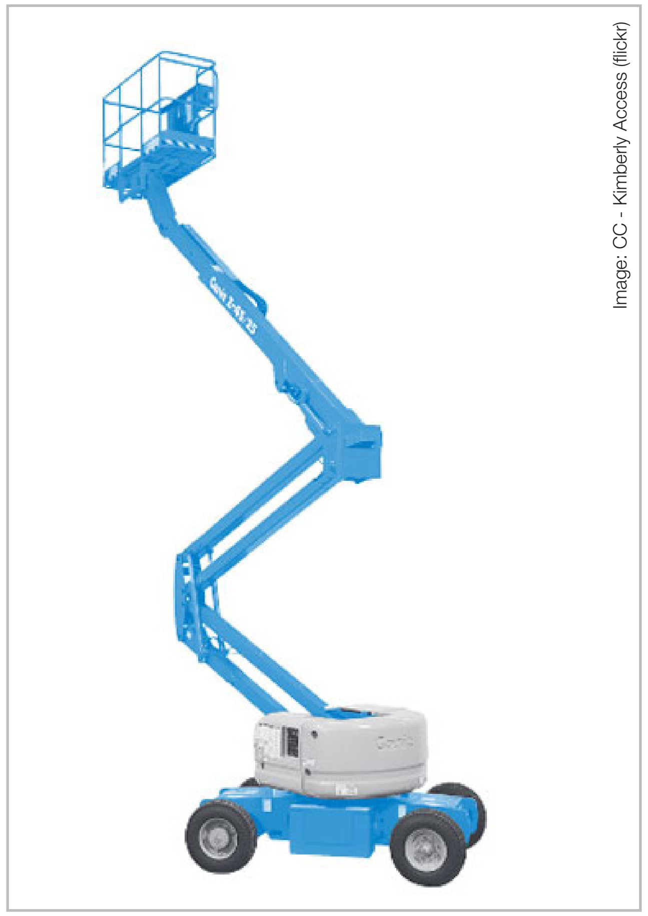


Fig 40. Motorized personnel lift

D-4.2 Small Venue

The equipment systems for the Small Venue will include:

- Guillotine Doors: two large motorized doors that, when closed, acoustically isolate the Large Venue from the Small Venue
- telescopic seating risers: motorized seating risers with integrated seats provide seating for 200 people. When not in use, the risers retract into the storage niche
- Acoustic Banners

Fig 39. Acoustic partition door

It is expected that loose theatrical, lighting and sound equipment will be used in the Small Venue.

Company switches will be included to provide power for temporary production electrical needs at the stage floor level and at the upper technical level.

D-4.3 Studios

It is expected that loose theatrical, lighting and sound equipment will be used in these spaces.

Company switches will be included to provide power for temporary production electrical needs.

D-4.4 Foyer and Foyer Event Area

It is expected that loose theatrical, lighting and sound equipment will be used in these spaces.

Company switches will be included to provide power for temporary production electrical needs.

D5 | Audience Seating

Audience Seating refers to any chair or seat that is used to accommodate audiences within performance spaces. These seats are an integral part of the quality of audience experience in the Venue and are specialty items that must be procured from specialised auditorium seating manufacturers in order to meet the complex requirements in durability, audience comfort, auditorium acoustics and visual aesthetics.

In addition, certain seats will have operational requirements and some will need to be integrated into adjustable seating systems elements. In most venues, the seats will be of steel and wood construction, with an upholstered seat cushion, and an upholstered back cushion. Seat bottoms and seat backs will not be upholstered. All of these chairs will have automatic seat bottom raising mechanisms, and, as appropriate, aisle letter markers, seat number markers, aisle lights, and donor plaques.

See Facility Description for technical requirements related to audience seating.

D-5.1 Fixed Audience Seating

Fixed audience seats will be installed in the Large Venue. Each chair will be supported by a pedestal, or standard, attached to the floor of the Seating Wagons. The supports in both conditions will be coordinated with the location of supply air either through air supply units built into the seat pedestal, or in the face of each of the risers.

The fixed seats will be carefully laid out to ensure good audience sightlines in both horizontal and vertical planes of vision. To ensure this, designers will use two or more fixed seating chair unit widths as required to provide the optimum staggered sightlines. Chair back angles will also vary from the main level to the first tier to the second tier (and above), as required to optimize the chair envelopes, sightlines, and audience comfort.

The fixed seats will meet all prevailing code requirements for seat spacing, egress width, aisle widths, and number and proximity of exits. At aisles where the row rise is insufficient to accommodate an aisle lighting fixture cast into the riser, the chairs on the aisle will have aisle end panels with integral light fixtures to provide the code required aisle lighting. However, at stepped aisles with sufficient height, each riser will have a recessed fixture to serve this purpose, so the chairs need not accommodate the fixtures.

A number of fixed seats based on code requirements will be easily demountable to create space for mobility impaired audience, unusual staging requirements, camera positions, etc. These seats are typically wheeled (or carts provided) for easy manipulation by technical staff) and designed with a quick release system.

D-5.1.1 Fixed Seating Accommodations

Concrete auditorium floors have special requirements to accommodate chair installation, depending on the type of chair. Floor mounted chairs require a 75mm minimum thickness concrete with the top 38mm free of any obstructions, including reinforcing. Riser mounted chairs require a 100mm minimum thickness concrete with the top 63.5mm free of any obstructions, including reinforcing. Risers must be plumb to + or – 3mm.

If a wooden floor is employed and placed on a concrete subfloor, the seating anchors must pass through the wooden floor and into the concrete below with the same conditions as described above.

If no concrete is present, threaded inserts may be epoxied into the wooden floor with a pull out strength


Image: Figueras International Seating

Fig 41. Fixed audience seating

Fig 43. Fixed audience seating

as recommended by the manufacturer. Screwing or lag bolting the seating units into a wooden floor is unacceptable.

D-5.2 Loose Audience Seating

Loose chairs will be provided for Moving Balcony seating areas. These formal loose chairs will be chosen so as to coordinate with the fixed seating to meet the same requirements of room acoustics, durability, audience comfort and visual aesthetics.

Fig 44. Loose audience seat

Typically, they are upholstered and finished in a similar manner as the fixed seats.

D-5.3 Wheelchair Seating Areas

Fully accessible wheelchair seating areas will be designed for the Venue so that mobility impaired audience members and their companions can access each ticket category of seating safely. These areas may have easily demountable fixed audience seating to maximise the seating capacity.

In addition, many rows should be provided with swing-arm mechanisms to facilitate seating of mobility-impaired patrons not requiring a wheelchair.

D-5.4 Ushers' Seating

Small wall-mounted, flip-down seats will also be provided near major entrances within the Venues for ushers' uses.

This will ensure that the ushers stationed inside the room can watch the performance, and still be well positioned to assist latecomers or spectators who need to leave early.

These seats are not included in the seating capacity listed for each Venue.

D-5.5 Telescopic Riser System

Motorized telescopic risers are the main seating risers for the Small Venue. The telescopic risers will consist of multiple stepped steel framed platforms of uniform depth with uniform riser heights. The risers

Fig 45. Jump seats for ushers

will track and telescope in a straight line to permit their extension for audience seating, and their retraction for storage into a dedicated space under a gallery or in a niche, to clear the floor for events requiring an open, flat floor.

The aisles of the telescopic risers will be designed with intermediate steps to meet code requirements and to provide consistent step heights over the full depth of the riser units. The steps will be permanently attached to the risers; the first step to either side (rests on the floor) will be hinged so as to swing up onto the first riser for storage; the last step of each aisle is expected to require de-mounting when retracting the riser units. Safety railings at the ends of the riser units may either be specified to deploy automatically, or be manually inserted/removed. In order to heighten the audience's sense of envelopment, and to improve sightlines to the performance area, the riser rows could be curved depending on the Architectural Design.

All aisles and steps shall have integral aisle lights that meet code requirements and provide illumination at each change in elevation.

The motorized telescopic risers will be controlled by a basic, standalone control system of an individual push button in-out controller station (with emergency stop button) at the motor control panel located in the storage niche. An option to deploy/extend only the first (upper) few rows will be included for choir usage.

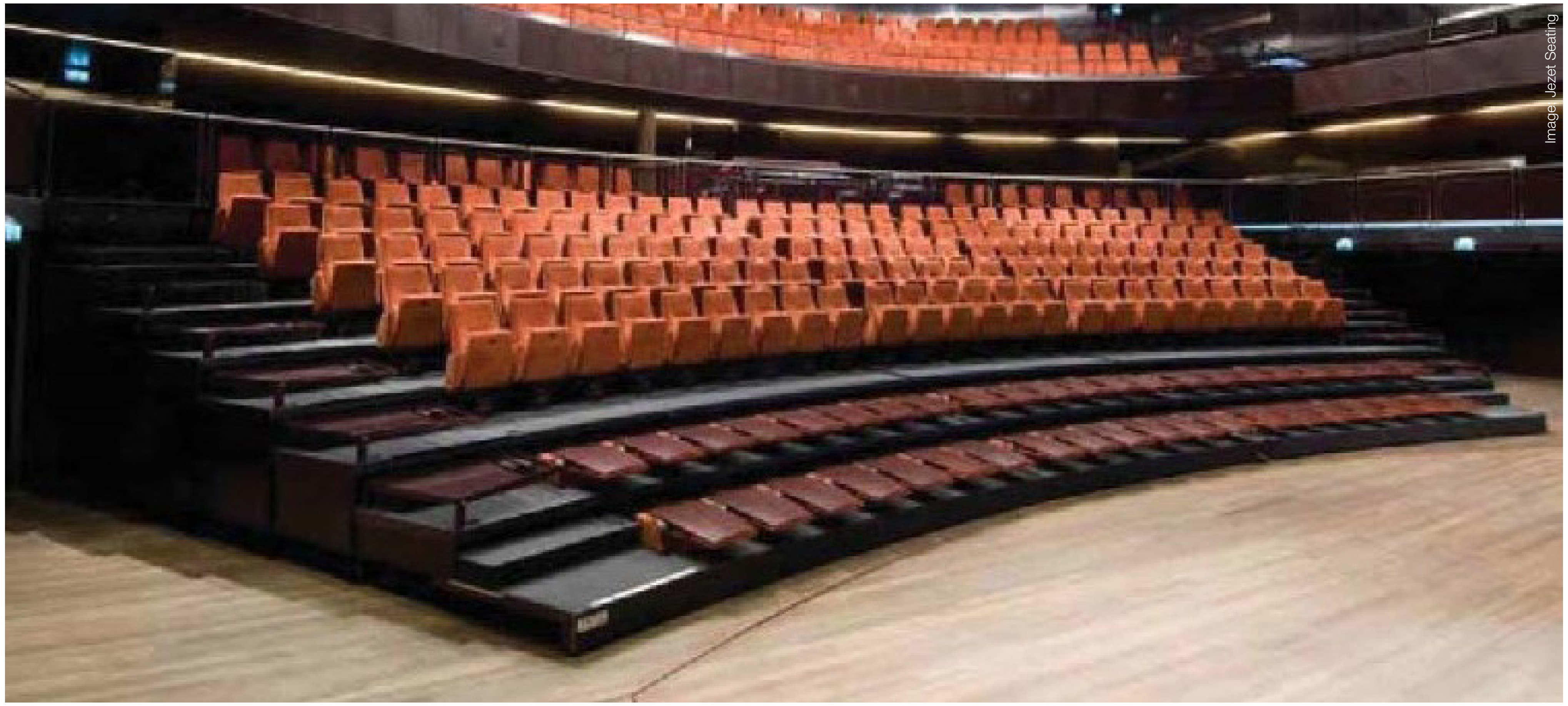


Image: Jezet Seating

Fig 46. Motorized telescopic risers with integrated, folding audience seating units

D6 | Production Lighting Systems

Production lighting will be achieved by a system of dimmers, non-dim circuits, temporary power supplies, control and data devices, with sockets located throughout the Venues for the connection of portable production lighting fixtures.

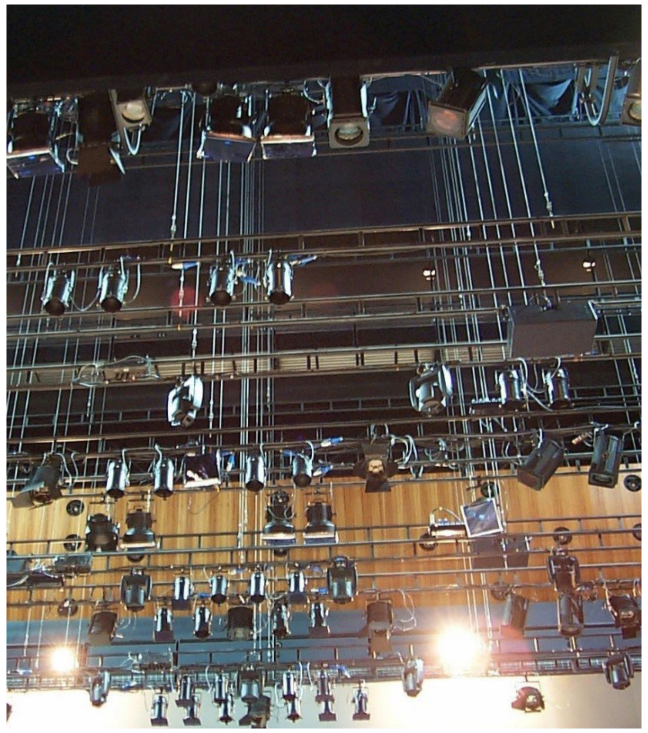


Fig 47. Lighting fixtures on lineset ladder battens

D-6.1 Large Venue

Production lighting positions will be provided from the overhead technical zone, operating galleries, balcony rails, side wall lighting accommodation, and from temporary moveable lighting positions. These positions will be equipped with standard 50mm pipe rails for attachment of lighting fixtures.

The working vocabulary for production lighting fixtures will be LED fixtures and moving light fixtures, as well as 750w ellipsoidal spotlights, 1kw and 2kw Fresnels, 750w PAR fixtures, Cyc lights and striplights.

D-6.1.1 House and Work Lighting

House lighting (dimmed general illumination, architectural lighting and installed audience lighting in the Venue) will be designed by the architect, electrical engineer or architectural lighting designer. Installed general illumination lighting fixtures will be circuited and scheduled by the electrical engineer. House lighting in the Venue will be connected to the performance dimming and controls to achieve an integrated system.

Work lighting includes fixtures used to illuminate the Large Venue seating, floor, stage, overhead technical and support areas during maintenance and non-production periods. Some work lighting fixtures may be portable, plug-in units included in the performance fixture package. Other work lighting fixtures will be permanent, architectural lighting fixtures. These will be designed, circuited, scheduled and specified by the electrical engineer based on theatre operations requirements. To achieve further integration of systems the work lighting will be circuited to devices controlled by the performance systems.

D-6.1.2 Running Light System

Running light fixtures consist of blue LED fixtures that provide visibility in the technical support and work areas during performances, without casting light onto the stage or into the audience. These running light fixtures will be located at each overhead technical level and at the pit level as well as the Side Circulation Areas at every level. As with the work lighting, control stations associated with the architectural lighting control system control the running lights. Many of these control stations will control both work lighting and running lights via pushbuttons that toggle on/off either work lighting circuits or running light circuits.

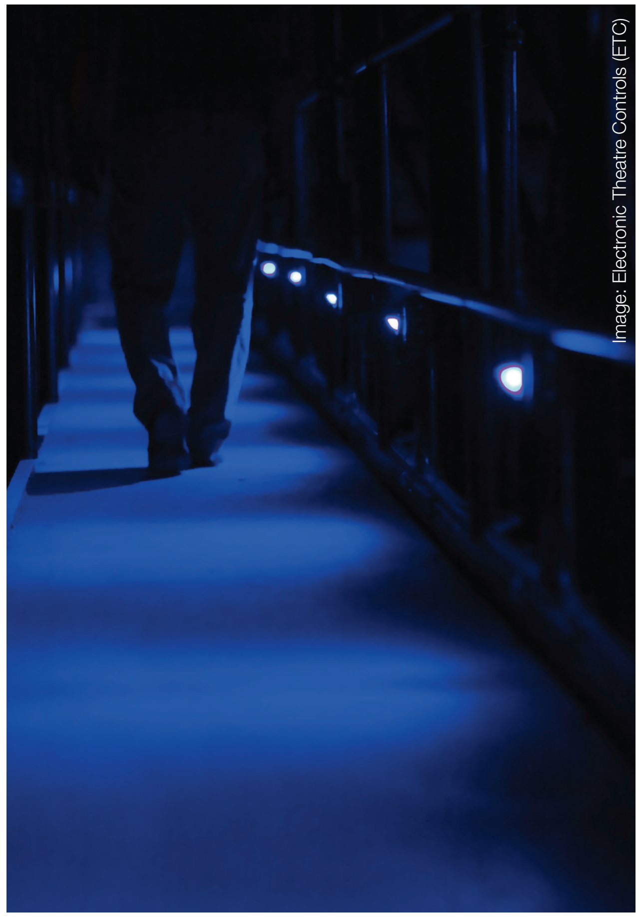


Fig 48. Running blue light fixtures in context, LED

Fig 49. Running blue light fixture, LED

D-6.1.3 Emergency Power/Lighting

Transfer of lighting loads to emergency power is best accomplished downstream of the production lighting dimming and relay control systems. Commercially available branch circuit automatic transfer switches may be appropriate for this project, if required.

Feeding dimming systems and relay control system with emergency (or alternative) power is not recommended. Post-dimmer/relay for selected circuits is recommended.

Uninterruptible power supplies will be supplied for processors and computers on all performance sensitive computer systems, i.e. lighting control, sound control, lift and rigging controls etc.

D-6.1.4 Production Lighting Control Console

The production lighting control console will be a top quality, micro processor based memory device. It will control all production lighting systems. The console will normally be located in the shared lighting control / video projection control rooms (three rooms in total) with additional plug in points located at all windows as specified in the Facility Description and on the periphery of the stage / main floor.

Fig 50. Lighting control consoles in control room

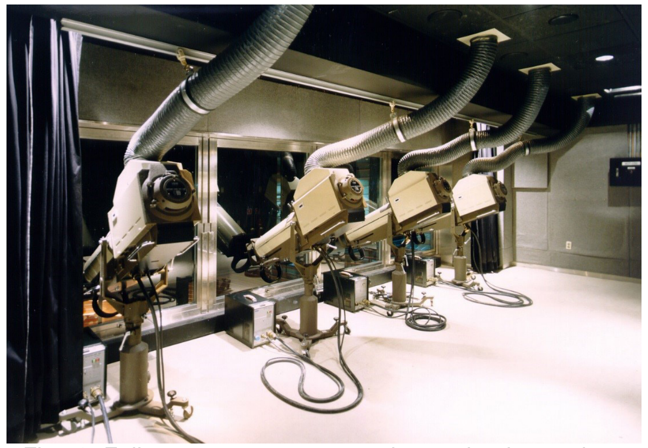


Fig 51. Followspot room – note exhaust ducting and power

The control signal will be distributed throughout the Venue by way of Ethernet (sACN) and DMX protocols. A house worklight processor will provide control over the architectural lighting and worklighting within the Venue. Access to this system will be by way of pushbutton, key switch and LCD touchscreen stations.

D-6.1.5 Followspots

A followspot, or spotlight, is operated manually by a technician. The followspot is used to follow a performer as he moves about the stage, or to highlight that performer (such as a musician or singer) during a solo moment.

There will be a minimum of two sizes of followspot units for the Large Venue, in order to accommodate the different production needs of performances in proscenium and open configurations. Followspots will be utilized at multiple locations: in dedicated control room positions, on the Moving Balconies, from the Windows, and in other temporary positions determined by the specific requirements of a production.

D-6.1.6 Control Spaces

The Large Venue will have dedicated production lighting control spaces as follows:

1. Lighting / surtitling / video control rooms will house equipment and have sightlines and operable windows to the Large Venue. Noise generating equipment will be located in equipment racks located within the room in appropriate sound isolating enclosures. Equipment racks will be populated with equipment that requires frequent user manipulation.
2. Electrical rooms – dimmers will house dimmers for production lighting and house lighting systems
3. Followspot rooms: Dedicated primary and secondary followspot rooms will be provided to ensure that the noise from these lights are kept outside of the Large Venue. The primary follow spot room will be located in a traditional manner on the centre-line of the room in proscenium configuration.
4. Windows: all Windows may be used from time to time as additional control positions as necessary for the specific production.

D-6.2 Small Venue

The production lighting system for the Small Venue will be similar, but in smaller scale, to that of the Large Venue. While limited in size, the system will allow for enhanced illumination of performances with limited production needs. The Small Venue production lighting system will include:

- one rack of high-rise time performance dimmers (96 dimmers per rack)
- a modest computer-based control system
- power and signal distribution
- Ethernet system
- houselight (architectural) control system and emergency lighting transfer (if required)
- worklight, running light, and cue light systems
- a selection of production lighting fixtures and accessories

D-6.2.1 Control Spaces

The Small Venue will have dedicated production lighting control spaces as follows:

1. Lighting control rooms will house equipment and have sightlines and operable windows to the Large Venue. Noise generating equipment will be located within the room in appropriate sound isolating enclosures. Equipment racks will be populated with equipment that requires frequent user manipulation.
2. Electrical rooms – dimmers will house dimmers for production lighting and house lighting systems

D-6.3 Studios

The production lighting system for the Studios shall be similar, but in smaller scale, to that of the Small Venue. While limited in size, the system will allow for enhanced illumination of rehearsals with limited production needs. The Studio's production lighting system will include:

- one half-rack of high-rise time performance dimmers (48 dimmers)
- a modest computer-based control system
- power and signal distribution
- Ethernet system
- houselight (architectural) control system and emergency lighting transfer (if required)
- worklight, running light, and cue light systems
- a selection of production lighting fixtures and accessories

D-6.4 Foyer and Foyer Event Area

The production lighting system for the foyer and foyer event area shall be similar to that of the Studios. While limited in size, the system will allow for enhanced illumination of events with limited production needs. The foyer and foyer event area production lighting system will include:

- one touring (rolling, temporary) quarter-rack of high-rise time performance dimmers (24 dimmers)
- a modest computer-based control system
- houselight (architectural) control system and emergency lighting transfer (if required)
- a selection of production lighting fixtures and accessories

D-6.5 Other Infrastructure Requirements

The performance dimming and control equipment will consist of dimmer/relay racks, control wiring and devices, and branch circuit wiring, distribution and connection devices. The electrical supply and distribution system must be designed to meet the following criteria:

- dimming system supply: 230 VAC / 50 Hz
- branch dimmed circuits: all 2-wire + ground (no shared neutrals) RCD
- insertion loss of the dimming system: range between 3 and 7%

The system will be designed considering the following:

- Most dimming systems produce distorted waveforms due to extremely non-linear currents drawn by the dimmers. This electrical interference can affect electronic control devices, computers, modems, etc.
- Branch circuit runs are often extremely long in performance buildings.
- Because of the harmonics generated by high speed SCR power switching supply neutral conductors must be oversized due to excess current in the neutral.

The dimmer racks should be located as close as possible to the branch circuits supplied. In a large installation it may be cost-effective to locate the dimmer racks in multiple locations (multiple dimmer rooms) within the Facility in order to minimize the lengths of branch circuit runs.

A harmonic mitigating transformer or K-13 rated transformer dedicated to the dimming system and company switch supplies will be provided to help to isolate the dimming system's distorted wave forms. The transformer can be efficiently located adjacent to the dimmer racks, minimizing the lengths of 230/400 feeders required, subject to acoustics isolation requirements. Because the transformer will likely be located adjacent to the performance space, meeting the acoustical requirements may mean that the transformer will need to be acoustically isolated by means of a floating slab, massive and multi-layer wall construction, flexible conduit connections and other noise attenuation solutions.

Most dimmers control power by dividing the AC wave form. An economical level of filtering is included in every dimmer but considerable harmonic distortion is still present and may cause audible noise from buss-bar systems, the dimmers themselves, and distribution


Image: Electronic Theatre Controls (ETC)

Fig 52. Example of dimmer racks

Fig 53. Dimmer racks in the dimmer room

wire ways if live and neutral wires are separated. The system design must take this into consideration and ensure that the systems meets the acoustical requirements (background noise level) of the Venues.

Electrical noise affecting audio amplification equipment is also generated, therefore rigorous ferrous screening and separation of these services will be essential in the system design.

In addition to a physical and wiring separation of audio power and conduit from production lighting circuits, it is recommended that other noise susceptible wiring be separated from this system, such as those associated with computer and telecommunications equipment.

At some stage of dimming, neutral current can exceed phase current on three phase systems, although these currents are normally less than the full-on current. For this reason, over-current protection of dimmed circuits will be provided as part of the performance dimming equipment.

Designers may assume a 70% diversity of total load. However, each branch circuit must accommodate its full specified load.

Production lighting loads shall be designed to go from nil to full listed load in less than one second.

D-6.5.1 Fault Current Protection

Commercially produced performance dimming systems typically have an AIC short circuit rating of 100,000 RMS symmetrical amperes. Either the short circuit let through must be reduced below the 100,000 amperes withstand rating of the equipment or the dimming systems must be specified and supplied with custom modification to increase the system withstand rating.

D-6.5.2 Performance Power Distribution

In the Venue, lighting will be provided to enable live presentation, effect lighting and scenographic illumination.

Branch circuit protection devices for all performance locations must be easily accessible to performance personnel. Panel boards for sockets and equipment on the stage floor must be located on or immediately adjacent to the stage work area.

D-6.5.3 Temporary Equipment Power

Company switches will be provided as power sources for temporary performance equipment.

Company switches intended to supply temporary dimming equipment may be supplied at the same elevated voltage as the installed dimming system since both systems have similar characteristics.

See also section 4.1.5.13.

D7 | Performance Audiovisual Systems

The Facility will be equipped with sophisticated performance audiovisual systems that serve a variety of functions.

D-7.1 Large Venue

The following section describes the performance audiovisual systems required in the Large Venue.

D-7.1.1 Base Audio System

A high-quality speech reinforcement audio system will be provided in the Large Venue for unamplified events. The following components will be included within the base audio system:

- Loudspeaker system:
  - Concealed speech reinforcement loudspeakers will be integrated into the architecture for use during non-amplified events when the room is in a traditional proscenium configuration.
  - Additional loudspeakers from the Loose Equipment pool will be used as a complement to the architecturally integrated system for speech reinforcement when the room is in non-proscenium configurations (eg, surround mode).
- Audio control system: Audio control/distribution will be achieved via a network based digital audio system (Dante or similar). All of the necessary components for a functional speech reinforcement system will be provided (stage boxes, digital audio console, network switches, digital signal processing for loudspeaker optimization, etc.).
- Wireless microphone system: Infrastructure and equipment to support a wireless microphone system will be provided. Multiple channels of performance-grade wireless microphones (including transmitters and receivers) are provided within the base audio system.
- Assisted listening system: An assisted listening system consisting of both transmitters and wireless receivers will be provided to meet universal accessibility requirements. The systems will broadcast audio either via IR emitters, FM radio frequency transmitters or induction loop. Quantities of receivers will be scheduled as per local code requirements, or International Building Code 2006, whichever is greater.

D-7.1.2 Performance Audio System

A high-quality performance audio system will be provided for events requiring amplification of speech and/or music. The following components will be included within the performance audio system:

- Loudspeaker system: A full range performance loudspeaker system with subwoofer components will be provided. The electro-acoustic system will be capable of reaching levels over 100dBA.
- Audio console: A high end audio console will be provided to monitor/record performance audio in the Large Venue.
- Audio control system: Audio control/distribution will be achieved via a network based digital audio system (Dante or similar). All of the necessary components for a functional performance sound system will also be provided (stage boxes, digital audio console, network switches, Digital Signal Processing for loudspeaker optimization, etc.).

Loose Equipment is intended to support additional audio and video needs of the Large Venue performance audio system in terms of performance and recording microphones, as well as loose loudspeakers for stage monitoring / front fills during live sound events.

D-7.1.3 Spatial Audio System

A spatial audio system that enables sound scene creation with full bandwidth audio sources moving in three dimensions around the room will be provided.

This spatial audio system will render virtual sound sources with accurate localization and movement parallax, adding to the perception of depth of field in sound scenes and creating the perceptual impression of a larger space existing beyond the confines of the physical room boundaries.

The system will support a wide variety of 3D audio reproduction techniques, including Wave Field Synthesis, Ambisonics and vector-based amplitude panning, as well as more conventional panning techniques such as stereo, 5.1 and Dolby Atmos.

The system will be configurable such that a conventional stereo or 5.1 production can be executed with no additional setup time compared to a conventional rig, with the added advantage that the stereo panning effects will be accurately recreated over the entire listening area instead of a single “sweet spot” location.

For the more open, flat floor configurations in the hall, it will be possible to use the system to create sound scenes that are spread out around the room and can be navigated by the audience in an ambulatory

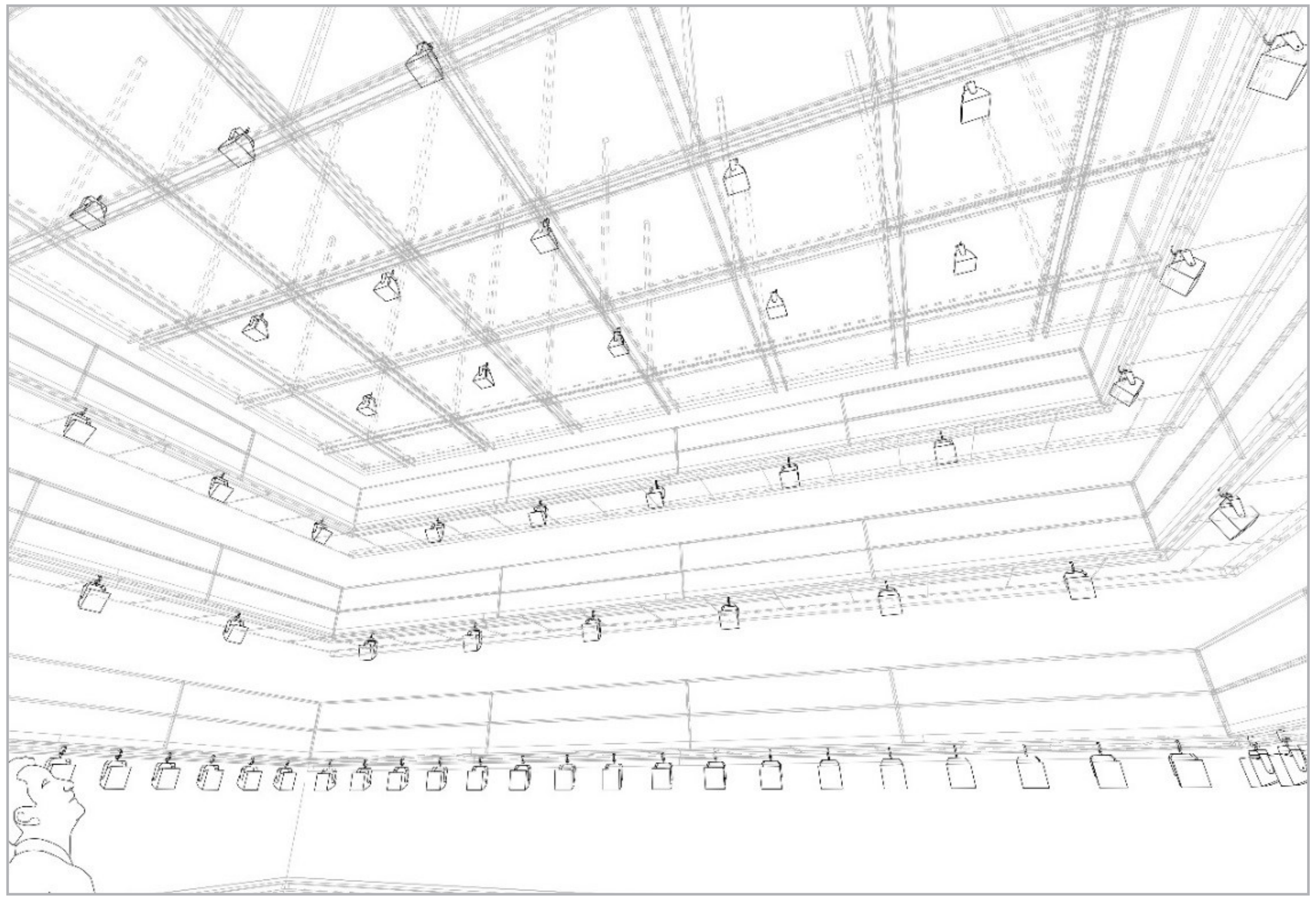


Fig 54. Spatial audio system sketch layout for the Virginia Tech CREATE Cube project

fashion.

The spatial audio system will include the following components:

- wall mounted loudspeakers on three levels along the perimeter of the space (located behind seating in the Moving Balconies) – shared with the performance audio system and active architecture system
- array of loudspeakers and subwoofers flown above the space – shared with the active architecture system
- large subwoofers installed in Venue floor for immersive, high sound pressure level (SPL) type productions – shared with the performance audio system
- rendering engine for full 3D Wave Field Synthesis
- digital signal processors, converters, network switches to connect into the Dante audio network

D-7.1.4 Active Architecture

Coupled physical spaces are used in concert halls to provide the capability to extend the room reverberation time by coupling the venue to a physical reverberation chamber, typically with doors that can be opened and closed (eg, Meyerson Symphony Hall, KKL). The active architecture system provided for the Venue will behave in a similar fashion by coupling the physical architecture of the space to a virtual room processor(s) through electroacoustic means (microphones and loudspeakers located along the perimeter of the room). Changing the strength/loudness of the system will be analogous to opening and closing the doors in the physical case.

When the Large Venue is configured to have a short reverberation time with variable acoustics deployed, the active architecture system will allow sound designers / producers to extend the room reverberation time and control early decay times independently, providing significant flexibility in terms of listener envelopment, clarity and room reverberance with the press of a button.

The active architecture system will include the following elements:

- wall mounted loudspeakers on three levels along the perimeter of the space (located behind seating in the Moving Balconies) – shared with performance audio system and spatial audio system

- ceiling mounted loudspeakers on three levels above balcony seating areas (incorporated into the underside of the Moving Balconies) – shared with the base audio system for speech reinforcement
- array of loudspeakers, microphones and subwoofers flown above the space, shared with the spatial audio system
- digital processing and connectivity to the Venue audio system such that the active architecture system loudspeakers can be utilized as a complement to the performance audio and spatial audio systems.

D-7.1.5 Tie Line System

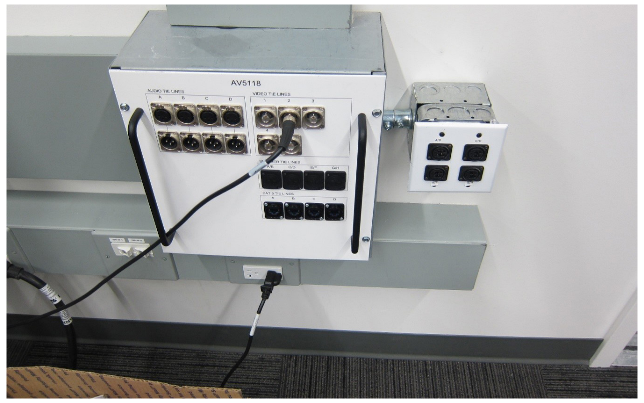


Fig 55. Tie line panel

A tie line system with a full complement of cabling types, including microphone/line, video/coax, CAT6, fibre optic and loudspeaker cabling will be provided. Tie line panels will be distributed strategically throughout the Large Venue and backstage to support a variety of interconnectivity needs. Tie lines will connect back to the broadcast control / recording room.

Fig 56. Wireless intercom

D-7.1.6 Intercom System

An intercom system will be provided to allow technical staff to easily communicate during productions. We recommend an integrated wired + wireless system to provide users flexibly of use and mobility throughout the Facility.

- The wired intercom will include both wall stations in production offices and dressing rooms for easily communication backstage.
- The wireless intercom is intended to be able to be used throughout the Facility to allow mobility when the system is in use.

D-7.1.7 Control Spaces

The Large Venue will have dedicated sound, video and communications control spaces as follows:

1. Sound control rooms will house equipment and have sightlines and operable windows to the Large Venue. Noise generating equipment will be located in equipment racks in adjacent Projection Booths. Equipment racks will be populated with equipment that requires frequent user manipulation (patch bays, video preview monitors, control equipment, etc.).

Fig 57. Temporary front-of-house mix position, Virginia Tech

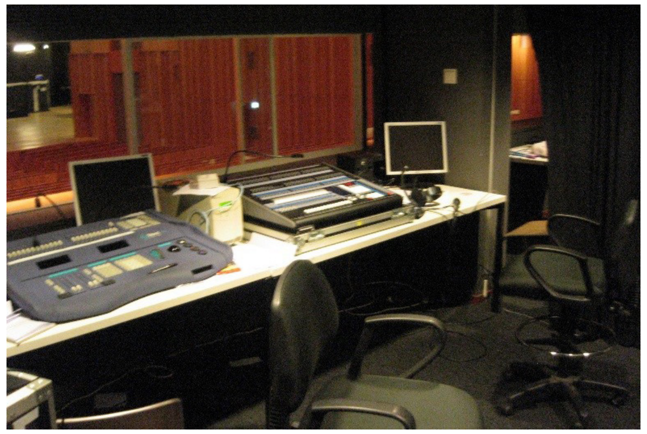


Fig 58. Sound control (top), audiovisual electrical room (bottom)

2. Sound house mix position will be provided for performances where the sound operators needs to be in the same acoustic space as the audience.
3. Broadcast control / recording room will be an independent but interconnected control room that connects to the various performance spaces includes audio/video recording/monitoring equipment. Refer to the broadcast control / recording room section for more information.
4. Electrical rooms – audio and video will house back-end equipment that does not require frequent user manipulation (head-end equipment for intercom, show relay modulators, amplifiers, etc.)
5. Operable openings fitted with optical glass will be provided around the Large Venue as potential additional locations for projection into the Large Venue from the circulation area around the exterior of the room.
6. Projector booths: dedicated projector booths (combined with electrical rooms) will be located adjacent to sound control rooms in the Large Venue. A permanent projector will be installed in the central projection room facing the stage in proscenium mode for typical presentation needs in this mode.
7. Windows: all Windows may be used from time to time as additional control or projector positions as necessary for the specific production.

Broadcast Control / Recording Room

The broadcast control / recording room is a large room for audio/video broadcast, sound recording, and sound and video editing, adjacent to a small recording booth and a dedicated audiovisual electrical room to house equipment. The broadcast control / recording room will be designed to be the 'hub' of inter-connectivity between spaces with centralized recording and monitoring capabilities. It will be the centre of a technical star configuration connecting the Large Venue, Small Venue, Studios, production rooms, technical team office, foyer and outdoor projection seating area (see Figure 59). Additional connectivity will be provided to support an exterior broadcast truck.

The following equipment will be provided:

- Tie-line system: Tie lines will be provided to the performance and control spaces noted above, including a full complement of audio / video / CAT6 / fibre tie lines, as well as digital audio network connectivity. Multiple tie line panels will be distributed strategically throughout the broadcast control / recording room to support a variety of interconnectivity needs. The tie lines will connect back to an equipment rack in the electrical room.
- Broadcast audio: HD digital audio recording and monitoring capabilities will be provided, including a dedicated audio console, multichannel audio recording device connected to the digital audio network, studio-quality audio monitors and audio editing/mixing software.
- Local pan-tilt-zoom cameras: multiple fixed position pan-tilt-zoom cameras will be provided to capture video for broadcast/monitoring/recording purposes in the Large Venue.
- Broadcast video: video camera control, signal routing, and recording of the video camera feeds from satellite spaces equipped with pan-tilt-zoom cameras will be provided.
- Recording studio audio: an audio system including two main studio monitors for stereo sound, a 5.1 monitoring system, an audio console and multichannel audio recorder, a PC with digital audio workstation and audio recording software/plugins, with outboard processing gear, as well as a full complement of studio microphones and stage monitors will be provided.

Fig 59. Example of recording studio and booth

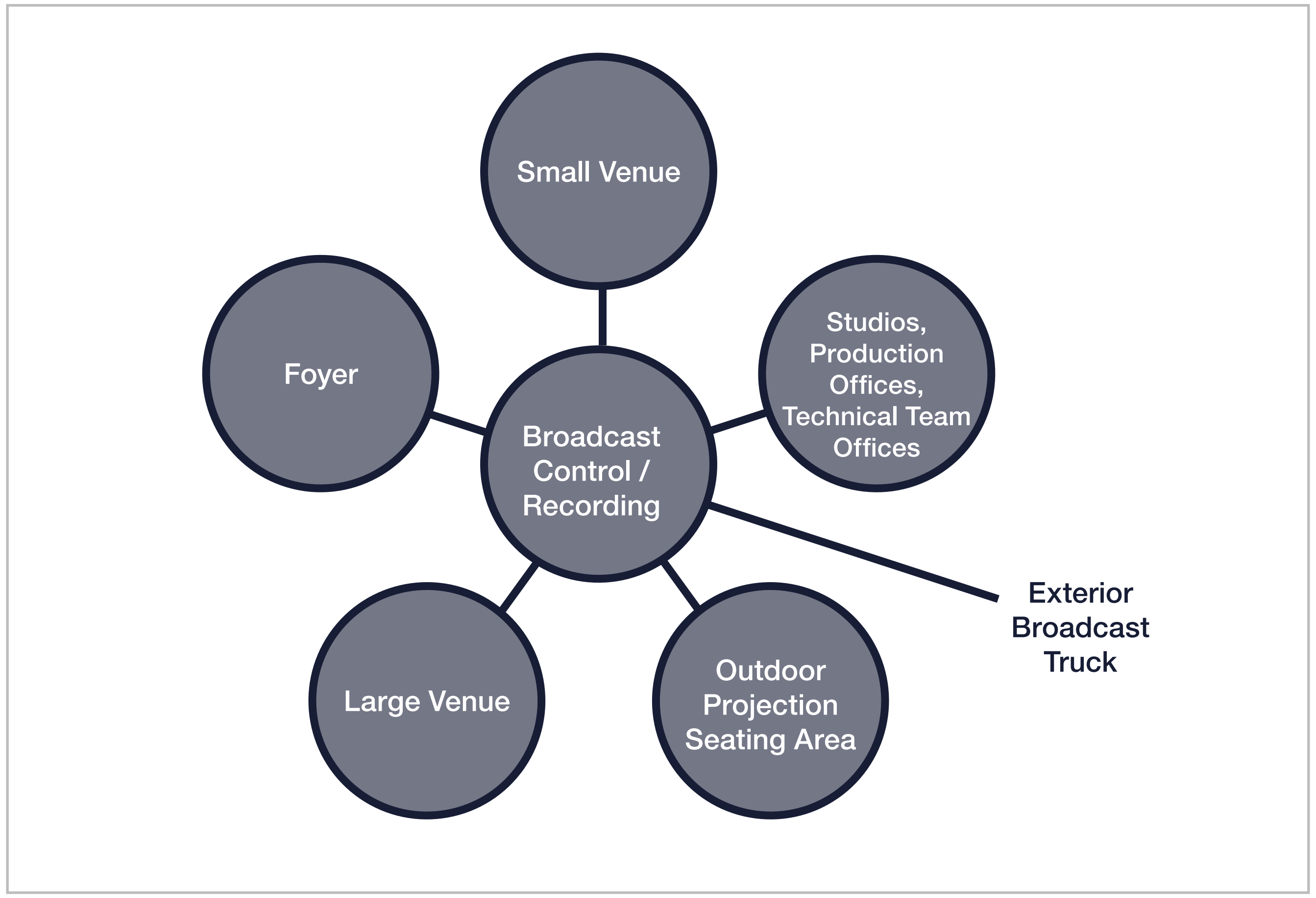


Fig 60. Star configuration of interconnected spaces

Fig 61. Example video editing station equipment

Video Editing Station

A PC-based video editing station will be provided for local video editing purposes. The station will be mobile, with possibility to be installed in the broadcast control / recording room, the production offices, or the technical team office.

The mobile video editing station will include the following equipment:

- Video system: A dedicated PC will be provided for video editing and digital video ingest. Multiple professional level HD preview monitors will be provided to assess picture quality. Additional owner furnished video equipment may include a vectorscope and/or video playback/ingest decks (eg, DigiBeta, DVCAM, HDCAM, HDV).
- Audio system: The audio system will include a 5.1 surround sound system with studio quality loudspeakers for audio monitoring. A digital audio editing/mixing system will be provided for audio production and surround mixing. A half size equipment rack on casters will house rack mounted equipment.

D-7.1.8 Loose Equipment

The following loose equipment will be provided as part of the project:

1. Loose microphones: a collection of performance and recording microphones will be provided to support amplified events and recording throughout the Facility.
2. Loose loudspeakers: a collection of portable loudspeakers will be provided to serve as front fills, surround sound, speech reinforcement and stage monitoring for amplified events around the Facility. This will include speech reinforcement and house announcement needs in the Small Venue, as well as ad hoc immersive sound events and installations in the foyer and outdoor gathering space.
3. Loose audio mixing console: a moveable Dante network enabled audio mixing console will be provided to support various performance and recording configurations in the Small and Large Venues, and for ad hoc events in other spaces throughout the Facility.
4. Video projection: a large format video projection system consisting of large, medium and small portable fast fold projection screens and multiple portable high output HD video projectors will be provided for program requiring projection and/or immersive projection mapping (see e.g. Figure 63) inside the Large Venue and/or other locations, e.g. Small Venue, Studios, foyer, and outdoor projection seating area. The projectors will be provided with portable enclosures to protect them

Fig 62. Portable projection screens

Fig 63. Large format projector

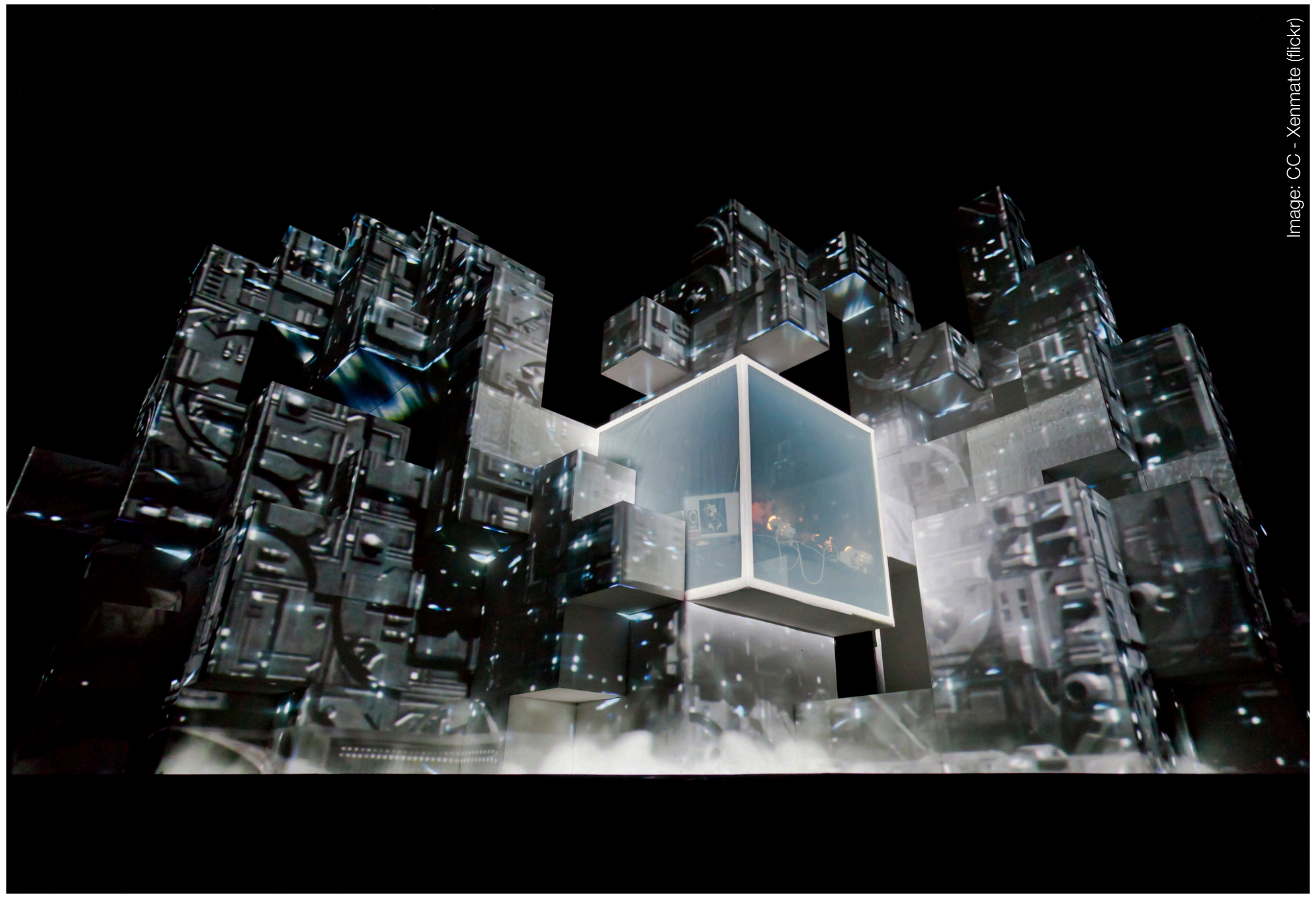


Fig 64. Example of projection mapping for Amon Tobin's ISAM tour

for outdoor use and attenuate projector fan noise for indoor use. Dedicated projection rooms will be provided around the Large Venue, with operable openings fitted with optical glass as potential additional locations for projection into the room.

D-7.2 Small Venue

The Small Venue will include the following elements:

- Sound control room: The sound control room will house sound, video and communications equipment and have sightlines and operable windows to the Small Venue. Noise generating equipment will be located in equipment racks in an adjacent electrical room. Equipment racks will be populated with equipment that requires frequent user manipulation (patch bays, video preview monitors, control equipment, etc.).
- Tie line system: A tie line system with a full complement of cabling types, including microphone/line, video/coax, CAT6, fibre optic and loudspeaker cabling will be provided. Multiple tie line panels will be distributed strategically throughout the space to support a variety of interconnectivity needs. The tie lines will connect back to a local equipment rack. Additional tie lines will be provided back to the broadcast control / recording room for inter-room connectivity and recording purposes.
- Digital audio I/O: In conjunction with the tie line system, the Small Venue will be connected to the digital audio network provided for the Large Venue. The current equipment budget includes local digital audio network input and output equipment for efficient connection back to the broadcast control / recording room.
- Local pan-tilt-zoom camera: A fixed position pan-tilt-zoom camera will be provided to capture video for broadcast/monitoring/recording purposes.
- Loose equipment is intended to support the audio and video needs within the Small Venue – no dedicated/installed local sound, video and communications systems are currently envisioned/allocated (other than digital audio I/O equipment and tie line connectivity noted above).

D-7.2.1 Control Spaces

The Small Venue will have dedicated sound, video and communications control spaces as follows:

1. Sound control rooms will house equipment and have sightlines and operable windows to the Large Venue. Noise generating equipment will be located in equipment racks in adjacent projection booths.

Equipment racks will be populated with equipment that requires frequent user manipulation (patch bays, video preview monitors, control equipment, etc.).

2. Electrical rooms: electrical rooms will house back-end equipment that does not require frequent user manipulation (head-end equipment for intercom, show relay modulators, amplifiers, etc.) will be shared with the Large Venue and attention will be paid to appropriate distribution of these spaces to ensure appropriate functionality
3. Projector booths: dedicated projector space (combined with electrical room) will be located adjacent to sound control rooms.

D-7.3 Studios

The Studios systems will include the following:

- Tie line system: A tie line system with a full complement of cabling types, including microphone/line, video/coax, CAT6, fibre optic and loudspeaker cabling will be provided. Multiple tie line panels will be distributed strategically throughout the space to support a variety of interconnectivity needs. The tie lines will connect back to a local equipment rack. Additional tie lines will be provided back to the broadcast control / recording room for inter-room connectivity and recording purposes.
- Spatial audio system (Studio 1 only): A spatial audio system that enables sound scene creation with full bandwidth audio sources moving in 3 dimensions around the room will be provided in Studio 1. The system is envisaged as a smaller scale composition platform for 3D sound pieces destined to be played the Large Venue. The system shall also function as a standalone system to support small scale live theatrical, dance or musical performance, as well as temporary sound art installations.
- Audio system: In conjunction with the tie line system, the Studios will be connected to the digital audio network provided for the Large Venue. The equipment budget includes local digital audio network input equipment for efficient connection back to the broadcast control / recording room.
- Local pan-tilt-zoom camera: A fixed position pan-tilt-zoom camera will be provided to capture video for broadcast/monitoring/recording purposes.

Loose Equipment is intended to support additional audio and video needs of the dressing room / Studios in terms of performance and recording microphones, as well as loose loudspeakers for stage monitoring during live sound events.

D-7.4 Foyer and Foyer Event Area

This section describes the required performance audiovisual systems for the foyer and foyer event area.

Fig 65. Interactive video signage

D-7.4.1 Foyer

The following system will be included in the foyer:

- Interactive video signage: Interactive touch video displays will be provided throughout the foyer area for digital signage, patron information and/or show relay feeds from the Large Venue.

D-7.4.2 Foyer Event Area

The following systems are envisaged to support ad hoc events held in the event area (eg, informal performances, presentations, receptions):

- Tie line system: A tie line system with a full complement of cabling types, including microphone/line, video/coax, CAT6, fibre optic and loudspeaker cabling will be provided. Multiple tie line panels will be distributed strategically throughout the area to support a variety of interconnectivity needs. The tie lines will connect back to a local equipment rack. Additional tie lines will be provided back to the broadcast control / recording room for inter-room connectivity and recording purposes.
- Ad hoc audio/video systems: All audio/video reinforcement or reproduction in the foyer event area will be provided via loose ad hoc equipment. The loose equipment may tie back to the facility-

Fig 66. Informal foyer performance at Sage Gateshead

Fig 67. Informal foyer performance at Alice Tully Hall

Fig 68. Outdoor gathering space

wide systems via the audio / video / CAT / fibre tie line system; however, no dedicated sound, video and communications equipment is intended to support the foyer, ie, no dedicated/installed audio system (other than the paging / show relay system loudspeakers) will be provided in the foyer.

D-7.5 Outdoor Projection Seating Area

The following systems are envisaged to support ad hoc events held in the outdoor projection seating area (eg, outdoor projection of performances happening in the Large Venue):

- Tie line system: A tie line system with a full complement of cabling types, including microphone/line, video/coax, CAT6, fibre optic and loudspeaker cabling will be provided on the exterior of the Facility near the outdoor projection seating area. The tie lines will connect back to a local equipment rack located in the foyer connecting back to the broadcast control / recording room for inter-room connectivity purposes.
- Power: Power outlets with allowances for high lumen count (>20k) projectors will be provided on the exterior of the Facility.
- Ad hoc audio/video systems: All audio/video reinforcement or reproduction in the outdoor projection seating area will be provided via loose ad hoc equipment. The loose equipment may tie back to the facility-wide systems via the audio / video / CAT / fibre tie line system; however, no dedicated sound, video and communications equipment is intended to support the outdoor projection seating area, ie, no dedicated/installed audio system is required to be provided in the outdoor projection seating area.

D-7.6 Conference Rooms

Conference rooms will serve as meeting spaces and small group workspaces. The installed sound, video and communications systems will be designed to support interaction and information sharing.

1. Video system: One wall mounted flat panel video display capable of showing video from a laptop input in table. A video conferencing system with a hard (eg, Cisco) or soft-codec (eg, Skype, Lync, Blue Jeans) will be provided with a video camera provided above or below the video display.
2. Audio system: Distributed ceiling mounted

loudspeakers for program audio. Local table microphones to support video and teleconferencing.
3. Control system: A wired touchpanel control on the table will be provided for control of audiovisual, lighting and shading systems.

D-7.7 Production Offices

The production offices will be configured to accommodate a video editing station as described in Section A4-7.1.7.2. The offices will include the following infrastructure:

- Tie line system: A tie line system with a full complement of cabling types, including microphone/line, video/coax, CAT6, fibre optic and loudspeaker cabling will be provided. The tie lines will connect back to the broadcast control / recording room for inter-room connectivity and recording purposes.

D-7.8 Technical Team Office

The technical team office will be configured to accommodate a video editing station as described in Section A4-7.1.7.2. The office will include the following infrastructure:

- Tie line system: A tie line system with a full complement of cabling types, including microphone/line, video/coax, CAT6, fibre optic and loudspeaker cabling will be provided. The tie lines will connect back to the broadcast control / recording room for inter-room connectivity and recording purposes.

D-7.9 Other Infrastructure Requirements

D-7.9.1 Paging and Show Relay Systems

A paging and show relay system will be provided throughout the Front of House and Back of House spaces to provide an audio and video feed from the hall for late comers, staff and performers. Audio paging functionality is included to allow staff to page different areas of the Facility as needed. The following systems will be provided:

- Video show relay: Permanent broadcast quality pan-tilt-zoom cameras and microphones will be provided in the Large Venue, Small Venue and Studio 1 to capture the audio and video from the stage area. Video monitors will be located in strategic Front and Back of House spaces including Large Venue entrances, dressing rooms / performer spaces and offices.
- Audio show relay and paging: In addition to audio reproduction via the flat panel show relay video displays, ceiling loudspeakers will be provided throughout Front and Back of House spaces (including corridors) for show relay and/or paging capabilities. Paging by zone will be possible from paging stations, typically located in the foyer area, Large and Small Venue control rooms, broadcast control / recording room and in the Back of House circulation immediately adjacent to the Large Venue stage area (in proscenium configuration), the Small Venue and the Studios cluster.

D-7.9.2 Isolated Ground Power

An isolated ground power system will provide clean technical power for all audio systems. A separate transformer will be needed to support the power system.

D-7.9.3 Temporary Equipment Power

Company switches will be provided as power sources for temporary performance equipment.

Company switches intended to supply temporary audiovisual equipment shall be part of the isolated ground system described above.

See also Section D-4.1.5.13.

D8 | Performance Equipment List and Budget

D-8.1 Introduction

The following tables outline the performance equipment included in the project. The list is divided into base and additional equipment (which has been deferred for later purchase). The additional equipment list also includes fire protection elements that may not be required but should be procured as part of the performance equipment if they are.

This list should be understood as a budget allocation; the specific details and specifications will be subject to refinement and adjustment through the design process. Equipment will reflect the most up-to-date systems available for the expected functionality at time of procurement.

The infrastructure of the Facility will foresee the accommodation of all the equipment defined in this list (with the exception of the fire protection elements, as appropriate).

D-8.2 Summary Table

SPACE	BASE COST (SFr)	ADDITIONAL EQUIPMENT COST (SFr)
Large Venue	16,862,966	11,125,107
Small Venue	822,250	1,484,075
Studios	217,927	699,237
TOTAL – NEW THEATRE LUCERNE	**17,903,144**	**13,308,419**

Table 1. Summary table for the performance equipment list and budget

D-8.3 Large Venue

Equipment Item	Number of Units in Base	Number of Units in Additional Equipment	NOTES	BASE	ADDITIONAL EQUIPMENT
Theatre Equipment – Technical Grid Level					
Removable portal system	1	0	Assumes 58g / m2 flame retardant ripstop nylon sail cloth. 625m2 proscenium panel. Colour to be chosen by architect. Nylon webbing all 4 sides with grommets, attachment hardware. Guide wires at SL / SR, floor mounting hardware. Side "ears" turn out to fill balcony void zone. Storage cart or large hamper.	105,244	0
Rigging linesets, motorized (variable speed)	20	25	Variable Speed: 0 - 70m per minute). Ladder battens with 1m extensions each end; Load capacity: 909kg.	955,629	1,194,536
Spotline winches, motorized (variable speed)	20	22	Variable Speed: 0 - 90m per minute. Load capacity: 909kg. Includes spotblocks for mounting to rigging gantries.	801,562	881,719
Grand drape bi-parting action, motorized	2	0	Two sets of traveller track, carriers, biparting winch motor, pulleys, and pull cord, with guide wires, and control cabling	125,127	0
Lineset rigging gantries (technical zone)	20	25	Grid hanger mounted “work station” bridge crane units, with trolleys for chain hoist or spotblock mounting. Beams and trolleys may be locked in place with spring pin through-bolt mechanism for ease of use. Assumes 10 per rigging bay. Manually deployed.	241,510	301,887
Point rigging gantries (technical zone)	125	85	Grid hanger mounted “work station” bridge crane units, with trolleys for chain hoist or spotblock mounting. Beams and trolleys may be locked in place with spring pin through-bolt mechanism for ease of use. Assumes 10 per rigging bay. Manually deployed.	169,161	115,029
Cable reels, motorized (PL Multicable, ENET)	68	22	19 pin connectors, 6 circuits.	1,061,810	343,527
Loudspeaker array rigging	3	0	Fixed speed winch motors (2m per minute); multiline grooved winch drums with brakes; liftlines with demountable connectors; slackline detection. Load capacity: 909kg	107,118	0
Tip-and-Fly Grid Ceiling	49	0	Decorative panels are made of lightweight aluminium framing constructed to look like the working wire-rope grids. Each unit is 2.4m x 3m. False grid will be suspended from lineset or chain hoist rigging systems.	61,210	0
Master control system	1	0	A centralized control computer for all motorized theatre equipment; specialised control software; main control console; two portable control pendants; receptacles for control console and control pendant plug-in points; programmable logic controller (PLC) based motor control panels (MCP) for all theatre equipment motors; Ethernet routing, switching, and distribution equipment sufficient to allow communication between the central control computer and all other control system devices; all safety interlock switches, limit switches and other position sensing devices other than those directly attached to motors, gear boxes, shafts or theatre equipment provided in other sections; switchable alarm system to alert personnel in grid attic, operation galleries, stage level, and the area surrounding the lift to movement of the system. Alarm shall announce differently for different types of movement. SIL 3.	553,182	0
Grand drape, grand valance, and stage draperies	1	0	Includes: house curtain and valance; 2 upstage travellers with manual biparting action; five sets of headers, legs, side tabs; scrims, 2 black and 2 white; 1 cyclorama, 2 bounce; and all storage bags and wheeled, covered hampers.	138,139	0
Chain hoists	0	14	Fixed speed; load capacity: 909kg. Includes wheeled roadcases. Rated for overhead use	0	408,068
Cinema screen masking system	0	1		0	84,528
Grid hoist system	0	2	1 ton capacity hoist on trolley beam at gridiron. Chain bag, pendant, trolley.	0	30,813
Adjustable proscenium: header and legs drapery	1	0	"Proscenium arch = 16m wide x 10m high. Underside of gridiron at 25m (clear height from finished stage floor) One header unit. Legs: two legs each side. All units are flat sewn draperies."	251,087	0
Subtotal				**4,570,779**	**3,360,108**

D-8.3 Large Venue (Cont'd)

Equipment Item	Number of Units in Base	Number of Units in Additional Equipment	NOTES	BASE	ADDITIONAL EQUIPMENT
Adjustable Acoustics					
Tip-and-Fly Forestage Reflector, motorized	1	0	19m x 7m finished dimension. Reflector composed of aluminium / steel framed panels, cladding of plywood / hardboard with cardboard honeycomb interior. Reflector stores in stagehouse fly loft in vertical position. In play position (horizontal), reflector has two possible locations - rigging system to transport reflector to secondary (upstage) location. Integrated architectural lighting units (Par MCM).	391,516	0
Acoustic Banners, motorized (fixed)	80	40	Roller or stacking type. It includes also 2 lines of transverse banners over the audience chamber wire-rope grid (no pockets)	1,140,925	570,463
Acoustic Banners, motorized (demountable)	20	20	Roller or stacking type. Durable cover (roadbox) has rigging connections, power and control receptacles.	310,215	310,215
Subtotal				**1,842,656**	**880,678**
Theatre Equipment – Stage Level					
Forestage extension lift	1	0	Lift 1; linklift or Spiralift lift columns, minimum 6 lift columns. Includes obstruction sensing, infinite positioning. Skirting, drive system covers, cable collection baskets.	331,243	0
Forestage reduction lift	1	0	Lift 2; linklift or Spiralift lift columns, minimum 6 lift columns. Includes obstruction sensing, infinite positioning. Skirting, drive system covers, cable collection baskets.	326,663	0
Double-Deck Lift (Doppelgänger)	0	1	Two deck level lift (upper and lower decks)	0	333,659
Audience seating lifts	2	0	Lifts 3 & 4; linklift or Spiralift lift columns, minimum 6 lift columns. Includes obstruction sensing, infinite positioning. Skirting, drive system covers, cable collection baskets.	627,509	0
Seating Wagons - forestage	6	0	Steel framing, wood deck	490,931	0
Seating Wagons - audience seating	6	0	Steel framing, wood deck	336,032	0
Auditorium Moving Balconies	1	0	3 levels for audience seating. Motorized rack and pinion vertical climbers. Toothed rack on building columns, 2 motorized gears per bridge unit. Finishes (including audience railings) by others. Electrical umbilicals for load and signal wiring. Bridges and railings to connect to building. 9 units total.	2,035,240	0
Stagehouse Moving Balconies	1	0	3 levels for audience seating. Motorized rack and pinion vertical climbers. Toothed rack on building columns, 2 motorized gears per bridge unit. Finishes (including audience railings) by others. Electrical umbilicals for load and signal wiring. Bridges and railings to connect to building. 3 units total.	1,072,896	0
Live sound mix position infill platforms and railings	1	0	Built into main floor Seating Wagon at centre.	41,640	0
Audience safety railings	1	0	For all lift zones. Architectural finishes (by others). For use at edge of lift shafts at audience seating slab edges, and on lift decks. Includes safety interlocks, transport carts	39,974	0
Technical safety railings, manual	1	0	Demountable safety railings for use at edge of lift shafts in technical areas. Includes safety interlocks, transport carts. Steel painted high visibility yellow.	39,974	0
Demountable stage trap system	0	1	1.2m x 1.2m square. Steel framed traps with built-up wood flooring. 735kg/m2 loading. Includes all demountable beams, purlins, columns, and locking hardware. Coverage: entire stage area not filled by Lifts. 6m x 12m	0	141,471
Orchestra pit platforming	0	1	Manually erected platforms to raise orchestra pit floor to various heights to accommodate musicians. Demountable legs, railings, chair stops. Includes all hardware and transport carts.	0	129,811
Orchestra pit safety net system	2	0	Manually deployed netting with demountable outriggers, connection hardware, wheeled storage hampers with lids.	25,400	0
Surtitles	0	1	Projection for opera libretto	0	285,993
Subtotal				**5,367,501**	**890,934**

D-8.3 Large Venue (Cont'd)

Equipment Item	Number of Units in Base	Number of Units in Additional Equipment	NOTES	BASE	ADDITIONAL EQUIPMENT
Theatre Equipment – Supplementary					
Safety curtain, steel door leaf, motorized	0	1	Additional equipment	0	260,143
Steel structure, technical portal	0	1	Additional equipment	0	264,203
Fire safety curtain, motorized	1	0	Straight-lift type. 2-hour rating. With motorized uplift winch, lattice track counterweight. 10 liftlines per lineset. Fixed speed (5m per minute). Zetex or similar.	147,612	0
Tab set rigging, motorized (variable speed)	0	8	Variable Speed: 0 - 70m per minute. Demountable ladder battens or light ladders; Load capacity: 350kg.	0	139,076
Supplementary rigging equipment	0	1	Mule blocks, loft blocks, and spotblocks for motorized (wire rope) rigging; rope rigging blocks; rope (manila and synthetic); sandbags, various weights. ALLOWANCE	0	17,905
Sprung dance floor module system + roll-out dance flooring	0	1	Temporary sprung dance floor modules and rolls of dance floor vinyl to cover 16m x 16m area. With wheeled storage carts, hardware, transition units. Harlequin, L'Air, or similar	0	70,267
Demountable tab ladders	0	10	Light ladders, 3m tall x 2m wide. Rigging connections. 50mm outer-diameter pipe.	0	24,984
Demountable lineset ladder battens	0	10	250m total	0	23,943
Demountable trussing	0	10	250m total	0	436,175
Staging platforms, demountable	0	1	Enough for 12m x 12m area. Includes transport carts, demountable legs, bracing.	0	103,370
Dance lighting towers	0	10	3m tall. Square truss (aluminium) with castered base, locking mechanism.	0	112,427
Miscellaneous backstage equipment	0	1	Scaffolding with wheels, planks, stabilizers; ladders of various sizes (A-frame and straight extension); furniture dollies; hand trucks, "ghost" lights. ALLOWANCE	0	44,867
Man lift/aerial work platform, motorized	0	1	One 2-person aerial work platform, drivable. One 1-person aerial work basket.	0	107,222
Subtotal				**147,612**	**1,604,582**
Production Lighting					
Theatrical Lighting Instruments & Accessories					
Ellipsoidal package	75%	25%	Various beam spreads for large venue and rehearsal space	52,852	17,617
Ellipsoidal accessories package	75%	25%	Top hats, drop-in iris, colour frames, spare lens tubes	1,395	465
Wash fixture package	75%	25%	Various PARs and fresnels	82,709	27,570
Wash fixture accessories package	75%	25%	Various barn doors and top hats	7,625	2,542
Striplight package	75%	25%	LED striplights with gel frames and trunions	86,327	28,776
Followspot package	75%	25%	Short throw and medium throw	51,479	17,160
Moving fixture package	25%	75%	LED wash fixtures and intelligent fixtures with shutters	120,117	360,352
Accessory package	75%	25%	Safety cables, side arms, c-clamps, and light ladders	7,579	2,526
Cable package	75%	25%	Various length cables, 2-fers, 3-fers, multi-cables, and DMX	61,314	20,438
Fog machine	50%	50%	One fog machine in base	1,905	3,176
Spare lamp package	75%	25%		4,760	1,587

D-8.3 Large Venue (Cont'd)

Equipment Item	Number of Units in Base	Number of Units in Additional Equipment	NOTES	BASE	ADDITIONAL EQUIPMENT
Production Lighting (Cont'd)					
Theatrical dimming & controls					
Control console package	1	0	Full memory console for Large Venue with a back-up board, mid-range console for rehearsal space, with LCD monitors, remote controls and control faceplates included	205,915	0
House control faceplates	1	0		31,126	0
Work control faceplates	1	0		10,010	0
Control rack package	1	0	9 performance dimmer racks, 864 dimmers, faceplates, DMX nodes, and cue-light system	765,623	0
Subtotal				**1,490,735**	**482,207**
Audiovisual Systems					
Base building - building wide connectivity	1	0	Note that these are building wide systems	70,354	0
Base building - production intercom	1	0	Note that these are building wide systems	285,993	0
Base building - audio paging	1	0	Note that these are building wide systems	357,492	0
Base building - show relay	1	0	Note that these are building wide systems	246,669	0
Base building - signage (foyer)	1	0	Note that these are building wide systems	227,651	0
Large venue base audio systems	1	0		279,558	0
Large venue base video systems	1	0		48,619	0
Base building - loose equipment	1	0	Note that these are building wide systems (shared between spaces)	1,260,029	0
Large venue base broadcast/ recording systems	0	1		0	429,705
Large venue - program audio	0	1		0	631,902
Large venue - spatial audio system	0	1		0	833,098
Large venue - active architecture	0	1		0	2,116,350
Large venue - discount if spatial audio & active arch are both purchased	0	1		0	-666,193
Other - conference rooms	0	1		0	152,935
Subtotal				**2,776,366**	**3,497,798**
Audience Seating					
Theatre - auditorium seating - fixed	748		Base number 748 fixed auditorium seats	**667,318**	**0**
Theatre - auditorium seating - loose	0	1022	Cost of loose chairs (additional equipment)	**0**	**408,800**
Subtotal				**667,318**	**408,800**
TOTAL – LARGE VENUE				**16,862,966**	**11,125,107**

Table 2. Large Venue performance equipment list and budget

D-8.4 Small Venue

Equipment Item	Number of Units in Base	Number of Units in Additional Equipment	NOTES	BASE	ADDITIONAL EQUIPMENT
Theatre Equipment					
Guillotine Doors	0	2	Each door 11.5m wide x 8m tall. Motorized vertical travel - may be counterweighted. Fire-rated and Rw56 dB acoustic rating	0	401,000
Telescopic risers - motorized	1	0	Seating for 200 people. 4-5 rows. Motorized deployment. Folding seats are integrated into risers. (Cost for seats below)	368,000	0
Acoustic Banners and Curtains	0	60	No curtains or banners in base. Fixed absorption included in base (in architectural finishes). Additional equipment cost for motorized roller or stacking banners. Floor plan 15.5m x 15m. Banners shall cover all walls. Banner length 11m fully deployed	0	943,137
Subtotal				**368,000**	**1,344,137**
Production Lighting					
Dimming and control	1	0	96 Dimmers	124,588	0
Theatrical fixtures and accessories	50%	50%	50% in additional equipment cost	139,938	139,938
Subtotal				**264,526**	**139,938**
Audiovisual Systems					
Small Venue base systems	1	0		23,165	0
Subtotal				**23,165**	**0**
Audience Seating					
Integrated seats	200	0	Folding seats integrated in telescopic risers	166,558	0
Subtotal				**166,558**	**0**
TOTAL – SMALL VENUE				**822,250**	**1,484,075**

Table 3. Small Venue performance equipment list and budget

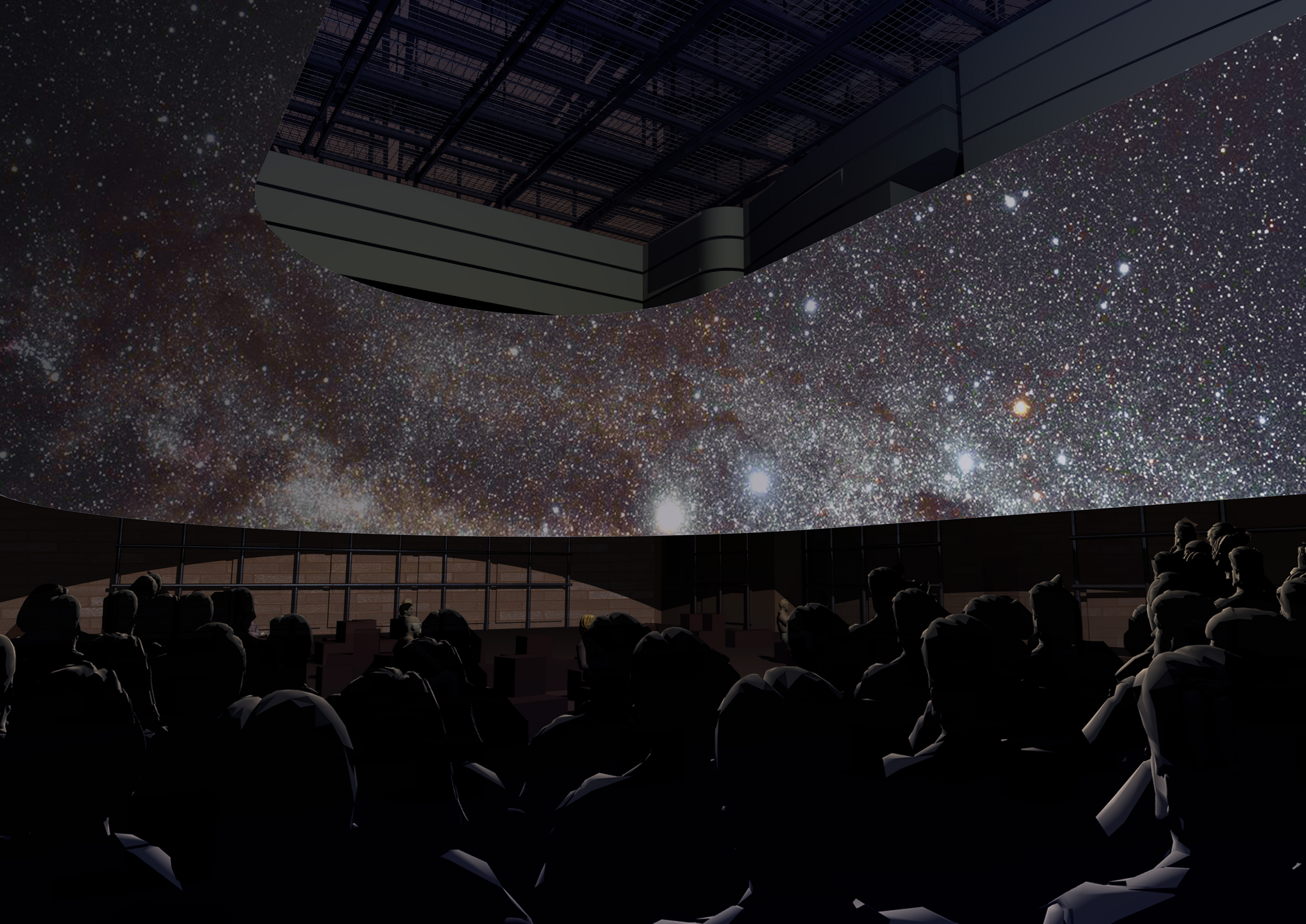
D-8.5 Studios (1-4)

Equipment Item	Number of Units in Base	Number of Units in Additional Equipment	NOTES	BASE	ADDITIONAL EQUIPMENT
Theatre Equipment					
Pipe grid (Studio 1)	1	0	11.66m x 8m pipe grid on 1.5m x 1.5m centres. 50mm (outer diameter) steel pipe. Connecting hardware: fixed pipe clamps. Room size = 12.66m x 8m x 7m	87,964	0
Rigging pipes (Studios 2, 3 & 4)	0	3	Additional equipment cost for straight pipe lengths hung from ceiling on 1.5 meter centres. Assume 11 pipes of 50mm (outer diameter) steel pipe.	0	90,000
Acoustic Banners and Curtains (Studio 2, 3 & 4)	4	8	Walk-draw acoustic Curtains along all 4 walls for Studio 2. Additional equipment cost for manually deployed Curtains for Studios 3&4. Fixed absorption included in base for Studios 1, 3 & 4 (in architectural finishes).	50,000	100,000
Subtotal				**137,964**	**190,000**
Production Lighting					
Dimming and control	1	0	48 dimmers	79,964	0
Theatrical fixtures and accessories	0	1		0	195,388
Subtotal				**79,964**	**195,388**
Audiovisual Systems					
Studio 1 - systems	0	1		0	313,849
Subtotal				**0**	**313,849**
TOTAL – STUDIOS				**217,927**	**699,237**

Table 4. Studios (1-4) performance equipment list and budget

Venue Concept | **Chapter 2**

ARUP



1 Introduction

At the heart of the New Theatre Lucerne project is a unique performance venue that aspires to be an internationally recognised platform for creative experimentation in theatrical performances. Arup's concept for the venue is designed to meet the highest professional standards to effectively support the artistic ambitions of the Luzerner Theater and the Lucerne Festival.

2 Pierre Boulez's Salle Modulable

The Salle Modulable was first proposed by Pierre Boulez and Patrice Chéreau for the Opéra Bastille — a hall in which the walls and ceiling could expand and contract to create a variety of performing environments. The vision for this space was part of Boulez's life work in challenging the physical restrictions of space that he felt were standing in the way of the evolution of opera. Unfortunately, his Salle Modulable was never built at the Opéra Bastille due to budget cuts.

Boulez's long collaboration with the Luzerner Theater, his indomitable spirit of exploration and his vision to create a platform on which artists can explore different ways to present and experience opera has been a foundational inspiration for the New Theatre.

3 The New Theatre

The concept for the Large Venue in the New Theatre Lucerne has built on the spirit of Pierre Boulez's desire to challenge convention and has also been informed and inspired by consultation with the incoming intendant of the Luzerner Theater, Benedikt von Peter; the intendant of the Lucerne Festival, Michael Haefliger; as well as international artists, including Peter Sellars and Sir Simon Rattle.

The Concept Framework have defined and shaped the broad characteristics of the project (see Chapter 1, Section 2). Specific clauses that impact the design of the Large Venue are as follows:

3.1 Artist Experience

The venue should provide an internationally recognised platform for creative experimentation in musical theatre, opera, dance and drama.

The venue shall have the highest quality performance and rehearsal spaces. Quality considerations include size (dimensions), acoustics, theatre technical systems (theatre equipment, seating, light, sound and video), ergonomics and safety.

The venue shall have sufficient and appropriate support spaces for rehearsals, workshops, and creative discussions.

3.2 Audience Experience

The venue shall have the capacity to deliver a world class quality of performance experience in opera, music theatre, dance and drama. Quality considerations include the optimal audience /artist relationship for each configuration of the New Theatre, sightlines, circulation dynamics, and acoustics.

The entire visitor experience shall complement the standard of quality and charm associated with the KKL.

3.3 Venue

The venue shall enable artists to create and audiences to experience unconventional work that cannot be mounted in traditional performance halls.

The venue shall offer multiple configurations transforming the artist and audience space that range from traditional proscenium theatre format to large "black-box" in such a way as to allow artists as much creative freedom as possible in exploring the way artist and audiences interact including seating/stage locations and floor plane, wall and ceiling variability.

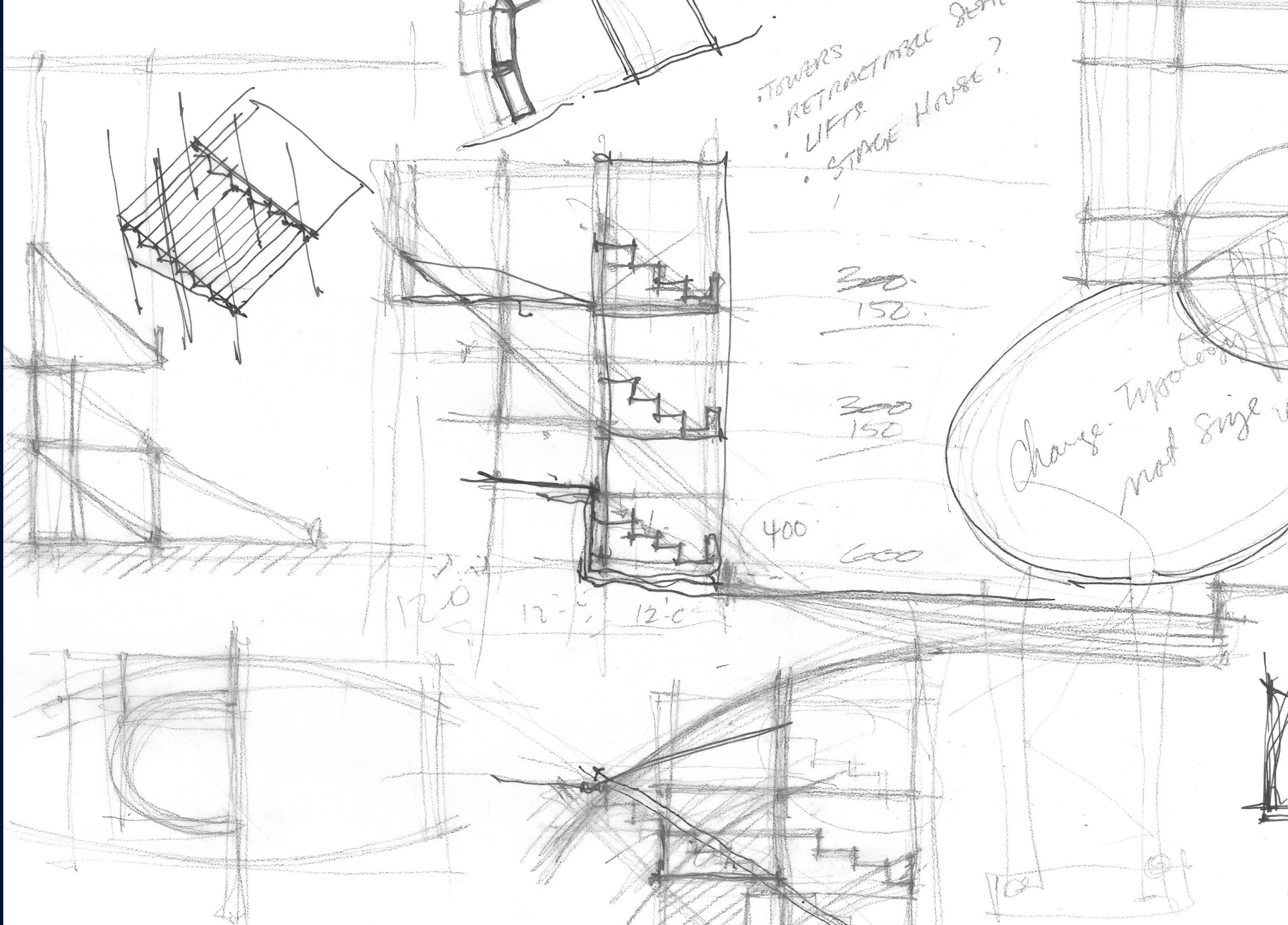
The venue should offer traditional performance formats at the highest international natural acoustics and sight-line standard. Non-traditional performance formats shall make effective use of cutting edge sound reinforcement and live video technology, as necessary.

Technical equipment systems installed in the New Theatre shall allow for time efficient and cost effective transformation between different configurations.

Support infrastructure for technical equipment systems shall be designed to support different scales and types of productions, as well as the intended range of usage and flexibility of the venue.

Audio/visual systems shall allow for multimedia, mixed-media, and immersive productions, seamlessly bridging between natural acoustics and reinforced sound, between natural sight and video, as well the

At the heart of the New Theatre Lucerne project is a unique performance venue that aspires to be an internationally recognised platform for creative experimentation in theatrical performances. Arup has developed a concept for the venue that is designed to meet the highest professional standards to effectively support the artistic ambitions of the Luzerner Theater and the Lucerne Festival.


·TOWERS
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·LIFTS
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use of physical décor and virtual environments. Large scale performances in the New Theatre should accommodate up to 1,200 seated audience members.

4 The Large Venue

The Venue's ability to physically transform between configurations parallels the project's ambition to experiment and explore different ways to shape the interface between audience and artists. Stakeholder consultation has supported Arup's experience that artists want a space they can respond to, an environment that has character at all times, that is a place at all times that artists will want to work in.

Arup aimed to develop this space without compromise to its functionality, sightlines or natural acoustics in traditional proscenium and proscenium-thrust configurations. The transformation should happen elegantly and cost-effectively, retaining the space's character rather than creating a void or a technical machine.

Arup considered the following questions:

- What makes a theatre traditional?
- Can we make the traditional elements disappear?
- How do flexible spaces maintain a character?
- Does the method of transformability need to respond to the different possible configurations?
- How do we design a transformable room that responds to different scales of audience and production?
- What elements need to be transformed?
- How has this concept been addressed in the past?
- Are there good historic examples?

The following key elements have driven the design of the Large Venue:

4.1 Intimacy

A driving characteristic of a world-class theatrical space is intimacy. The ability for artists to be able to communicate with audiences — to be able to be seen and be heard — is a question of sightlines and acoustics, but also of room and balcony shaping that enhances the feeling of connection between artists and audiences.

The Large Venue must offer an exceptionally intimate environment. This has been achieved with the careful layout of seats and incorporation of balconies and walls shaped with this goal in mind.

4.2 The Character of Balconies and Walls

Most theatres are defined by the presence, shaping and concept of balconies or, in the absence of balconies, wall shaping. If a room has balconies, they tend to dominate the space, and if there are no balconies, the character and shaping of the walls will form the experience of the space.

Therefore, it is critical to design a room where the balconies effectively support intimate performances, while the walls also provide character and atmosphere when the balconies are removed.

4.3 A Range of Transformability

A truly flexible venue will offer artists options to create different room configurations rather than simply choose from preset configurations.

To understand the extents of this range of flexibility, the team developed the extreme positions for the physical elements for the Large Venue as follows:

- the traditional opera house – the audience is arranged in levels facing a proscenium with an orchestra pit and a stage house or fly tower
- a big open room – the audience and performers could be placed in any context with each other

Enabling this variability requires the traditional venue elements to be removable — the audience area, the performance area, the orchestra pit and the stage house or fly tower. Similarly, these transforming variables must be mechanised to ensure operational efficiency.

While the traditional format and open room format represent definite configurations, the possible formats in this document, shown in between the extremes, represent just a few of the numerous possibilities that the Venue can support. The Large Venue offers a matrix of transformable elements that will respond flexibly to the imagination of the artists, who will truly define the configurations of the Venue. Figure 2 through Figure 8 illustrate some of these possibilities.

Figure 9 through Figure 16 include drawings of the proscenium configuration for the Large Venue.

4.4 A Space with Character

The Large Venue must at all times provide a character and characteristics for the artists to work with or react to. It should be a place where the audience can feel at home or completely out of place as intended by the artists, and at all times and in all configurations, it should remain recognizable as the New Theatre Lucerne.

4.5 A Space to Work

Intrinsic to the Venue Concept was the definition of work areas — stage areas — and specialised theatrical equipment systems that support the needs of all the theatrical performing arts disciplines. Stage dimensions, rigging systems, lift shaping and location, Seating Wagons and seating wagon storage, audiovisual systems and performance lighting systems are just some of the critical design elements that will ensure that the Large Venue is a space with technical characteristics that will best support artists' work.

4.6 Silence

An essential goal for this Venue is silence. Quiet in the performance environment creates a special atmosphere, one in which performers and audiences are bound by a common focus: the performance. Quiet translates into an air of expectancy and an aura of quality for both audience and performers.

Achieving a silent environment will be a focus of the design process that impacts all aspects of the project.

4.7 Room Acoustics

The goal of intimacy is also a driving acoustical characteristic for the room in traditional format. Additional acoustic requirements include fidelity and clarity within a warm, rich, reverberant and enveloping sound environment. Today's audiences are conditioned by personal audio systems and high-quality home systems which also makes achieving an impactful experience an important goal.

Arup envisions an intimate sound that is simultaneously enveloping and generous, combining both intelligibility and richness, a sound that allows the audience to understand the words spoken by the actors or sung by the singers on-stage. If there is an orchestra, its sound should have the quality, texture and complexity of the sound in a great concert hall without compromise to balance.

This quality of acoustical experience will be achieved with careful shaping of the room and incorporating the side balconies. The underside of these balconies will enhance clarity and together with the detailed shaping of wall surfaces will contribute to the texture, complexity and envelopment of the sound.

Many opera houses have very clear and dry sound, lacking liveness and texture. This space should provide a richer, fuller sound, similar to the acoustics in Teatro Colón in Buenos Aires or Nationaltheater Munich without the sonic harshness that can occur in small venues when large orchestral forces perform.

Optimum balance and good communication between singers and the orchestra are also critical. The design will include surfaces around the proscenium area and the pit to support the voices of singers on-stage and a moveable forestage reflector to provide support to musicians and optimize communication between performers and projection of the singers' voices.

4.8 Acoustical Transformability

For artists to create their own sound experience, the space will include elements that allow them to transform and shape the acoustics to their needs. In addition to the Moving Balconies and reflector mentioned previously, additional elements of the design will allow the character of the sound in the space to be changed.

A series of Acoustic Banners and Curtains will allow the artist to reduce the reverberance and liveness of the room or otherwise shape the acoustical environment. The Windows in the walls will add additional absorption and diffusion to the space.

For example, for amplified events and immersive sound, the adjustable acoustical elements will provide a controlled environment where artists will be able to develop sound installations in an acoustically neutral environment.

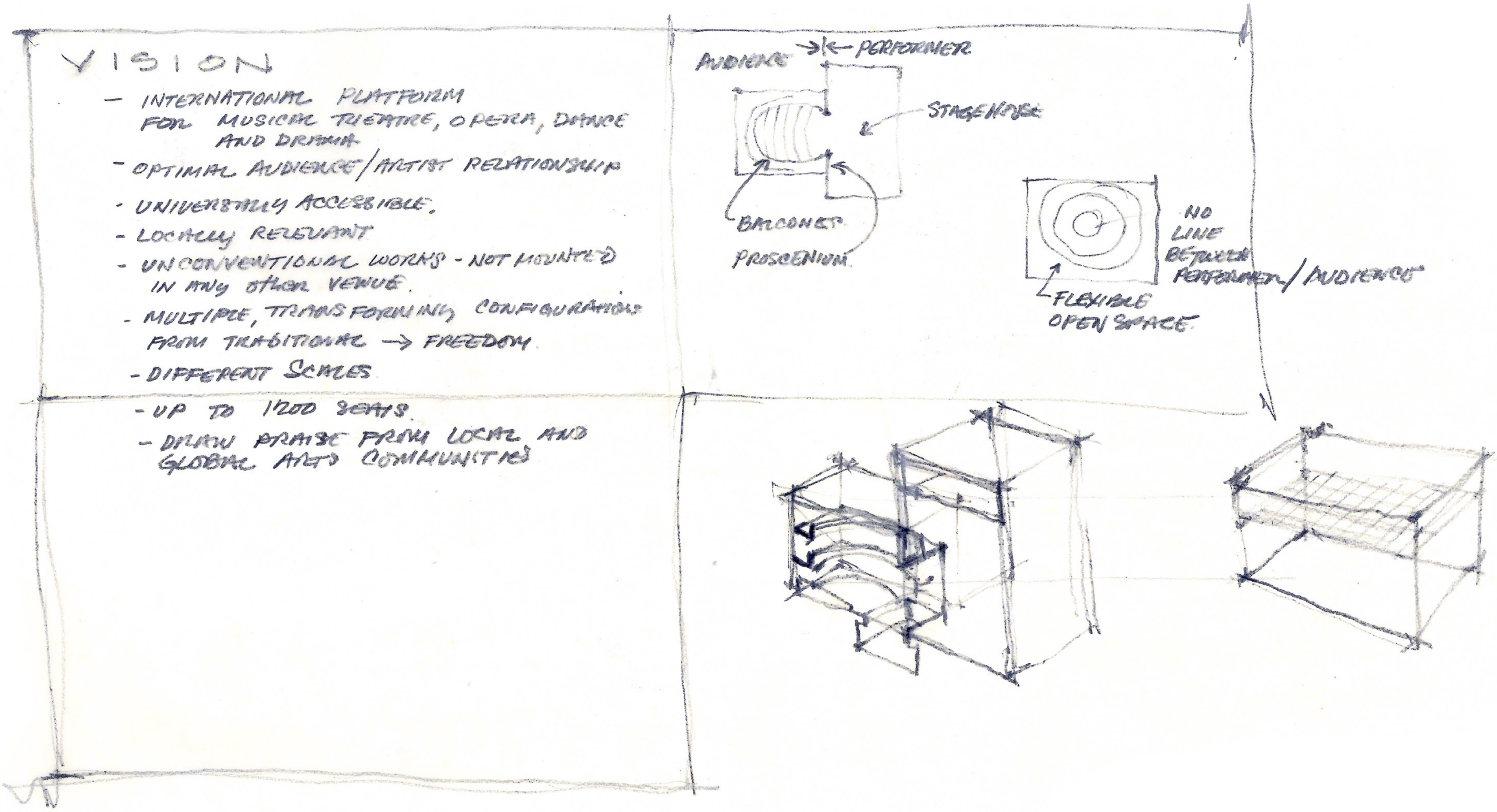
Alternatively, for smaller-scale unamplified events where clarity is vital, the artists will have the option to deploy only one, two or all three balconies to provide the required support.

4.9 Immersive Sound and Image

In a truly flexible space like this, audiovisual systems must allow multimedia, mixed-media and immersive productions to seamlessly bridge between natural acoustics and reinforced sound, and between natural sight and video.

The Large Venue concept will include the necessary infrastructure for artists to use a spatial audio system that will allow them to create sound scenes moving in three dimensions around the room. This spatial audio system will render virtual sound sources with accurate localization and movement parallax, adding to the perception of depth of field in sound scenes and creating the impression of a larger space existing beyond the confines of the physical room's boundaries. This could be paired with projected visual images to create immersive multisensory experiences.

Alternatively, an active architecture system would allow sound designers to seamlessly change the audience's perception of envelopment, clarity and room reverberance to fit the production's goals.



Large Venue | Vignette

Windows throughout the hall will allow artists to create unique performances with actors or musicians in the openings or audiences viewing the action from them. Windows may be used in conjunction with or independently of the Moving Balconies.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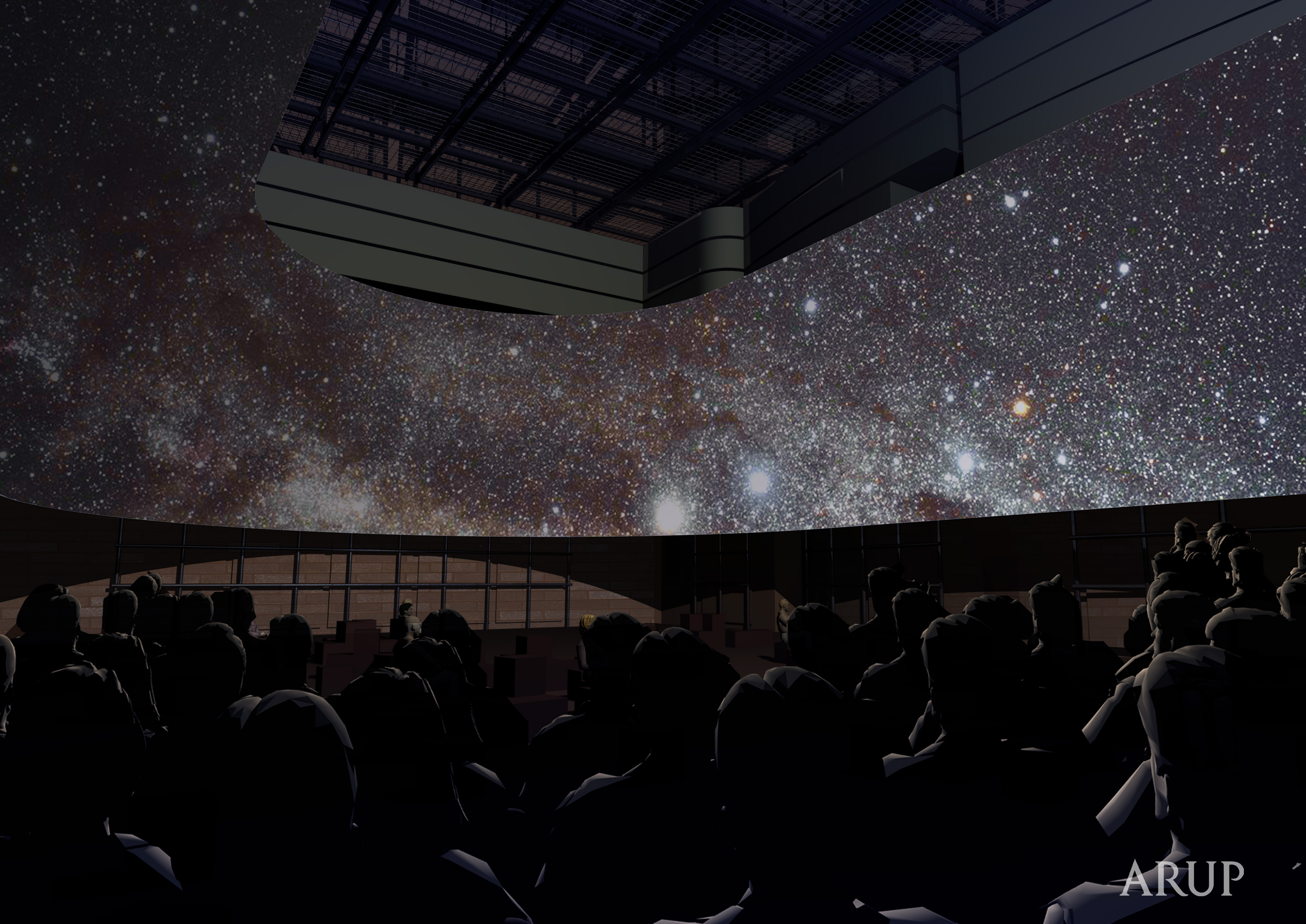
Large Venue | Immersive

Artists will be able to use the facility infrastructure to create immersive experiences using 360 degrees video and immersive sound.



Large Venue | Multiple Stage

Dynamic performances with action occurring in multiple stages will allow artists to create performances that have audiences moving around and interacting with performers.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Large Venue | Centre Stage

A central stage configuration will allow performers to be surrounded by the audience.


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Large Venue | Theatre

The Venue can be configured as an intimate proscenium theatre with multiple shaped Moving Balconies wrapping around the orchestra floor.

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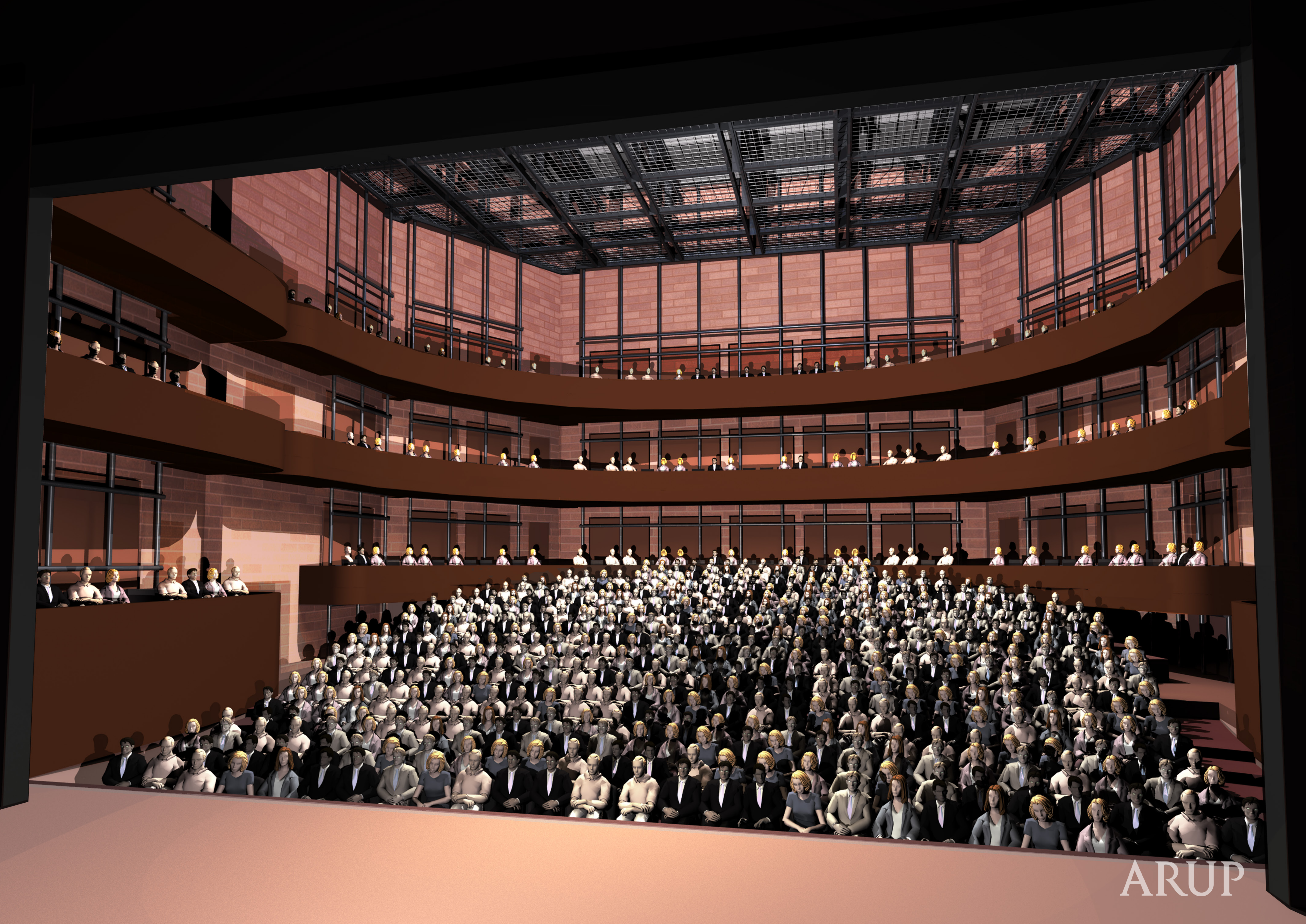
Large Venue | Theatre Facing Audience

The Moving Balconies will create a setting for audiences and actors to have an intimate shared experience. The Venue has been developed with a focus on creating a close interaction between audience and performers. This will continue to be the defining characteristic of high quality performing arts experiences.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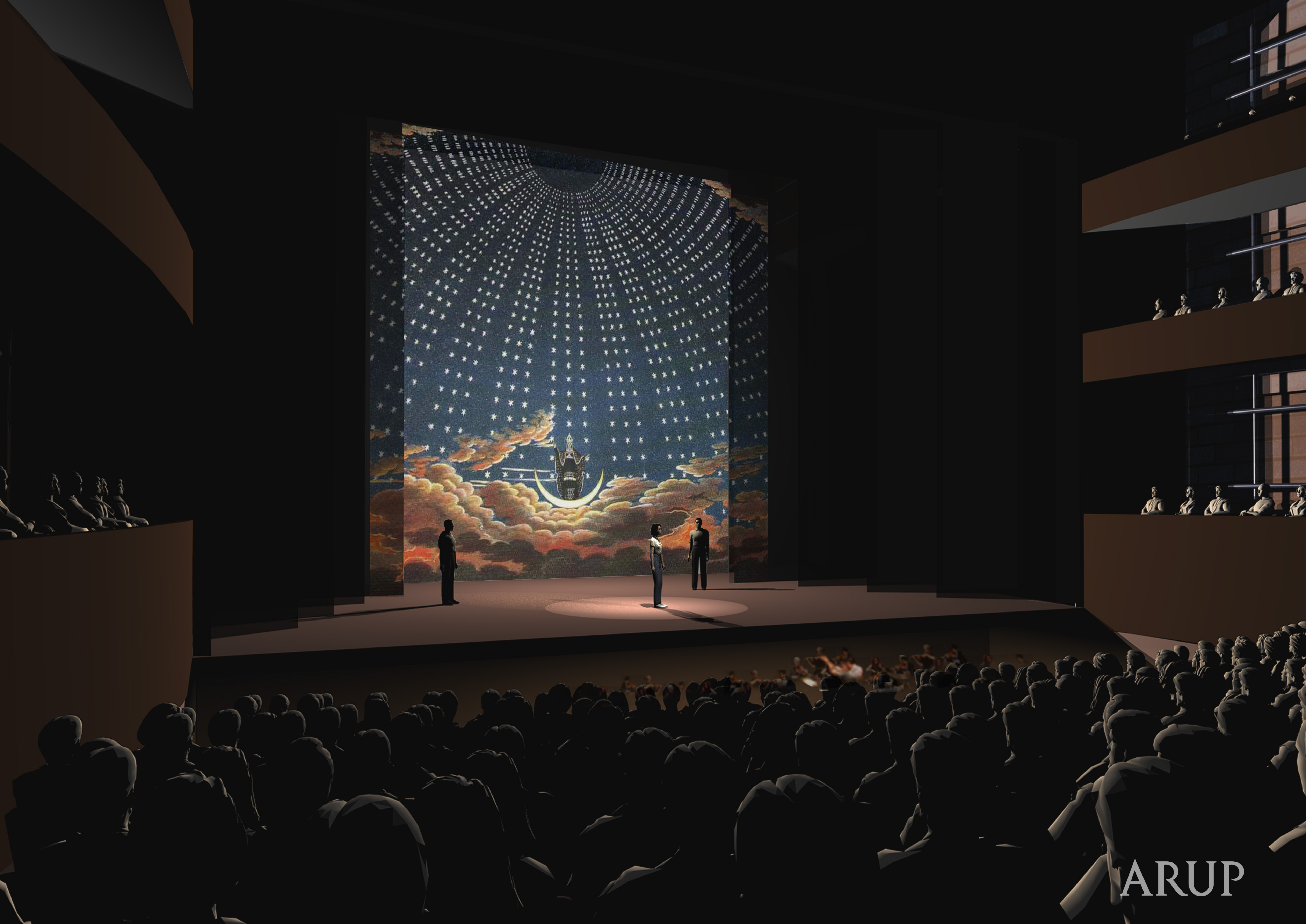
Large Venue | Traditional Opera

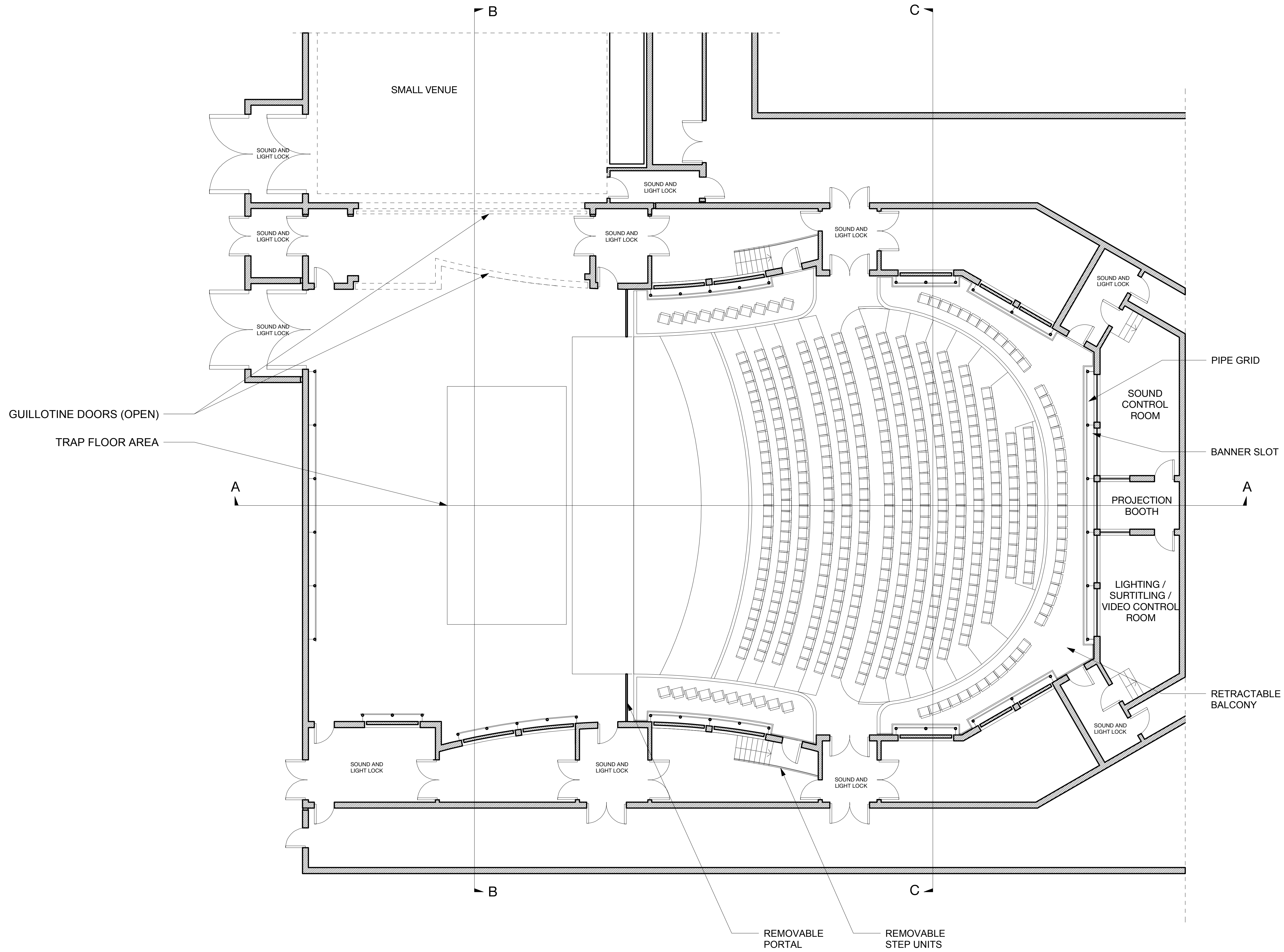
The Venue will be able to accommodate a range of traditional staged performances, preserving the audience – artist intimacy by adjusting the pit and stage sizes. The infrastructure will allow artists to explore innovative performances that use a traditional looking environment that changes through the performance or is enhanced/modified through the creative use of multi-media.



Large Venue | Drawing Set

Fig 1.

Proscenium | Orchestra Level



Proscenium | Level 1

Fig 2.

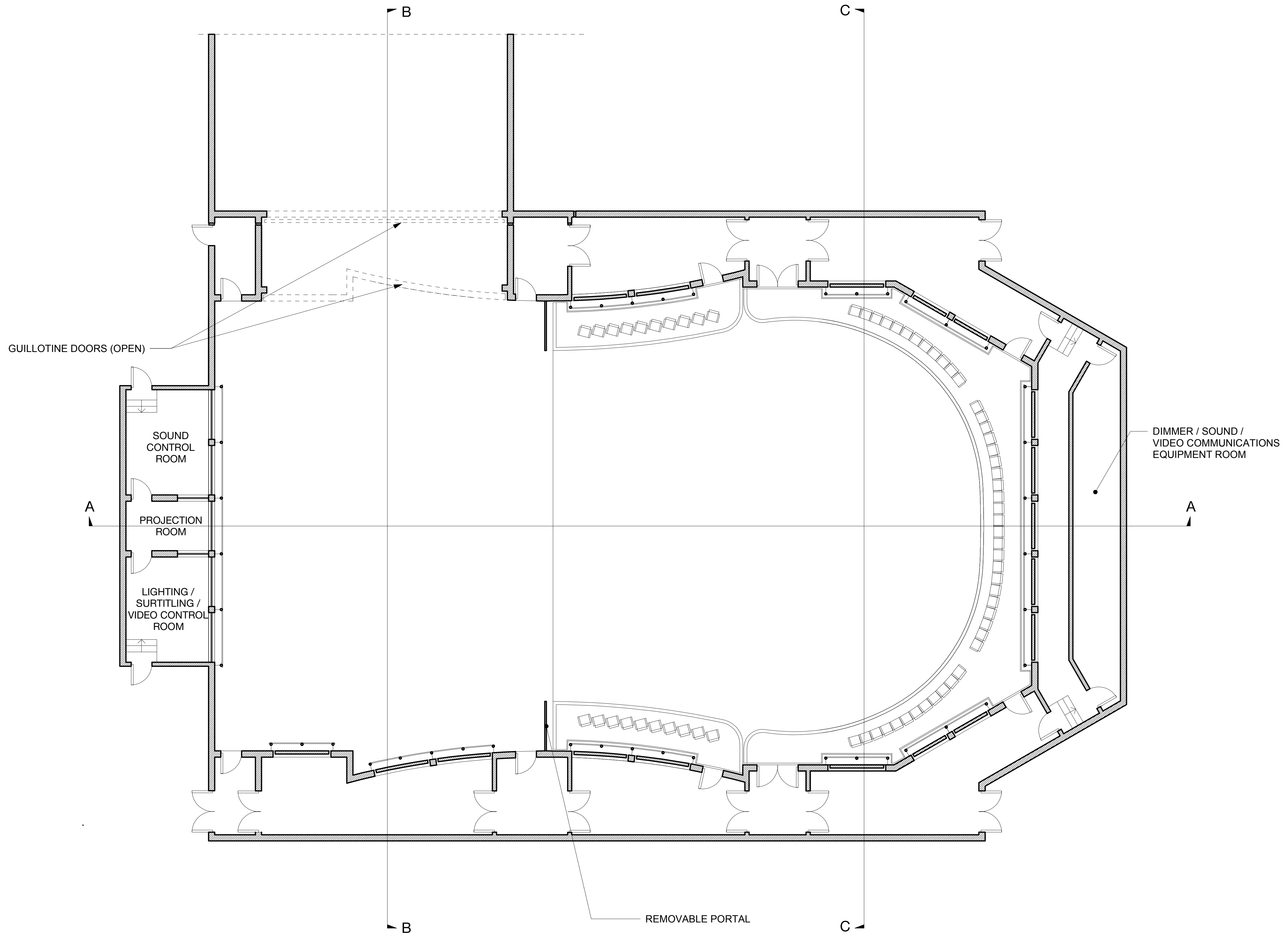
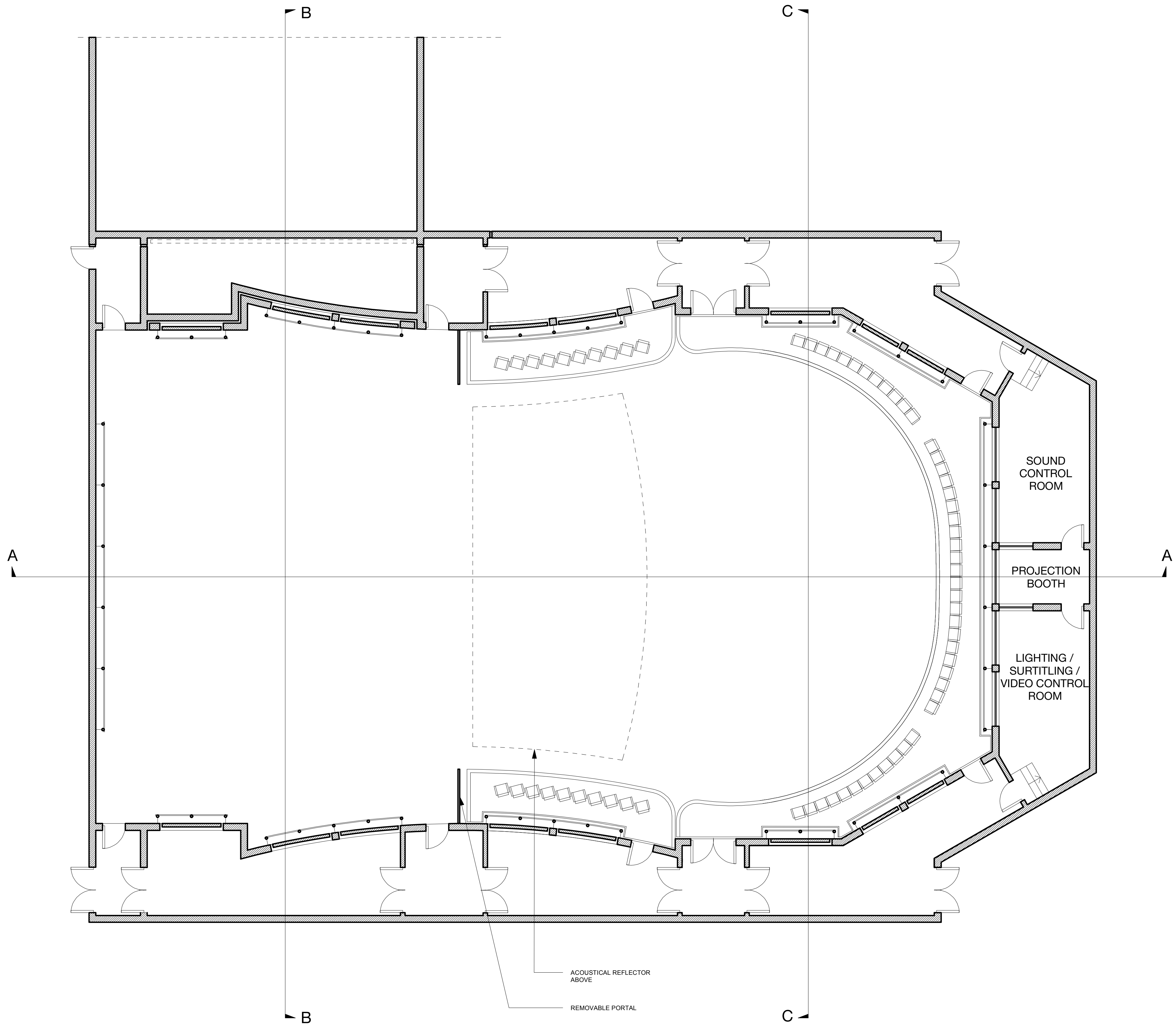


Fig 3.

Proscenium | Level 2



Proscenium | Grid Level 1

Fig 4.

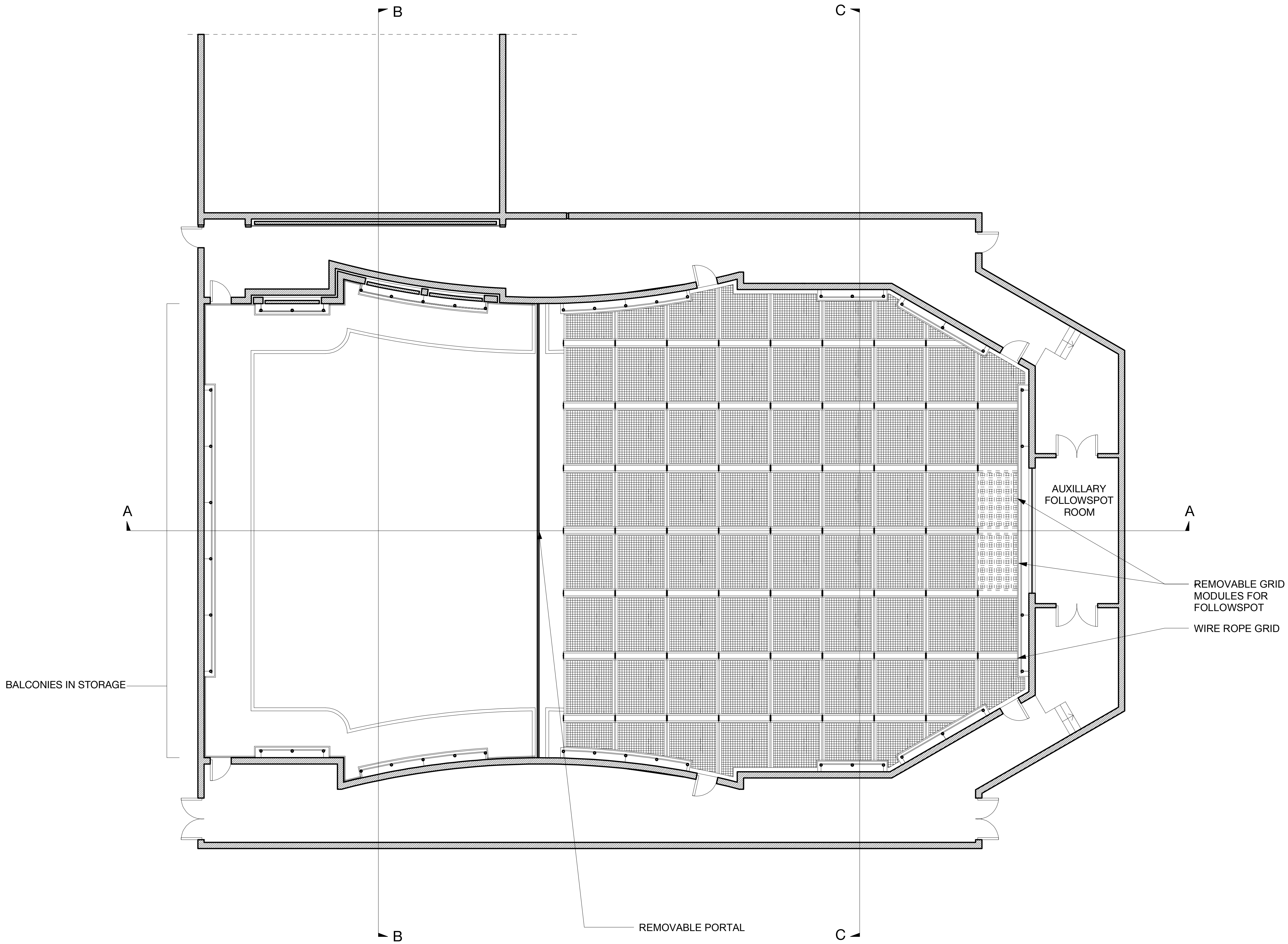
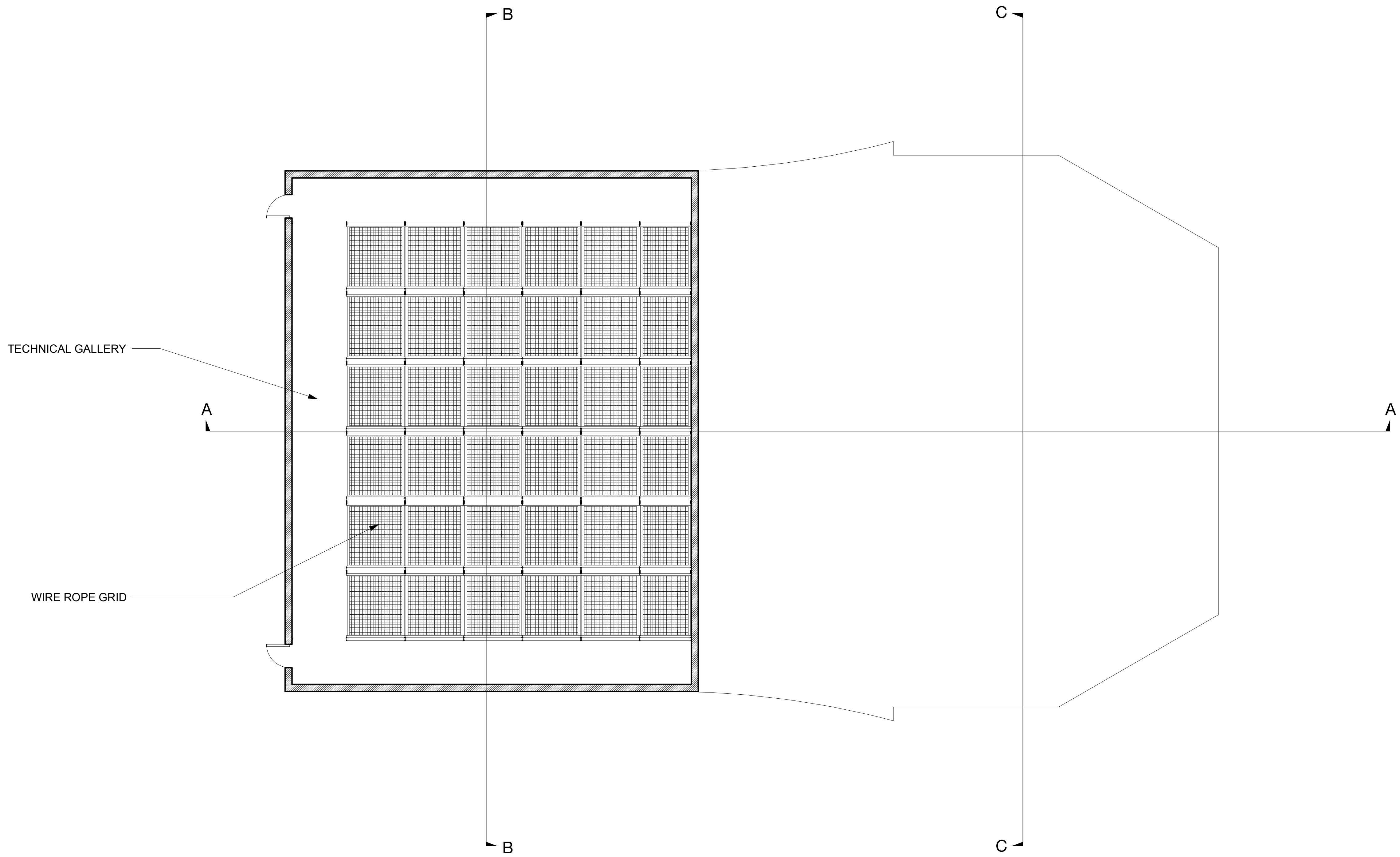


Fig 5.

Proscenium | Grid Level 2



Proscenium | Section A-A

Fig 6.

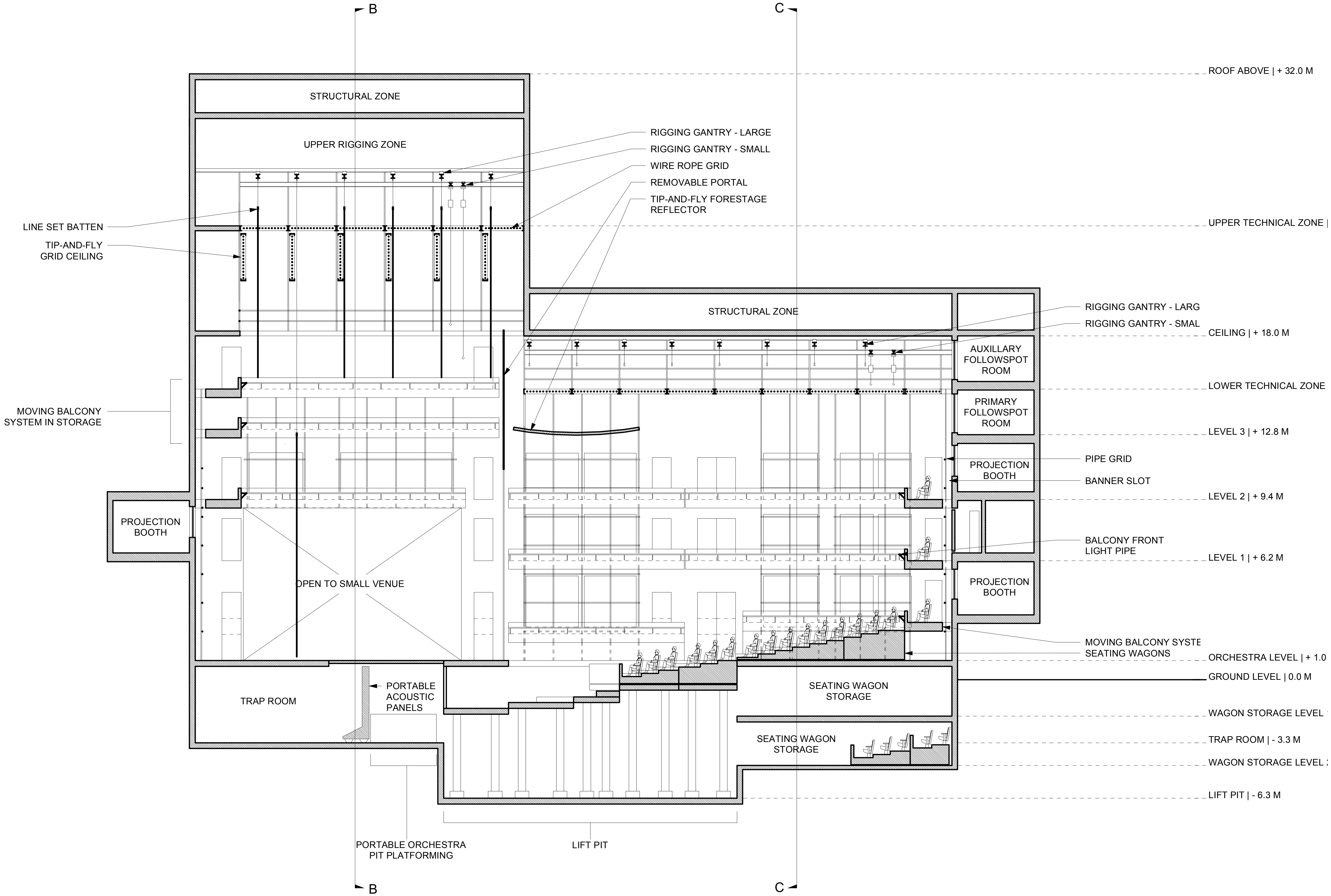
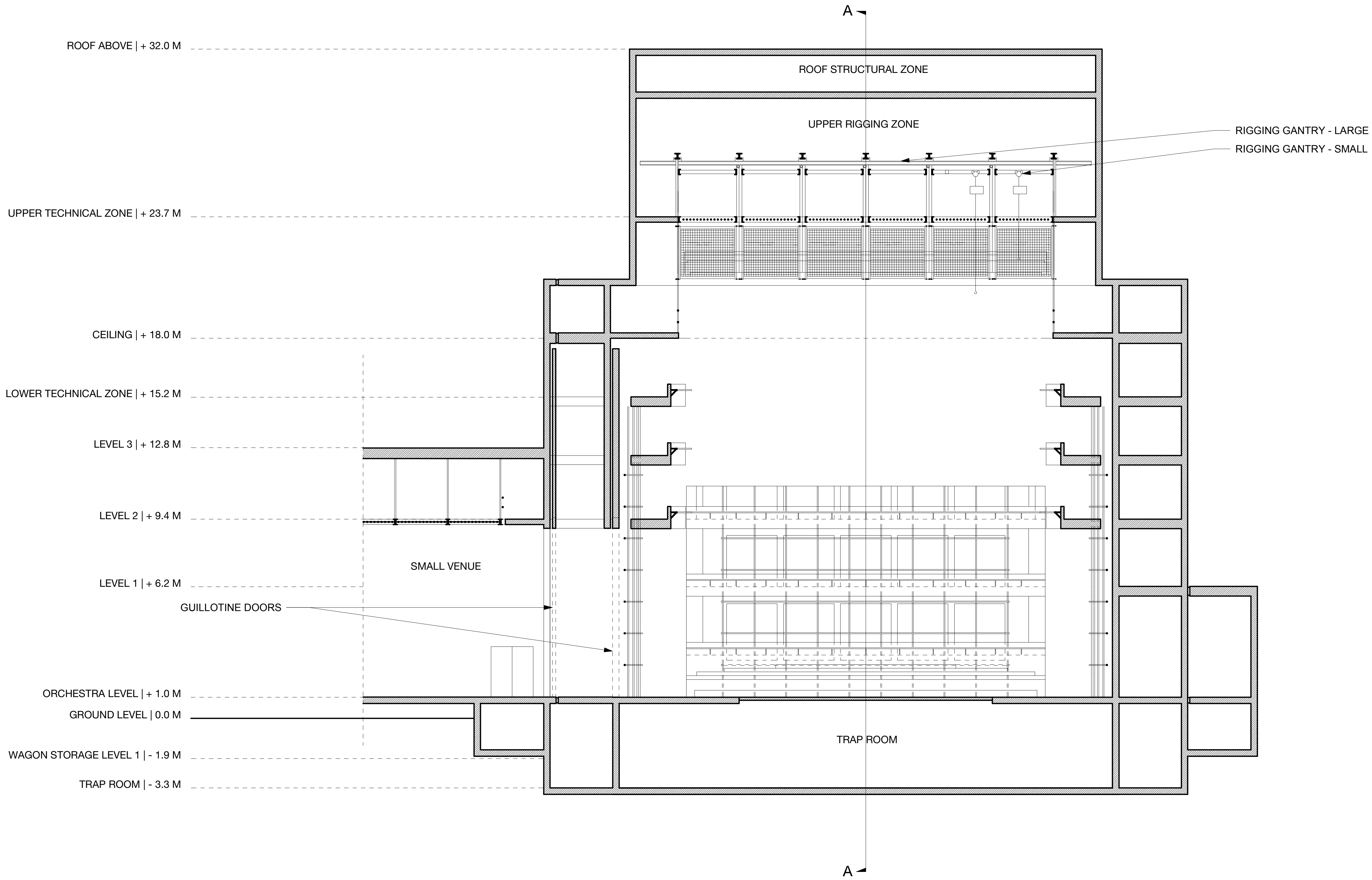
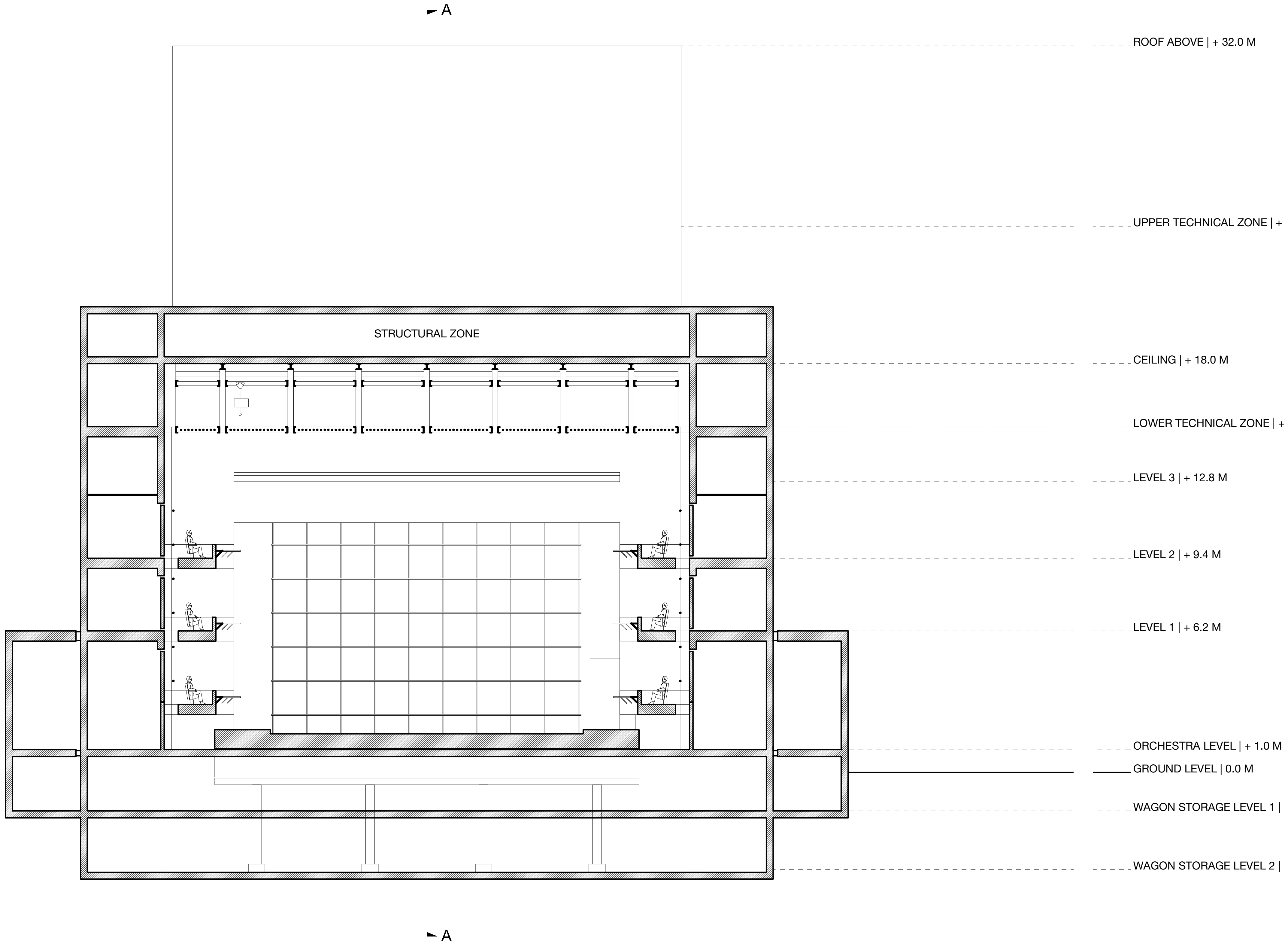


Fig 7. **Proscenium | Section B-B**



Proscenium | Section C-C
Fig 8.



5 The Small Venue

The Small Venue is a flat-floor performance venue. It is conceived to be at times an adjunct space for the Large Venue. While the Large Venue must support an extremely wide variety of transformability, the Small Venue must support flexibility. The Venue will be designed to be flexible using a retractable seating bank for 200 seats to create an end stage set-up. When the seating bank is stored the venue will have a wide open flat floor which will all the audience/ performer relationship to be explored. Given the size and flexibility of the Small Venue it is expected that it will be in use all constantly as rehearsal, performance and community rental space.

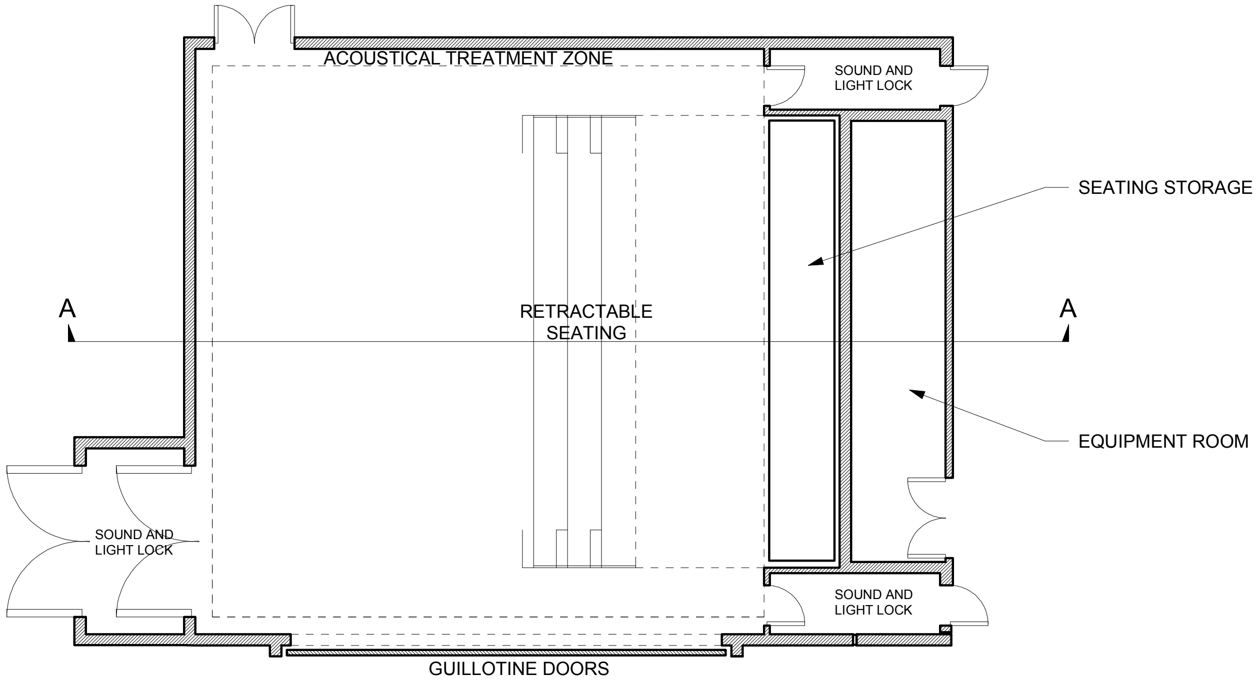
The Small and Large Venue may be connected via tall openings in both venues. This will allow the Small Venue to act as a side stage for the Large Venue if it required. The Small Venue will be equipped (just like the Large Venue) with a wire-rope grid over the entire space. This will allow rigging, lighting and audience seating to be configured in any way that could be imagined.

The Small Venue will have adjustable acoustic Curtains will change the acoustic environment according to the need of the performance.

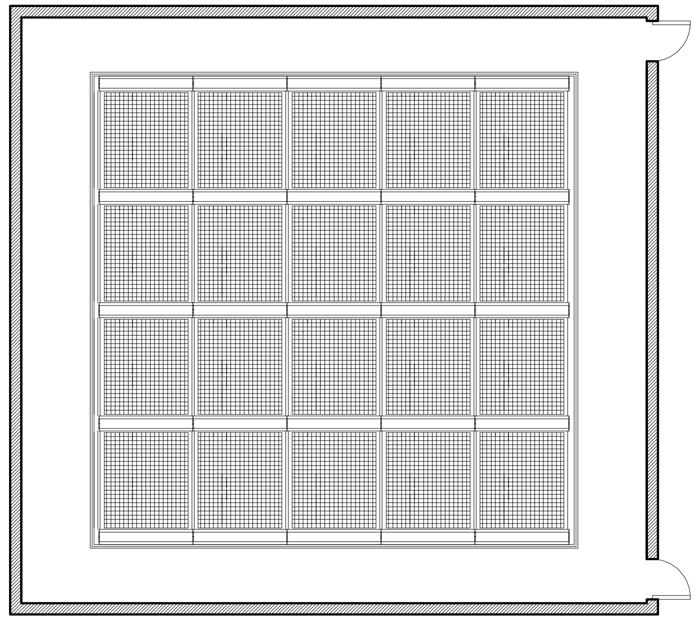
The following figures Figure 17 Small Venue – End Stage Plans and Figure 18 Small Venue – Flat Floor Plans include drawings of two possible configurations for the Small Venue.

Small Venue | Drawing Set

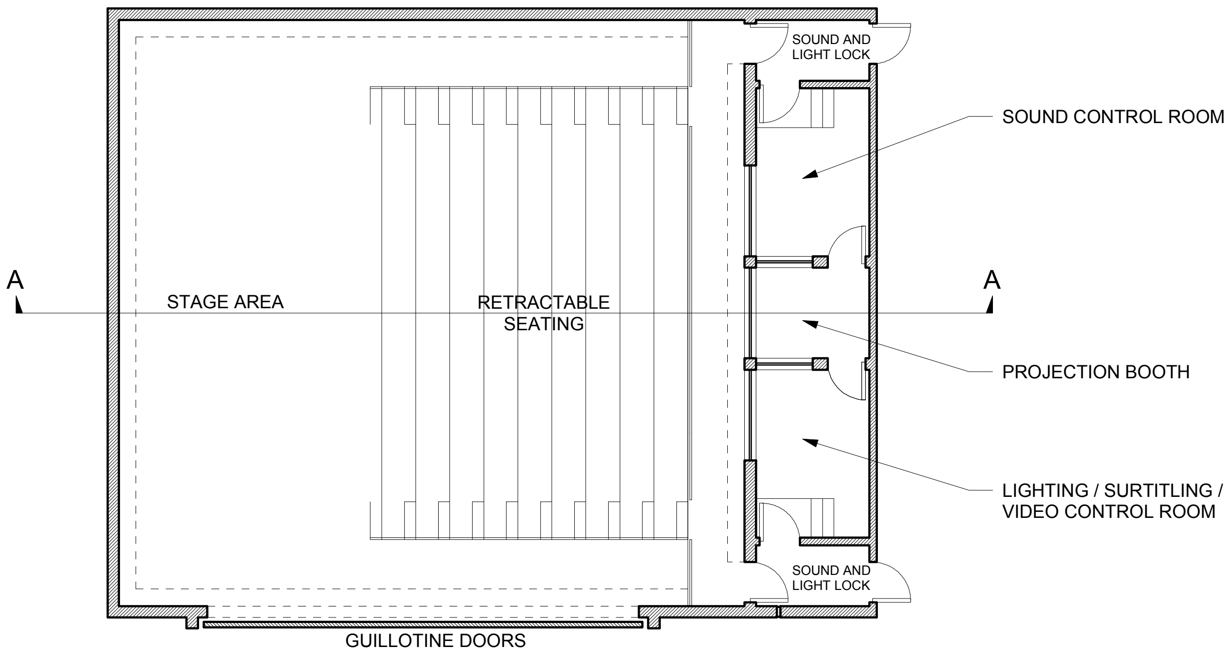
Fig 9. **Small Venue | End Stage Configuration**



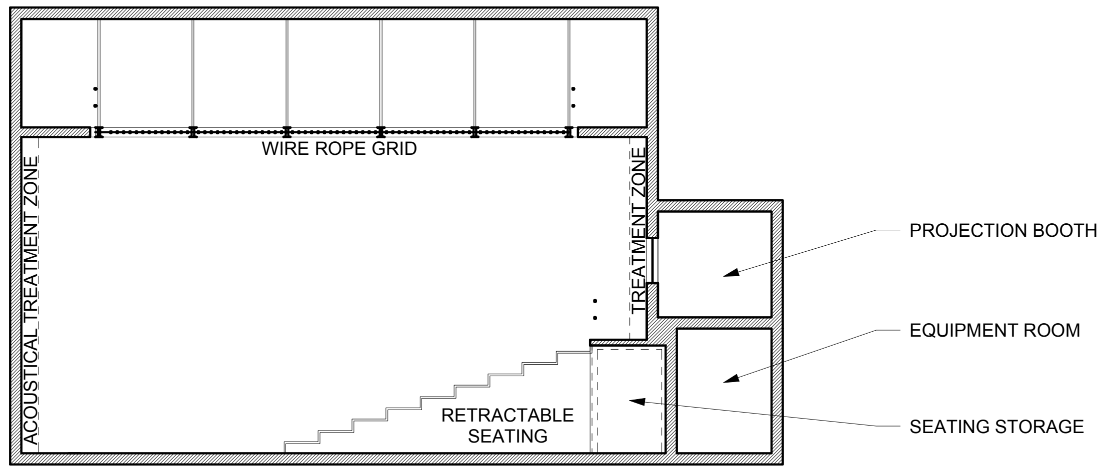
STAGE LEVEL PLAN



WIRE ROPE GRID PLAN



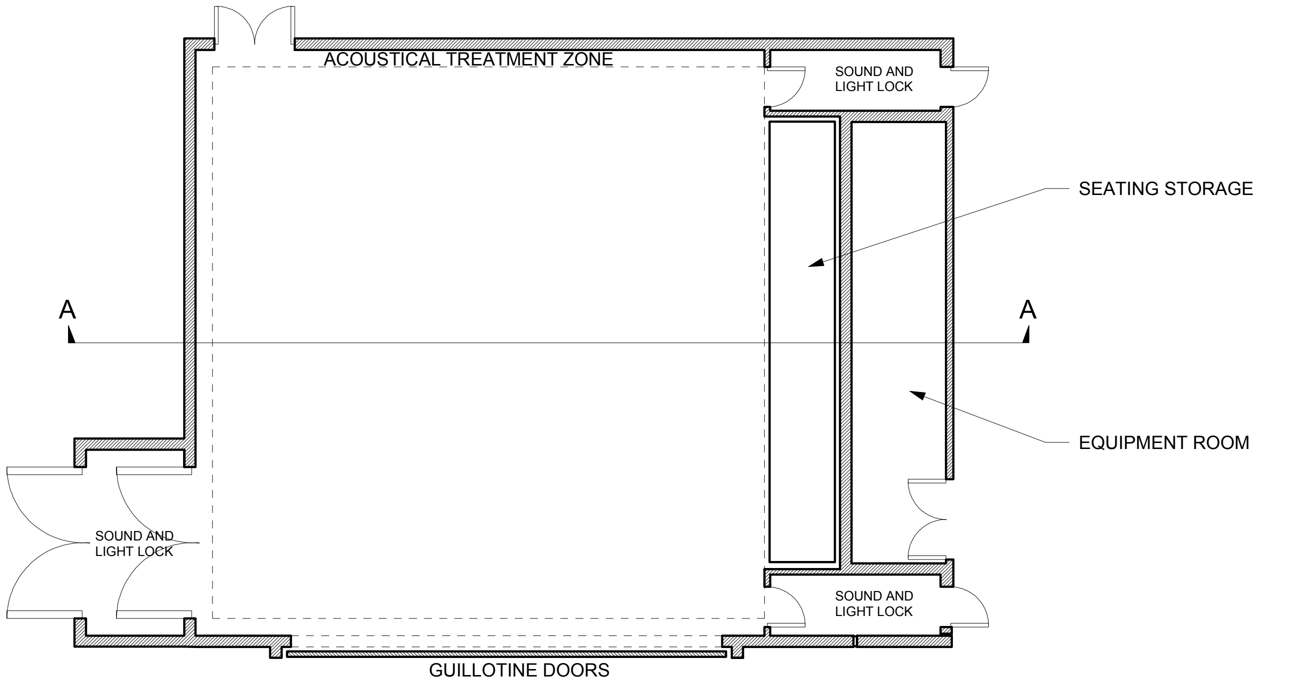
SECOND LEVEL PLAN



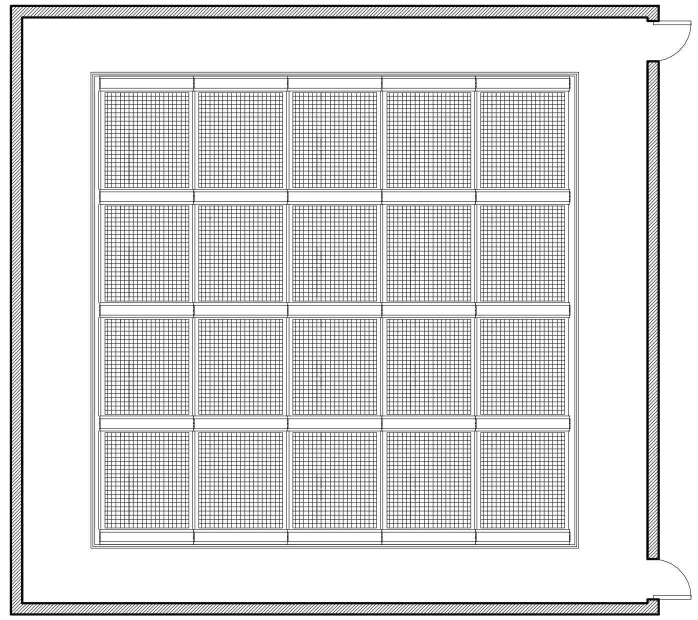
SECTION A-A

Small Venue | Flat Floor Configuration

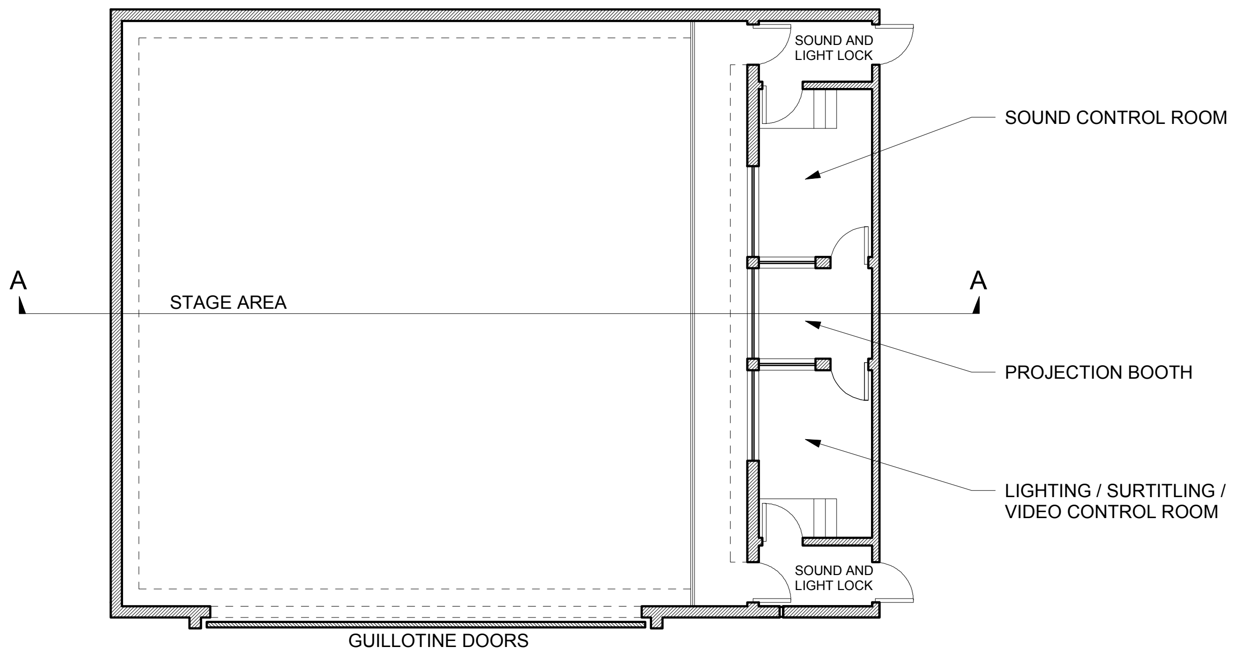
Fig 10.



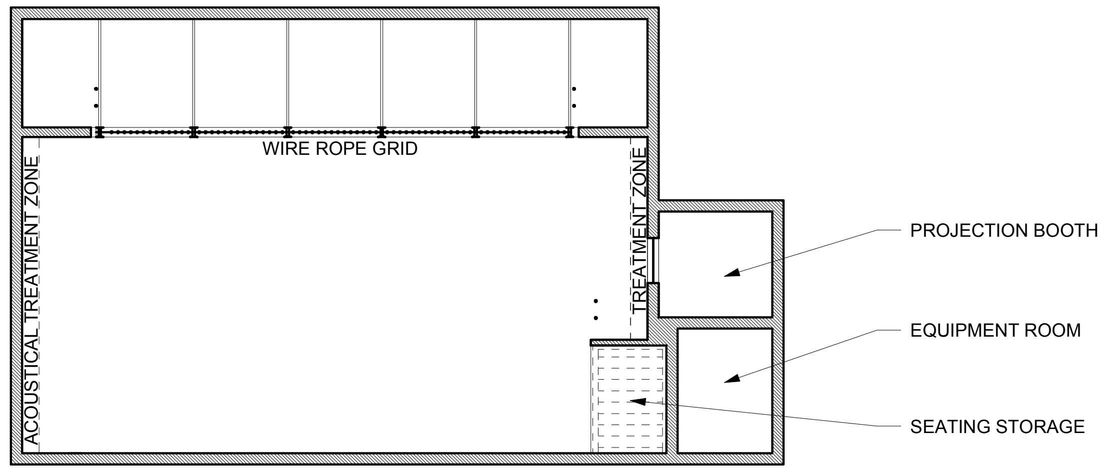
STAGE LEVEL PLAN



WIRE ROPE GRID PLAN



SECOND LEVEL PLAN



SECTION A-A

New Theatre Lucerne

Feasibility Analysis | **Volume II**

ARUP

Site Analysis | **Chapter 1**

ARUP

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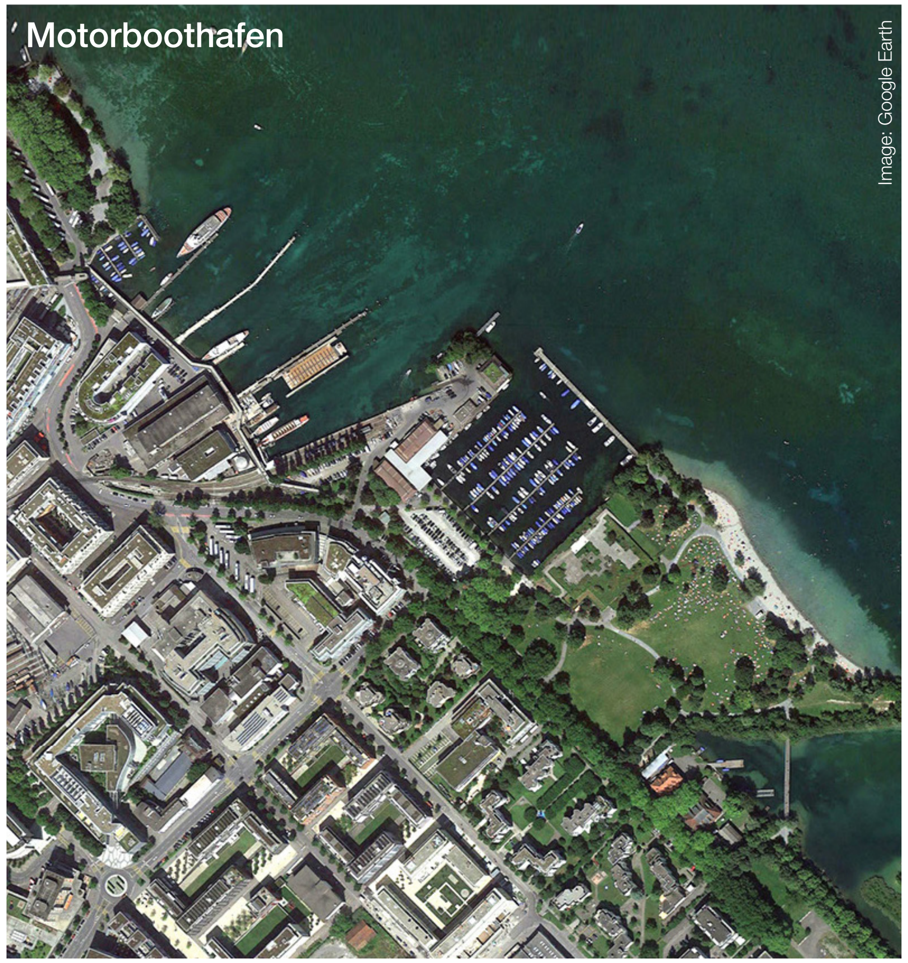
Theaterplatz
Image: Google Earth


Inseli
Image: Google Earth


Motorboothafen
Image: Google Earth

1 | Introduction

As part of the Strategic Planning and Feasibility Study, Arup has carried out a Site Analysis for three available sites for the New Theatre Lucerne: Theaterplatz, which houses the existing theatre in Lucerne; Inseli Park, a park in close proximity to the train station and the Kultur- und Kongresszentrum (KKL); and Motorboothafen, the furthest from the city centre, located next to Ufschötti Park.

The Site Analysis encompasses a review of the site locations; a Massing Study, which tests the volume of the New Theatre as defined in the Technical Concept (Volume I) on each site; and a Site Assessment in which each site is assessed against a set of defined evaluation criteria in correlation with the Concept Framework. Arup has assessed the three available sites for their ability to accommodate the spaces defined in the Technical Concept and to respond to the technical and experiential requirements of the Concept Framework.


Image: CC Oschti @ German Language Wikipedia

2 | Location

2.1 Lucerne

Natural and man-made assets in Lucerne together form a unique landscape.

The city is located in the middle of a valley, where the Reuss River flows into Lake Lucerne. The relationship with water characterizes the urban form and the image of the city.

A bridge over the river is first mentioned in texts from 1168, and it is from 1333 on that we see the first records of the construction of the now famous Chapel Bridge. On historic drawings from the 17th century, the city is shown on both sides of the Reuss River with the connecting bridge between them.

The city expanded between 1800 and 1900, enlarging the urban area and benefiting from improved railway connections. The first major expansion is the area currently called Neustadt (New Town), the area to the west of the railway.

At the end of the 20th century, the city's image changed significantly, first with the renovation of the railway station and then with the construction of the KKL along with the design of a pedestrian area along the lakeshore. These projects were designed by two globally renowned architects: Santiago Calatrava and Jean Nouvel, respectively.

2.2 Location and Experience

The success of the New Theatre Lucerne will be highly connected to the selection of the site.

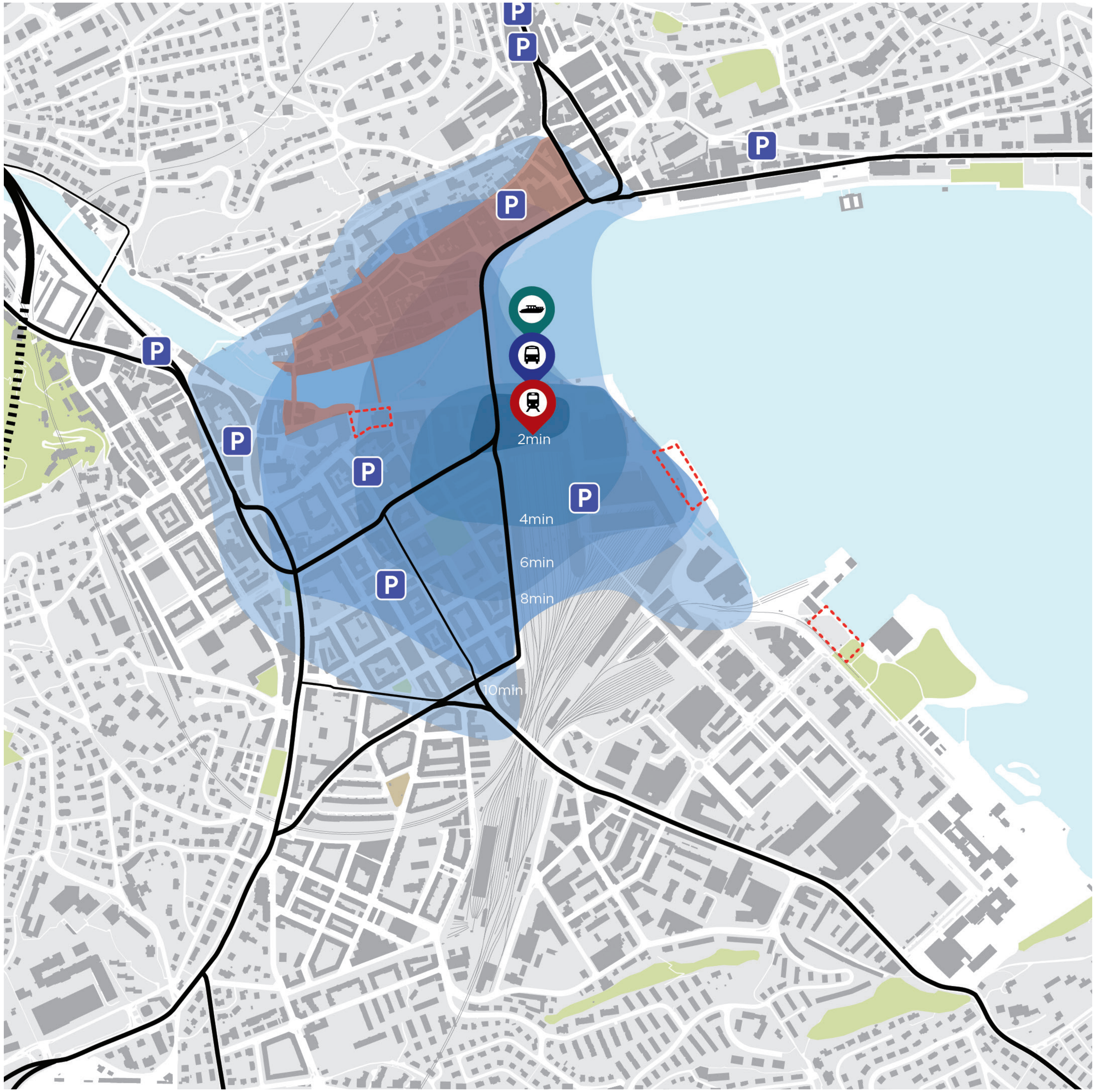
For the community of Lucerne, a theatre is a focal point — a gathering place — and should form a centre of gravity within the urban landscape consistent with the high importance of culture to the people of Lucerne.

The current Luzerner Theater (located at Theaterplatz) is well situated, embedded in the historic urban environment. Its location adjacent to an open square and opposite the Jesuit Church represents both an urban focal point and a social and urban typology that resonates well in the community.

For international visitors, culture is a major part of their experience of the city. The Lucerne Festival, which has been in continuous operation since 1938, draws audiences each year from across the country and internationally, and is recognised as one of the premier music festivals in the world.

The international visitor's experience is a collage of historic charm, beautiful natural landscape, gastronomy, quiet pedestrian experience, boutique shopping, modern architecture and exceptional cultural experiences.

For most visitors, the train station is the gateway to the city.



2.3 Three Sites

The City and Canton of Lucerne have identified three potential sites to be assessed for the New Theatre:

2.3.1	Theaterplatz
2.3.2	Inseli
2.3.3	Motorboothafen

2.3.1 Theaterplatz | Character

Theaterplatz is located in the historic part of the Lucerne city centre along the embankment of picturesque Reuss River. It comprises the existing theatre building and an open space to the west of the building.

The riverfront is composed of a continuous street front. Theaterplatz is one of the few open spaces along the river bank and therefore plays a significant urban role within the landscape. It is partially pedestrian, partially a green area and partially used as road access, parking area and drop-off for the theatre.

Shops, bars and restaurants are located in close proximity. The university library and a few relevant specialised stores (eg, musical-instrument makers) are also nearby.

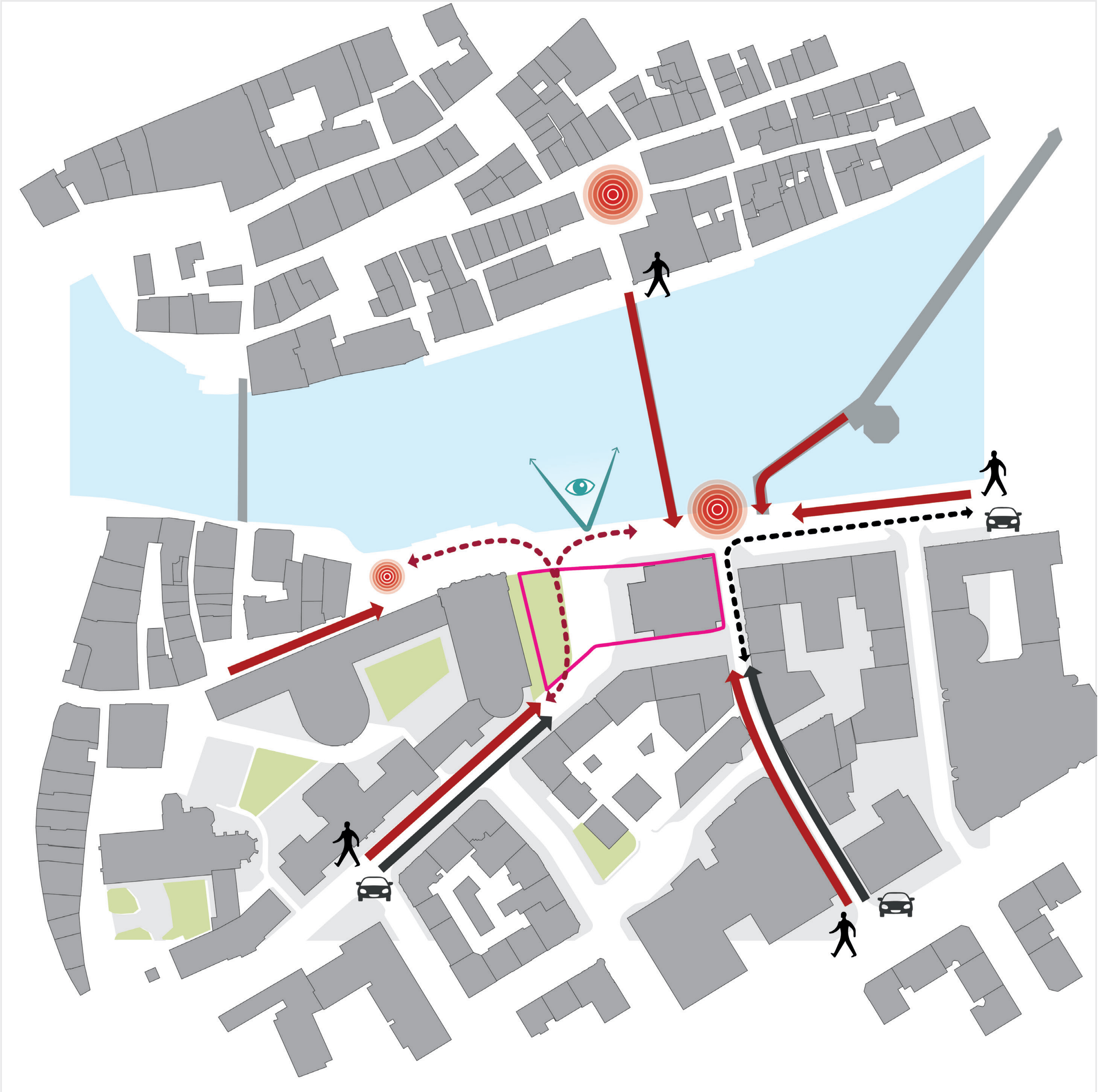
The area is well connected with the historic centre of Lucerne on the other side of the river through three pedestrian bridges.

2.3.1 Theaterplatz | Site

Theaterplatz is a trapezoidal area of approximately 2,700m², located next to the Jesuit Church of Lucerne.

The plot has a tight shape, which extends in the east–west direction, facing the Reuss River in front of the pedestrian bridges connecting to the historic city centre.

Currently, the site is partially occupied by the existing Luzerner Theater building.



Pedestrian Flows

Road Access

Connection

Visual

Site

Centre of Gravity

2.3.2 Inseli | Character

Located in immediate proximity to the KKL, a university facility and the railway station, Inseli is a historic public park. The park area is the outer part of the site towards the lake, whereas the part closer to the street is composed of a tour bus parking lot on reclaimed land.

Inseli is periodically used for outdoor cultural functions including audio and video projections of performances from the KKL. Inseli, as a community recreational area, holds emotional and historic significance for the people of Lucerne.

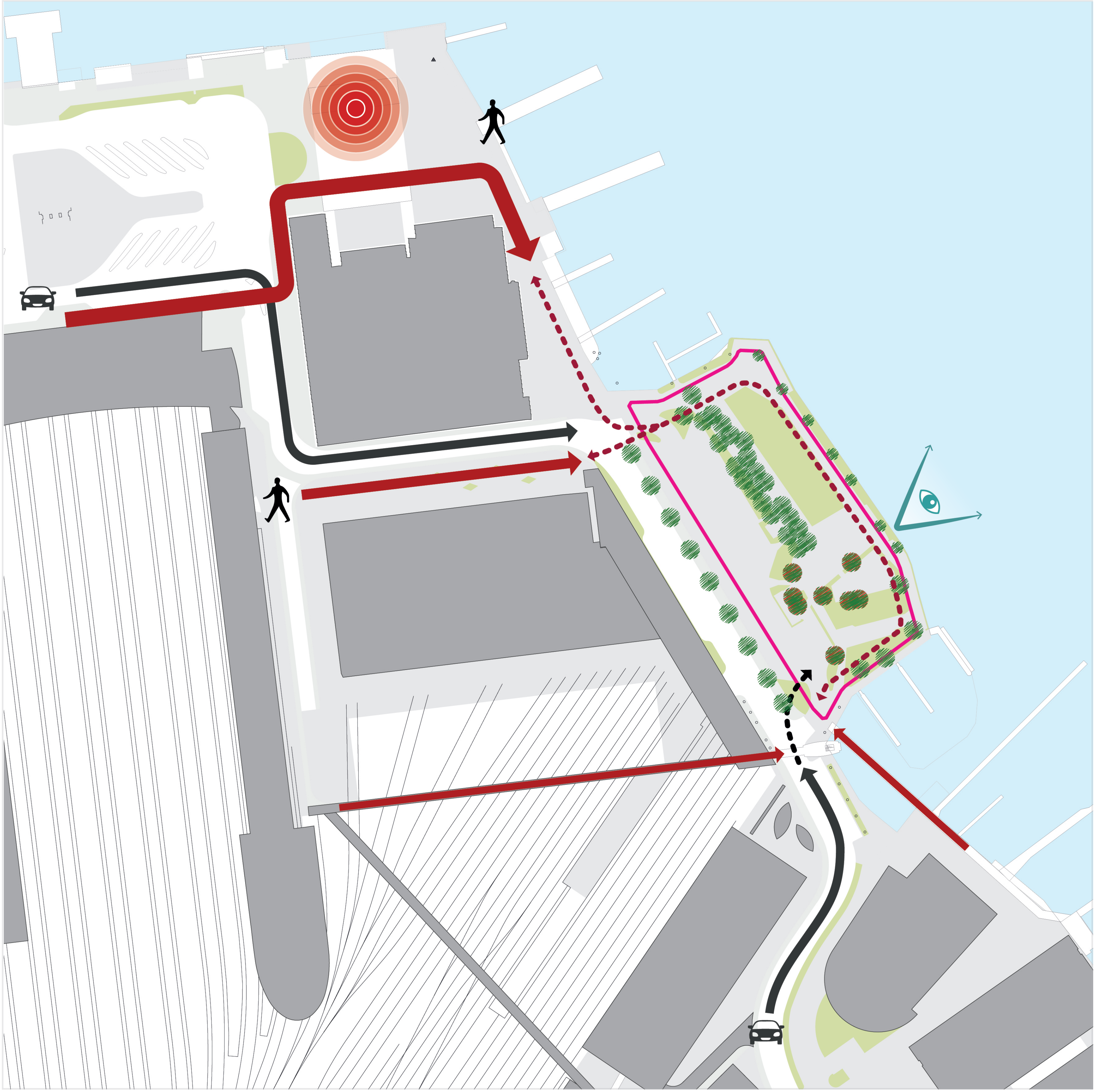
The site offers little additional attractions (retail or restaurant) aside from those offered by the KKL and seasonal outlets in the park itself.

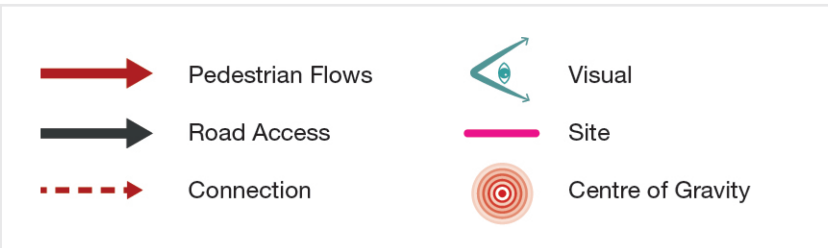
2.3.2 Inseli | Site

Inseli is a rectangular area of approximately 9,300m², located next to a University of Lucerne building and the KKL.

The plot extends along the north-west–south-east axis and has direct access to the lake on three sides.

Currently, the plot is partially occupied by a bus parking lot, while the rest of the area is an empty grass lawn with lines of trees.





2.3.3 Motorboothafen | Character

Motorboothafen is located at the western entrance of Ufschötti Park, a public park of 4.5ha with a beach and a small harbour for motorboats.

While the site is remote from the historic centre of the city, the park is an attraction for the citizens of Lucerne in the summer. It is surrounded by a residential neighbourhood, with few retail amenities.

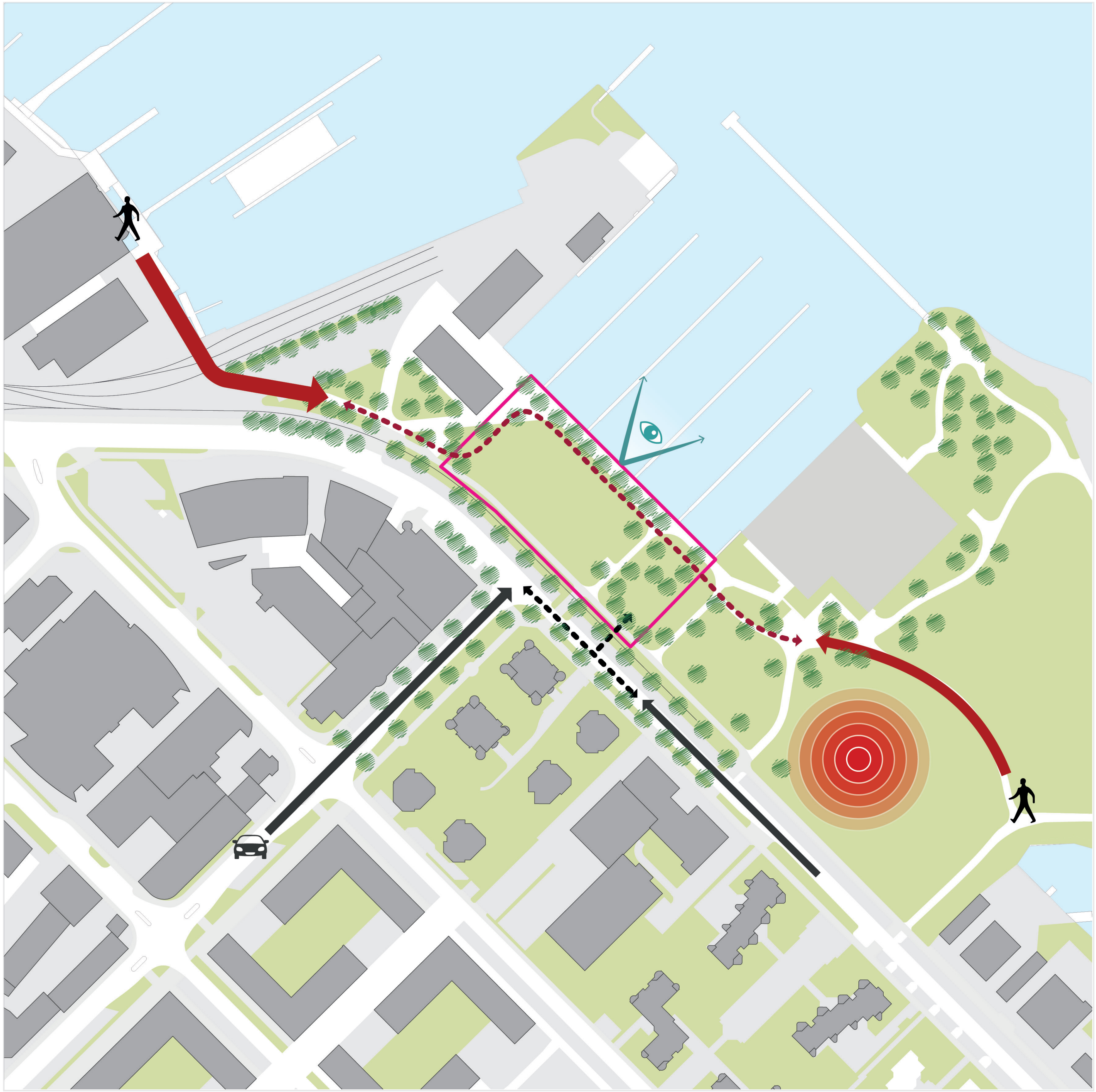
Currently, the site is used as a parking lot for the park and for the harbour. It is adjacent to a commercial-shipping-industry-related development.

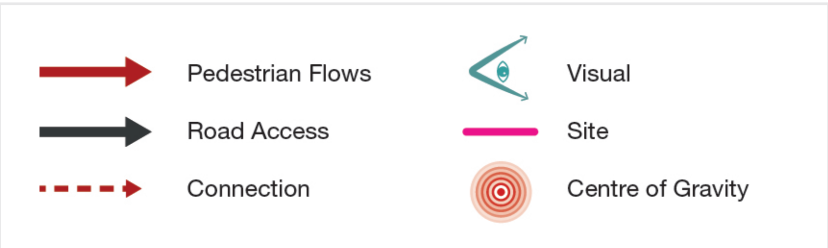
2.3.3 Motorboothafen | Site

Motorboothafen is a rectangular area of approximately 5,900m², located next to the marina port.

The plot extends along the north-west–south-east axis. While the site faces the lake, it offers no direct access to the water as the right-of-way must be preserved for the marina.

Currently, the plot is partially occupied by a parking lot. The rest of the area is a grass lawn connecting to Ufschötti Park.





3 | Massing Study

3.1 Approach and Methodology

Arup carried out a Massing Study to test the volume of the New Theatre on each of the available sites. The objective of this study was to develop a massing solution which meets a defined set of technical and operational requirements on each of the three available sites.

The Massing Study underwent a phased approach. Initially, a site-independent space analysis was carried out based on the concept for the Large Venue, the agreed room list and its areas, proportions, adjacencies and flows. An ideal compact massing was then developed as a benchmark, meeting all the technical and operational requirements of the Concept Framework. In a third step, a site-specific evaluation was carried out, testing the ideal massing on each of the sites and evaluating required modifications.

The site-specific evaluation was then presented to and assessed in two workshops with a selected committee of City officials to select a site which can accommodate the New Theatre within the given system of urban and city planning boundaries.

3.2 | Space Analysis

3.2 Space Analysis

In this section, the spaces defined in the Technical Concept, specifically the Schedule of Accommodations (Volume I, Chapter 1, Appendix C) are analysed in regards to their gross areas, their functionalities and their required adjacencies with other areas.

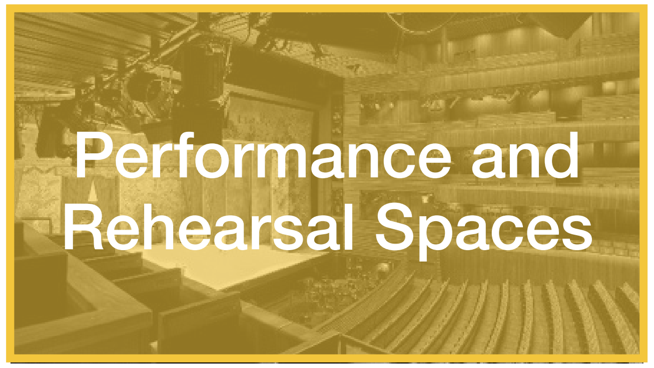
3.2.1 Schedule of Accommodations

This Massing Study is based on the Schedule of Accommodations approved by SMF and responsible representatives of the City of Lucerne on 19 May 2015. Whereas the final massing is smaller in area and footprint (see Volume I, Chapter 1, Appendix C), Arup has analysed this for relative impact on the site recommendation and concluded that this change has no impact on the outcome of the site evaluation.

For the purposes of the site massing, the total gross areas were used, interpreting how they are assigned to functional blocks.

The breakdown of areas includes the gross areas for each functional area, the gross estimated area of the mechanical and electrical services, and an area allowance for audience and staff circulation.

#	Main Function	Gross Area (m^2)
1.0	Exterior of Building	N/A
2.0	Foyer / Arrival Area	1,818
3.0	Large Venue	2,899
4.0	Small Venue	417
5.0	Large Venue Technical Support	501
6.0	Large Venue Storage	697
7.0	Studios	202
8.0	Artist Support Spaces	1,237
9.0	Venue Management	168
10.0	Technical Offices and Staff Support	365
11.0	Workshop Spaces	338
12.0	Make-up and Wig Workshop and Laundry	244
13.0	Artist / Staff Entrance	46
14.0	Loading Dock and Receiving	280
15.0	Building Operations	169
16.0	Circulation	4,920
17.0	Mechanical and Electrical Services	1,480

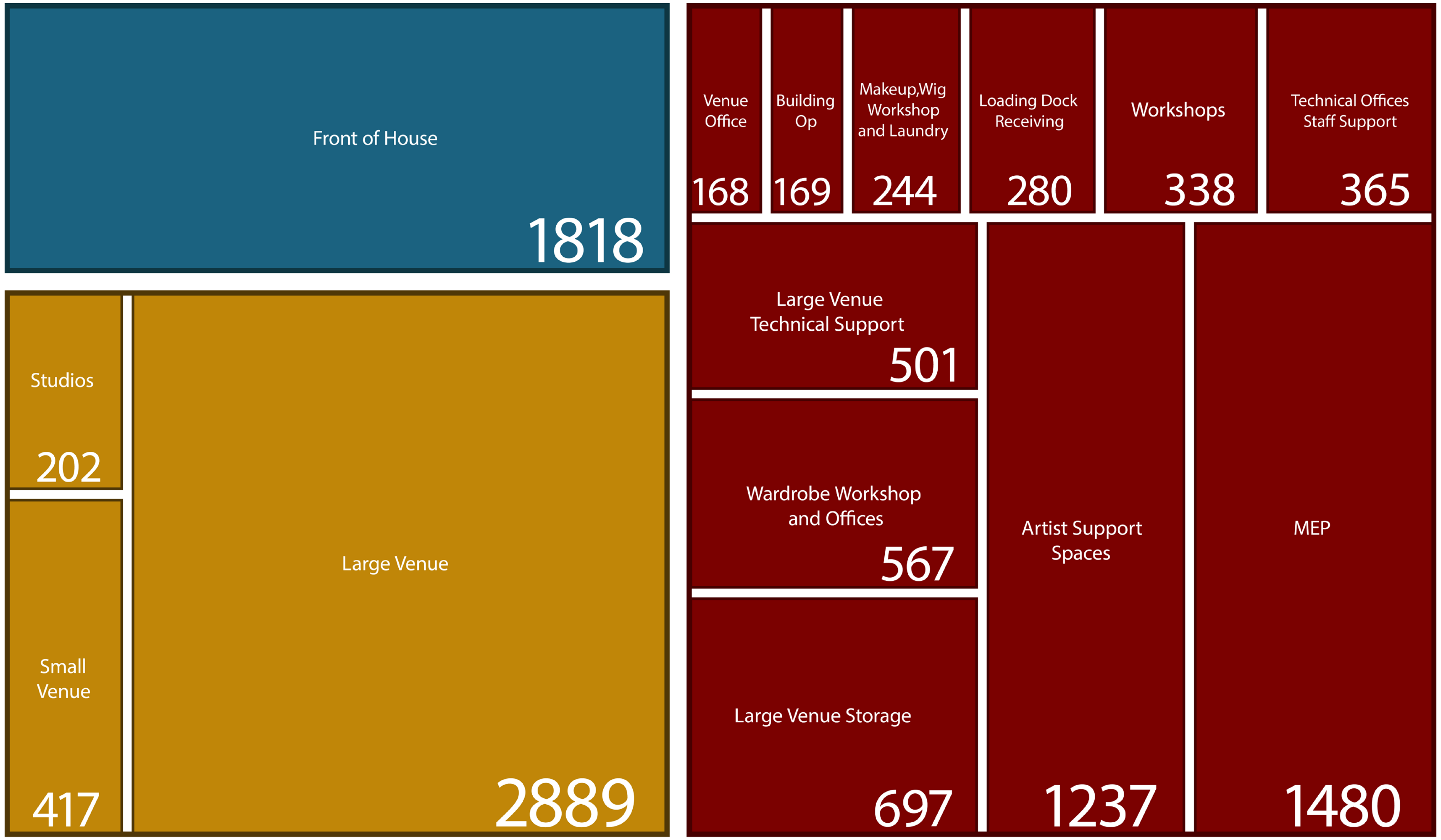


3.2.2 Main Component Proportions

This diagram shows the approximate proportions of the main facility components in relation to their gross floor area in the Schedule of Accommodations: Front of House, Performance and Rehearsal Spaces and Back of House.

The Back of House spaces occupy approximately half of the total area and the same amount as the Front of House and Performance and Rehearsal Spaces together.

For the purpose of this diagram, circulation areas are not taken into account.



Note: The diagram on the right displays the Schedule of Accommodations used for the Massing Study.

For the calculation of the total project costs, the final Schedule of Accommodations (see Volume I, Appendix C) was used.

3.2.3 Main Components General Adjacency

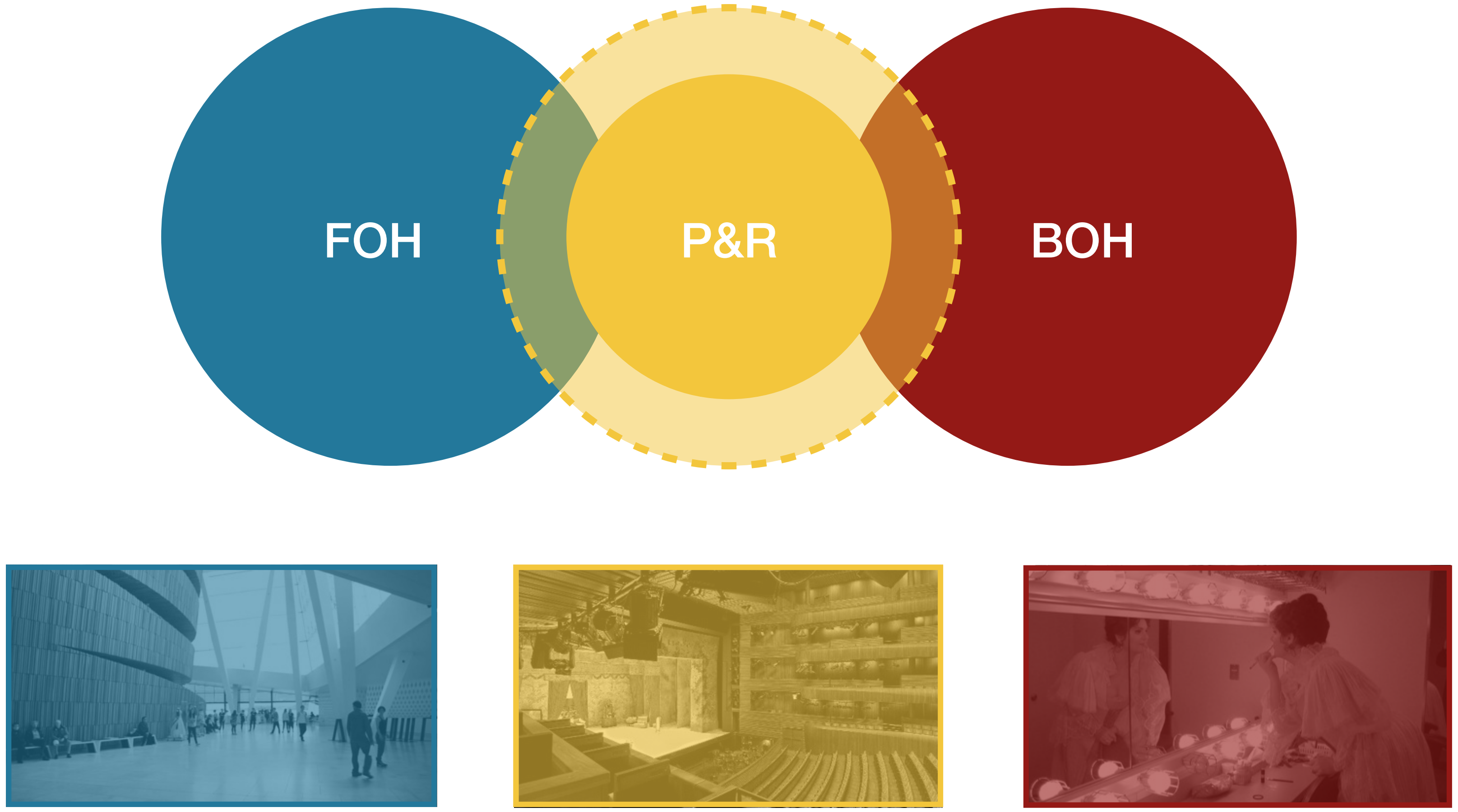
Throughout this chapter, the following colour scheme is used to represent the three main components of the Facility:

- Front of House (FOH)
- Performance and Rehearsal Spaces (P&R)
- Back of House (BOH)

In their adjacency, the Performance and Rehearsal Spaces are considered to be the theatre's heart and hub where audience and performers interact.

A large amount of circulation surrounds the Performance and Rehearsal Spaces, in order to meet the demand of audience and Back of House flows in, out and around the performance spaces.

Front of House and Back of House constitute two opposite poles on each side of the Performance and Rehearsal Spaces, each with their own entrances and distribution systems.



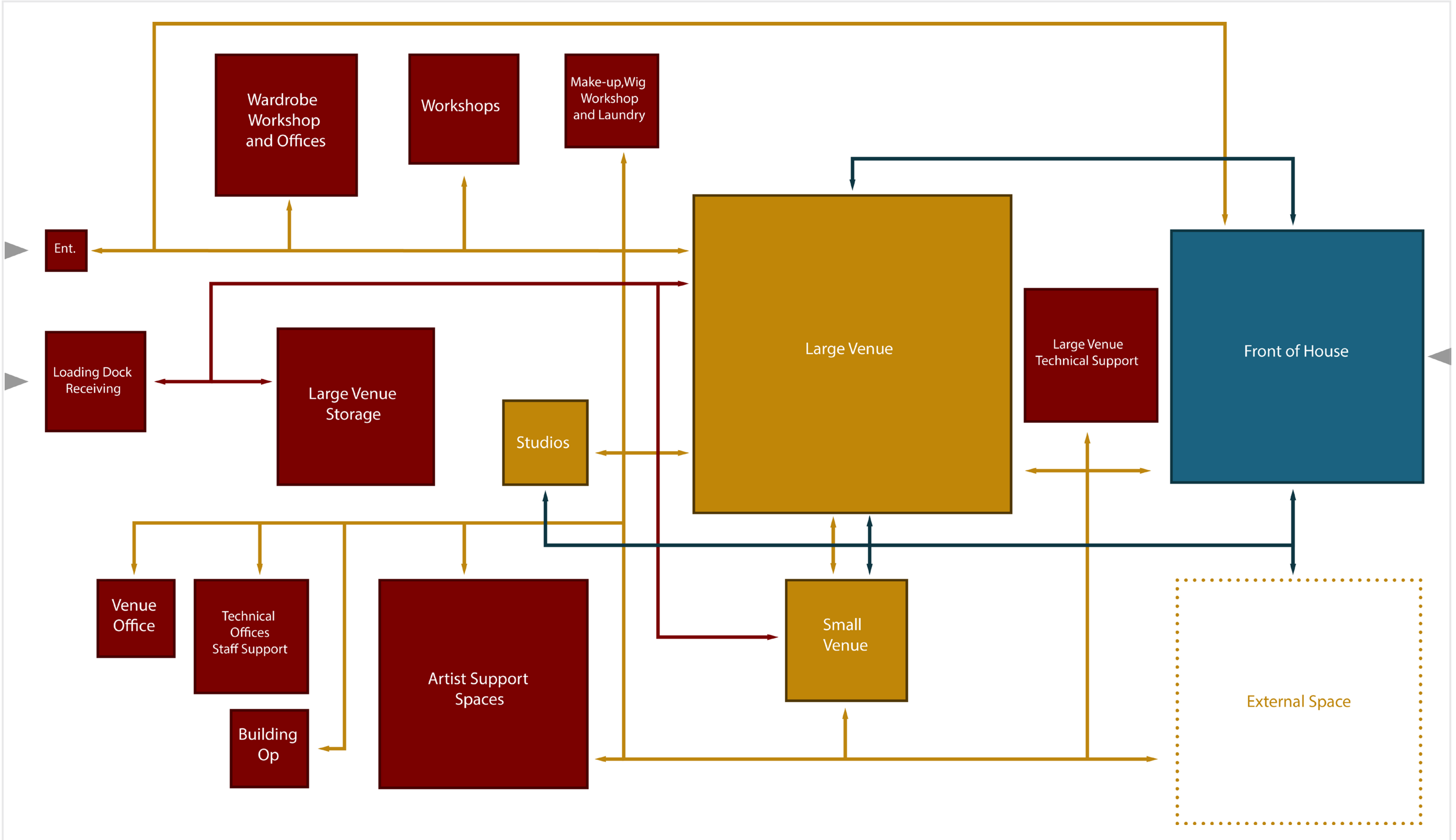
3.2.4 Adjacency and Flows

This diagram illustrates the flows and adjacencies between the functions within the three main components represented herein.

The audience accesses from the Front of House, from which easy intuitive access to all three Venues is granted. Direct access and visual relationship between the Front of House and external spaces is also a requirement.

Back of House areas have distinct access for artists, staff and goods, with a dedicated loading dock.

The Large Venue is located centrally and has direct connection with the Small Venue on the side. The Studios are also located in a position that allows for easy access to and from the Back of House.



3.3 | Ideal Massing

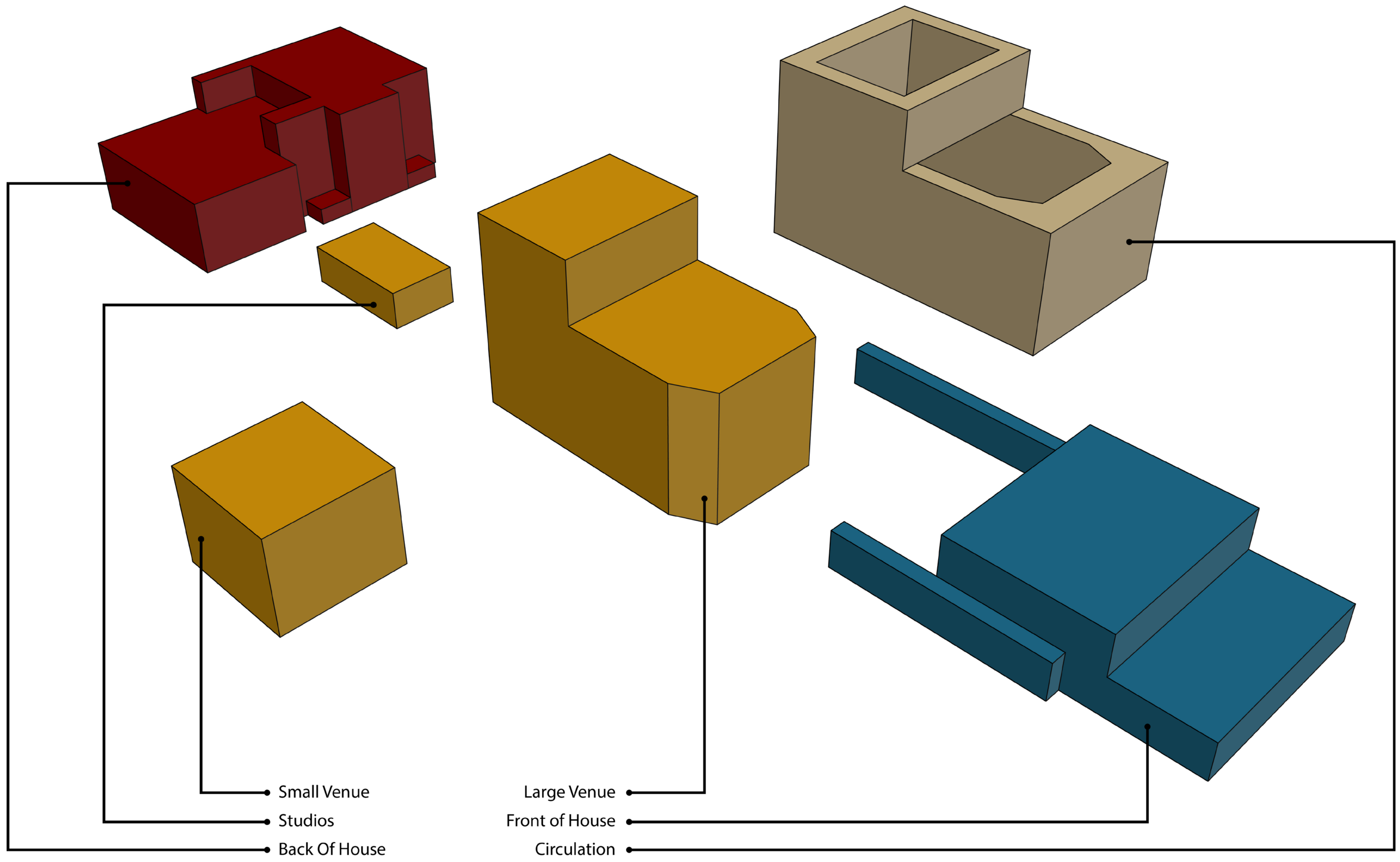
3.3 Ideal Massing

In this section an ideal massing solution is developed based on the spaces and adjacencies defined in Section 3.2. The ideal massing is developed independently of a site and will form the basis for the site-specific massing in Section 3.4.

3.3.1 Massing Components

The main functional components described in their gross area and adjacency in Section 3.2 are defined further in this section in volumetric terms based on their technical and operational requirements, taking into account vertical circulation and adjacency for each of the functions.

The volumetric components developed represent the technically optimal size and shape for each of the functions.

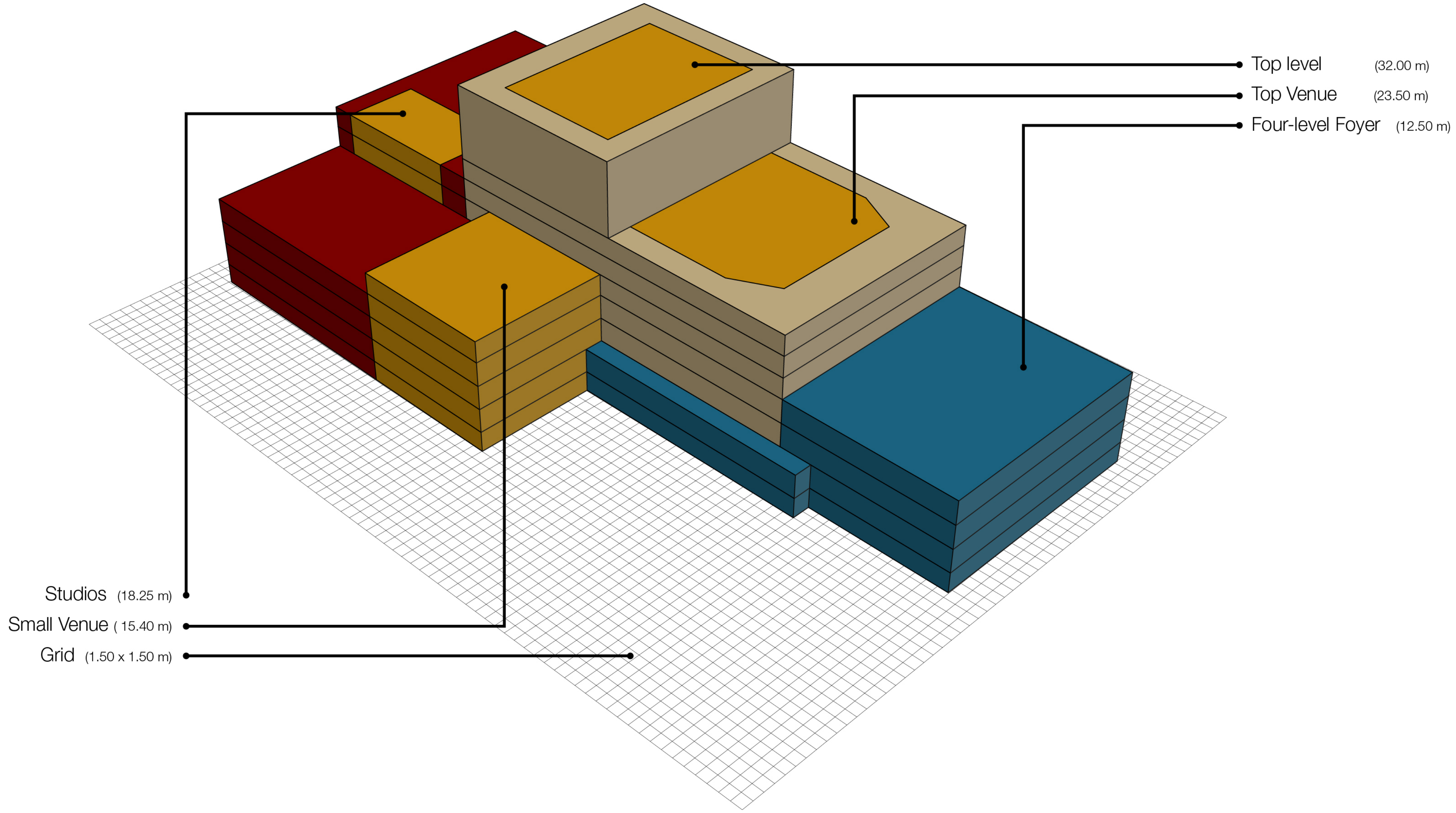


3.3.2 Ideal Massing

The volumetric components fit together and form an ideal compact massing, which meets the requirements of the Concept Framework both in terms of size and operational efficiency.

This abstract ideal massing is developed without a precise site in mind but acknowledging the limited space on the potential sites and the need for a compact footprint.

The ideal massing has been tested on the three potential sites and is the starting point from which to develop bespoke solutions adapted to each of the sites.

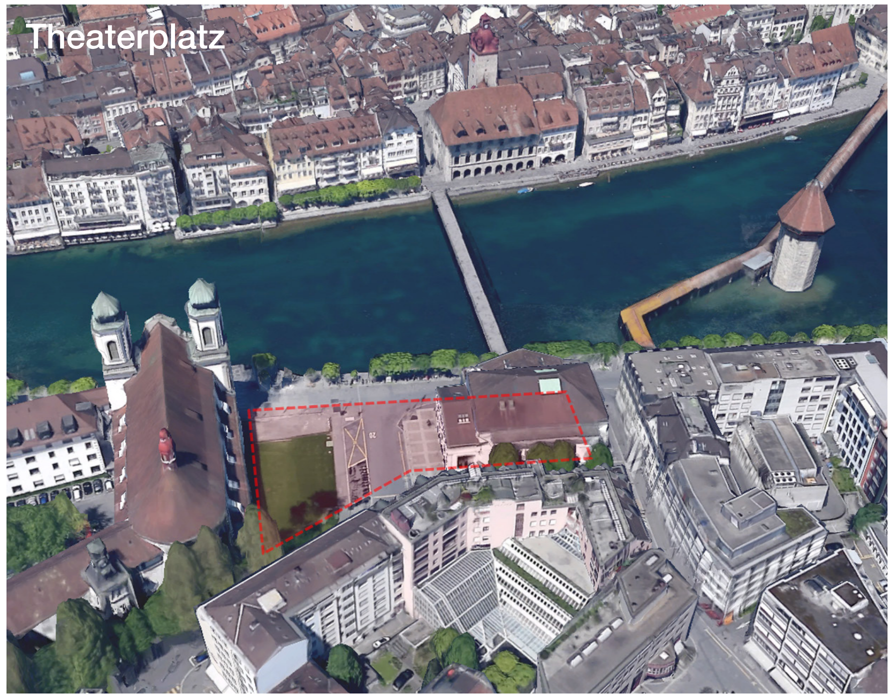


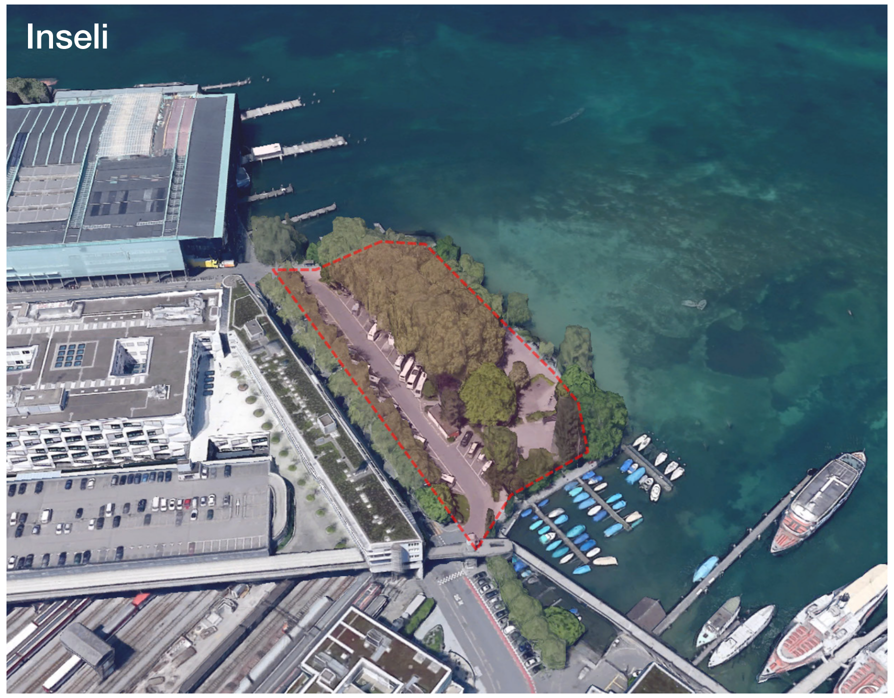
3.4 | Site Massing

3.4 Site Massing

In this section, the ideal massing developed in Section 3.3 is tested for the three available sites Theaterplatz, Inseli and Motorboothafen. For each site, multiple massing options were developed to fit the ideal massing onto the building perimeter available for each site. These massing options were then assessed with a committee of selected City and Canton officials to ensure that the proposed massing not only complies with regulatory restrictions such as building and zoning codes, but also serves its function in the community of Lucerne.

The result of Section 3.4 is a proposed massing option for each of the available sites.


Theaterplatz


Inseli


Motorboothafen

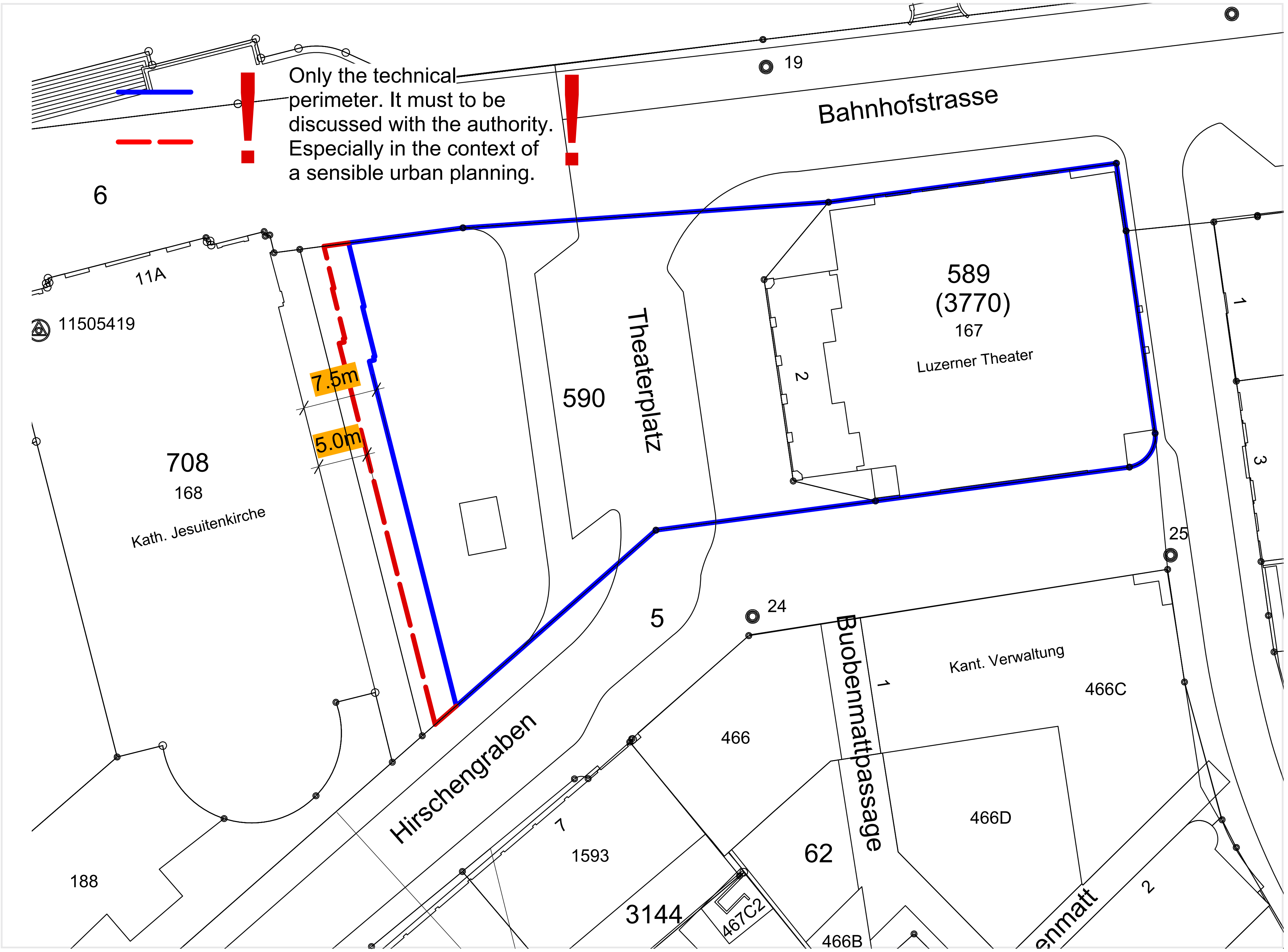
3.4.1 Theaterplatz

Image: Google Earth

Site Overview and Boundaries

The site includes the existing Luzerner Theater and fits tightly within the historical urban fabric, limited to the north by the alignment of buildings along the waterfront.

The boundary is defined by the footprint of the existing theatre on the east of the site and by the existing street alignments on the north and south. To the west, the site boundary is defined by the Lucerne Jesuit Church and by the minimum distance deemed appropriate considering the historical character of this landmark building.

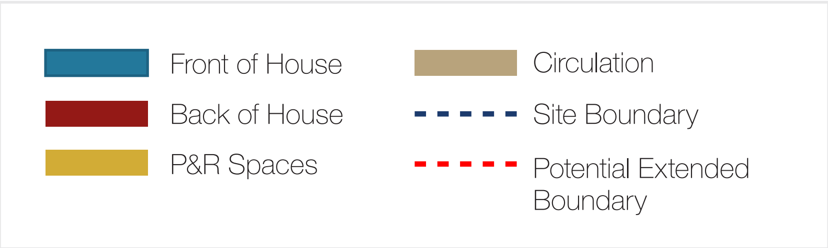


Theaterplatz

Ideal Massing Overlay

The overlay of the ideal massing footprint on the site shows that the space available is not sufficient to fit the Technical Concept as originally conceived.

Nevertheless, massing studies were developed in order to understand how much of a dimensional and operational compromise would be necessary to fit the theatre within the given boundary.



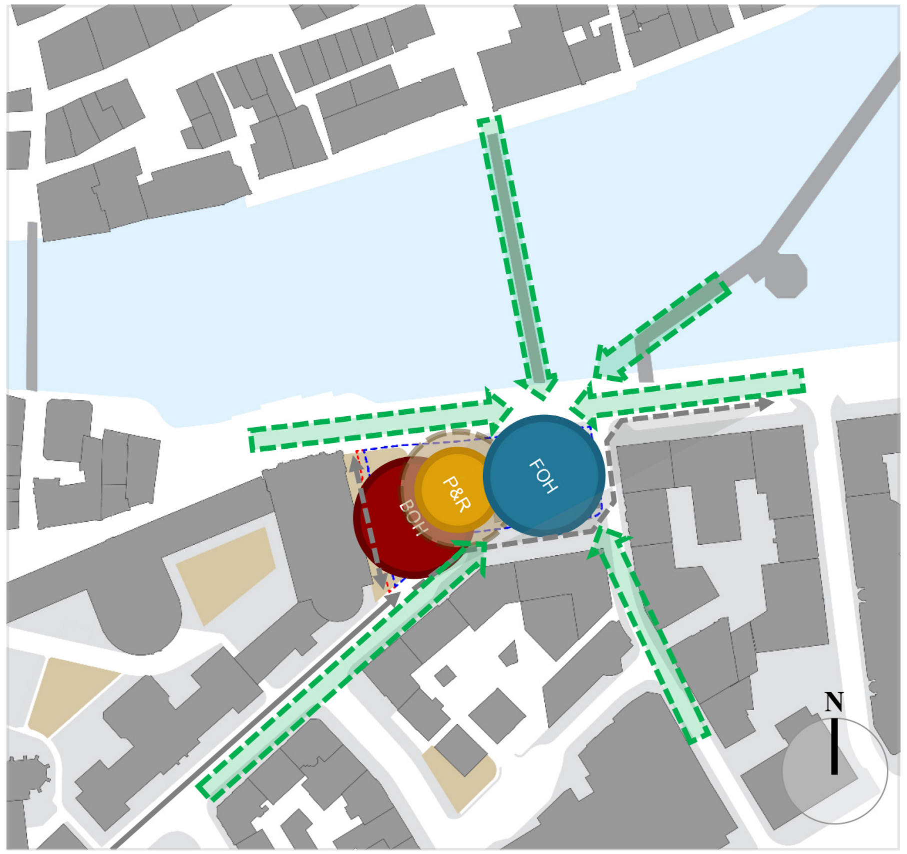
Strategic Brief Layout

A meaningful location for the Front of House areas would be possible both on the east and on the west of the site.

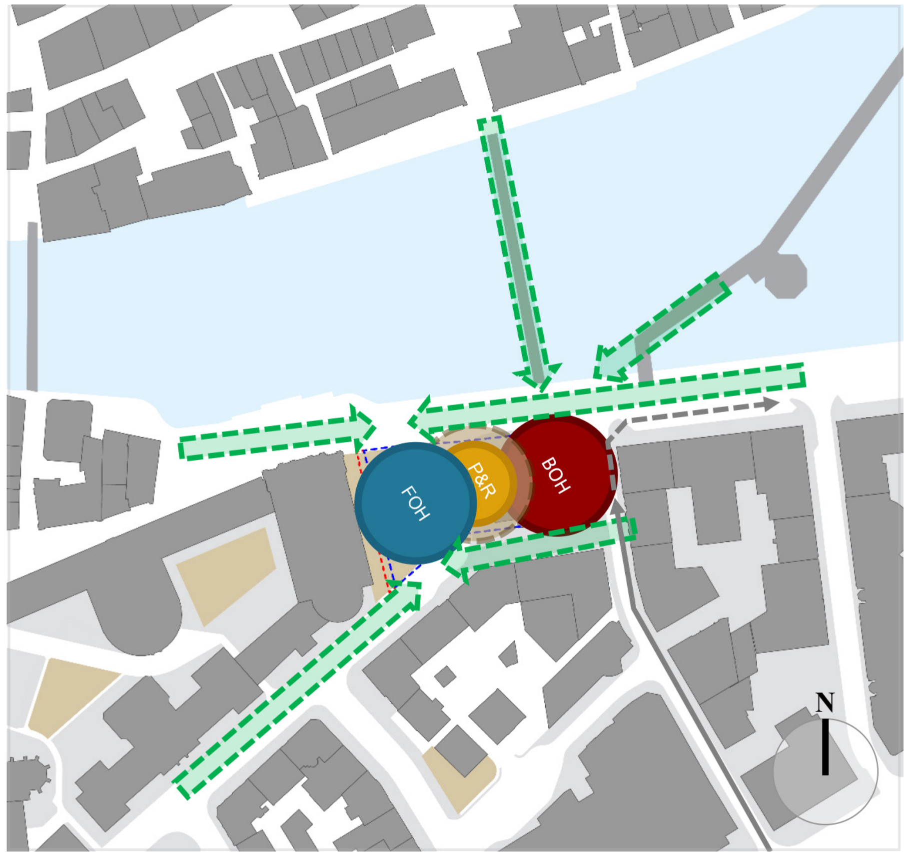
If the foyer were located on the west side, the transparent and open character of the foyer would establish a good relationship with the historical church opposite.

A Front of House area located on the east side would be conveniently facing the arrival point from the two bridges connecting with the other side of the busy historical city centre.

The location of Back of House areas proved to be more difficult due to the general lack of space and narrow streets around the site, which would limit trucks manoeuvring and parking. A loading dock located on the east side would mean severe disruption to traffic and would be limited to side loading and unloading of trucks. If located on the west side, the loading dock would work slightly better, taking advantage of the extra space, which could be created where Hirschengraben bends.



? Front of House closer to bridges' access
Back of House facing church not ideal but possible



? Front of House facing church
Back of House location difficult for loading dock

Pedestrian Access Flow to Front of House
Vehicular Access Flow to Back of House

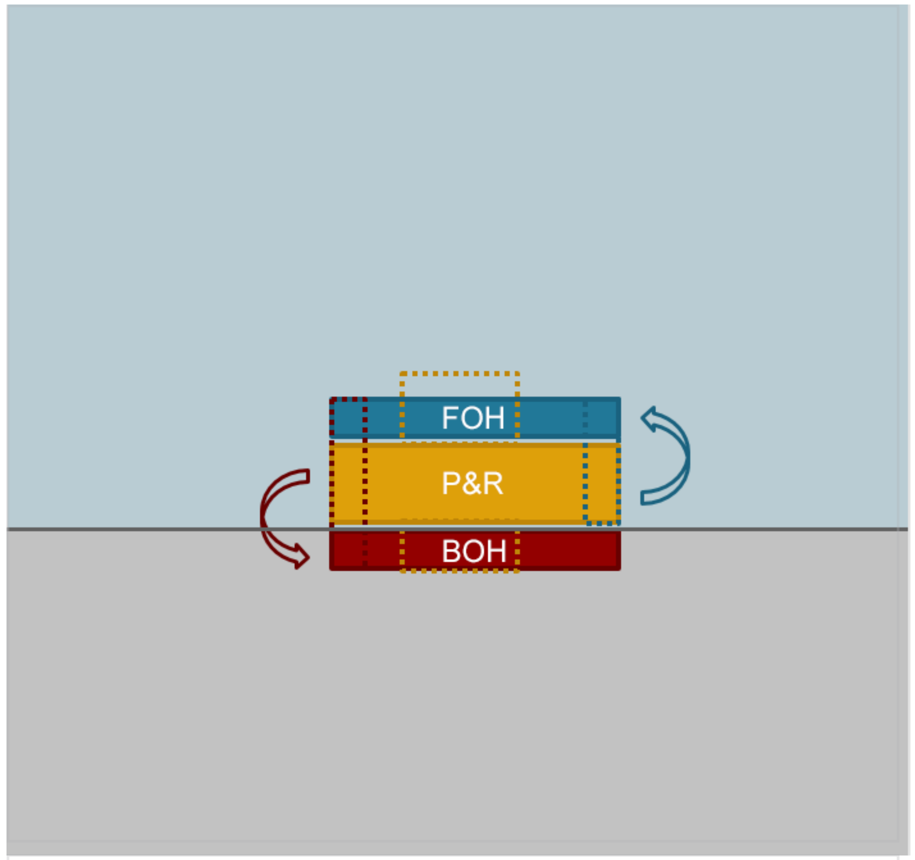
Theaterplatz

Top-Floor Foyer

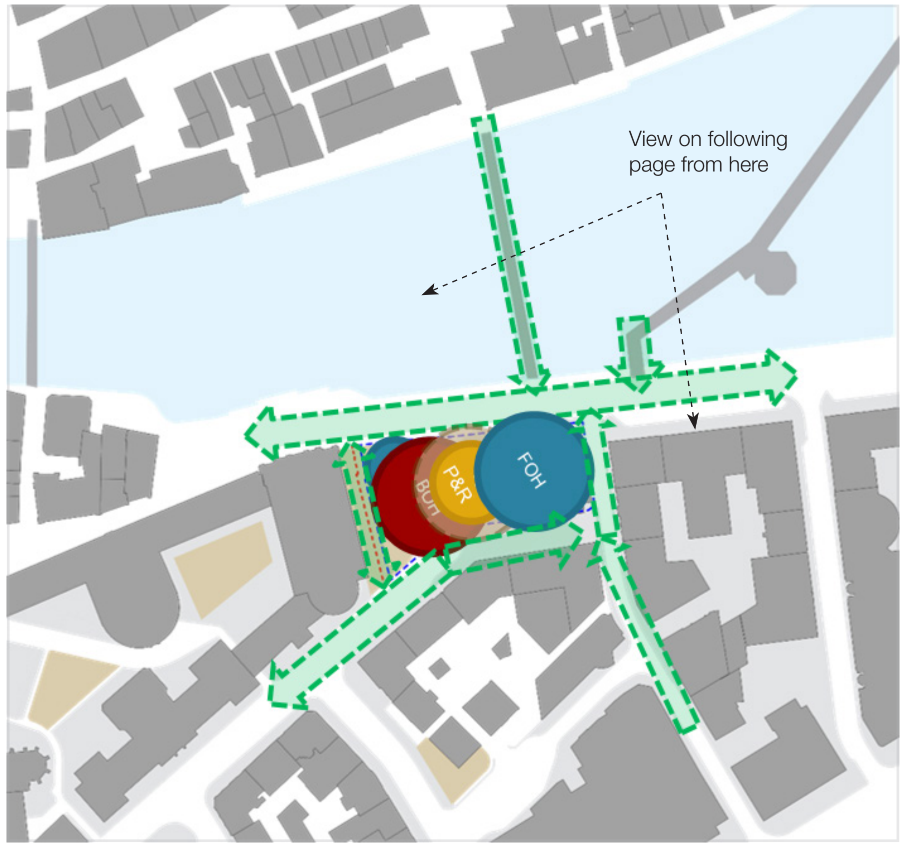
The main problem on this site is the lack of space. The area required by functions ideally located on the ground floor cannot fit within the boundaries.

Fitting the ideal massing on this site can be done only with an unconventional approach, involving greater complexity from both the operational and the experience points of view.

In the proposed solution, large areas ideally required on the ground floor would have to be located elsewhere. The foyer is located on the top floor of the building, with express lift access from the ground floor. Most of the Back of House areas are located in two basement levels, leaving just the loading dock on the ground floor and a few of the smaller spaces on the upper levels.



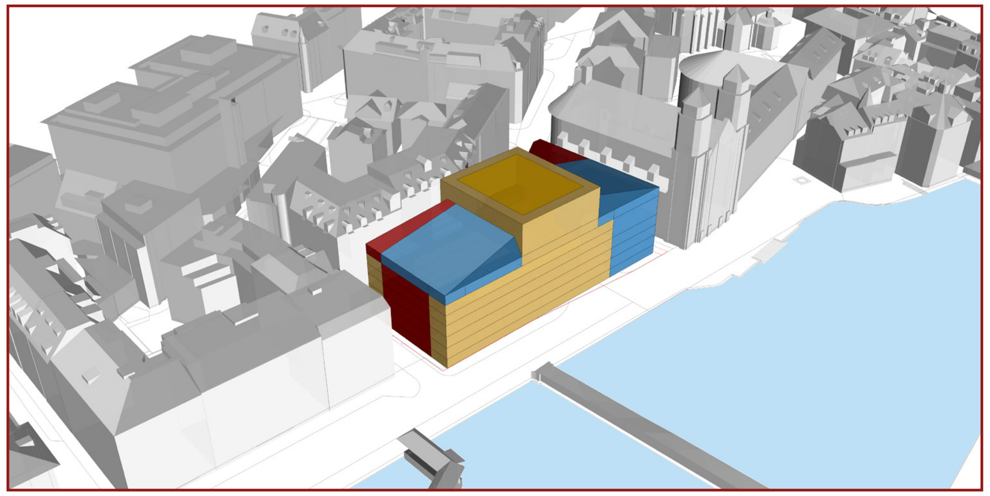
? Stacking functions in section: top-floor foyer and basement Back of House



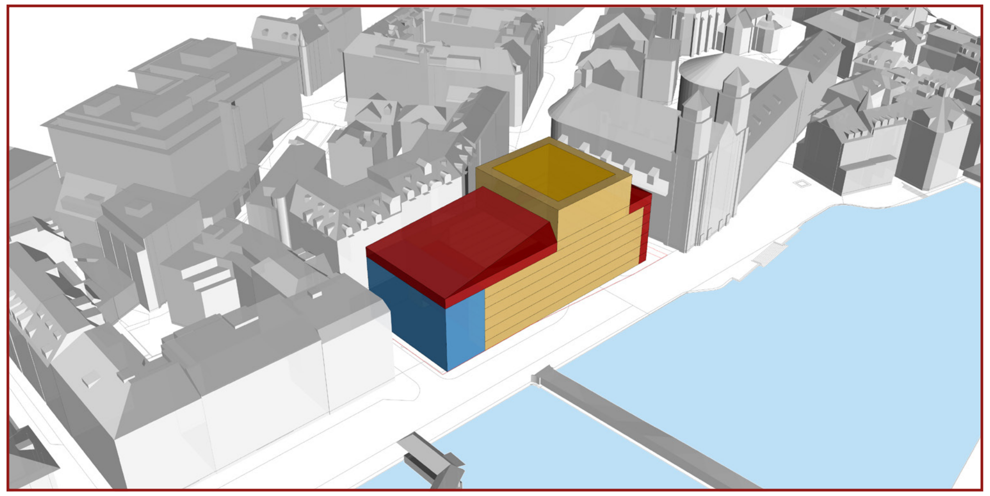
√ Top-floor foyer with express lifts and corner access Basement Back of House and rear loading dock

Initial Massing Studies

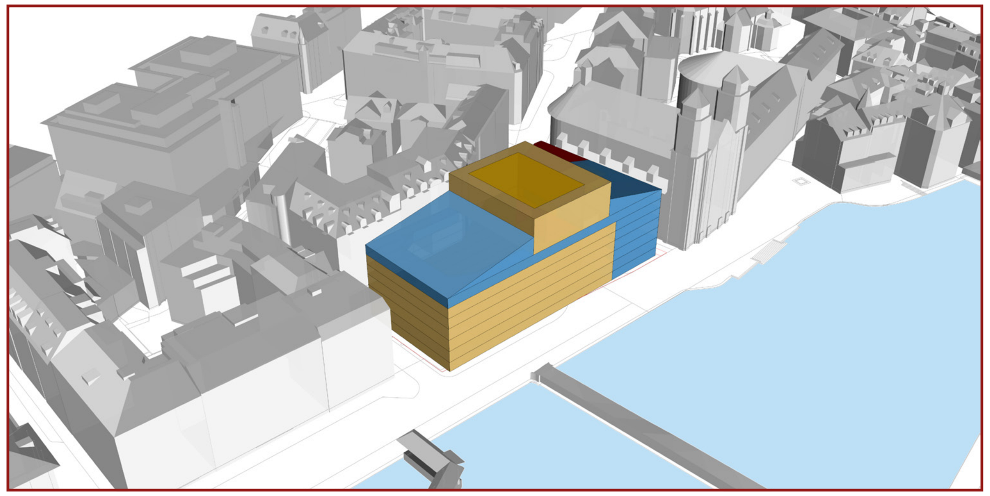
A broad range of options was considered at the outset, with alternative locations for the Front of House and Back of House areas in plan and section. Generally, Arup considered a rooftop foyer location and direct express lift access from the east, near the bridges' arrival, more successful (see the bottom right figure). These selections were developed further and are described in the following sections.



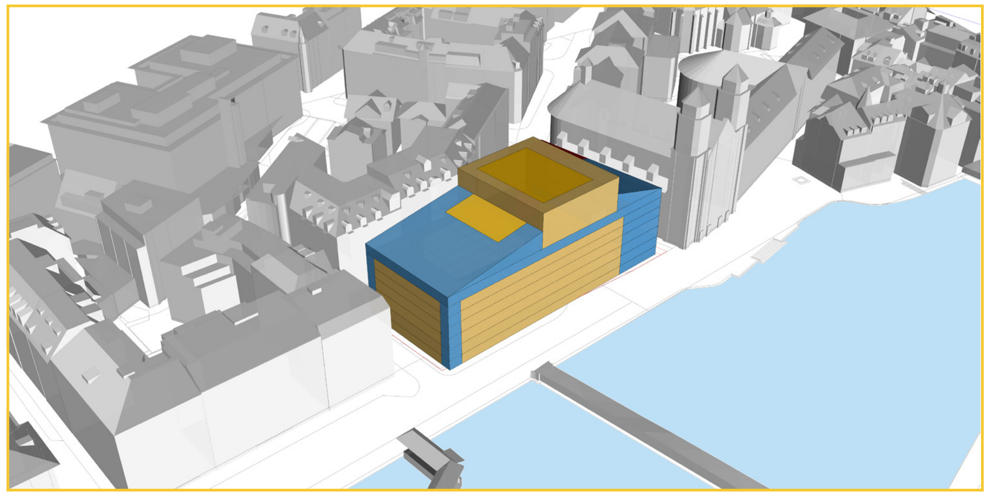
X Good relationship with church. Back of House does not work. Small Venue does not fit.



X Good foyer location but confrontational with church. Small Venue does not fit.



X Good relationship with church, but foyer access away from where expected.



? Acceptable foyer access. Fits reduced Small Venue. Operationally challenging.

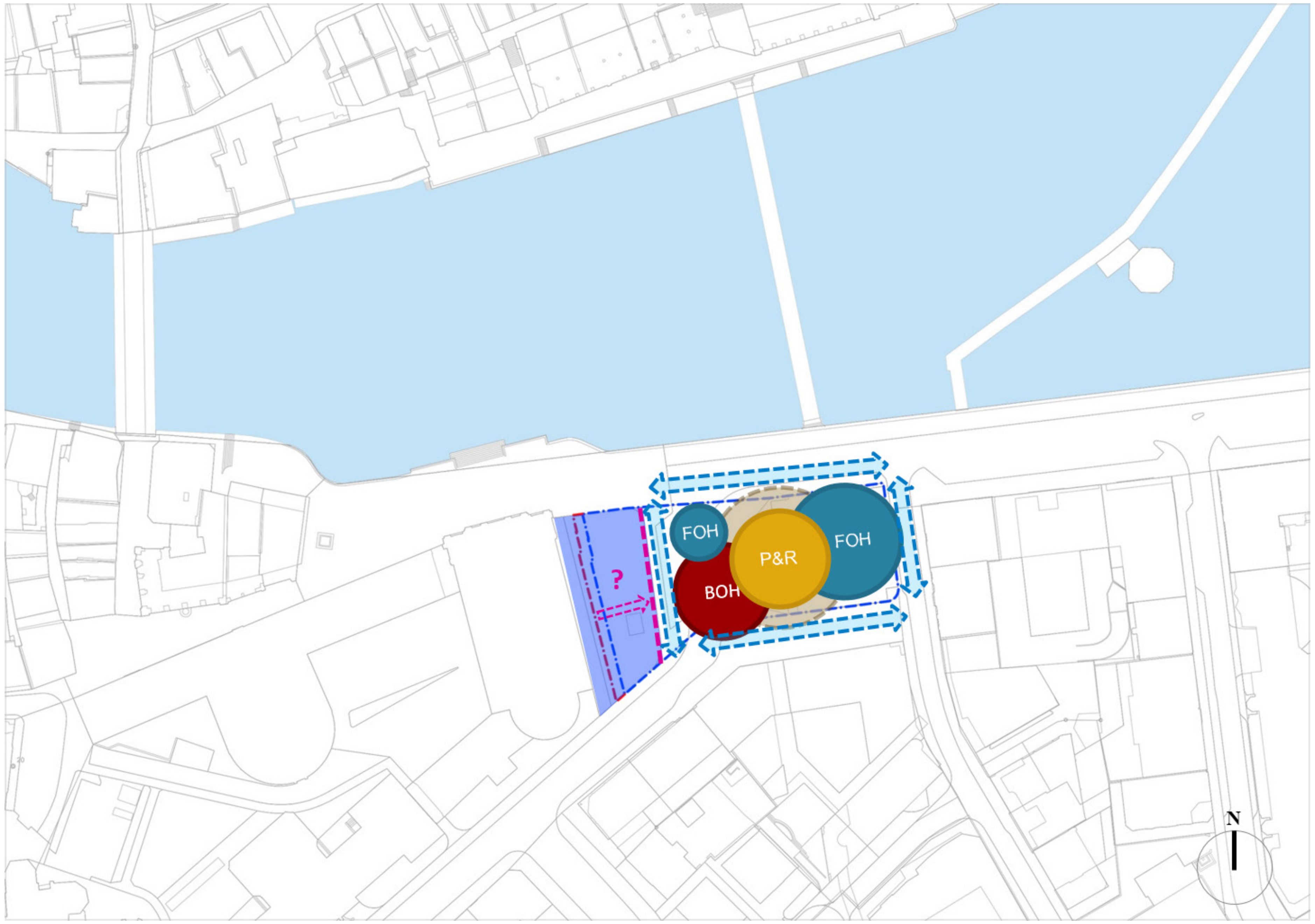
Theaterplatz

Massing Developments

Further studies took into account feedback from the City's committee and Lucerne Authorities, focusing mainly on two key priorities:

- allow for the appropriate distance form the Jesuit Church on the west of the site
- provide active street front at ground level around the theatre

Two additional massing solutions were developed based on these requirements.



Front of House
Back of House
P&R Spaces
Circulation
Distance from church w/size of existing green
Pedestrian circulation around active streetfront

The following massing options were developed and tested for Theaterplatz based on these requirements:

T1. Reduced Footprint Study One

A wider open space with the size of the existing green area was set as a constraint. The Small Venue does not fit in the resulting massing. Front and Back of House access at the ground floor is reduced beyond what is operationally acceptable.

The overall massing does not feel proportionate to the scale of the surrounding buildings.

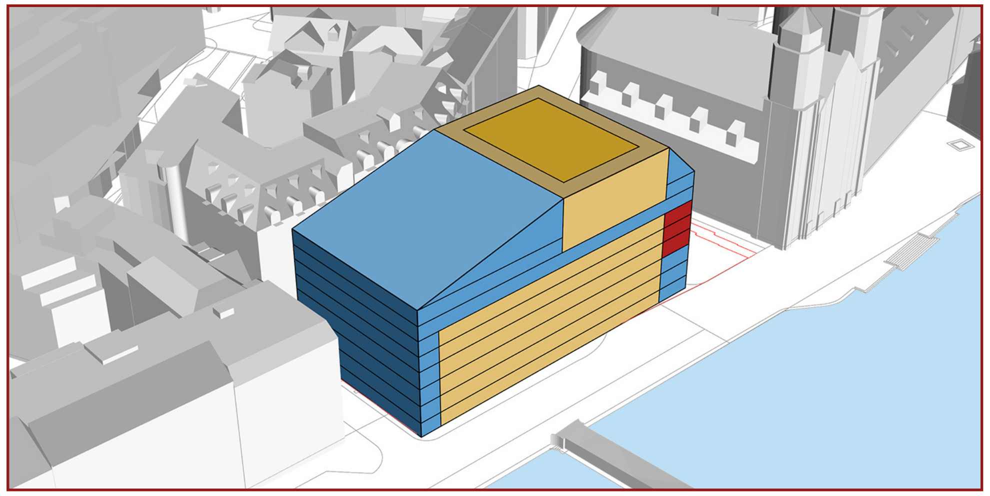
T2. Reduced Footprint Study Two

The foyer is located on the ground floor, with all other Front of House spaces, activating the street front. The Large Venue moves up by two levels while the Small Venue does not fit. The separation of Performance and Rehearsal Spaces and Back of House by the intermediate foyer at the ground floor, combined with the general lack of space, makes this solution not viable from an operational point of view.

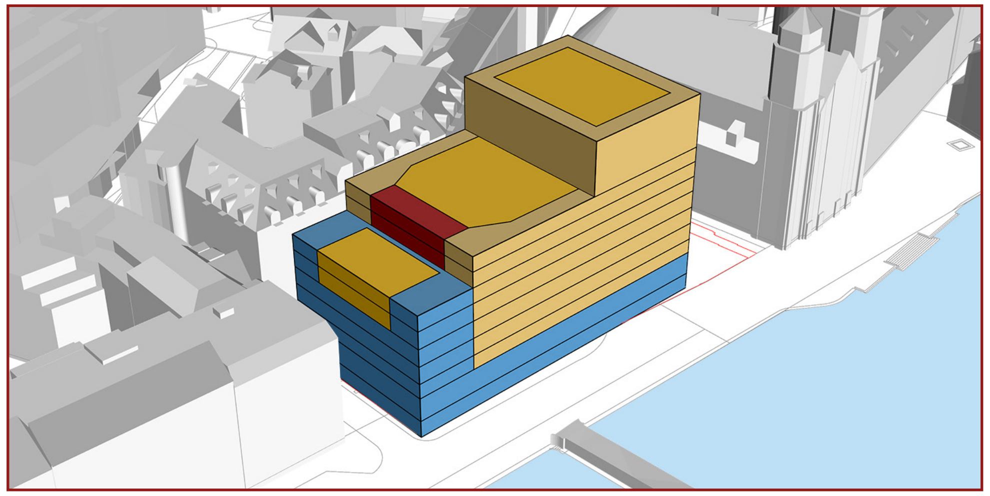
The massing for this option seems out of proportion compared to the surrounding context. The open space created by the church still looks small considering the height of the buildings.

T3. Recommended Massing

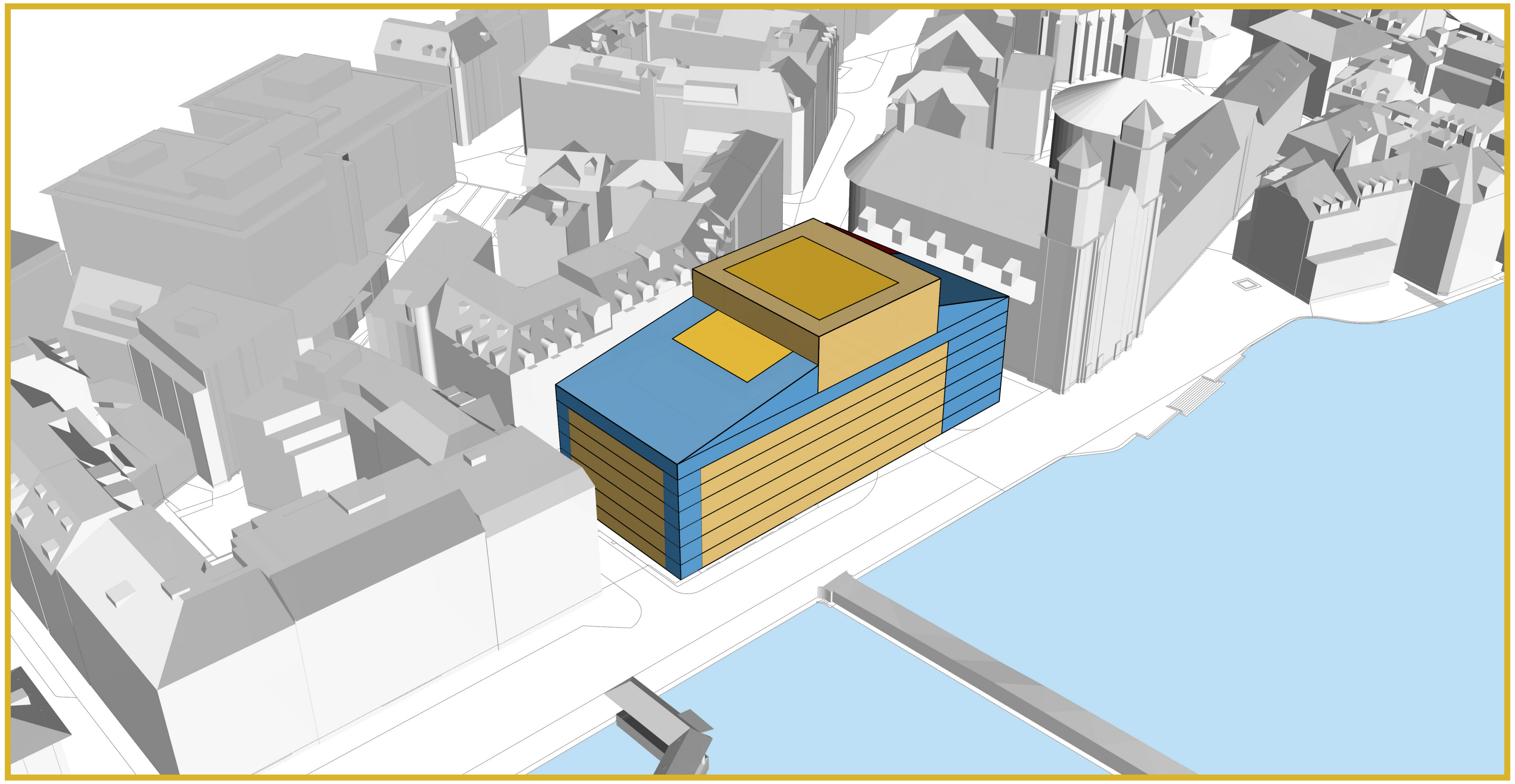
The two massing solutions T1 and T2 do not allow for the required footprint. A massing option with a larger footprint and closer to the church (as in the bottom figure) is required to make the building operationally viable. Therefore, the acceptable initial massing study T3 was selected for further study. This option is illustrated in more detail in the following pages.



X T1. Reduced Footprint Study One



X T2. Reduced Footprint Study Two



? **T3. Recommended Massing**

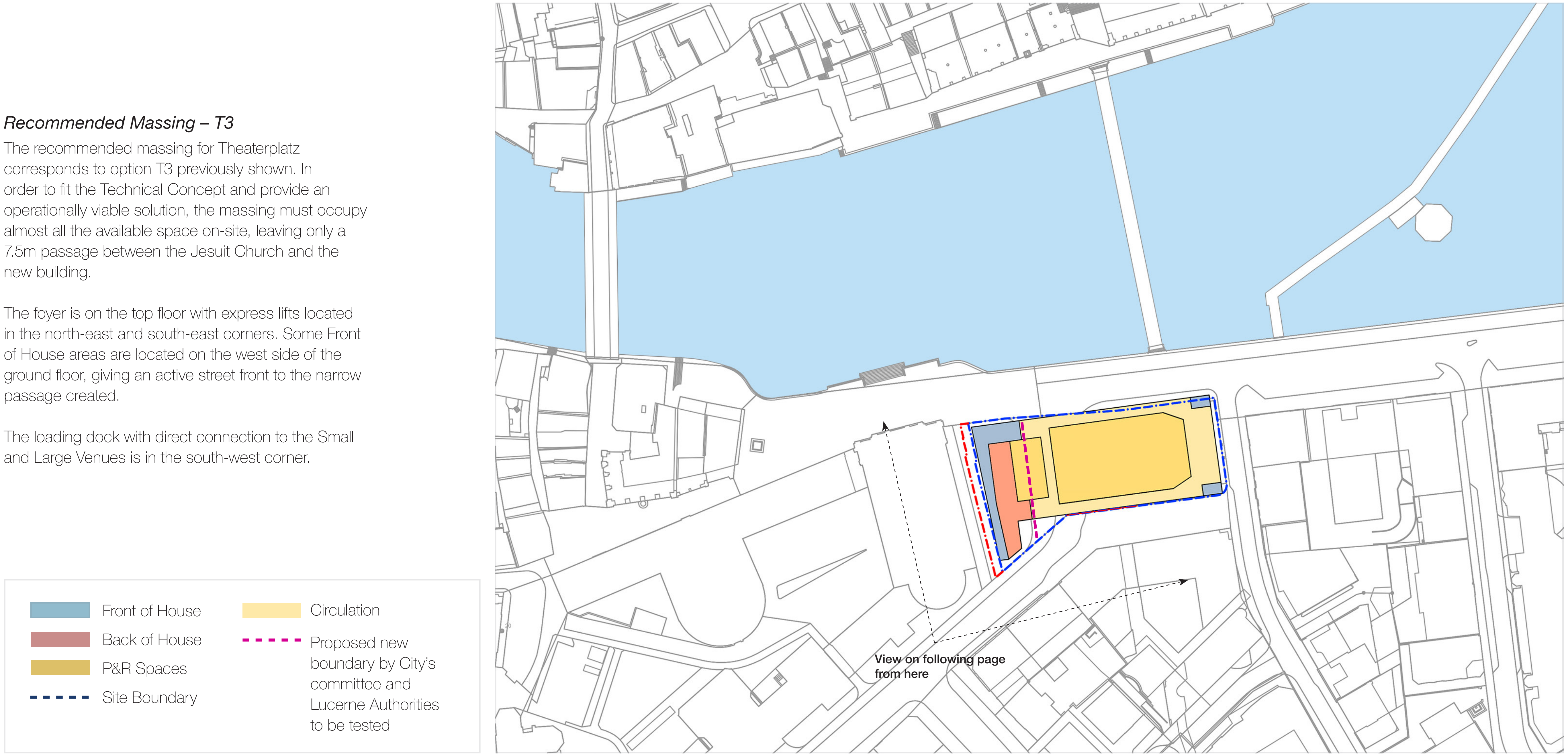
Theaterplatz

Recommended Massing – T3

The recommended massing for Theaterplatz corresponds to option T3 previously shown. In order to fit the Technical Concept and provide an operationally viable solution, the massing must occupy almost all the available space on-site, leaving only a 7.5m passage between the Jesuit Church and the new building.

The foyer is on the top floor with express lifts located in the north-east and south-east corners. Some Front of House areas are located on the west side of the ground floor, giving an active street front to the narrow passage created.

The loading dock with direct connection to the Small and Large Venues is in the south-west corner.

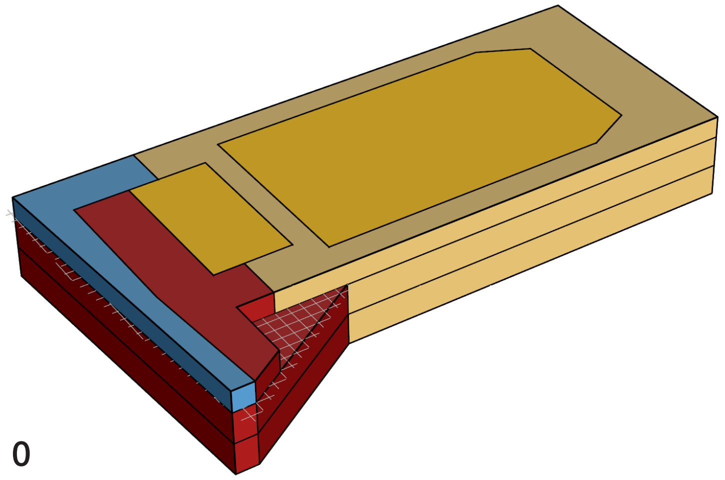


T3 Building Anatomy

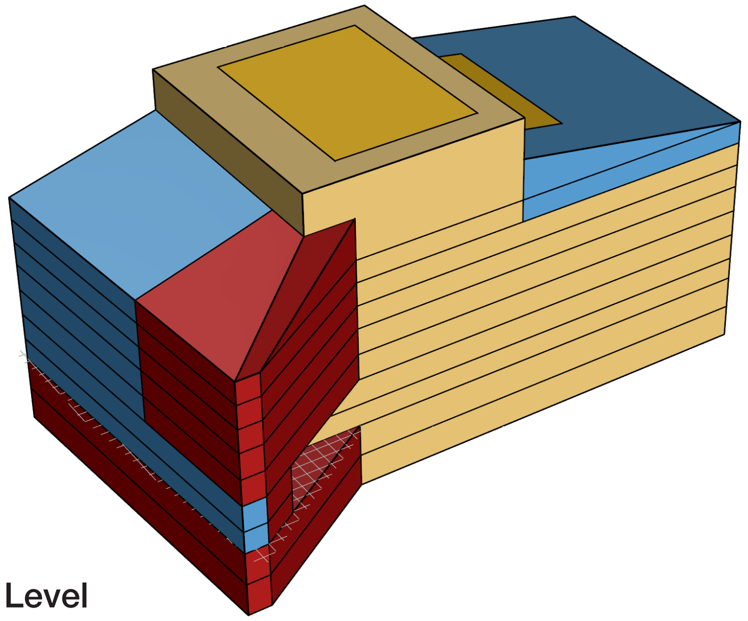
The top-floor foyer with express lifts from the ground-floor entrance is operationally challenging but could have a unique distinctive character. Other Front of House areas, including ticketing and an exhibition space, are located on the west side of the building, activating the street front and establishing a more open relationship with church.

The loading dock and Back of House entrance on the south-west corner of the ground floor connect vertically to the other Back of House areas, mostly located around the Large Venue technical spaces in the two basements, with some of the more frequently occupied spaces on the west side upper floors and a direct connection to the top-floor foyer.

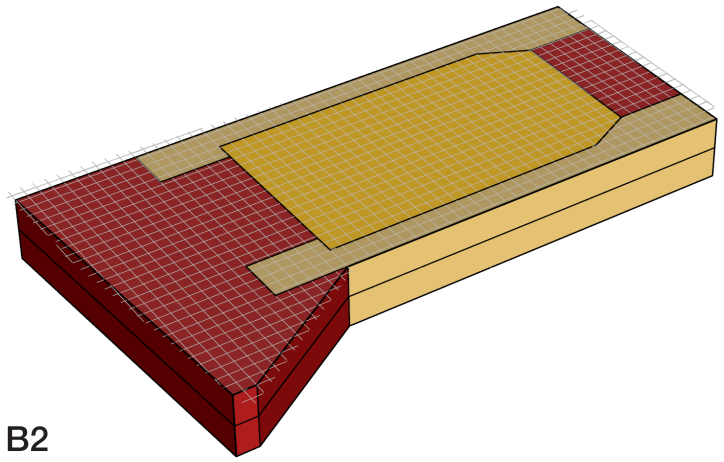
The Large Venue and a reduced Small Venue are both located on the ground floor (+1m), while the Studios are on the top floor.



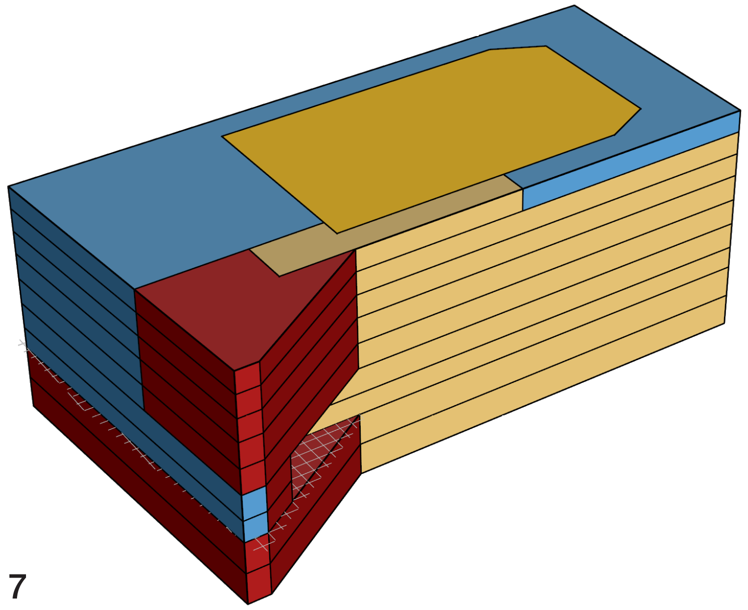
Level 0



Roof Level

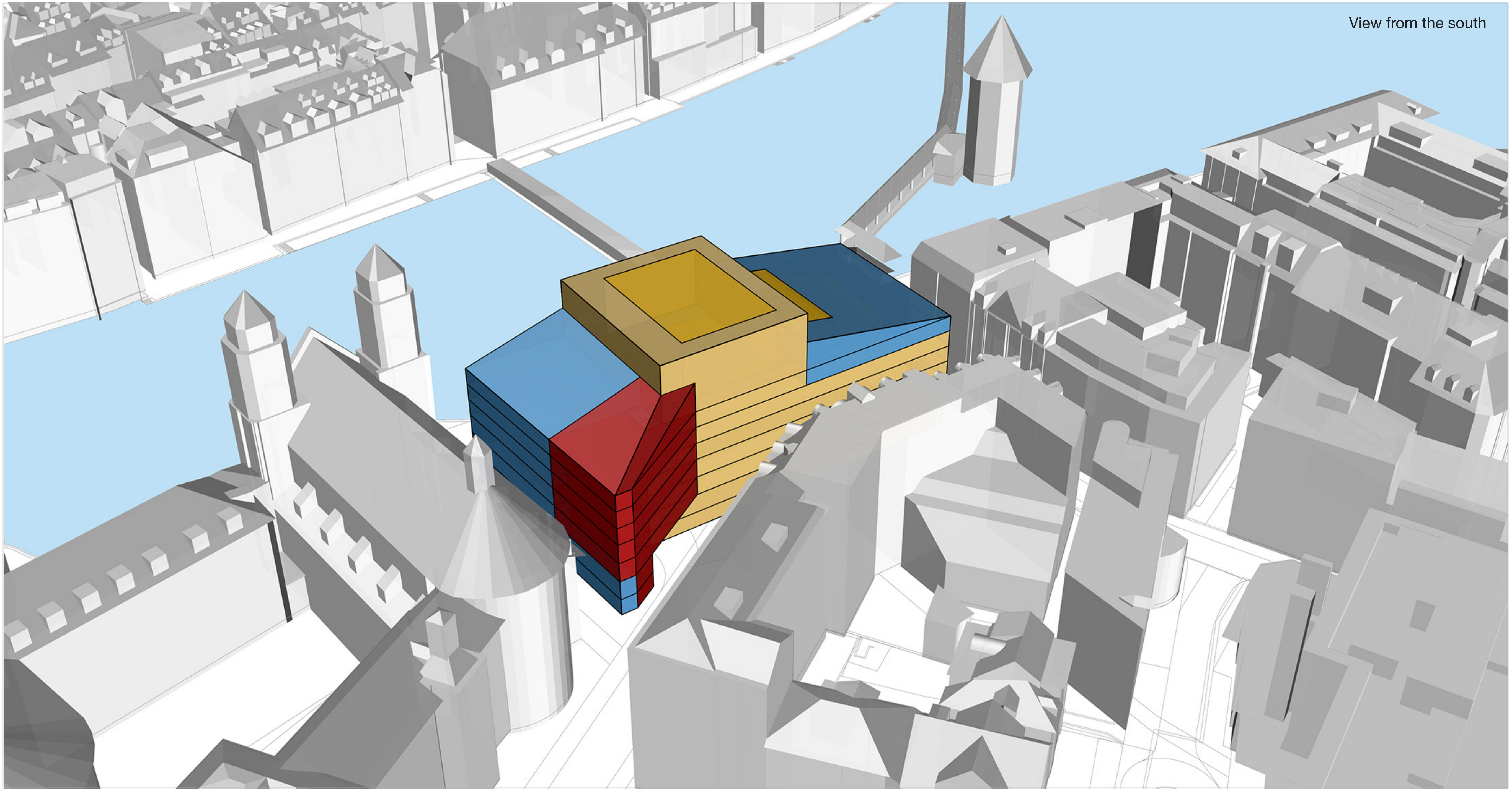


B1 & B2

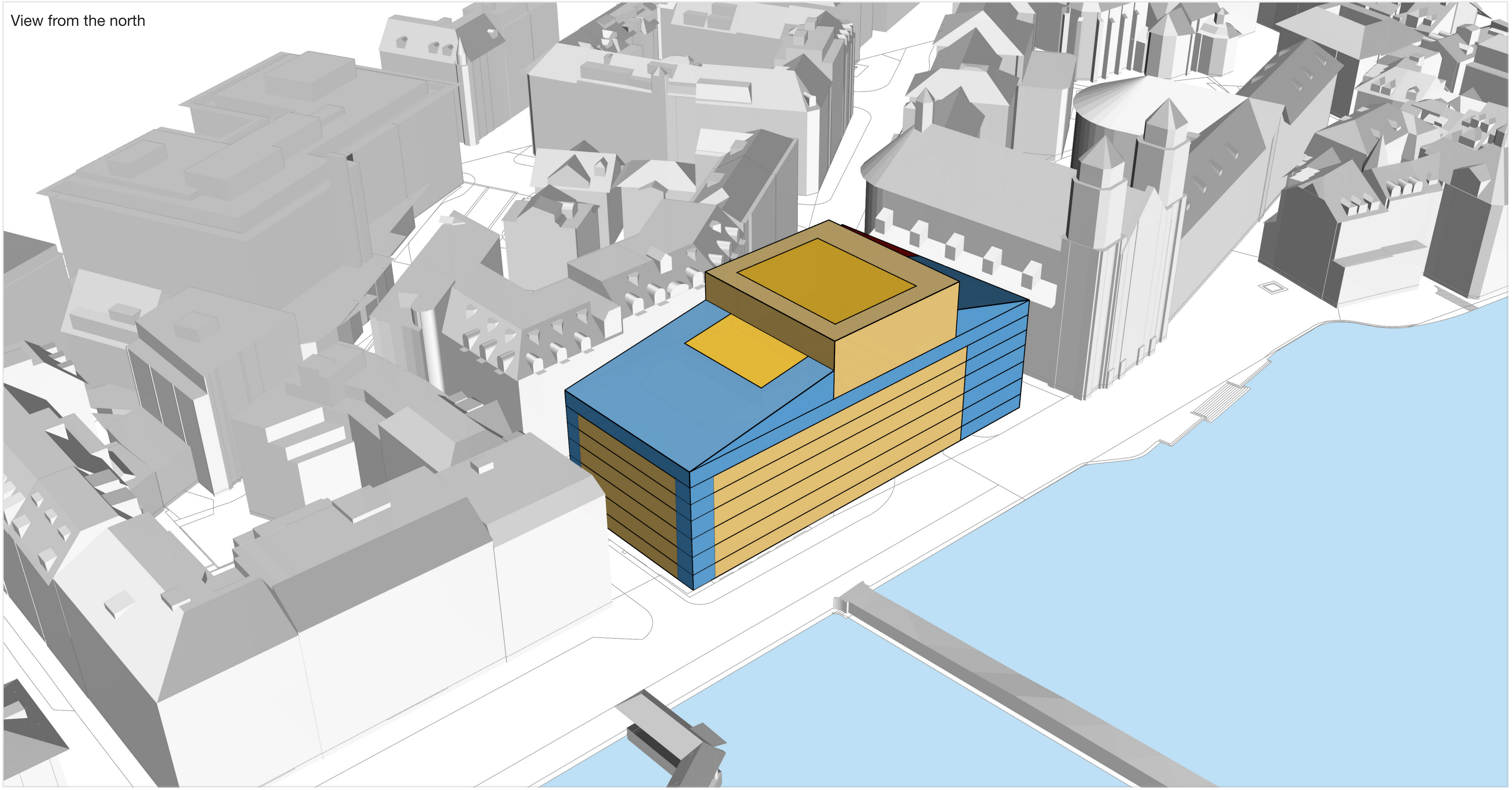


Level 7

Theaterplatz



T3 Massing evaluation in context The overall massing fits tightly within the historical urban fabric and, considering its height, feels too close to the church and the other buildings around it.



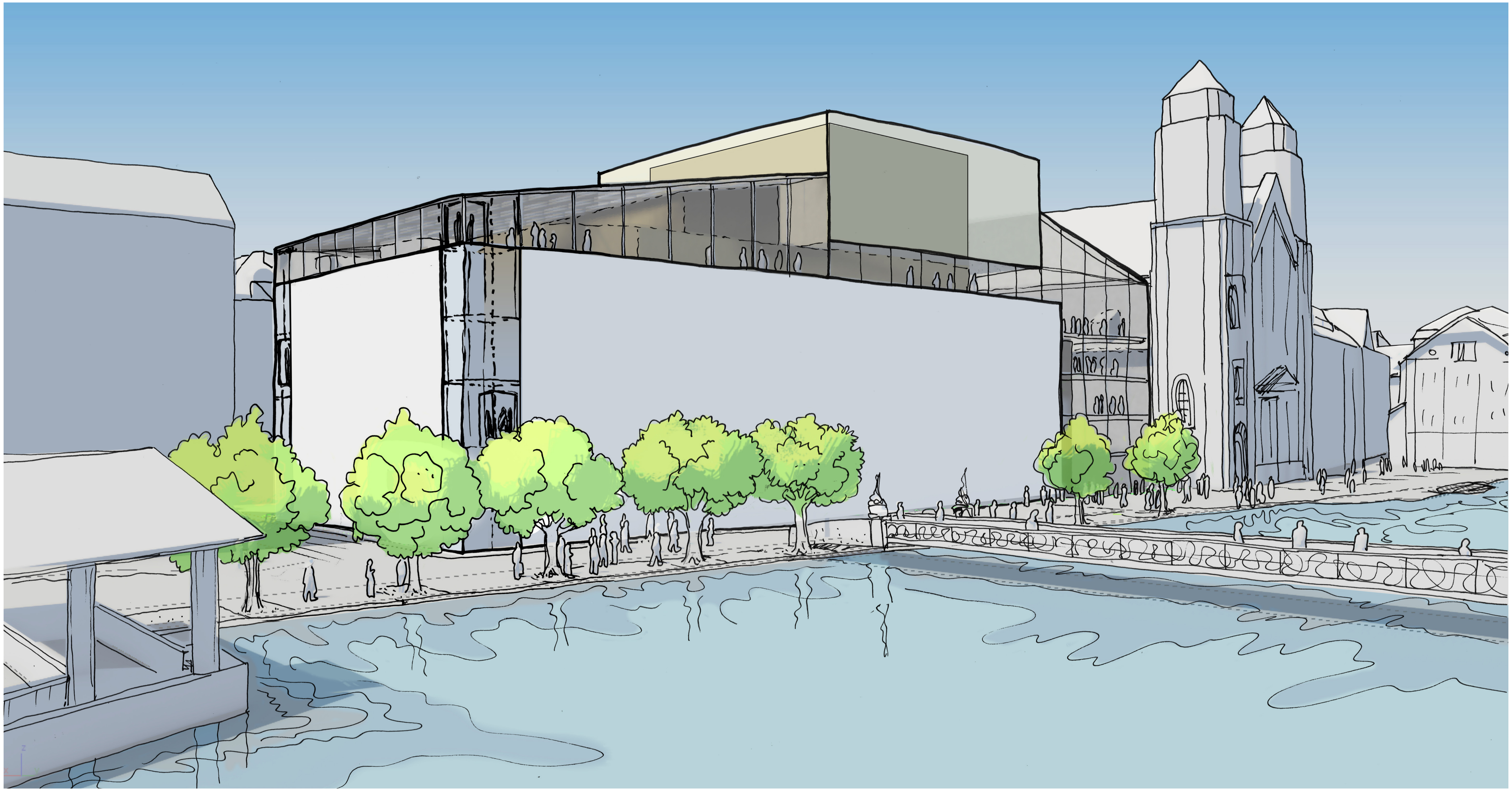
T3 Massing evaluation in context The building profile is reasonably proportionate compared to the other buildings around it. The extent of enclosed solid walls required for the Large Venue and the absence of an active street front facing the water does not feel appropriate.

Theaterplatz

T3 View from the lake The eye-level view from the opposite river bank highlights that the scale of this massing is balanced in height but too close to the church. The active street front in the lane created between the theatre and the church could help to mitigate the uncomfortable feeling of a narrow and very tall space.

T3 Bird's-eye view The photo montage shows the massing of this option in the context of the surrounding historical city. The dimension of this structure as a single building with mostly enclosed solid façades has to be considered against the mostly finer grain of the urban fabric around it.

Theaterplatz



T3 Daytime look and feel The massing of the theatre stands out for its size as one long building in a context with a finer grain and rhythm. The articulation of the large areas of solid walls required for acoustics are a difficult challenge, particularly when considering the view from the opposite bank and the approach from the bridges. The rooftop foyer, more open and transparent in character, is a very special place in contrast with the uniform enclosed terracotta roofs around it.

T3 Night-time look and feel At night there are opportunities to bring life into the building. Lit-up foyer and lifts would be very visible and potentially attractive, and projections could animate some of the blank walls to a dramatic effect, especially on the waterfront.

3.4.2 Inseli

Image: Google Earth

Site Overview and Boundaries

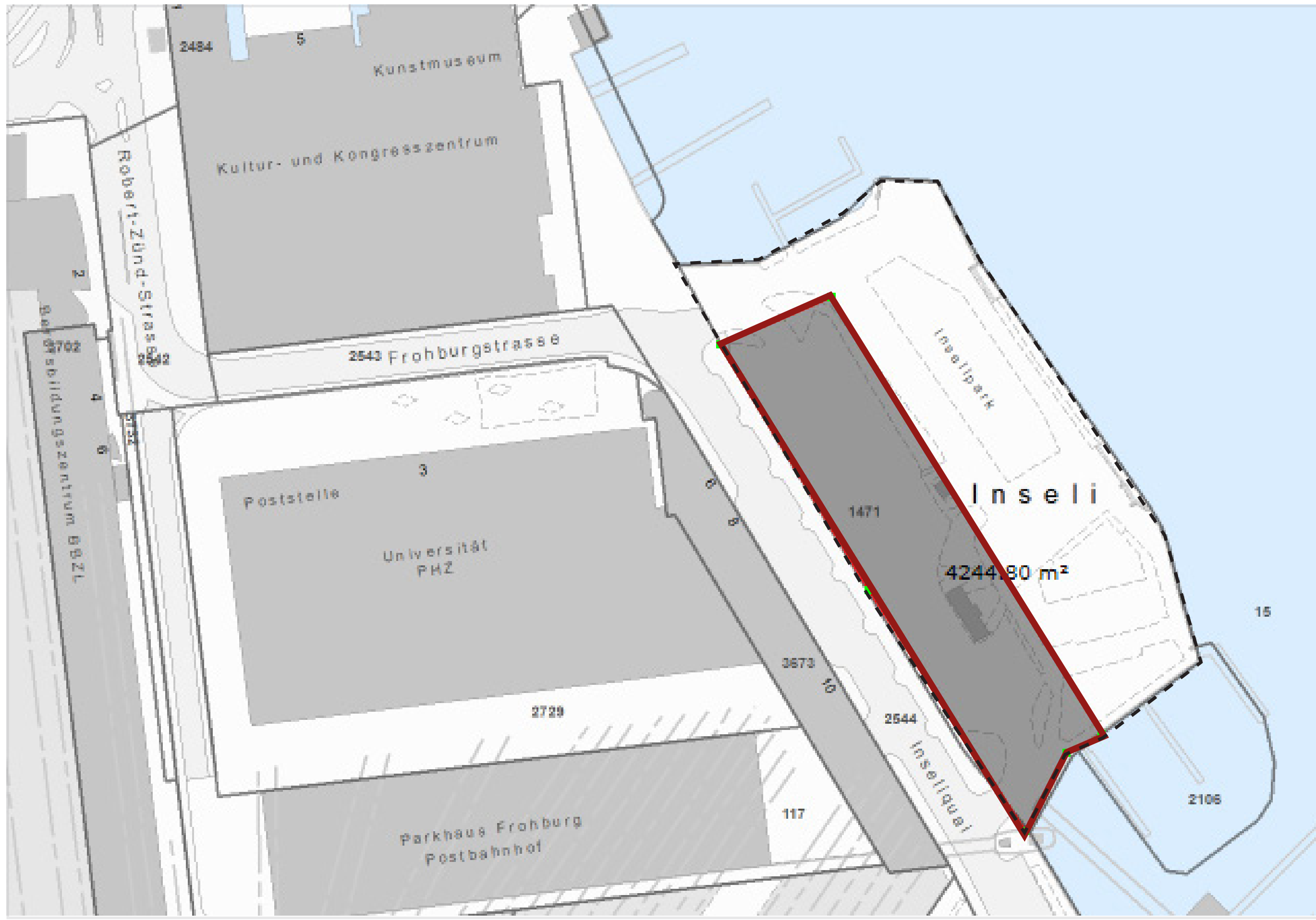
The site is shaped as a rectangle, stretched to follow the waterfront around the Inseli peninsula on three of its sides and the main road on the forth side.

The site's area includes Inseli Park as well as a parking lot for coaches.

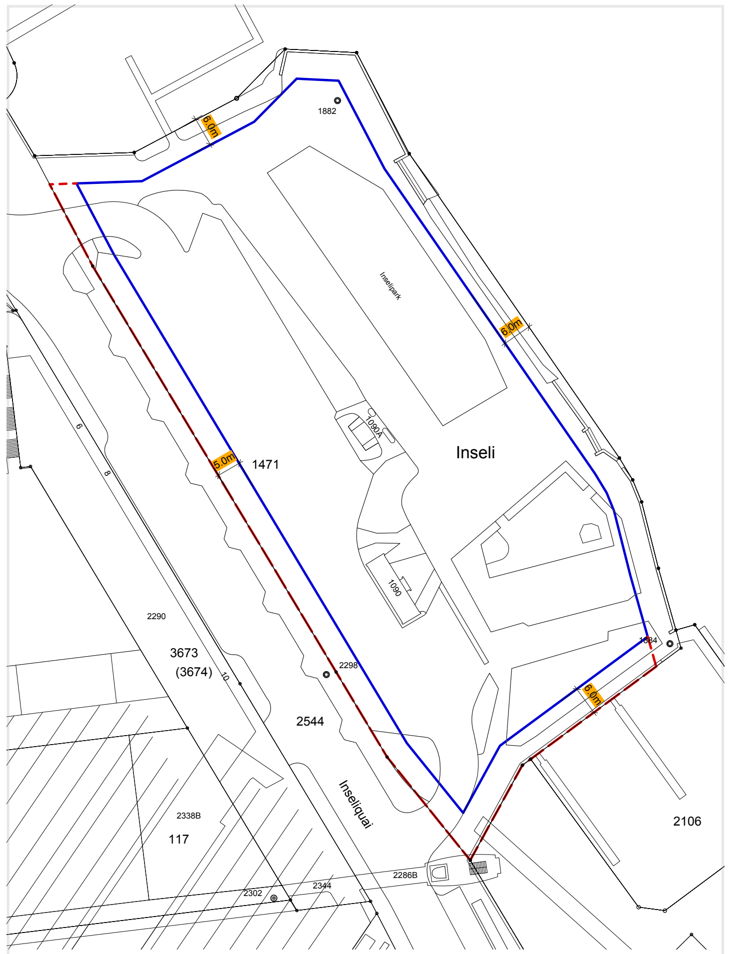
The boundary follows the site's physical constraints along the outer pavement alignment of the main road, keeping a 5m distance from the water.

The site features two lines of tall mature trees separating the parking lot from the park and smaller trees along the boundary.

Maintaining the balance of its green character is one of the key drivers in the choice of an appropriate massing for this site.

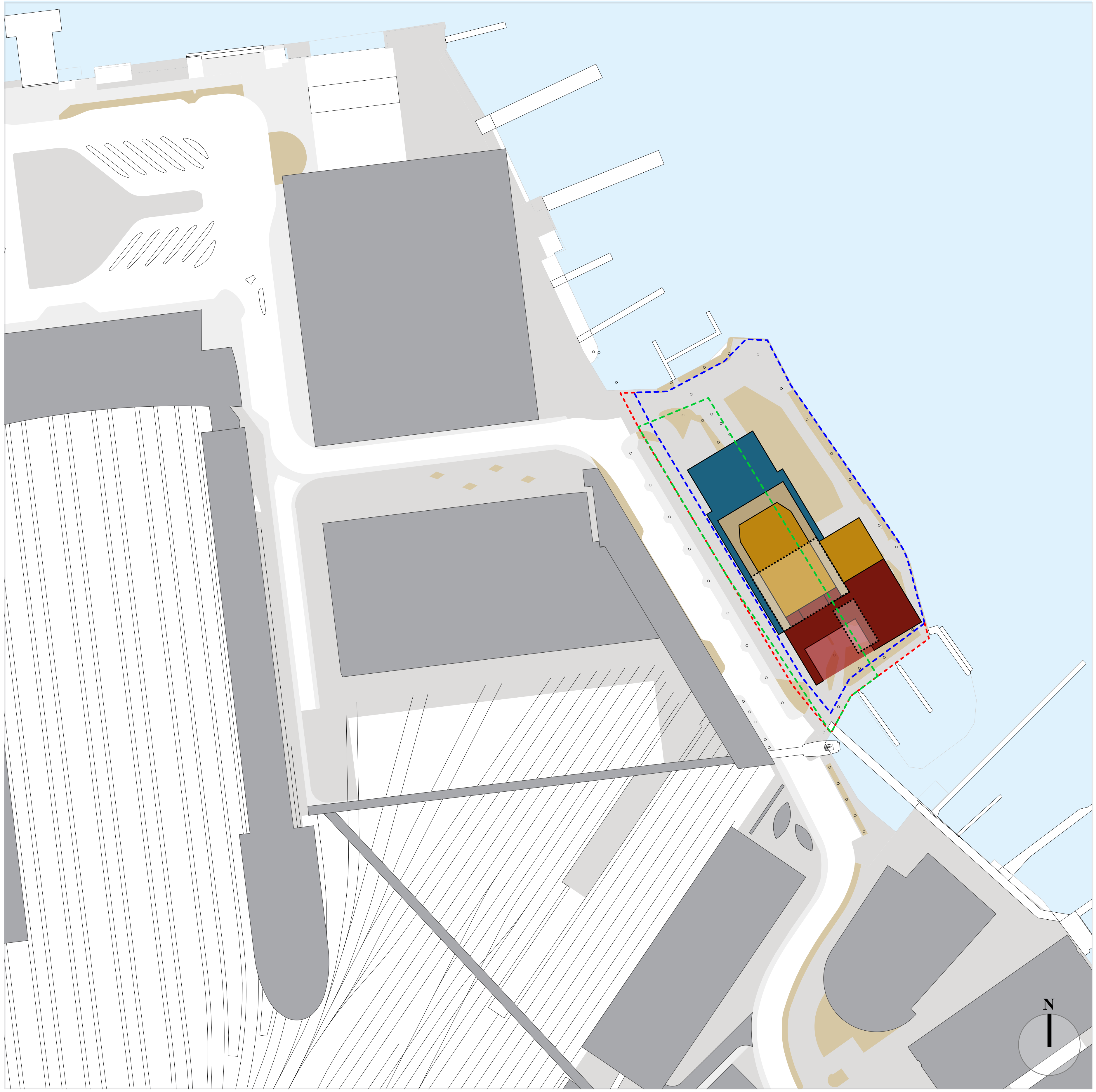


Site perimeter - - - - Extended site perimeter option



Possible if authority agrees Possible

Inseli



Ideal Massing Overlay

The ideal massing footprint fits on the site, but a few critical issues have been identified:

- The central line of mature trees is almost entirely affected, falling under the footprint.
- The space left in front of the foyer is not as grand as expected given the open green character of the site.
- The space behind the Back of House is reduced to a narrow passage in the attempt to give more open space to the foyer.

The above considerations have been taken into account in the development of the massing options proposed in the following pages.

Front of House	Site Boundary
Back of House	Potential Extended Boundary
P&R Spaces	Original Site Perimeter
Circulation	

Strategic Brief Layout

The best location for the foyer areas is on the north, towards the KKL, the train station, the university and the city centre. Part of the foyer could also extend in order to activate the waterfront area and the path leading to the south where a small harbour is located.

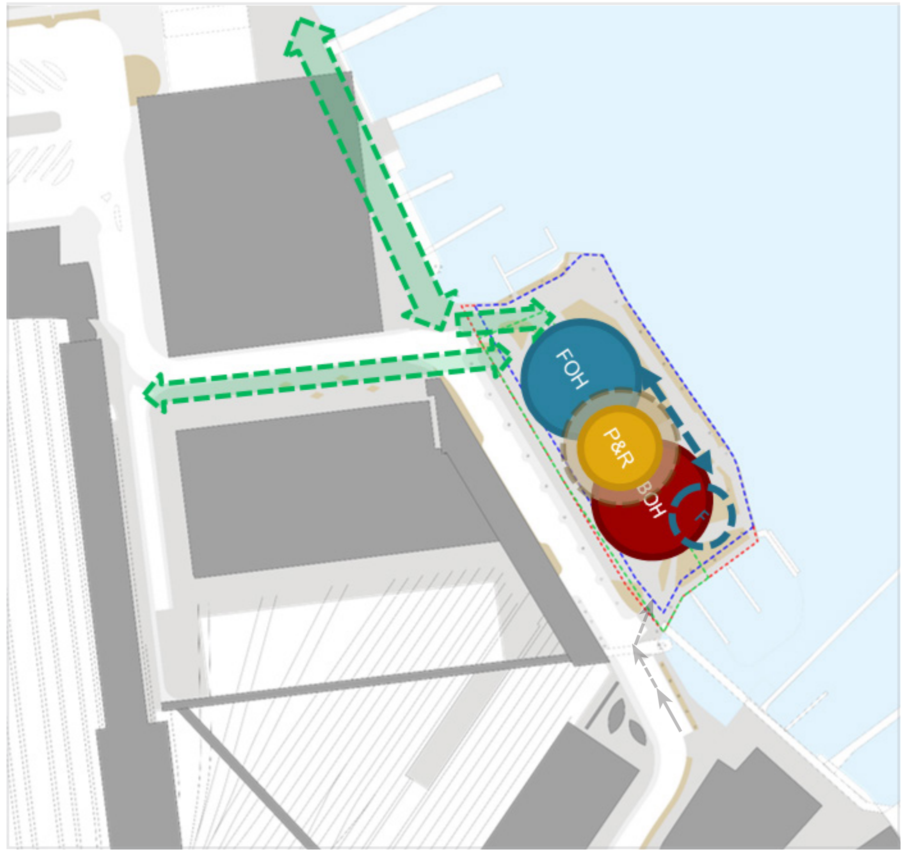
The Back of House areas can be located on the south, away from the busier public pedestrian areas, with direct access from the main road.

The organization of functions on-site must also take into consideration and respect as much as possible the balance of green areas, limiting the loss of mature trees.

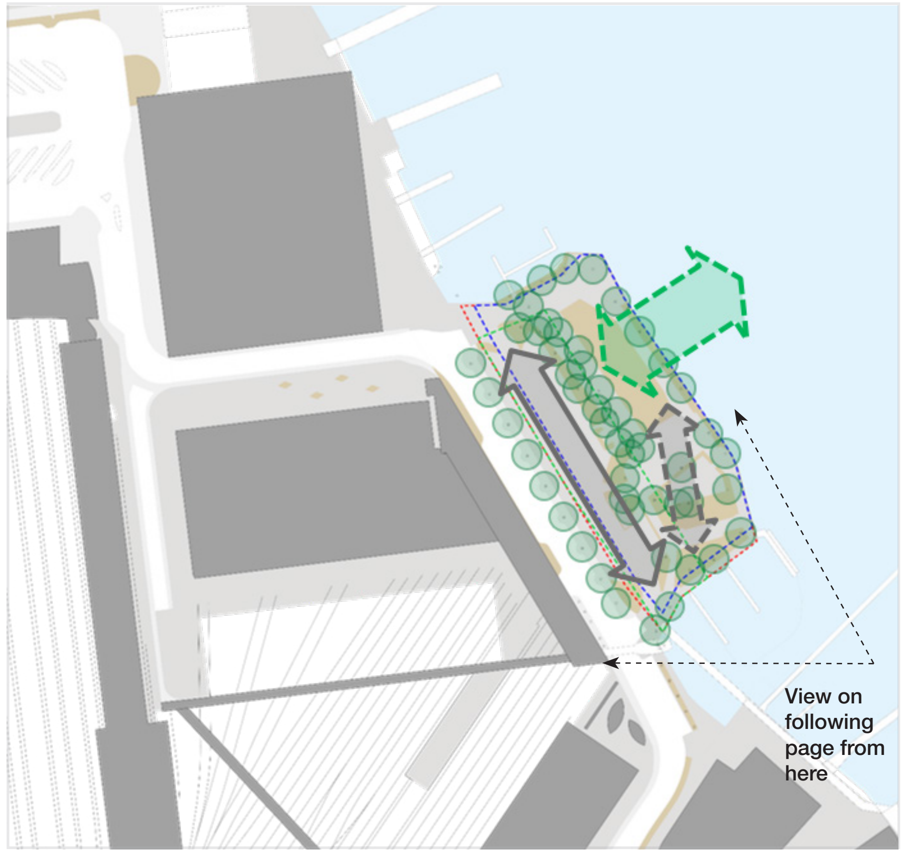
Pedestrian Access Flow to Front of House

Vehicular Access Flow to Back of House

FOH Link between Walkway and Park



√ Front of House closer to KKL, train station and university



√ Maintain balance of green areas
Maintain garden/lakefront relationship

Inseli

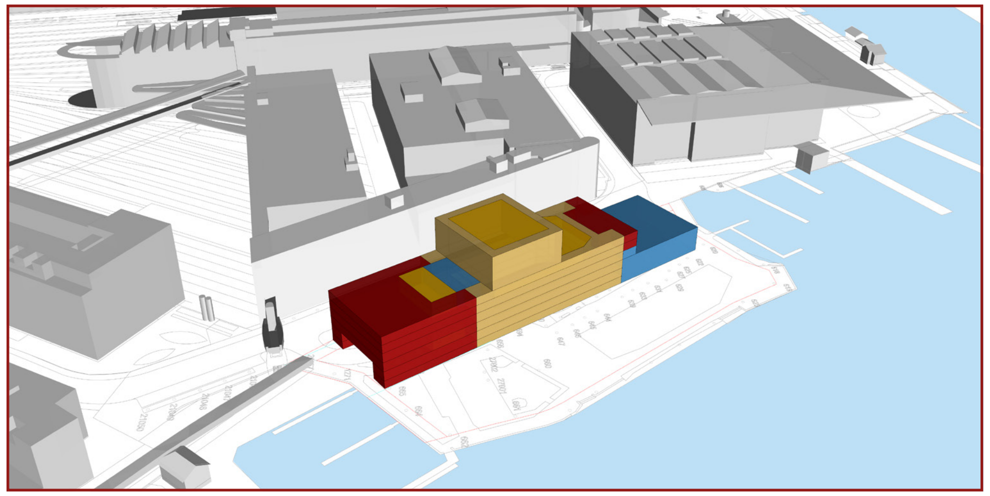
Initial Massing Studies

A range of diverse massing options were tested.

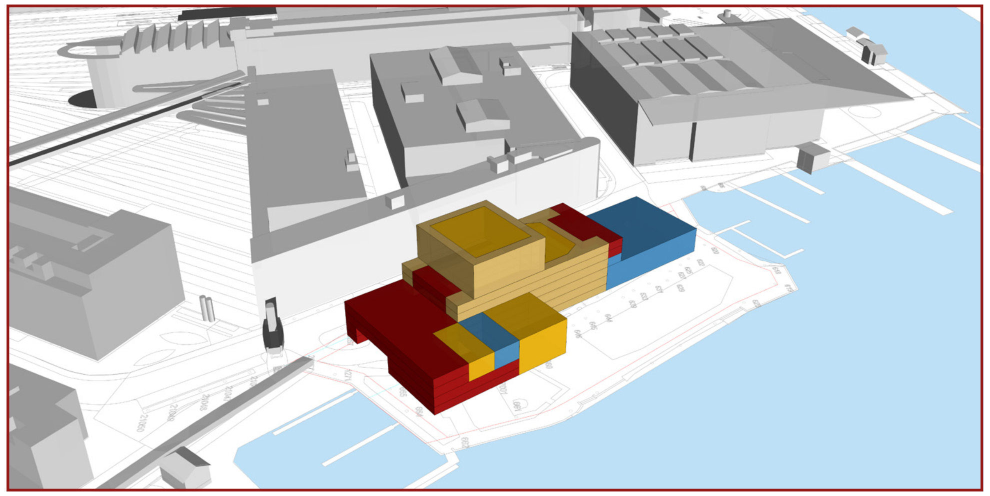
Longer narrower layouts proved to be unsatisfactory because of their relationship with the main direction of arrival.

L-shaped diagrams similar to the ideal massing had greater impact on the existing trees.

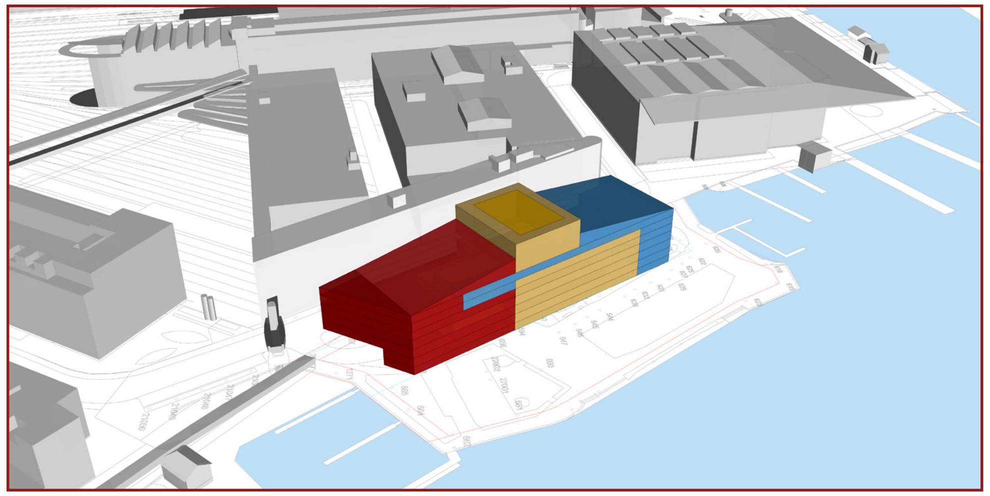
The compact U-shape option as shown in the bottom right figure is the most promising because of the limited impact on trees and generous open space to the front. This option is further assessed on the following pages.



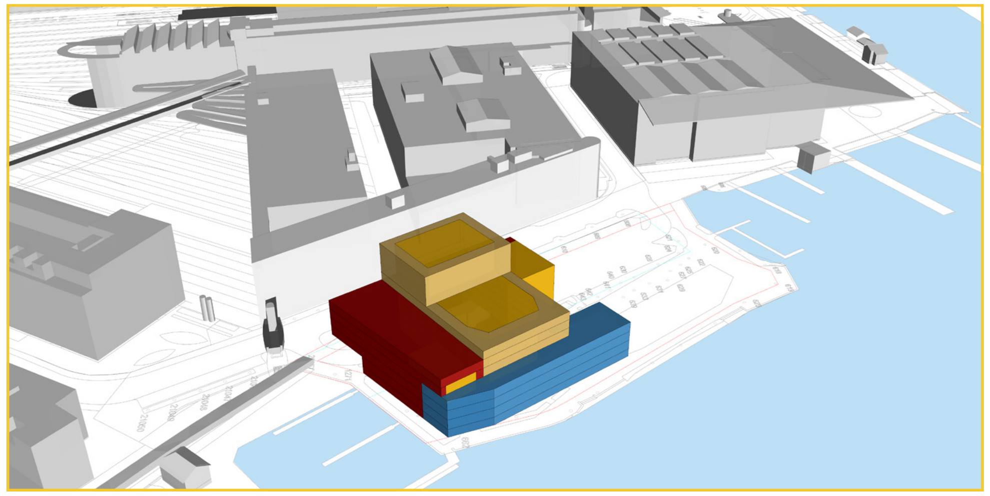
X Access from KKL and university not generous enough



X Impact on existing trees



X Access from KKL and university not generous enough and operationally compromised because of upside-down foyer

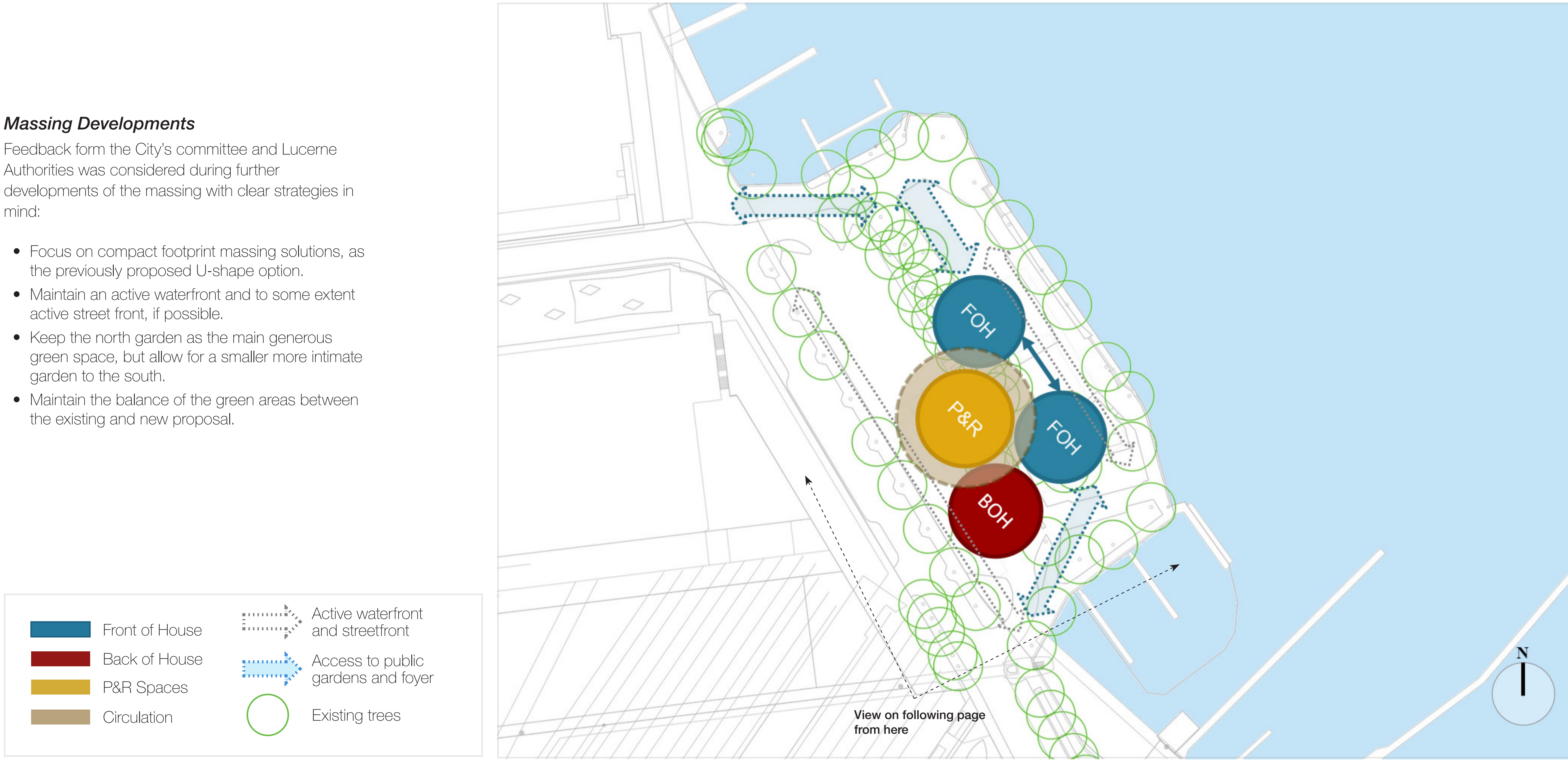


? Minimum impact on existing trees and generous outdoor green space towards KKL, but no public space on the south

Massing Developments

Feedback form the City's committee and Lucerne Authorities was considered during further developments of the massing with clear strategies in mind:

- Focus on compact footprint massing solutions, as the previously proposed U-shape option.
- Maintain an active waterfront and to some extent active street front, if possible.
- Keep the north garden as the main generous green space, but allow for a smaller more intimate garden to the south.
- Maintain the balance of the green areas between the existing and new proposal.



Inseli

The following massing options were developed and tested for Inseli based on these requirements:

I1. Central Massing

A massing placed centrally to the site was tested. Two small disconnected open spaces result from this configuration, which are not generous enough for the open green character of Inseli.

I2. L-Shape Massing

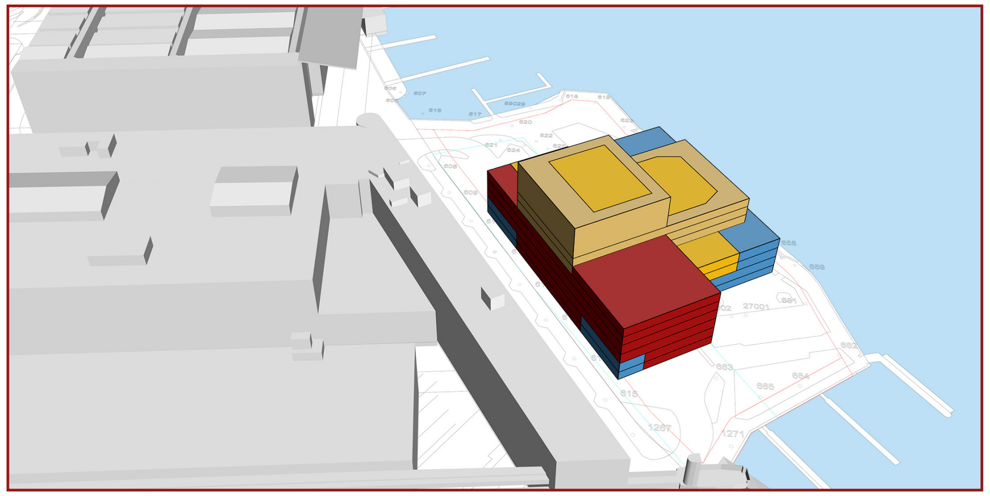
In this option, the Large Venue is oriented north-south with the Front of House facing north towards KKL. The foyer orientation and the possible active street front could work well, but this massing has a big impact on the existing mature trees and cannot keep the existing balance of green areas on the site.

I3. Detached Small Venue Massing

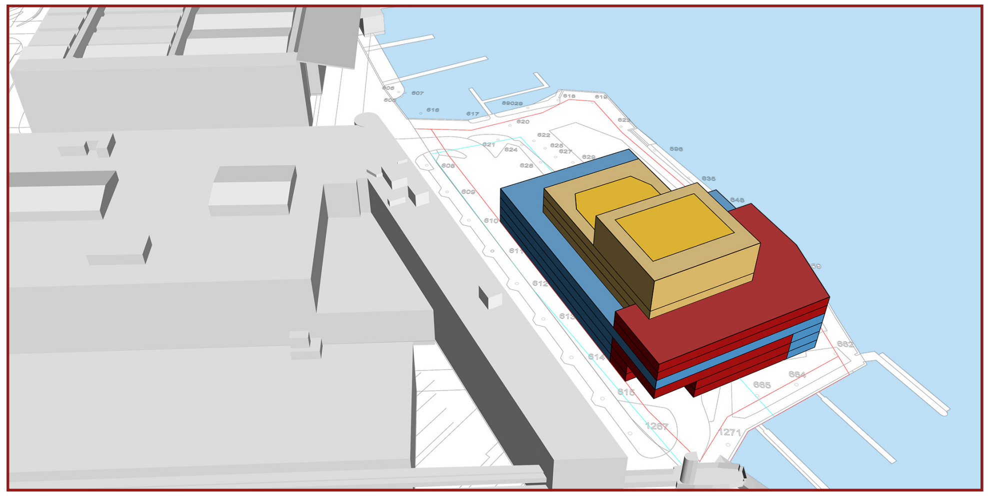
A further study was conducted with the Small Venue not directly connected to the Large Venue. This fits well on the site but did not produce significant enough benefits from the massing and site fitting to justify such a change in the way the Venues are operated. Moreover an enlarged basement area is required in this option.

I4. Recommended Massing

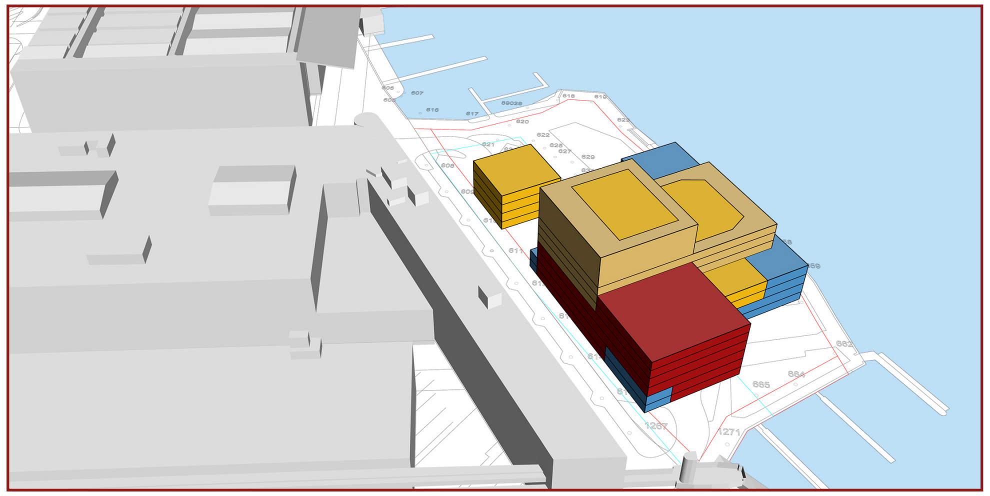
The U-shape compact option as previously shown in the bottom right figure on page 50 was repositioned on the site in a way that allows for sufficient space for an open public area on the south and was confirmed as the most successful massing for the site (see the bottom right figure to the right). This option is illustrated in more detail in the following pages.



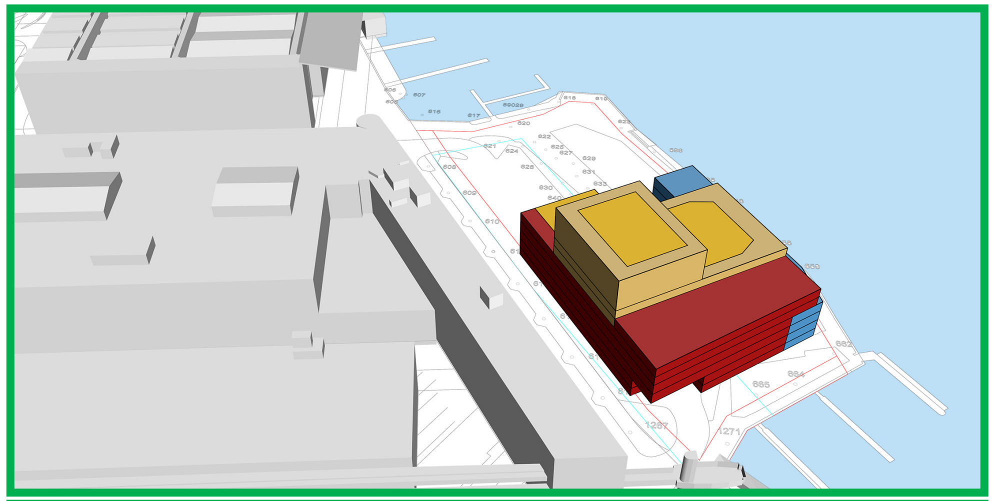
X I1. Central Massing



X I2. L-Shape Massing



X I3. Detached Small Venue Massing



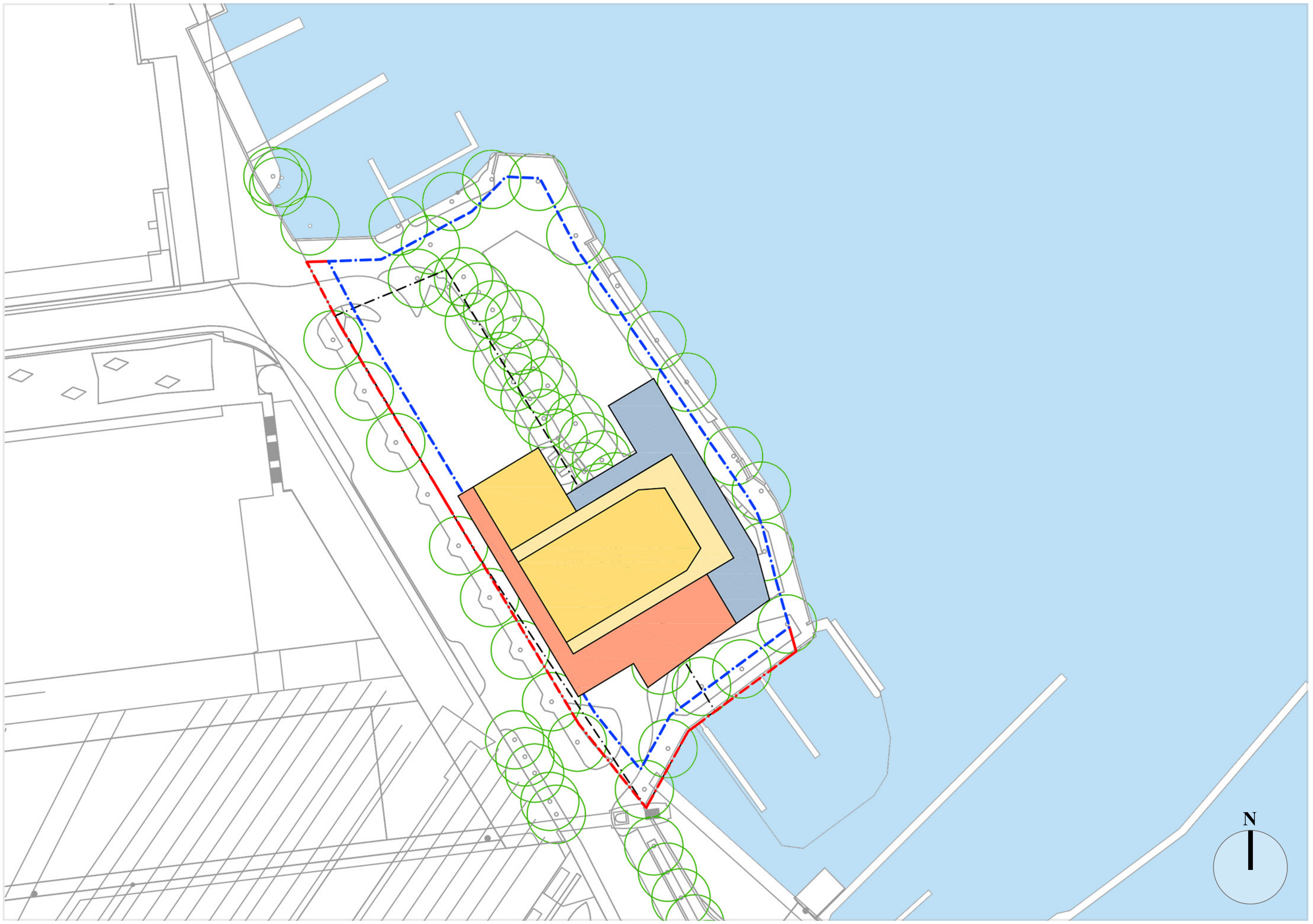
√ **I4. Recommended Massing**

Recommended Massing – I4

The audience entrance and foyer are oriented facing towards the large open green space to the north, but the foyer also extends along the waterfront and allows for an area facing south towards a smaller garden and the harbour.

The Large Venue is oriented at 90 degrees to the foyer, while the Small Venue in a side position faces the larger open space to the north.

The loading dock and Back of House are in the south-west corner towards the main road and with a direct connection to Large and Small Venues.



Front of House
Back of House
P&R Spaces
Circulation
Original Site Perimeter
Site Boundary
Potential Extended Boundary
Existing Trees

Inseli

I4 Green Areas Balance

The compact U-shape massing option I4 succeeds in maintaining the existing balance of green areas on-site, as its footprint is approximately the same size as the existing parking lot.

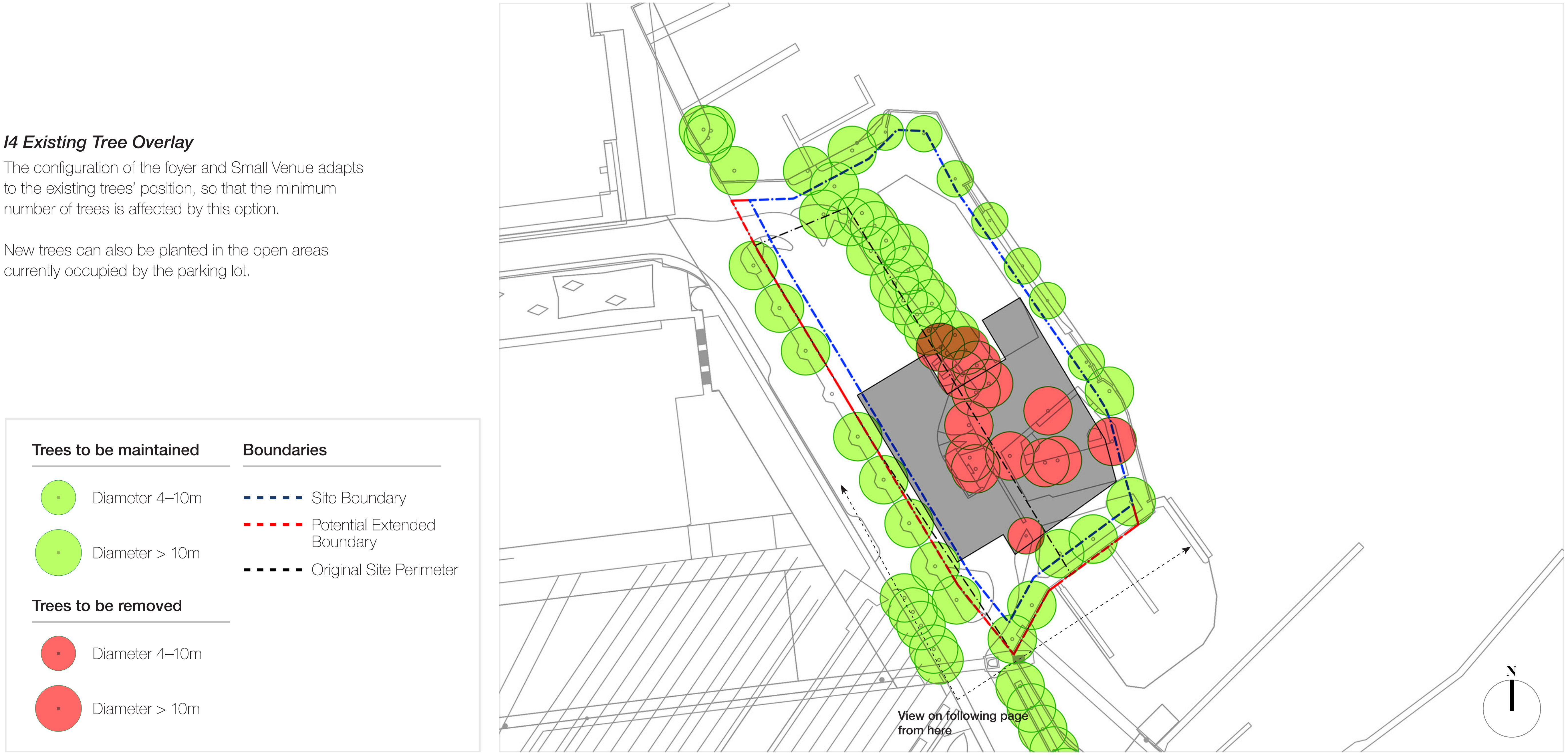
Current		After Project	
Green Area - **5948m²**		Green Area - **5593m²**	
Parking Area - **3332m²**		Building - **3420m²**	

Site Boundary   Potential Extended Boundary

I4 Existing Tree Overlay

The configuration of the foyer and Small Venue adapts to the existing trees' position, so that the minimum number of trees is affected by this option.

New trees can also be planted in the open areas currently occupied by the parking lot.



Inseli

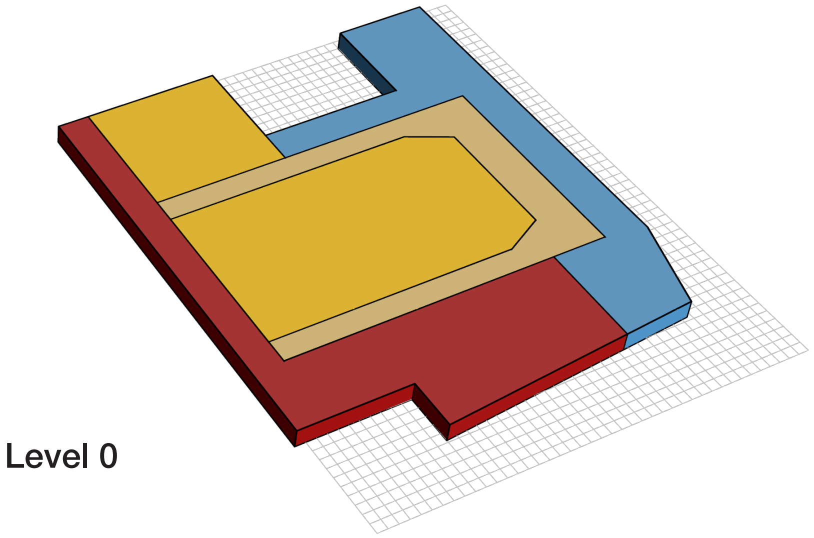
I4 Building Anatomy

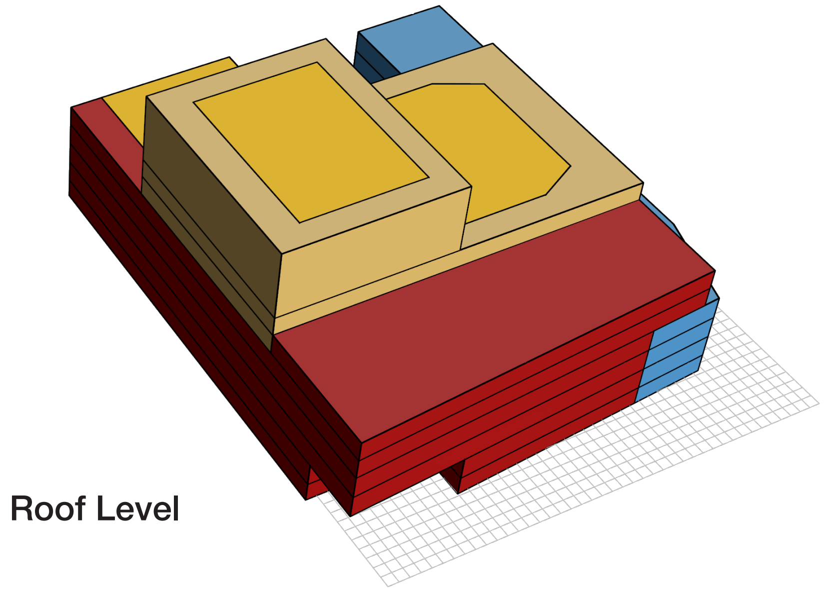
Basement areas are limited to what is required by the technical spaces of the Large Venue.

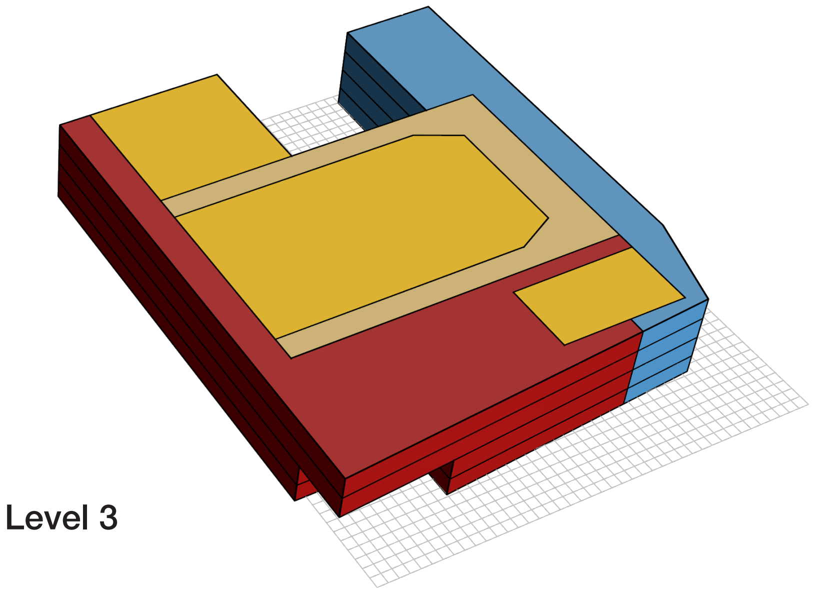
Large and Small Venues are located at the ground floor (+1m) and accessed by dedicated parts of the foyer. The Studios are located on the third level with access from the upper part of the foyer.

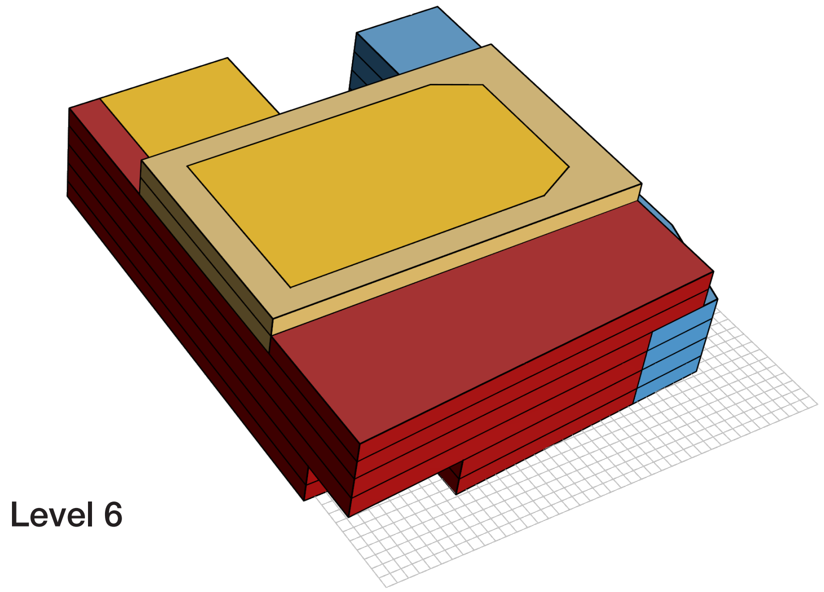
The Front of House areas are organised in a simple linear shape along the waterfront, with a side wing leading to the Small Venue.

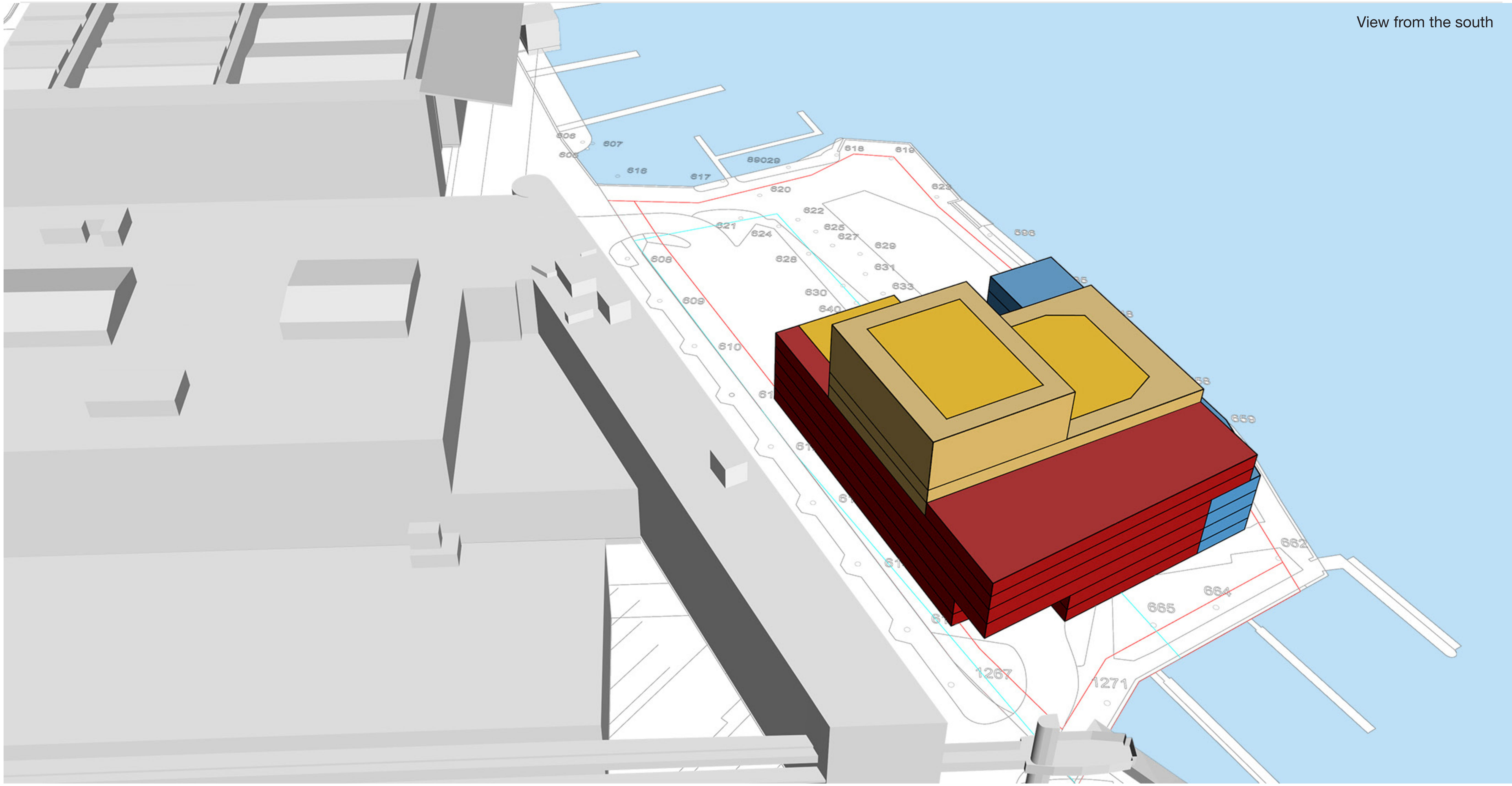
Back of House areas are arranged on the south of the building with good connections to all Front of House areas and Performance and Rehearsal Spaces.











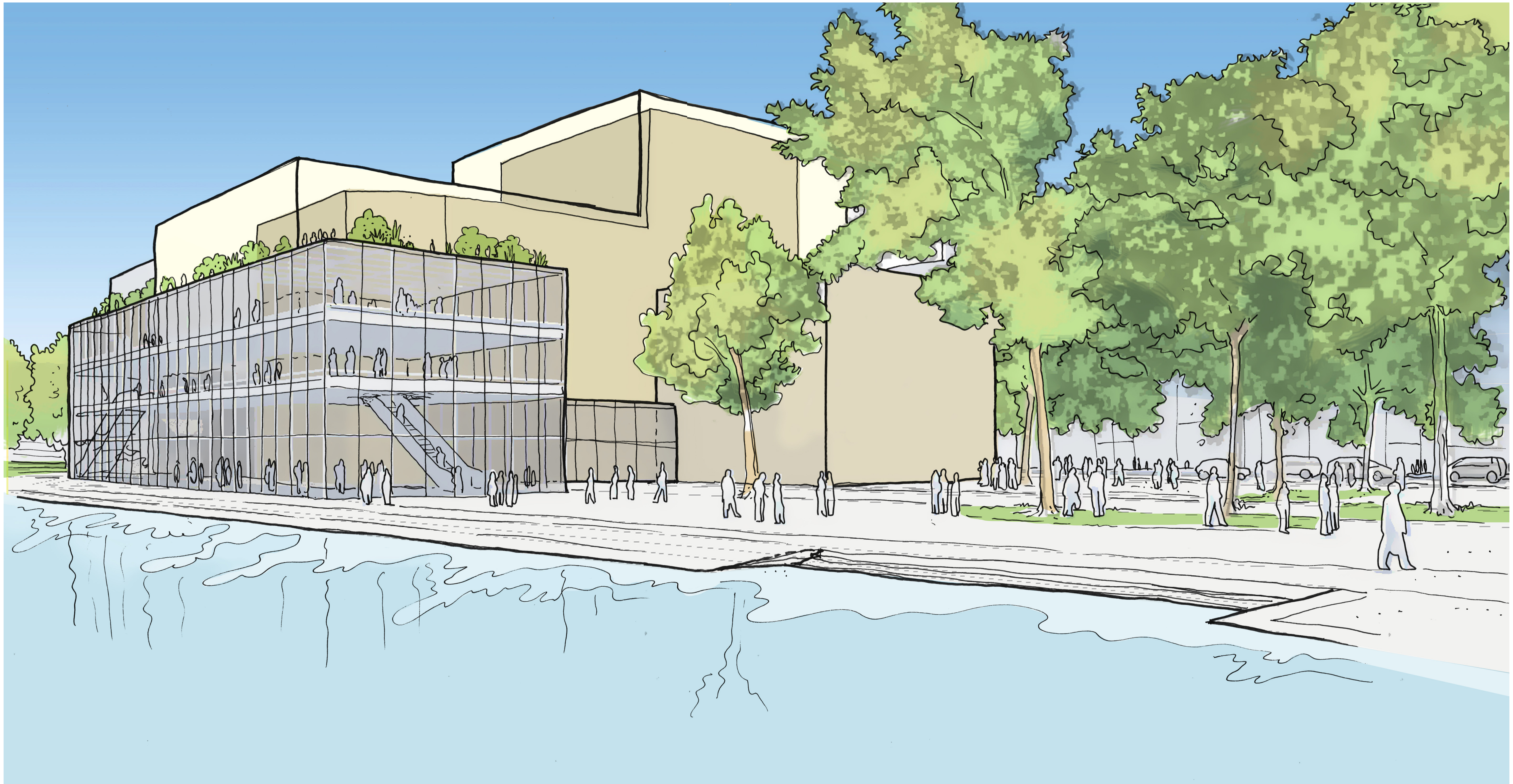
I4 Massing evaluation in context The massing looks proportionate to the surrounding buildings and to the quantity of open spaces both to the north and to the south. The building's height feels generally appropriate, lower on the waterfront and higher towards the main road.

Inseli

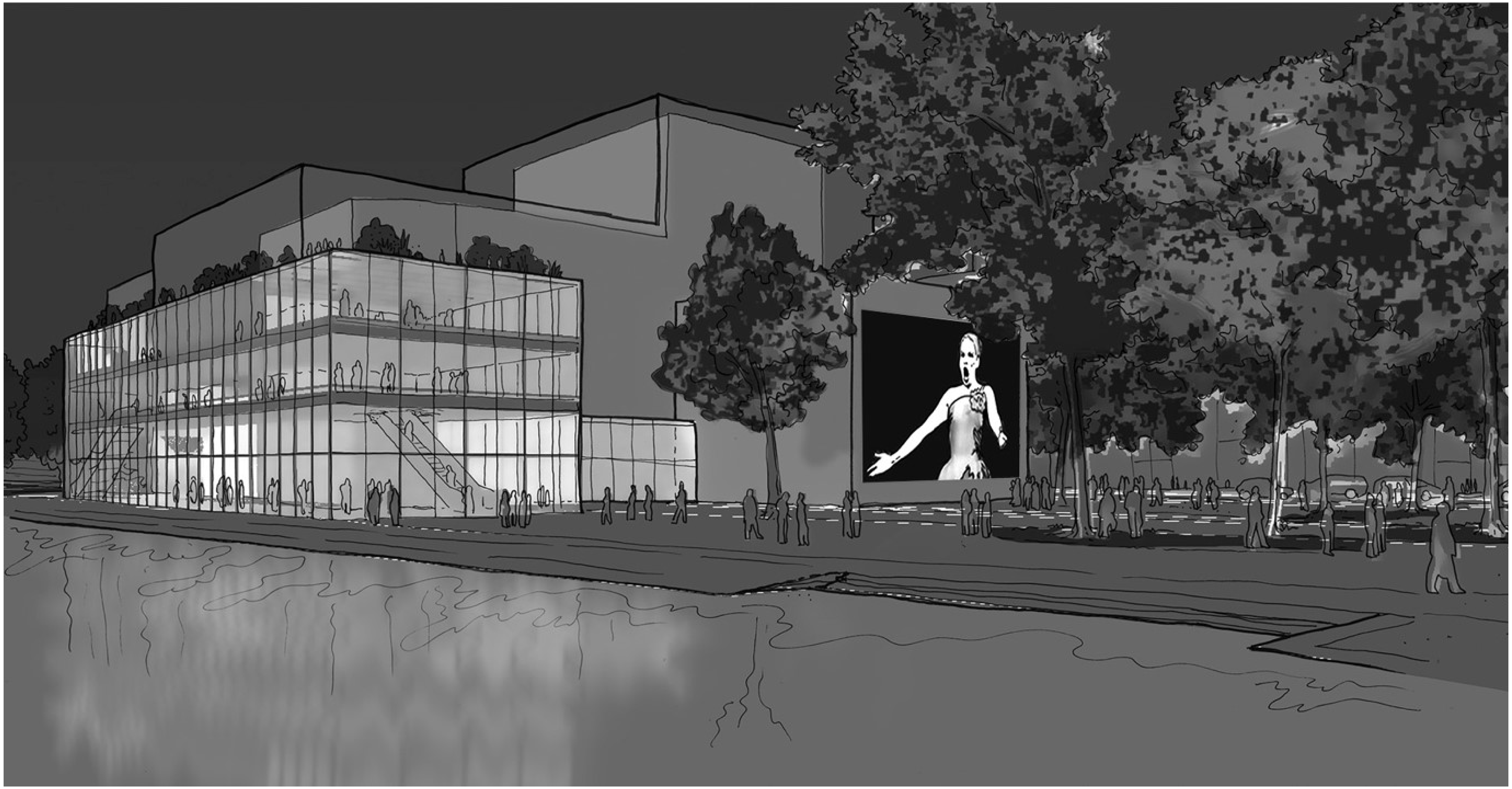
I4 View from the lake The volumetric composition of this massing option allows it to blend well within the context. The waterfront-facing foyer is a feature with great visual potential both from the inside out and from outside in. The fly tower does not feel out of scale when seen together with the nearby KKL and university buildings.

I4 Bird's-eye view The massing fits well in the modern urban fabric around it and has a good relationship with the generous and attractive green open space on the Inseli site.

Inseli



I4 Daytime look and feel The building has a very interesting relationship with the open spaces around it. Access via the tree-lined garden could be very atmospheric and the potential for expanding the theatre's activities outdoors is most valuable. All foyer areas have dramatic views over the water towards the lake.



I4 Night-time look and feel At night the foyer can become an attractive lantern reflected on the water and a focal point for people outside the building. Projections over the Small Venue walls can complement the outdoor activities.

3.4.3 Motorboothafen

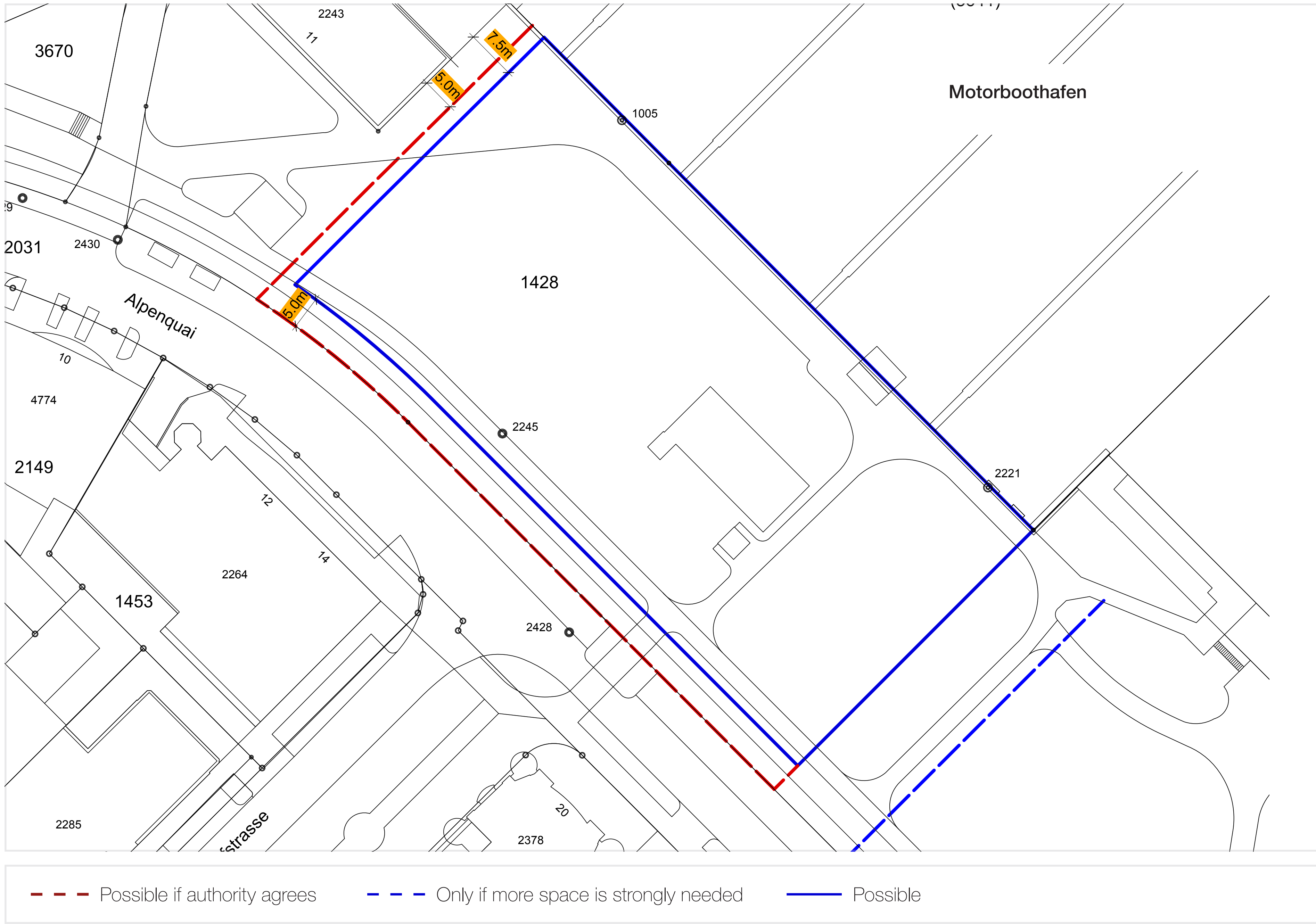
Image: Google Earth

Site Overview and Boundaries

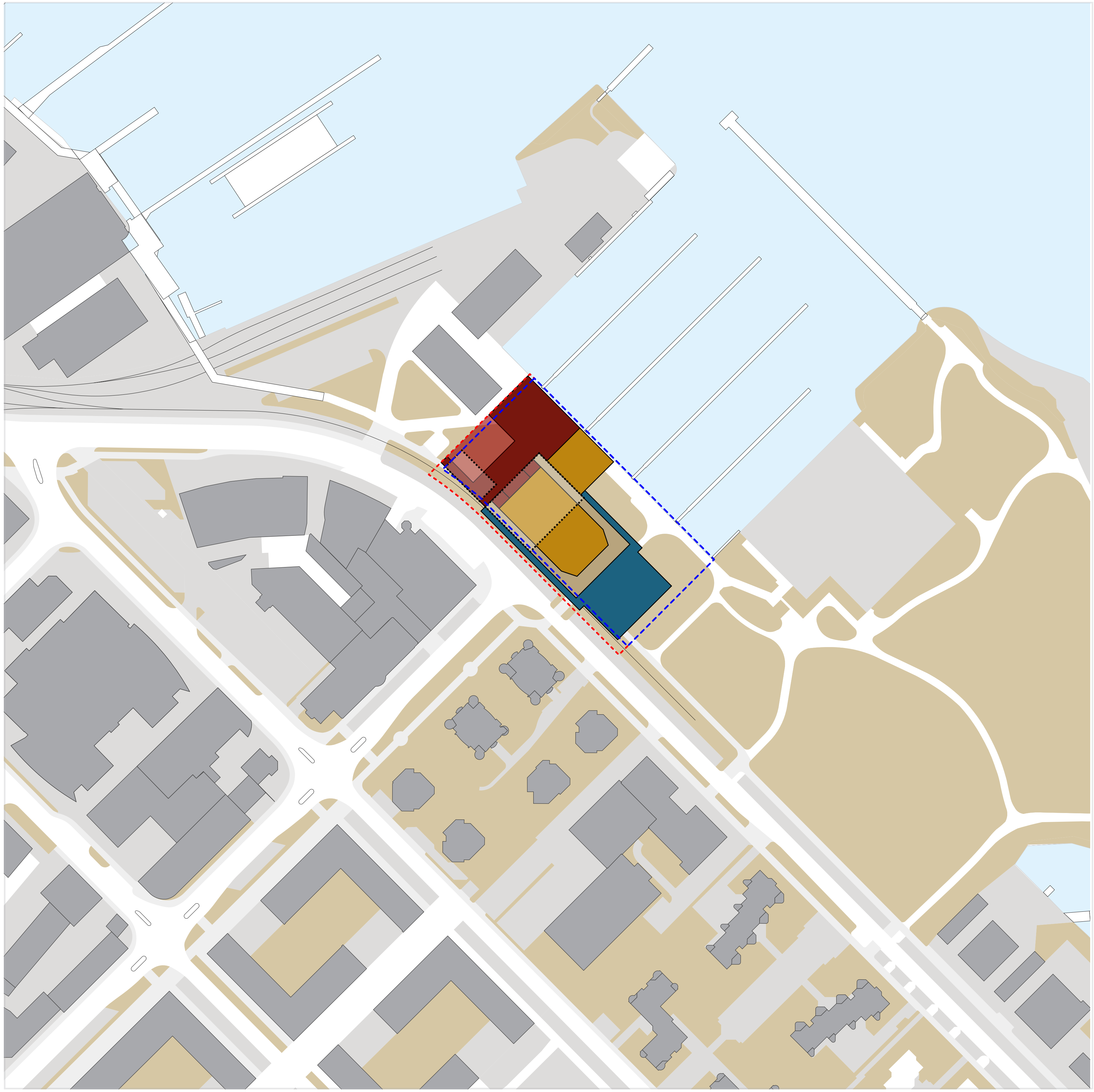
The site is a rectangular area between the small marina and the main road. On the south the site is defined by the edge of the park, while on the north by the access to the marina and relative warehouse buildings.

The given boundary was set on the water line of the marina and on the pavement alignment along the main road. On the north a 7.5m setback is defined from the buildings, while on the south the boundary is in line with the south edge of the marina.

Most of the site is currently used as a car park.



Motorboothafen



Ideal Massing Overlay

The ideal massing footprint is slightly wider than the available area and just fits in length. Ways of reducing the footprint need to be explored for an appropriate relationship with the context.

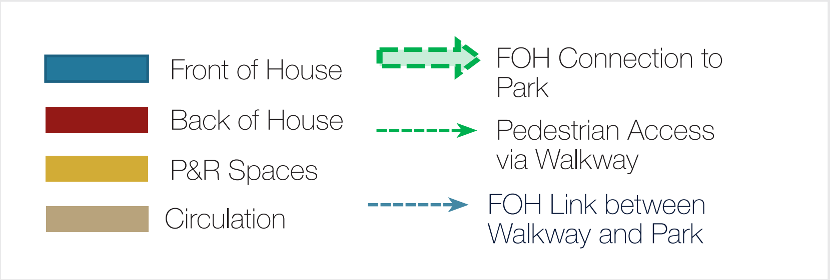
Front of House	Circulation
Back of House	Site Boundary
P&R Spaces	Potential Extended Boundary

Strategic Brief Layout Options

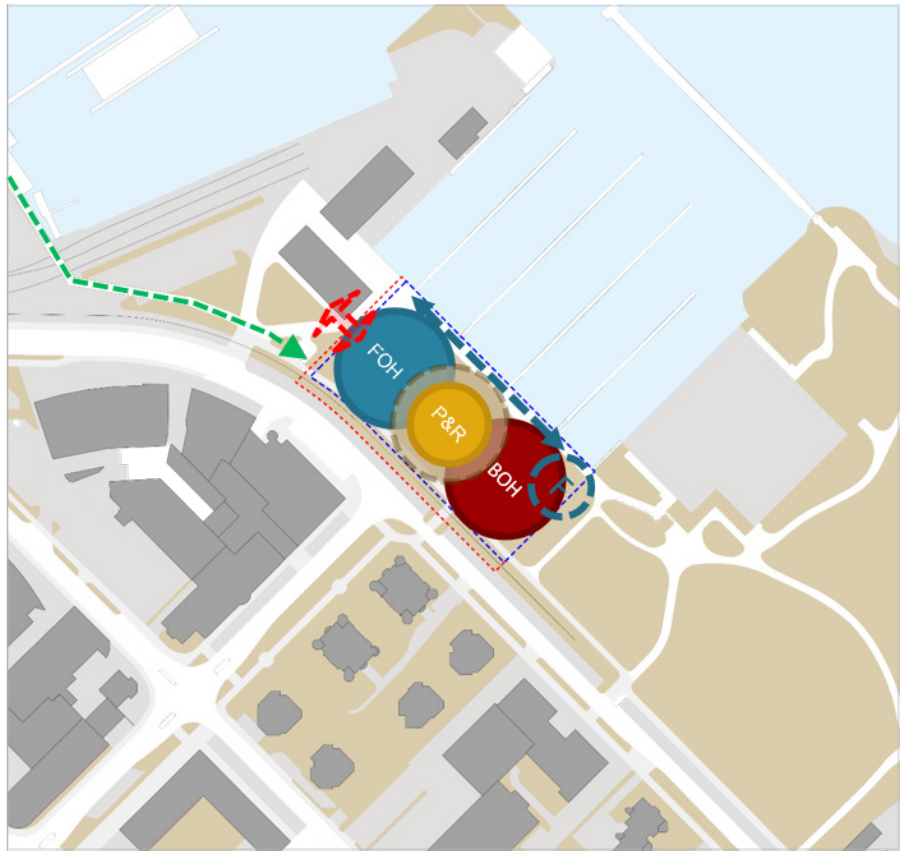
There are good arguments for the location of the Front of House both on the north as well as on the south end of the building.

A main entrance and foyer to the north would be the obvious position considering the audience arrival route from the walkway just north of the site. On the other hand, the beautiful park on the south offers a potentially very attractive relationship between the foyer and open space. During the massing studies, both locations were considered.

Ideally, a Front of House link could connect north and south so that the benefits from both solutions can be gained.

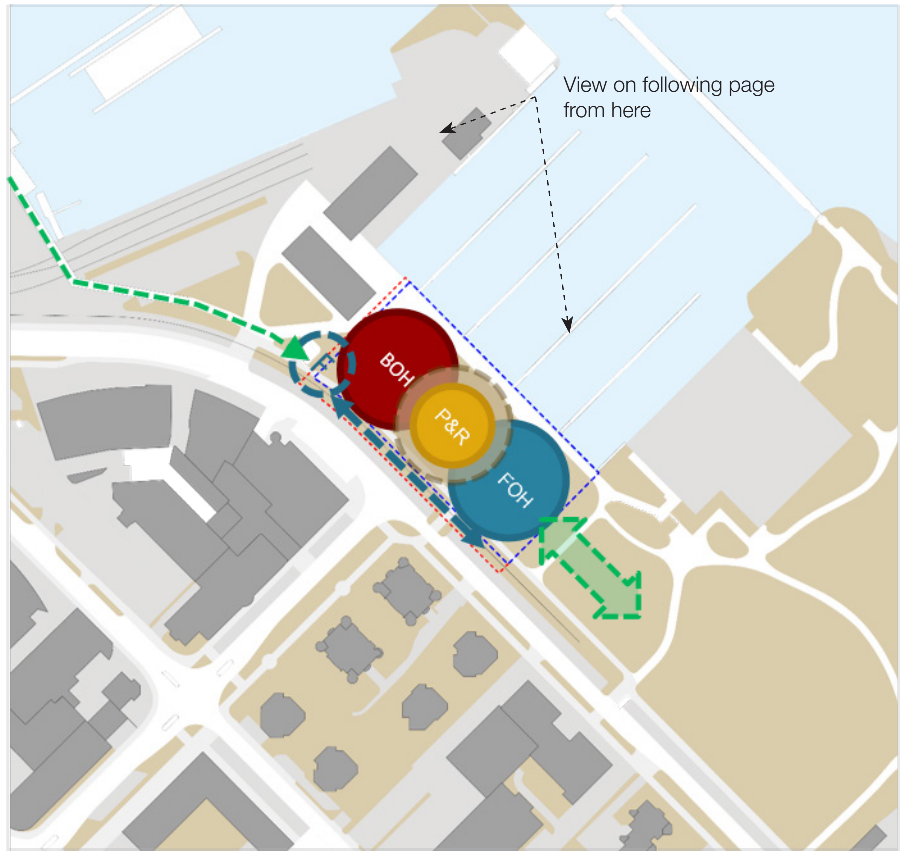


Must work in synergy with future redevelopment of adjacent site



? Front of House closer to walkway from city centre but currently compromised surroundings for quality of external spaces

Must have appropriate FOH connection towards the walkway



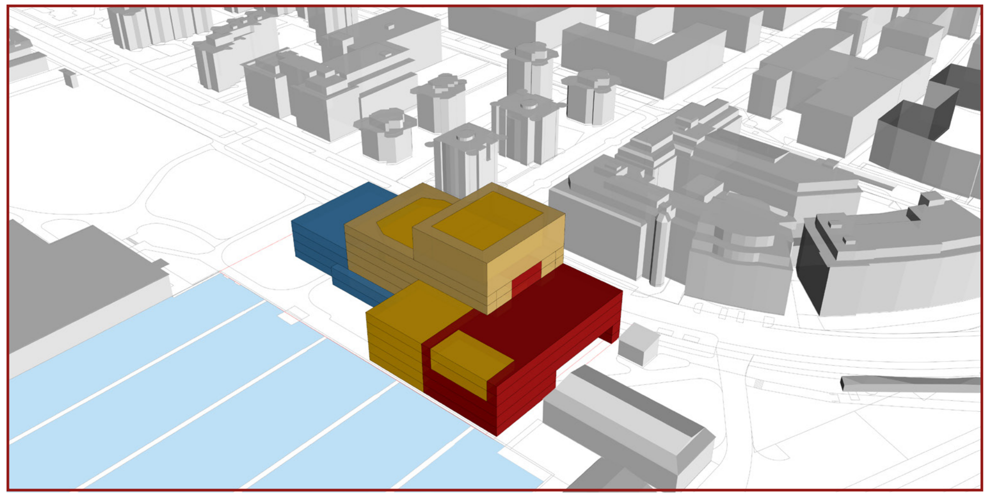
? Front of House closer to park, excellent settings for quality external spaces; Front of House connection towards walkway would be required

Motorboothafen

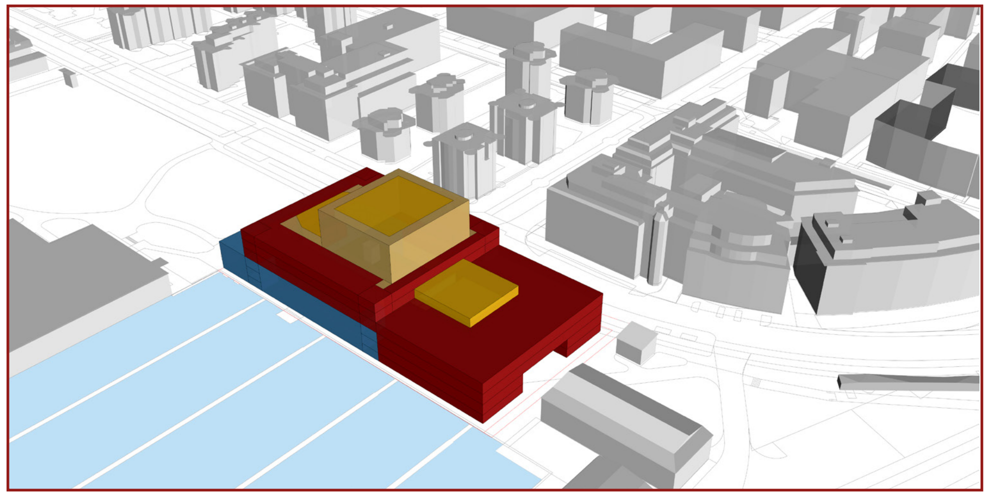
Initial Massing Studies

The initial massing studies resulted in two groups of options, one aiming at reducing the heights with a larger footprint, the other aiming at reducing the length and width of the ideal layout.

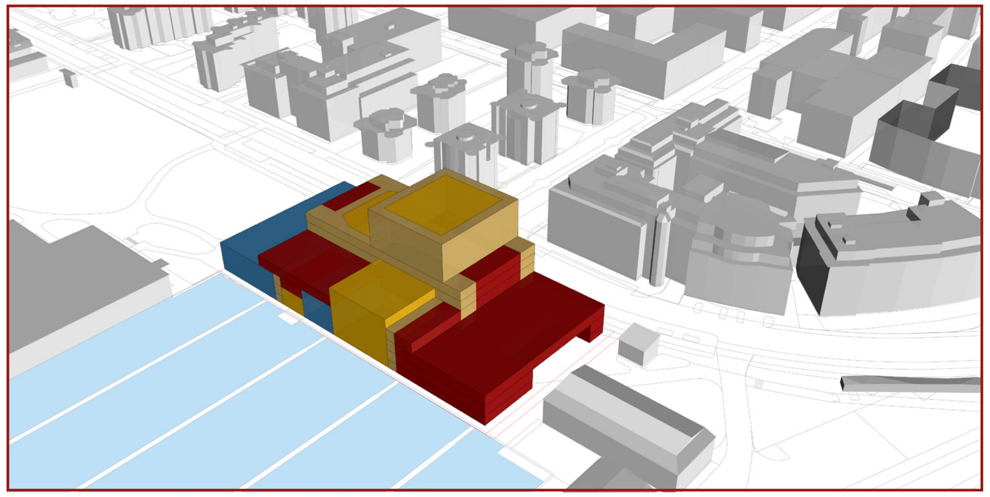
Neither of these directions proved to be satisfactory, and a set of new drivers was discussed for further development as demonstrated in the following pages.



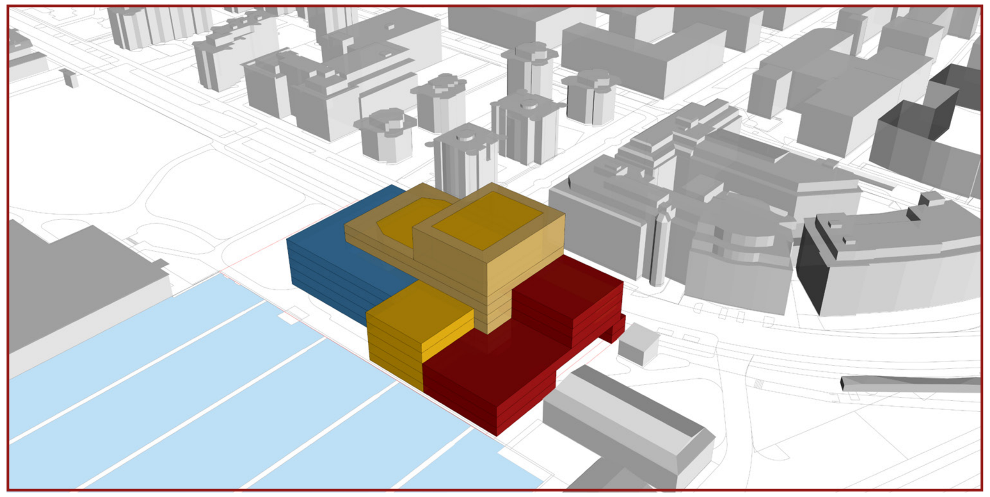
X Proximity to roadside trees and to boat yard boundary, no space on waterfront



X Large footprint, small waterfront space, proximity to boat yard boundary



X Large footprint, small waterfront space, proximity to boat yard boundary

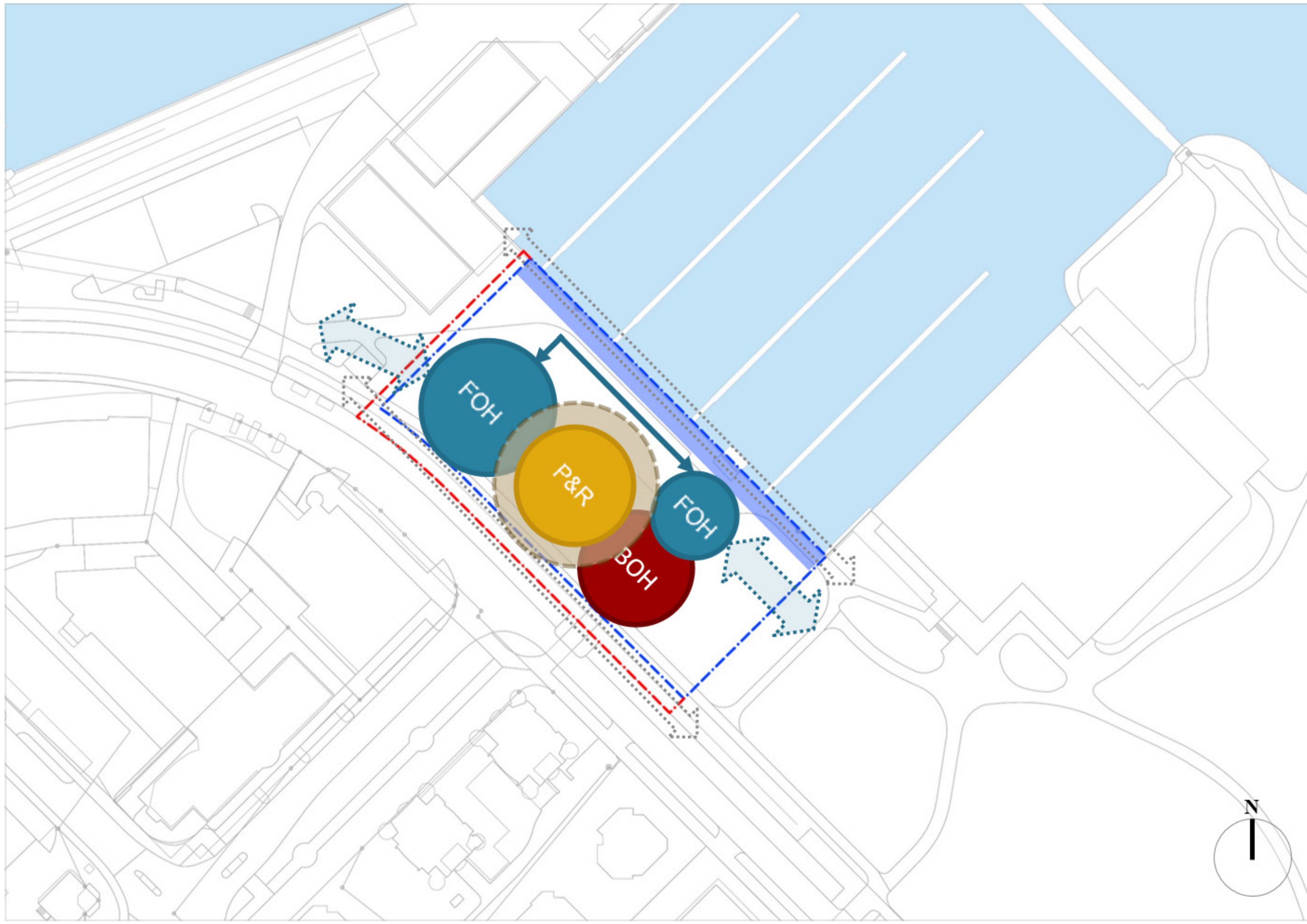


X No space on waterfront, no Front of House towards the north/centre, proximity to boat yard boundary

Massing Developments

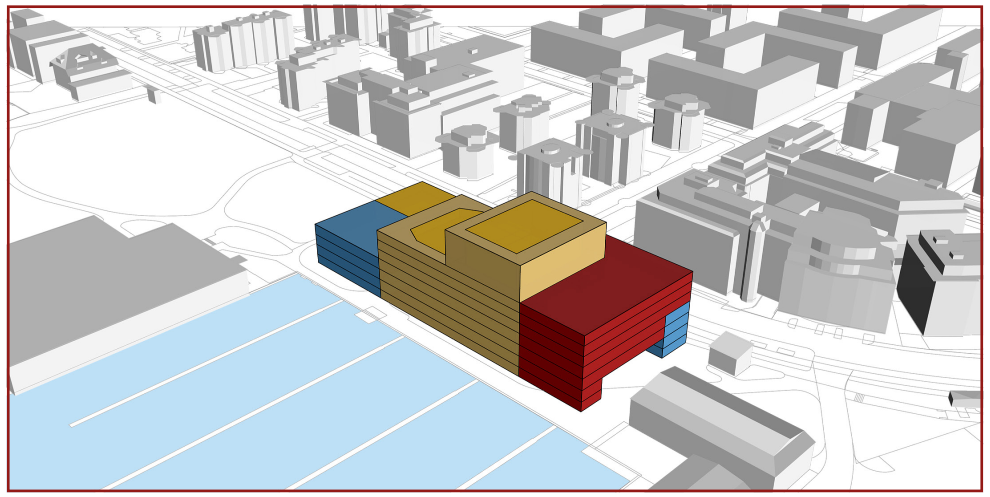
Feedback from the City's site committee and Lucerne Authorities helped focus further development of the massing with the following key drivers in mind:

- Focus on compact footprint massing solutions.
- Keep a more generous distance from the water to allow circulation.
- A foyer located on the north is preferred but with a strong connection to the south and the park.
- Look for opportunities for an active waterfront and/ or street front.

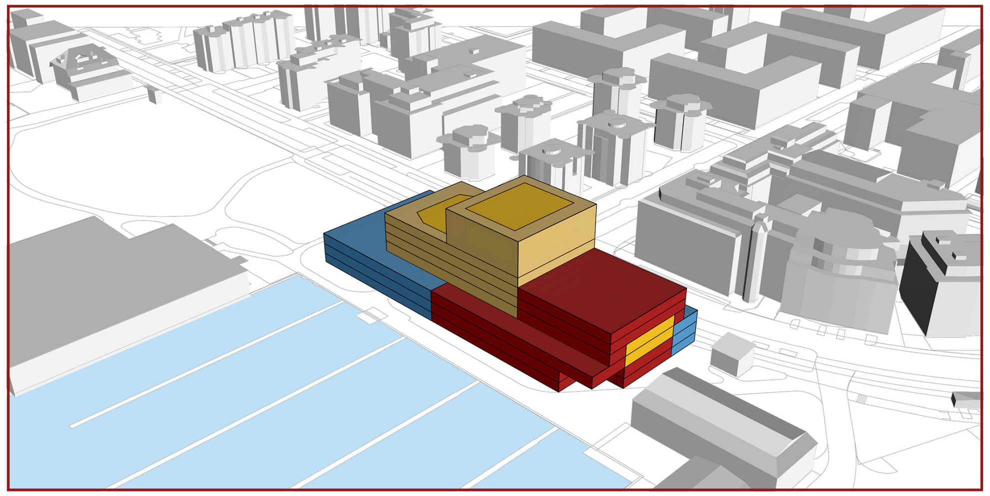


Front of House	Site Boundary
Back of House	Potential Extended Boundary
P&R Spaces	Active waterfront and streetfront
Circulation	Access to public gardens and FOH

Motorboothafen



M1. Detached Small Venue Massing



M2. South-facing Front of House Massing

The following massing options were developed and tested for Motorboothafen based on these requirements:

M1. Detached Small Venue Massing

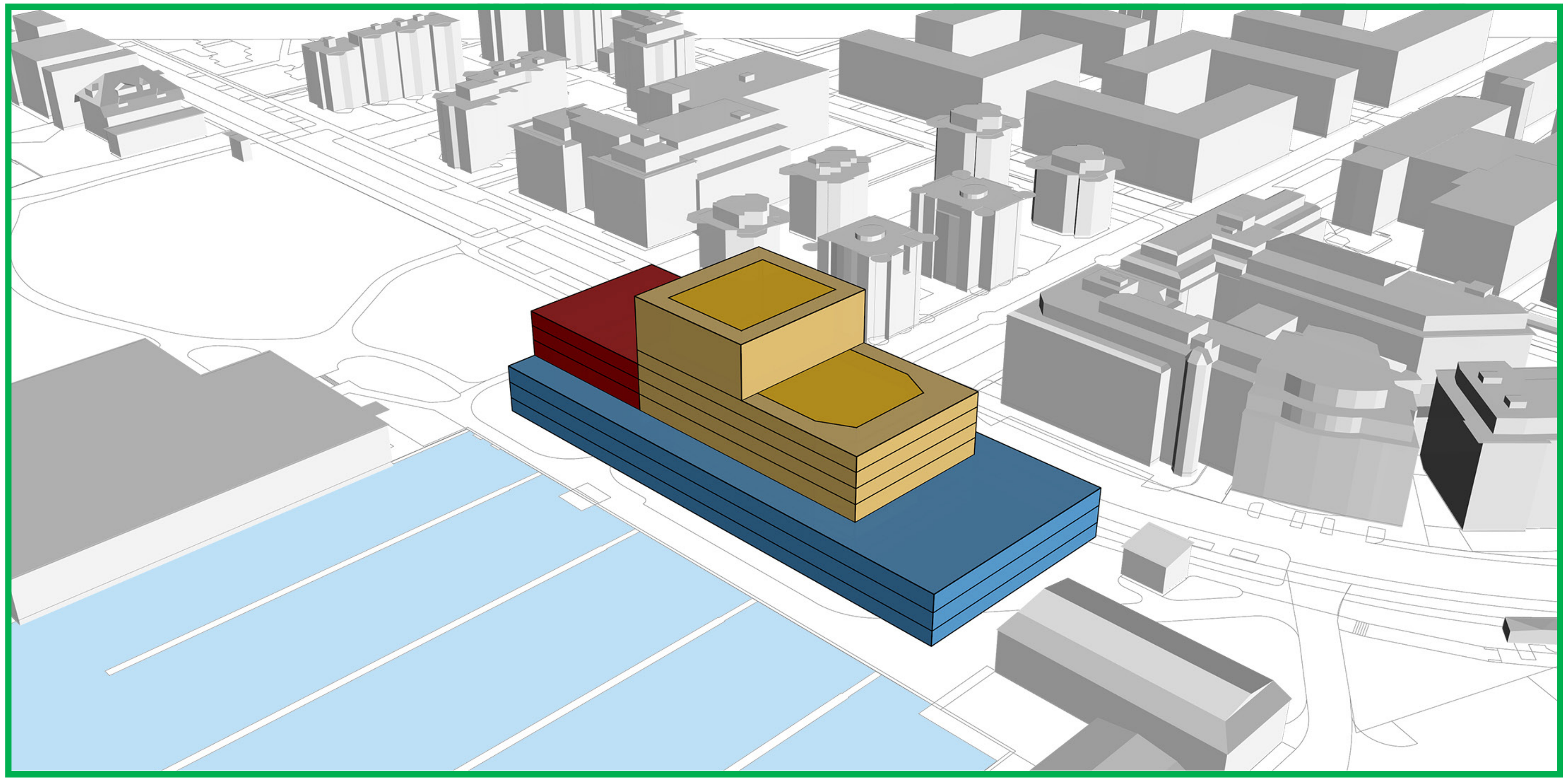
A further study was conducted with the Small Venue not directly connected to the Large Venue. This fits well on the site but does not produce significant enough benefits from the massing and site fitting point few to justify such a change in the way the Venues are operated, moreover in this option an enlarged basement area is required and the orientation of the foyer is not ideal.

M2. South-Facing Front of House Massing

This option is developed on a narrow footprint with the Small Venue in a rear position. The setback from the waterfront is appropriate in size. The Front of House is facing south, open to the park, with a foyer link extending north along the main road. The orientation and position of Front and Back of House are not ideal as the main audience access flow is from the north.

M3. Recommended Massing

The narrow footprint massing, with the Front of House facing north and a foyer link connecting to the park on the south, is the most successful option. This works well from an access point of view and creates an interesting active waterfront. This option is illustrated in more detail in the following pages.



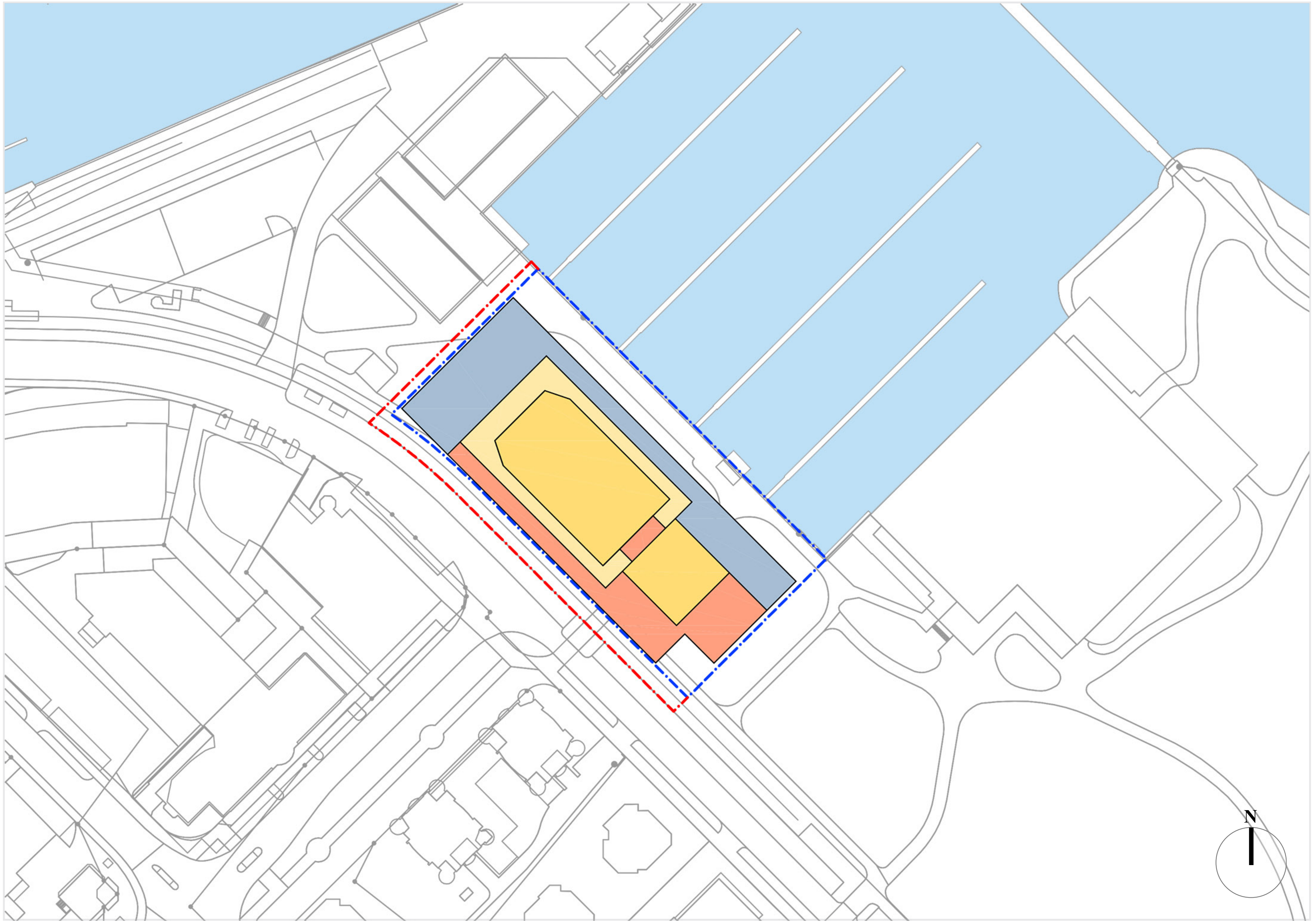
M3. Recommended Massing

Recommended Massing – M3

The audience entrance and foyer front are oriented facing north, but the Front of House extends along the waterfront and allows for an area facing south towards the park.

The Small Venue is behind the Large Venue, which helps making the footprint narrower.

Loading dock and Back of House are in the south-west corner towards the main road and with a direct connection to Large Venue through the Small Venue.



Front of House
Back of House
P&R Spaces
Circulation
Site Boundary
Potential Extended Boundary

Motorboothafen

M3 Existing Tree Overlay

The narrower massing manages to save trees on the east and west but still affects the trees on the south part of the site.

Trees to be maintained

Diameter 4–10m

Diameter > 10m

Trees to be removed

Diameter 4–10m

Diameter > 10m

Boundaries

Site Boundary

Potential Extended Boundary

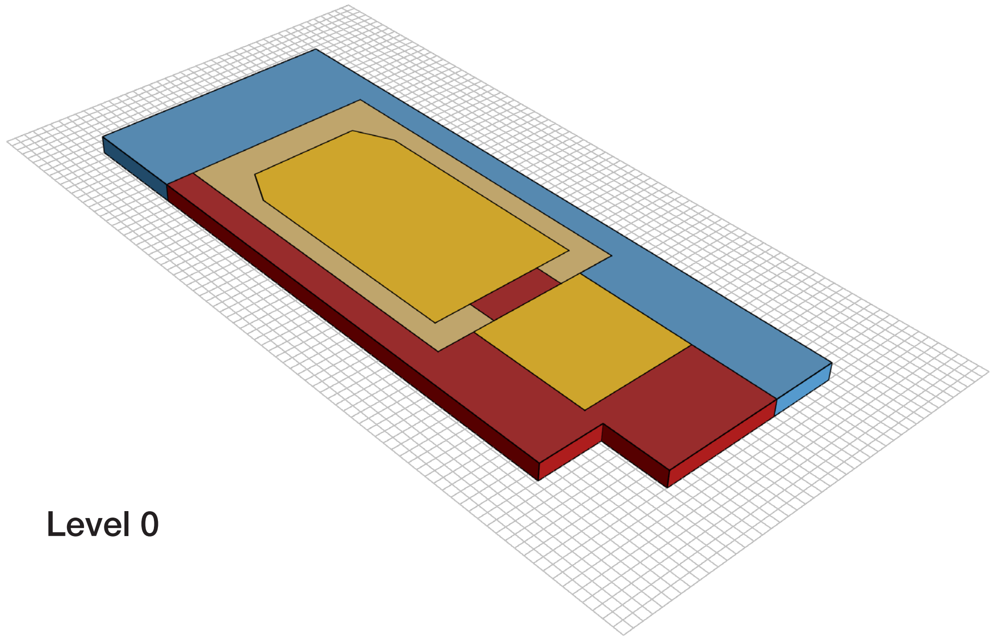
M3 Building Anatomy

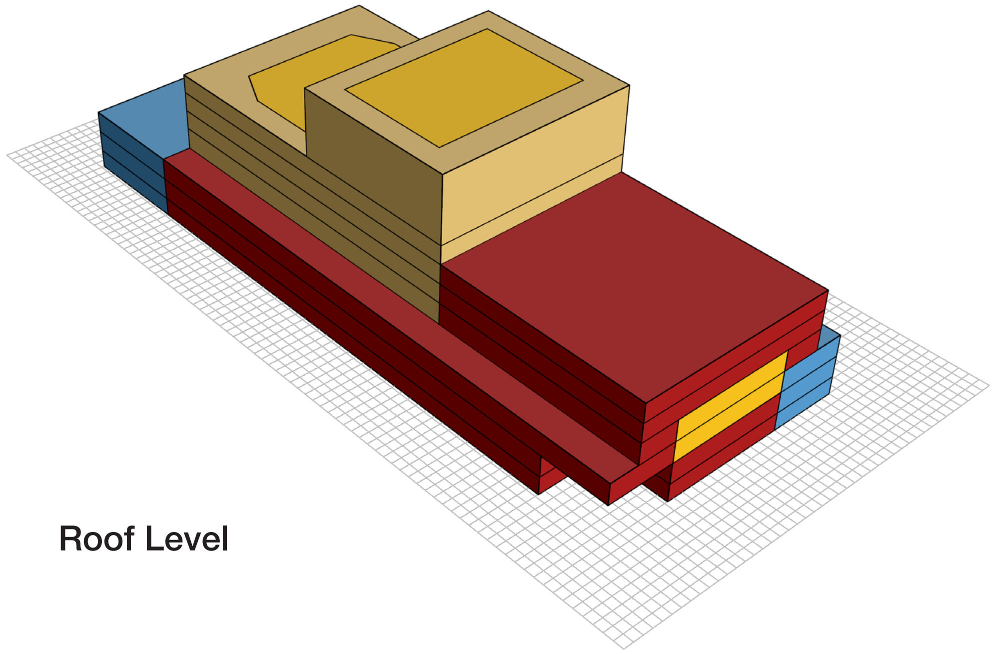
Basements areas are limited to what is required by the technical spaces of the Large Venue.

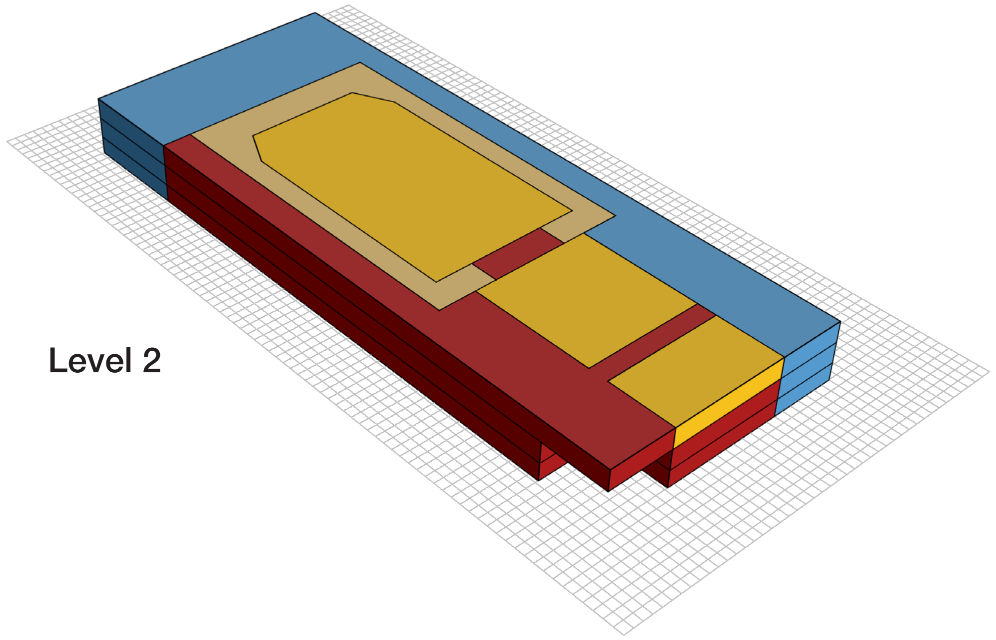
Large and Small Venues are located at the ground floor (+1m) and accessed by dedicated parts of the foyer. The Studios are located on the second level with access from the south upper part of the foyer.

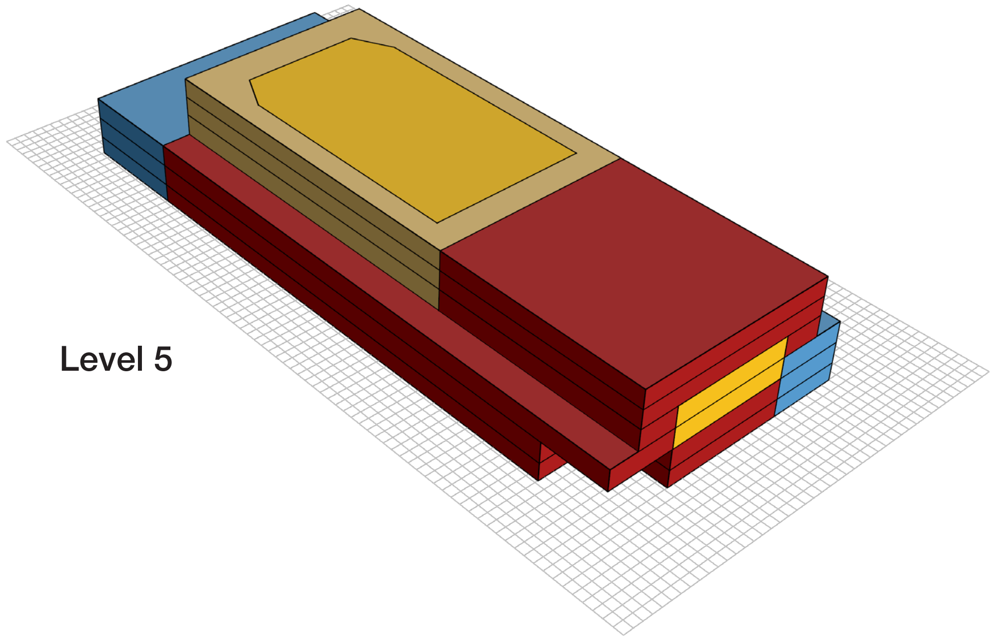
Back of House areas are arranged on the south of the building with good connections to all Front of House and Performance and Rehearsal Spaces.

This configuration requires additional foyer area and results in an less than optimal spatial arrangement of the Front of House spaces.

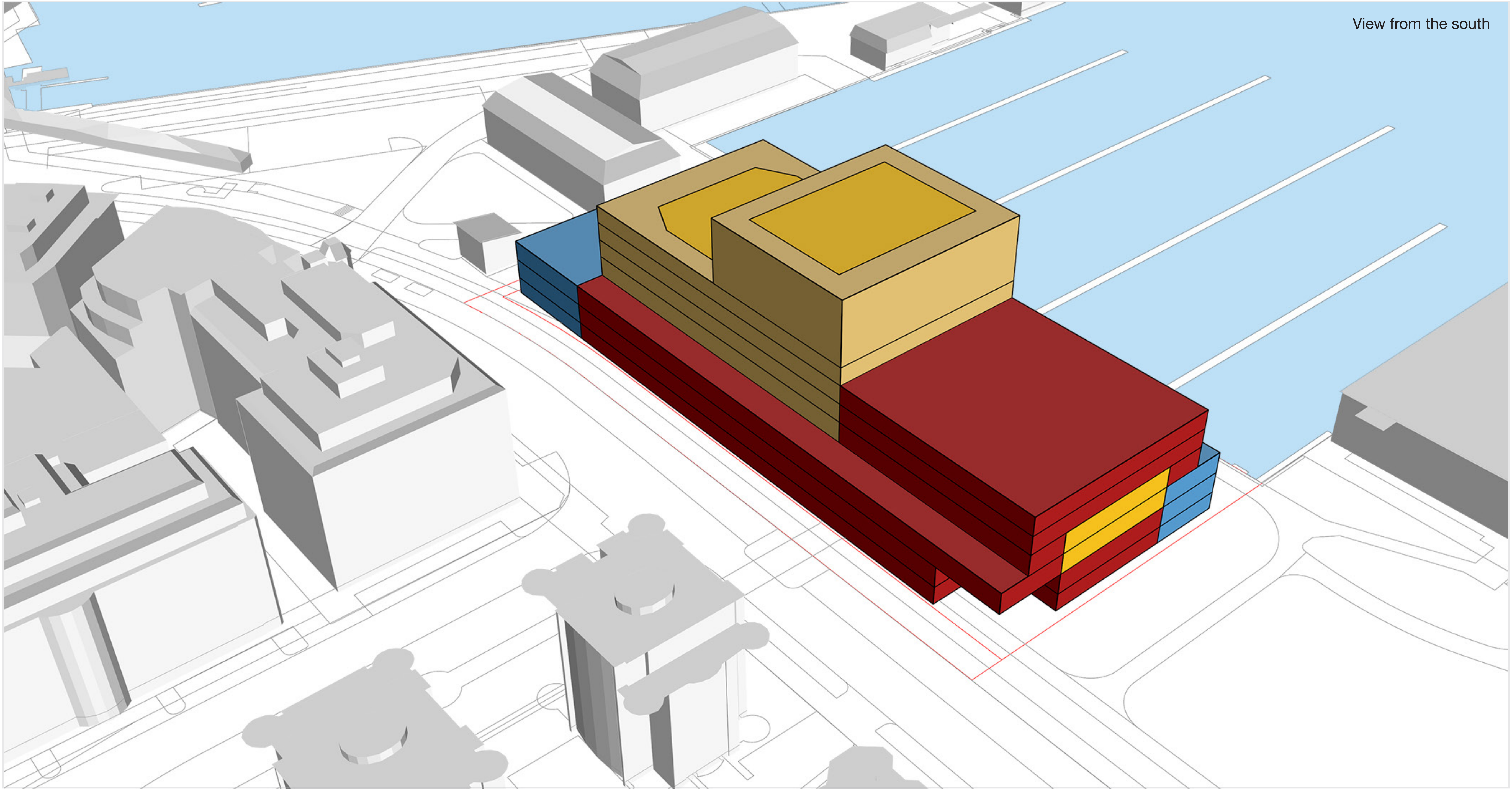




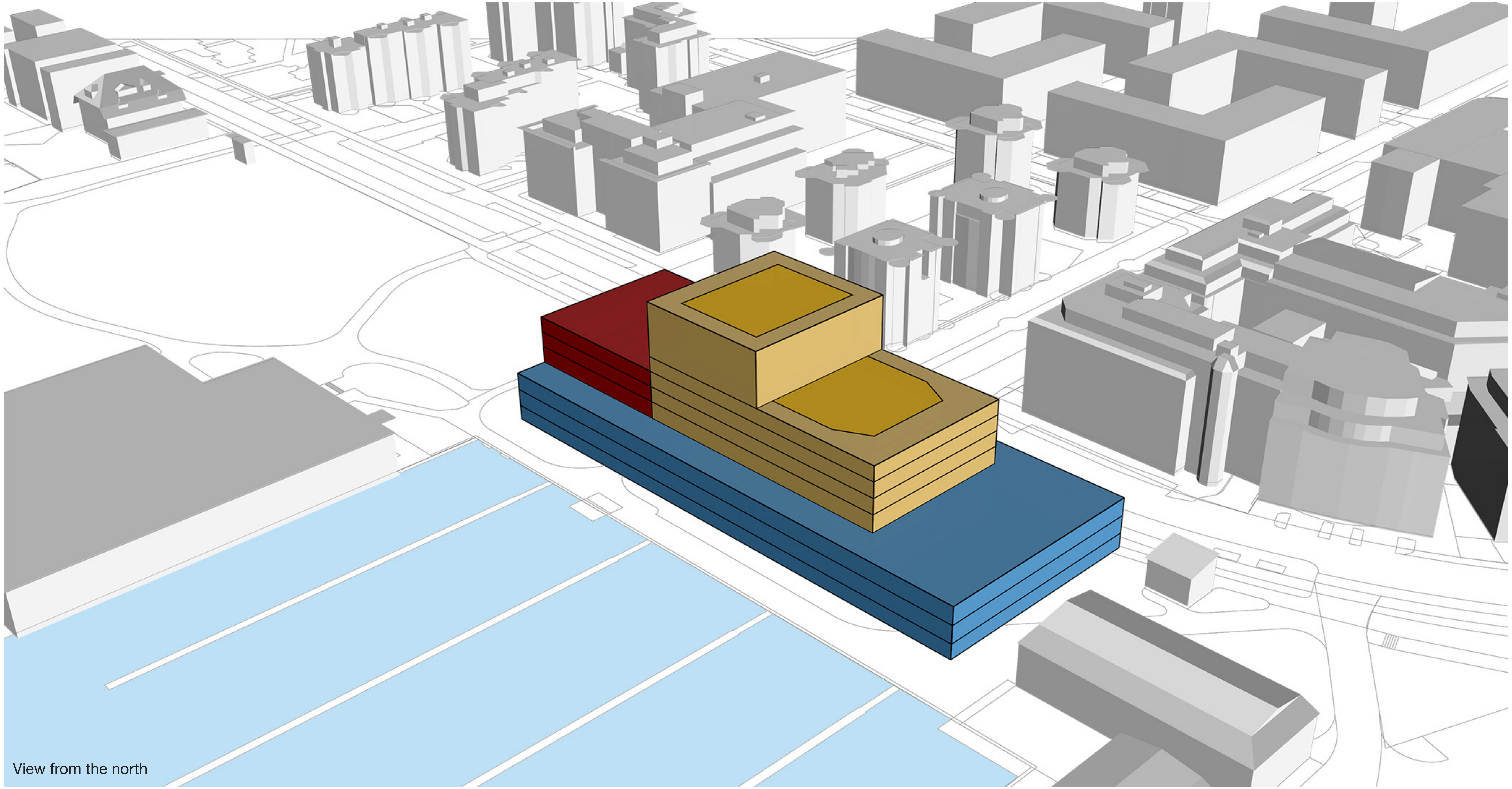




Motorboothafen



M3 Massing evaluation in context The massing looks bigger in proportions compared to the surrounding buildings. The site is almost fully used by the building, but this is balanced by the presence of a large park to the south. The fly tower is taller than the buildings around but sits centrally to the road leading to the building and could provide a good termination with its landmark character.

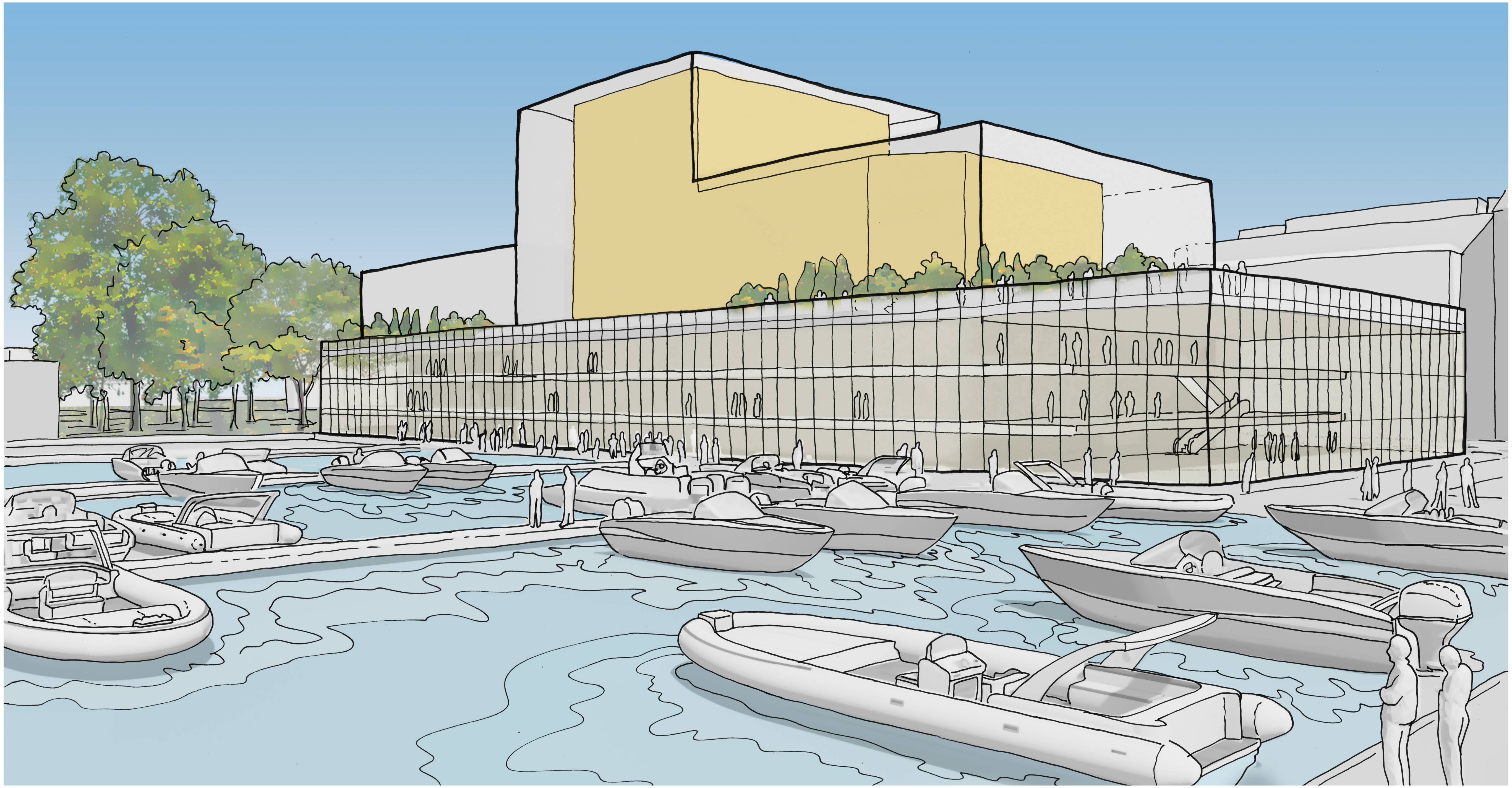

View from the north

Motorboothafen

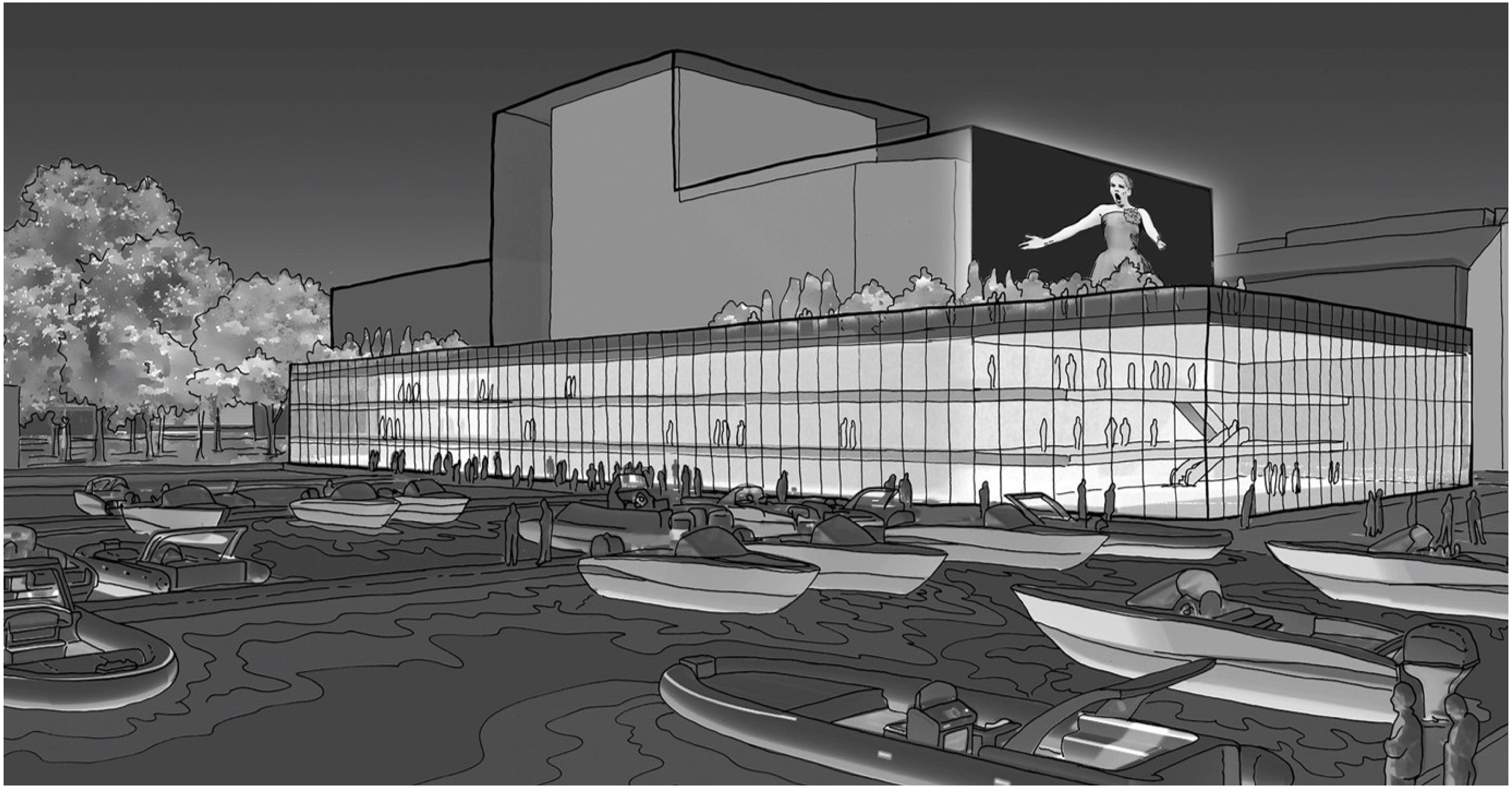
M3 View from the lake The massing stands out from the context profile and reads as a landmark form the lake.

M3 Bird's-eye view Despite being significantly bigger than the buildings around it, the massing fits well within the urban grid and with the size of the marina.

Motorboothafen



M3 Daytime look and feel The building provides a grand backdrop slightly in contrast with the otherwise small scale marina. The glazed Front of House link softens the jump in scale between the marina and the Large Venue. The waterfront area has certainly the potential to be an attractive and lively place.



M3 Night-time look and feel At night, the foyer can become an attractive focal point for the area. Projections on the walls can complement the outdoor experience.

3.5 | Conclusion

The following presents an overview and conclusion of the Massing Study for the three available sites.

Theaterplatz

- The only operationally viable massing option occupies almost all the area available on-site.
- A top-floor foyer and basement Back of House approach is necessary in order to make this option work, still it would be operationally challenging.
- The Small Venue can only fit if reduced to half of the required size and in a rear position.
- All functions are compressed without much room for design invention.
- The massing feels too tight a fit on the site considered its height and proportions.

Inseli

- A compact massing option is recommended, with a location that allows for a larger park on the north and a smaller public space on the south.
- The existing green area balance on-site is maintained with this massing.
- The massing fits well in the context of buildings and open spaces around it.

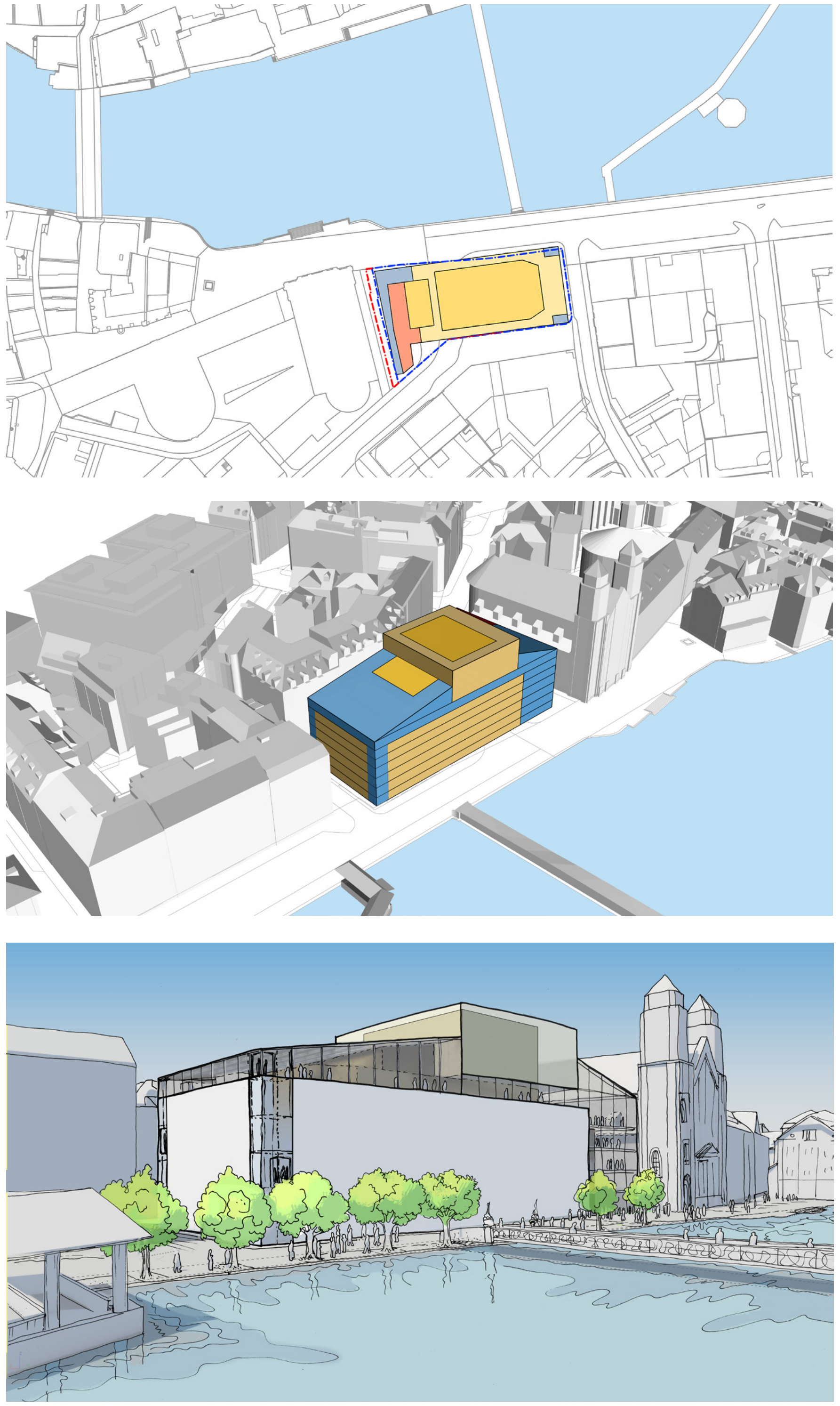
Motorboothafen

- A massing option with the Small Venue in a rear position is recommended.
- Both a north or south-facing foyer options are viable as long as a Front of House link is provided between arrival walkway and park.
- The massing stands out and reads as a landmark in the context.

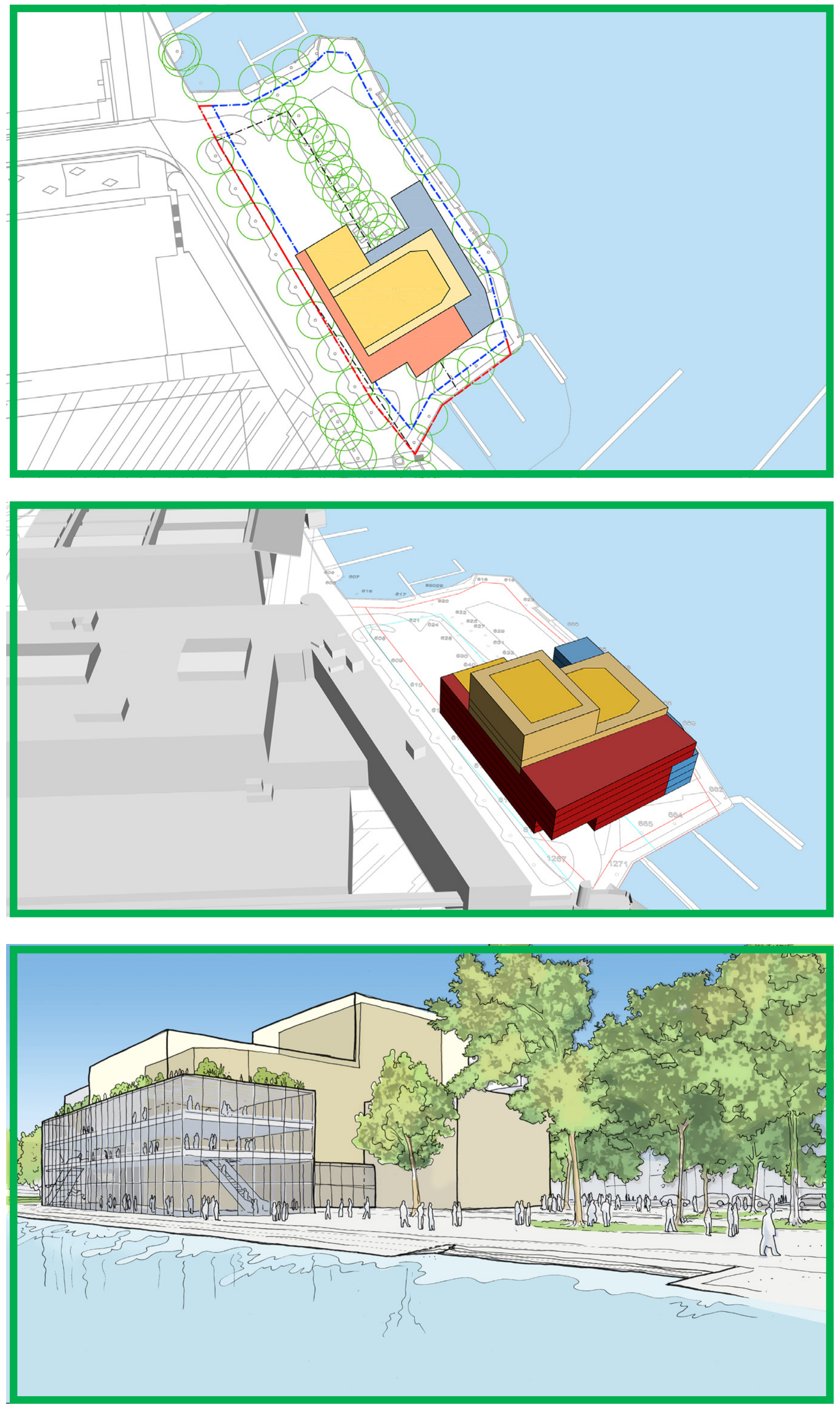
The Massing Study recommends Inseli as the preferred site to accommodate the New Theatre. Whereas both Inseli and Motorboothafen could have accommodated a massing in line with the spacial requirements of the Technical Concept, the Inseli site allows for a slightly more operationally efficient layout as well as for better integration of the New Theatre into the context of buildings and open spaces around the site. Theaterplatz is not a viable option as the limited size of the site does not allow for an operationally feasible layout of the New Theatre.


Image: Google Earth

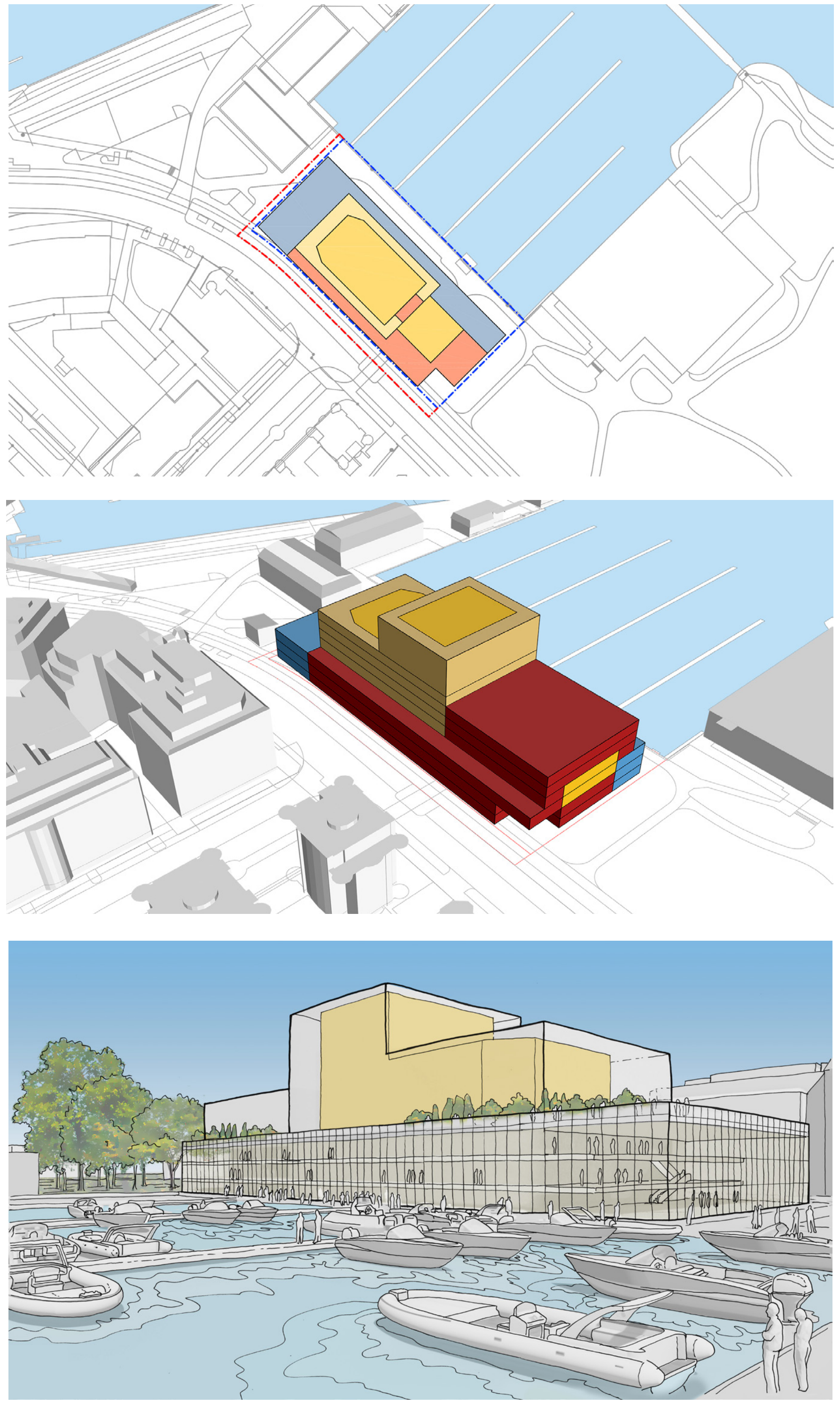
Theaterplatz – Recommended Option T3



Inseli – Recommended Option I4



Motorboothafen – Recommended Option M3



4 | Site Assessment

4.1 Approach and Methodology

In Section 4, each of the three available sites is assessed against a set of defined evaluation criteria. Each site was assessed for its ability to accommodate the spaces defined in the Technical Concept (further developed into a massing in Section 3), as well as its ability to respond to the technical and experimental requirements of the Concept Framework.


Image: CC - Kosala Bandara (flickr)

4.1.1 Concept Framework

This Site Assessment is based on the Concept Framework, specifically the vision of the Salle Modulable and the key success factors outlined in this section.

The Salle Modulable vision is as follows:

> *To create a “salle modulable” which shall be a performance arts venue in Lucerne known as the New Theatre that incorporates a uniquely flexible theatrical environment that affords artists a world-class platform for performance and creative experimentation, and offers local and international audiences an exceptional experience that builds on the reputation of the Kultur- und Kongresszentrum Luzern (KKL) and the Lucerne Festival. This Facility will also be the home of the Luzerner Theater.*

The Facility success factors that follow set out the project criteria that are most relevant to the design and construction of the New Theatre.

Each of the sites and their associated facility massing options have been analysed through the lenses of these success factors:

- context
- artist experience
- audience experience
- venue
- community expectations
- planning for efficient operations
- reputation

4.1.2 Success Factors for the Site Assessment

For the Site Assessment, five of the seven key success factors are considered primary factors, which correlate directly with the site:

- context
- artist experience
- audience experience
- community expectations
- planning for efficient operations

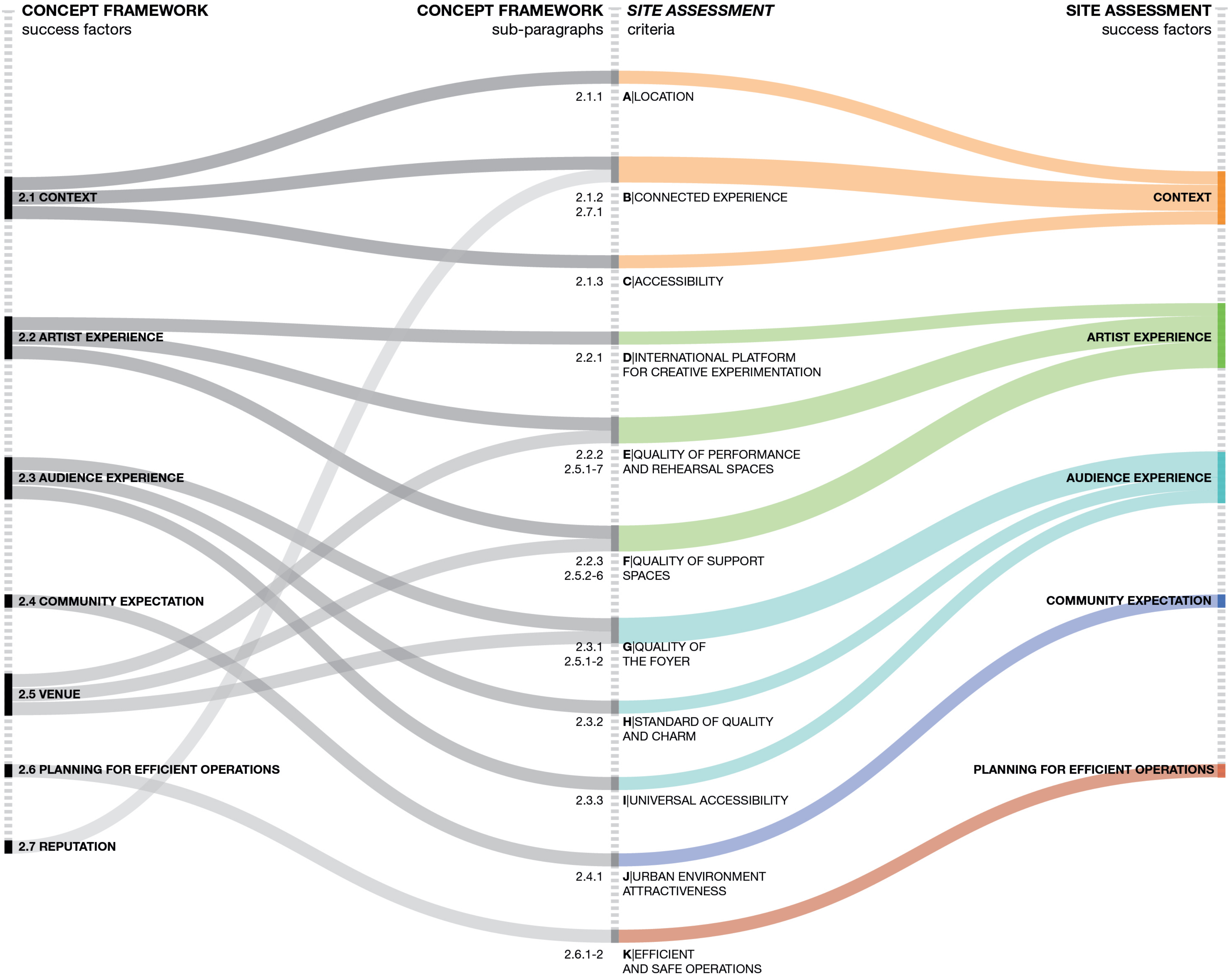
The remaining two key success factors — venue and reputation — are categorised as secondary success factors for the purposes of this study. In the context of site selection, achieving success in these two areas is dependent on the five primary factors.

Venue

The Technical Concept of the Large Venue outlined in Volume I is considered a constant throughout this study; modification of the Technical Concept is not considered an option. The site evaluation focuses on the way the site facilitates or hinders the artist and audience experience of and technical operations around the Large Venue (criteria E, F and G).

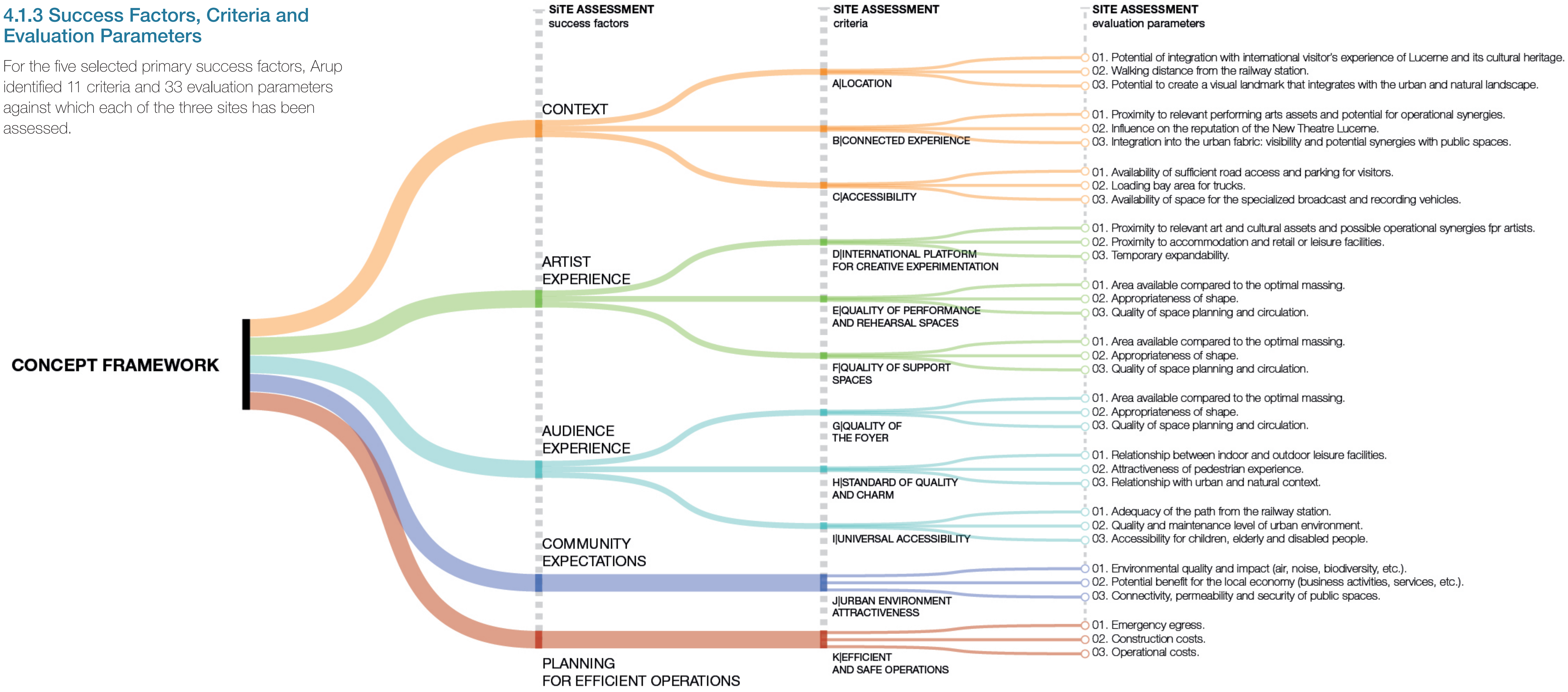
Reputation

The reputation of the New Theatre, as it relates to site selection, is connected primarily with the context the site offers. For the purpose of this study, context-related aspects are evaluated through the connected experience (criterion B).



4.1.3 Success Factors, Criteria and Evaluation Parameters

For the five selected primary success factors, Arup identified 11 criteria and 33 evaluation parameters against which each of the three sites has been assessed.

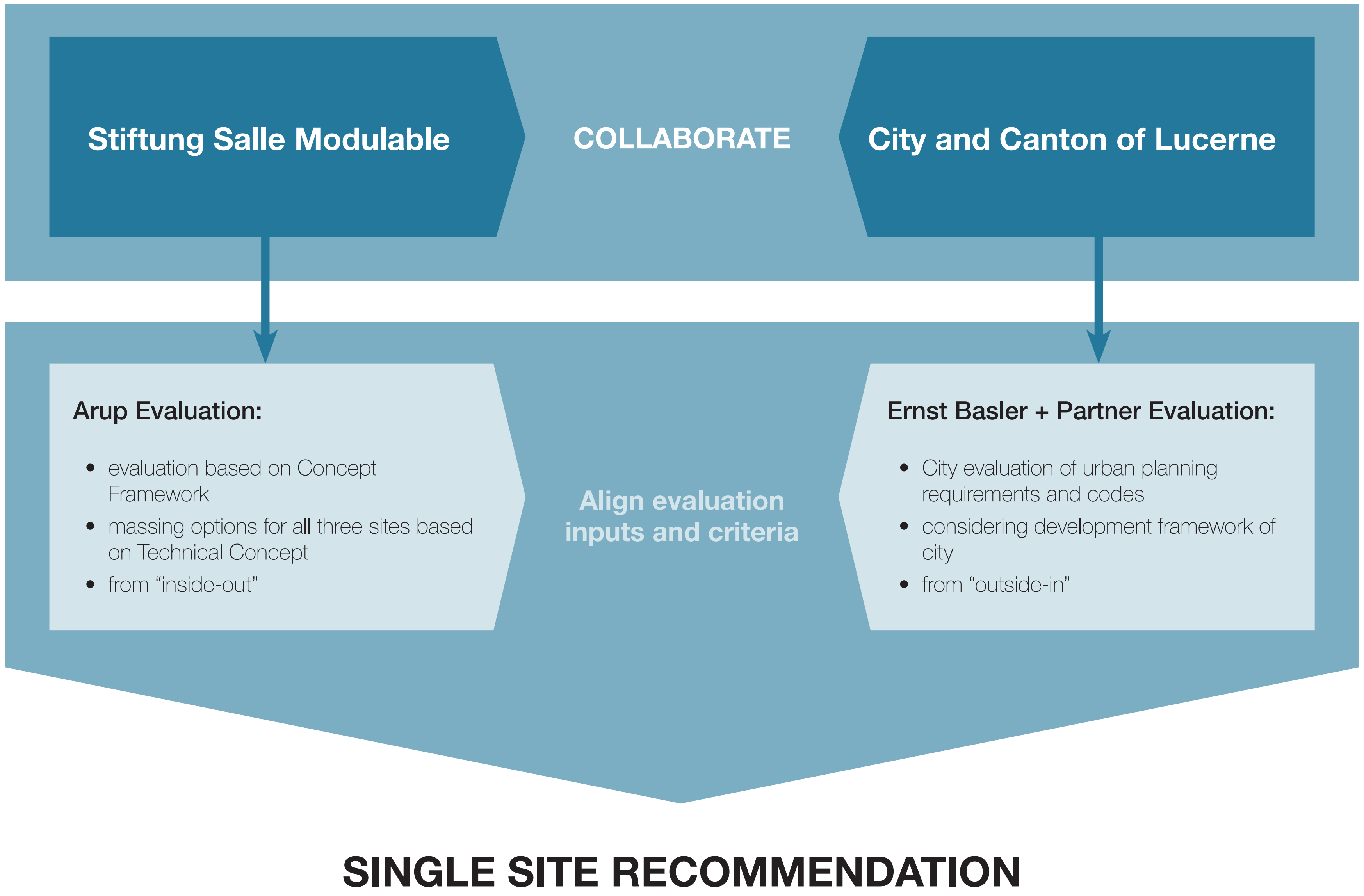


4.1.4 Parallel Evaluation

In October 2014, the City and Canton of Lucerne appointed Ernst Basler + Partner (EBP) to carry out a Site Assessment of the three potential sites for the New Theatre. Their mandate includes making recommendations to the City and Canton so that a site can be selected.

Arup conducted a parallel evaluation and made an independent site recommendation.

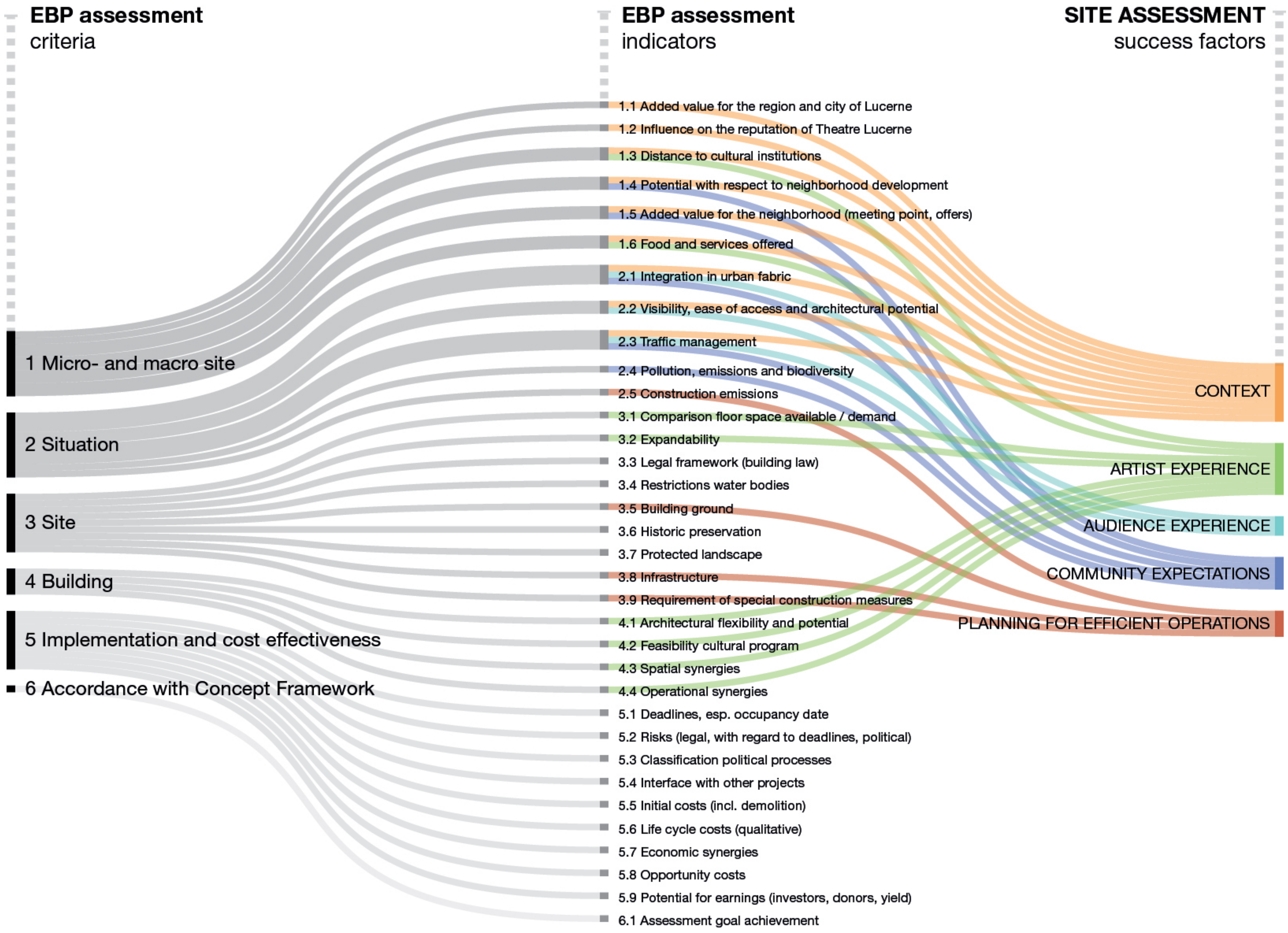
It is in the broader interest of the project that the two studies recommend the same site. For this reason, the City and Canton and EBP have proposed to base their evaluation process on the space program and Technical Concept developed for the project by Arup. Further, the evaluation criteria used by EBP reflect key requirements of the Concept Framework as well as broader urban planning and city planning considerations.



4.1.5 Accordance with EBP Parameters

For the purpose of facilitating the EBP process and making a single site recommendation together with the City and Canton and EBP, Arup mapped the EBP assessment indicators with the evaluation criteria used in this study.

Those EBP criteria which are not relevant for the Concept Framework were not analysed as part of this assessment.



4.1.6 Scoring

The assessment of each criteria has been summarised following the RAG (red/amber/green) approach.

All criteria have been weighted equally, and a recommendation will be made separately taking into consideration the evaluation in this report.

Where not otherwise stated, the evaluation is based on a qualitative assessment of the criteria.

R	A	G
The parameter is hardly or not satisfied	The parameter is satisfied with some exceptions or difficulties	The parameter is fully satisfied and the indicator is positive

4.2 | Assessment of Evaluation Criteria

In this section, the three available sites are assessed against the evaluation criteria defined in Section 4.1.3.


Context


Artist Experience


Audience Experience


Community Expectation


Planning for Efficient Operations

4.2.1 Context

For purpose of the Site Assessment, context is analysed through the following three criteria and nine evaluation parameters.

A. Location

01. Potential of integration with international visitor's experience of Lucerne and its cultural heritage
02. Walking distance from the railway station
03. Potential to create a visual landmark that integrates with the urban and natural landscape

B. Connected experience

01. Proximity to relevant performing arts assets and potential for operational synergies
02. Influence on the reputation of the New Theatre Lucerne
03. Integration into the urban fabric: visibility and potential synergies with public spaces

C. Accessibility

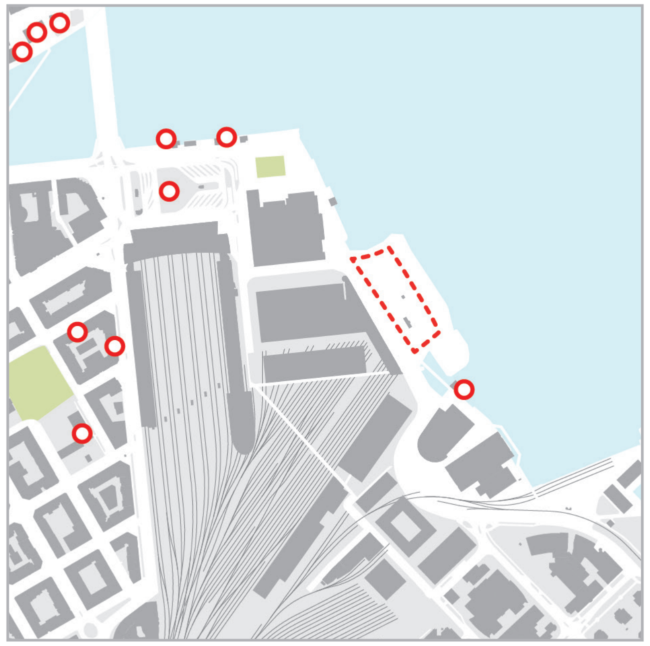
01. Availability of sufficient road access and parking for visitors
02. Loading dock area for trucks
03. Availability of space for the specialised broadcast and recording vehicles

01. Potential of integration with international visitor's experience of Lucerne and its cultural heritage

Geographical proximity to the historic centre and potential synergy with other cultural assets and main touristic pathways

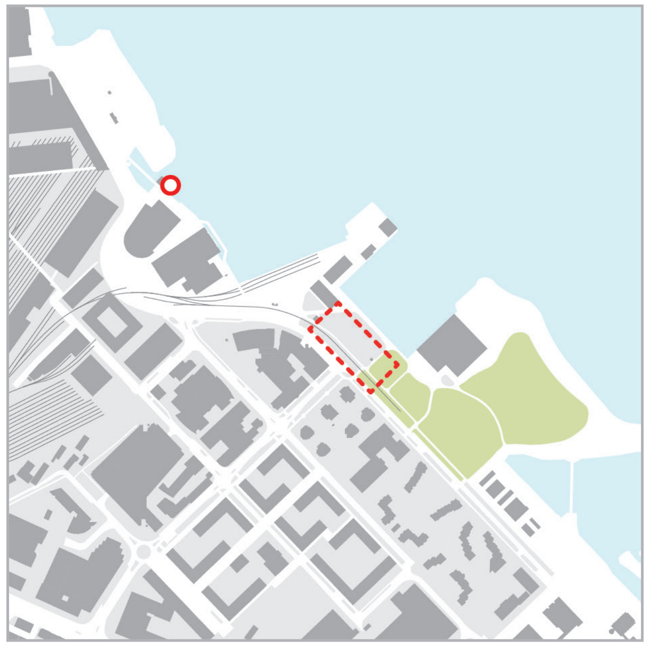
G Theaterplatz

Theaterplatz is located in the centre of the historic city in close proximity to significant cultural assets of Lucerne. The site faces the Reuss River, located next to the Jesuit Church. Chapel Bridge is only a short walking distance away. As a historic centre of gravity for the city of Lucerne, Theaterplatz is featured as a frequent visitor destination and therefore well integrated in the international visitor's experience.



G Inseli

Inseli is located along the lakeshore in immediate proximity to the KKL, an important contemporary cultural asset in Lucerne. KKL, with its existing appeal to visitors, could help integrate the New Theatre into the international visitor's experience. Inseli currently is periodically used for outdoor cultural functions including audio and video projections of performances from the KKL. Existing cultural assets in the historic centre can be easily reached.



R Motorboothafen

Motorboothafen is embedded between the lake, Ufschötti Park and a residential area; cultural facilities therefore are rare. The KKL seemingly represents a frontier for visitors on the eastern side of the city in terms of cultural assets.

O Existing cultural asset

02. Walking distance from the railway station

Distance, features and quality of the pedestrian path from the station

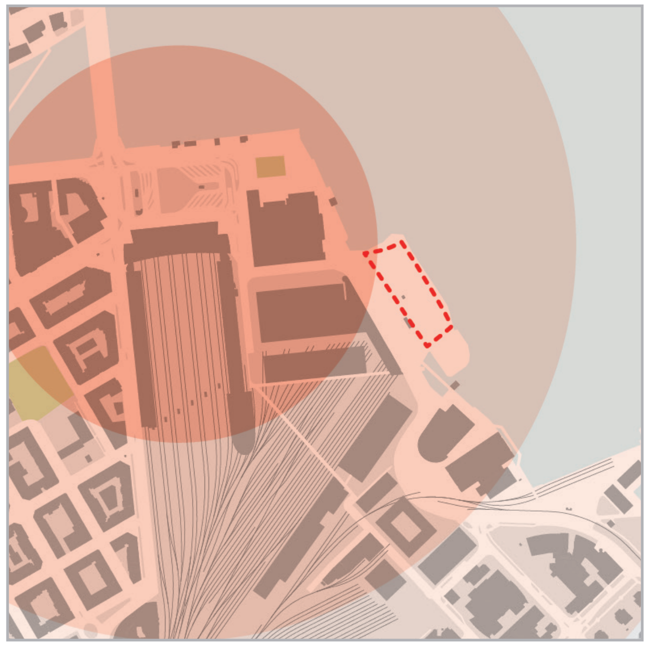
Radius of 15 min. walking from train station

Radius of 10 min. walking from train station

Radius of 5 min. walking from train station

G | Theaterplatz

The walking distance from the railway station to Theaterplatz is 275m, approximately 10 minutes by foot. Upon exiting the railway station, the path from the station to the site is a pleasant path along the river, positively influencing the visitor's experience.



G | Inseli

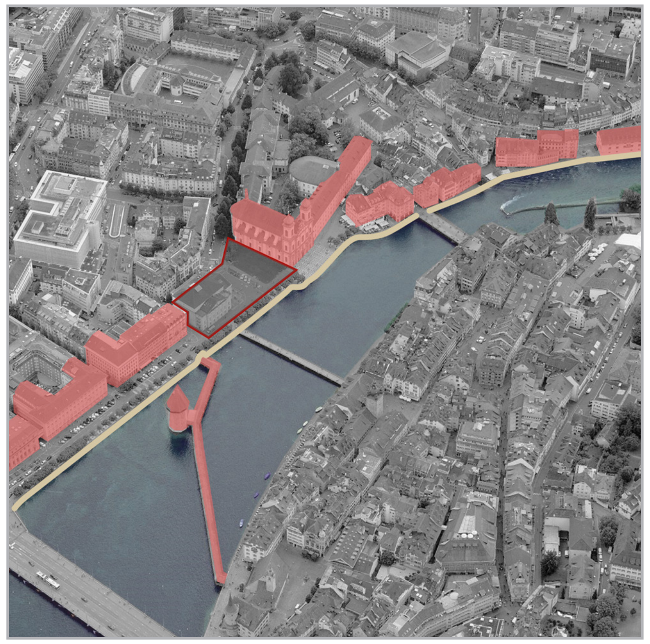
The walking distance from the railway station to the Inseli site is 220m and can be reached in under 10 minutes by foot. Two paths lead from the station to Inseli: a longer path along the picturesque lakeshore passing the main entrance of the KKL and a shorter, 4-minute walk, with less of a picturesque ambience past the university building.

R | Motorboothafen

The walking distance from the railway station to Motorboothafen is 550m, approximately 15 minutes by foot. The path leading to the site from the station is a 3m wide open-air pedestrian walkway which overpasses industrial facilities. Weather protection or lighting of the elevated pathway are inadequate for the visitor's experience that the New Theatre is striving to create.

03. Potential to create a visual landmark that integrates with the urban and natural landscape

Visibility, location and relationship with the urban and natural landscape



A | Theaterplatz

Theaterplatz is surrounded by a historic urban landscape and an open square which would have to be removed for the New Theatre due to site constraints. Spatial restrictions limit the potential of the New Theatre to be fully integrated into the existing urban context. The tight urban grain does not allow for a wide-angled visibility; however, visibility from the river is appropriate.

G | Inseli

Inseli is visible from different angles in the city, including those from across the lake. It is located next to the recent KKL, designed by the renowned architect Jean Nouvel, which establishes a distinct relationship with the landscape. The two performing arts facilities have the potential to create a cultural complex, building on the existing relationship with the KKL and the landscape.

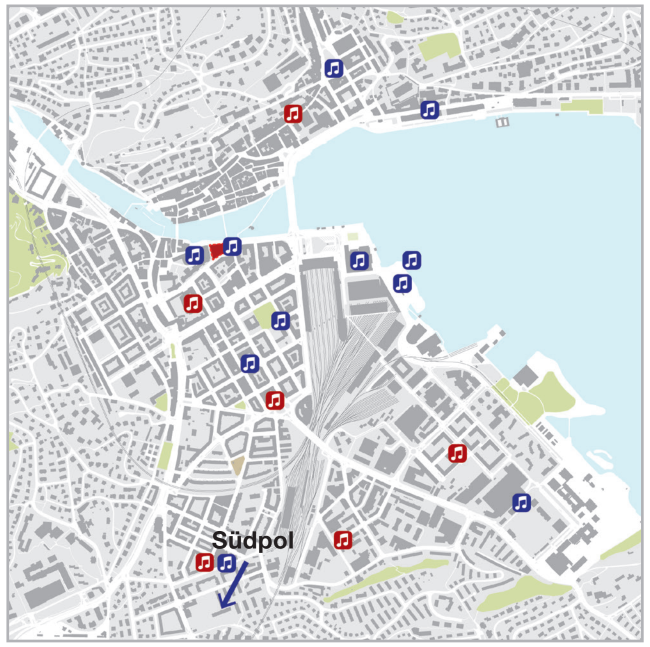
A | Motorboothafen

Motorboothafen is offset from the urban historic landscape of the city, limiting its visibility. The limited visibility, however, is counterbalanced by the site's good context and relationship to the water and the adjacent park.

B | Connected Experience

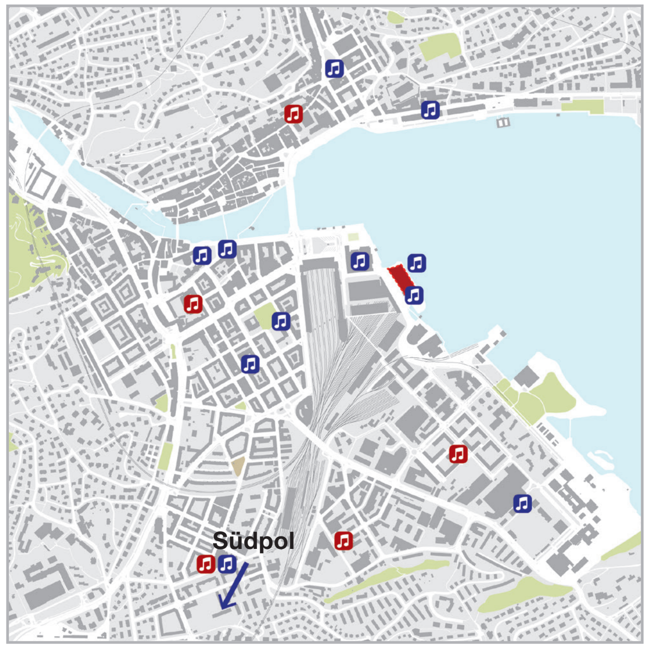
01. Proximity to relevant performing arts assets and potential for operational synergies

Distance from other facilities used by Lucerne Festival and the Luzerner Theater



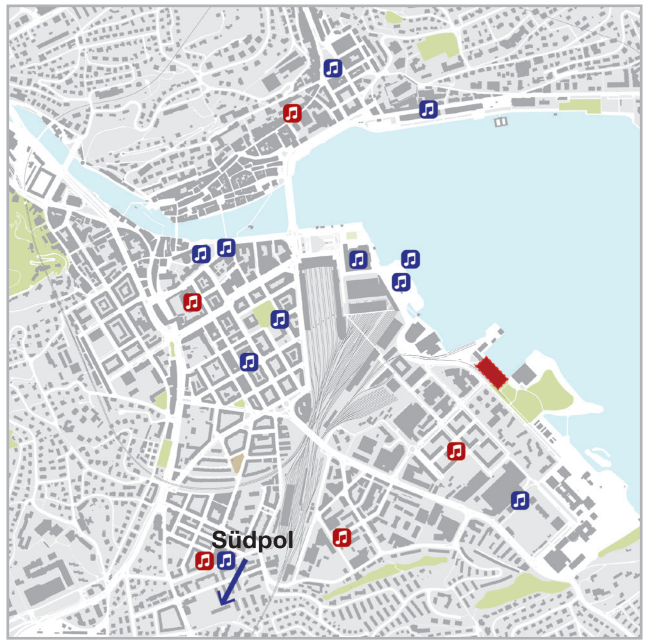
A | Theaterplatz

Theaterplatz is in close proximity to the KKL (12 min. on foot), facilitating potential operational synergies between the two locations. The site is close to the Jesuit Church, a venue which has an existing collaboration with the Luzerner Theater. Südpol — home to both the Luzerner Theater and Lucerne Festival — can be reached via the expressway by trucks and buses. Road restrictions, however, limit the max. height for vehicles to 3.50m coming from Südpol.



G | Inseli

The adjacency to the KKL has the potential of transforming Inseli and the area surrounding the KKL into an attractive cluster of performing arts spaces, a cultural district, creating significant opportunities for operational synergies for the New Theatre. Südpol can be reached easily through the neighbouring rail or bus stations. Easy access for trucks coming from Südpol is granted, particularly from the south.



R | Motorboothafen

Motorboothafen is located in an urban area with no major relevant performing arts assets in immediate proximity. Connections to this site, specifically pedestrian, are inadequate and do not allow for relevant operational synergies with other major performing arts assets in Lucerne. Südpol is easily accessible for trucks.

Facilities used by Lucerne Festival

Facilities used by Luzerner Theater

02. Influence on the reputation of the New Theatre Lucerne

How the site can support or enhance the reputation of the New Theatre

A | Theaterplatz

Theaterplatz has the ability to play with existing historic heritage in locating a new building in the core of the historic city where the old theatre is. Constraints of the site, however, will impact the visitor experience and the ability of the New Theatre to offer secondary (external) experiences. Impacts on the urban environment caused by the New Theatre, such as elimination of the existing square, may restrict the overall quality of experience for the visitor and the theatre's reputation.

G | Inseli

With its location on the lake and surrounded by green spaces and trees, Inseli offers great potential for the New Theatre to work with its surroundings and create a unique visitor's experience. The site is easily visible from across the lake and Lucerne's old town. The proximity to the KKL could create a cultural cluster with international resonance for its preeminence in the world of performing arts.

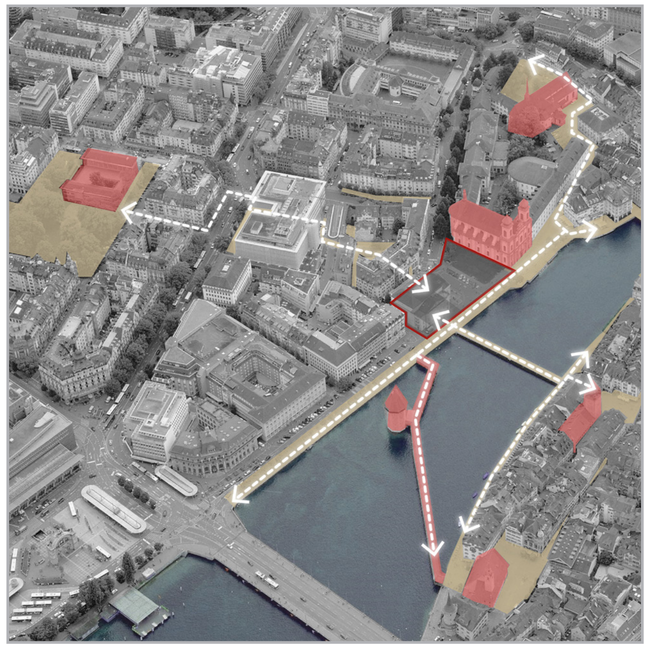
A | Motorboothafen

Motorboothafen as it currently stands does not portray the qualities needed to support the New Theatre's reputation. Its visibility is limited being far from both the historic centre and the KKL. For this site, the New Theatre would become the anchor of the waterfront redevelopment. Its reputation is largely dependent on future developments around the Motorboothafen site.

B | Connected Experience

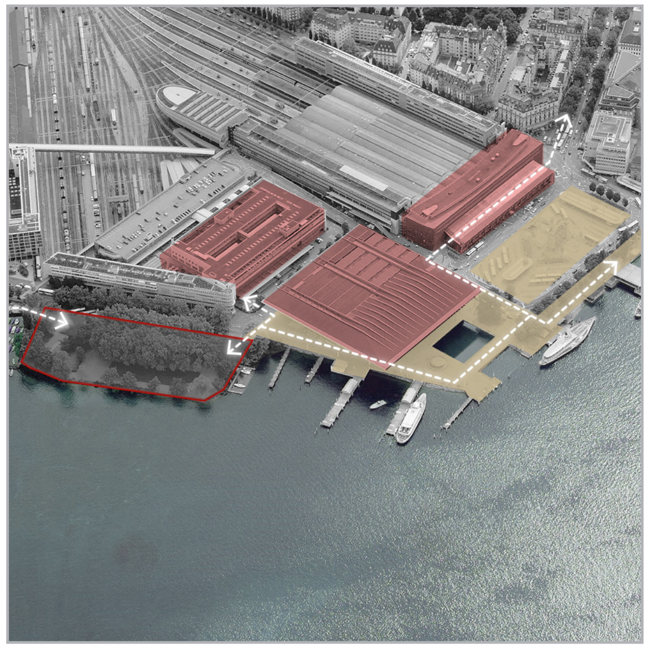
03. Integration into the urban fabric: visibility and potential synergies with public spaces

Typology, features and quality of the public spaces near each site



A | Theaterplatz

The New Theatre would be a new modern landmark in the historic fabric surrounding the Theaterplatz and for the river front experience. The river banks have multiple visual connections; physical connections are assured by three bridges. The New Theatre on this site however would eliminate the public square next to the existing theatre which currently forms a centre of gravity for the people of Lucerne and is part of a system of pedestrian areas around the Jesuit Church and the Cathedral, public courtyards and gardens located to the south of the river.



G | Inseli

Public spaces on Inseli have a direct relationship with the lake and the landscape. The New Theatre would become part of the skyline of recent, large-scale iconic buildings (the KKL, the railway station, and the university). A connected system of public spaces faces the lakeshore: the train station square serves as a functional hub; KKL's terraces and the piazza design a playful public space. The site itself is a public park that would be partially maintained and enhanced with the New Theatre.

A | Motorboothafen

While closely located next to a small marina and Ufschötti Park with which synergies would be enhanced by the New Theatre, Motorboothafen is distant from any of Lucerne's major public spaces. New synergies with the Inseli park and the KKL plaza could be created, depending on the future development and enhancement of the connecting pathway leading to these spaces. The quality of the site's public spaces relies on future urban developments.

01. Availability of sufficient road access and parking for visitors

Typology, features and proximity of parking as well as ease of road access

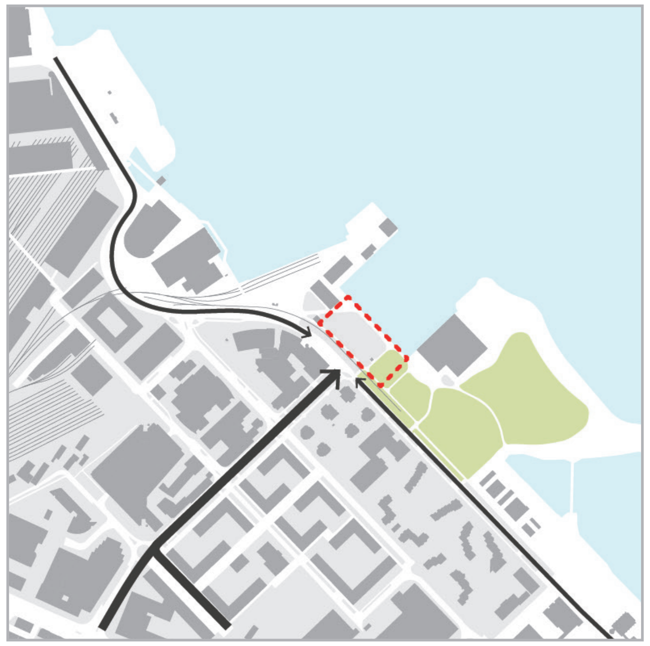
P Parking for visitors
Road access

A Theaterplatz

Urban collectors are located to the south-east and south-west of the site, accessible through a network of minor streets. While a car parking lot is located in close proximity to the site, drop off for touristic buses is difficult in the historic centre.

G Inseli

Inseli is easily accessible by road from the north-west and from the south-east. Car parking is available in close proximity to the site. Inseli is currently housing a tour bus parking lot serving mainly the KKL which would have to be relocated.

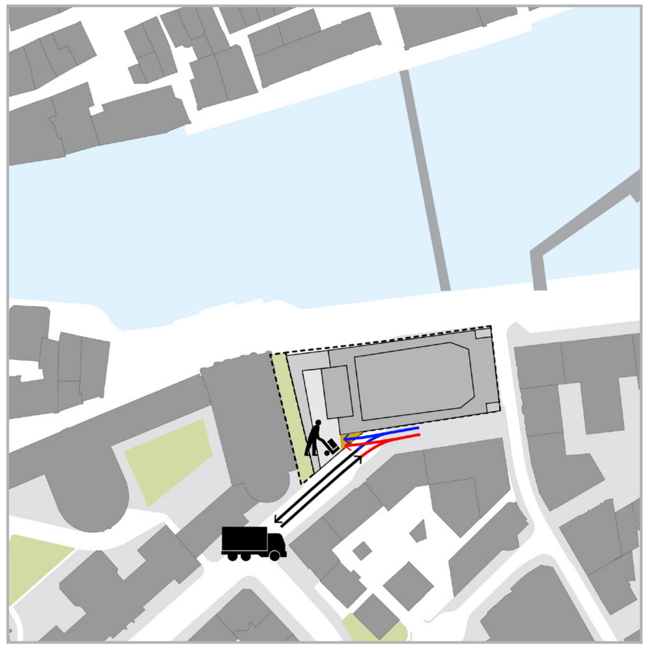


A Motorboothafen

Motorboothafen is accessible by road, with a main road coming from the south-west. Limited road parking is available, no car parking lots in direct proximity.

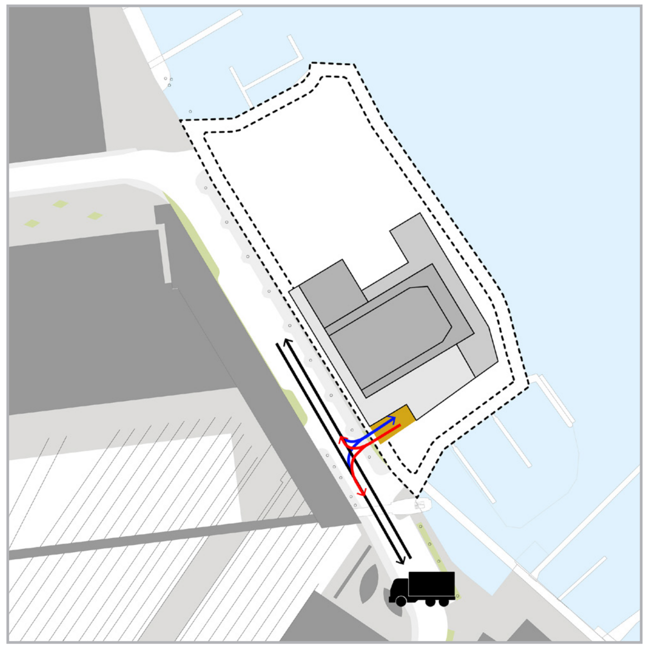
02. Loading dock area for trucks

Ability to accommodate loading docks and sufficient access for articulated trucks which are necessary for larger guest productions (up to 13m long)



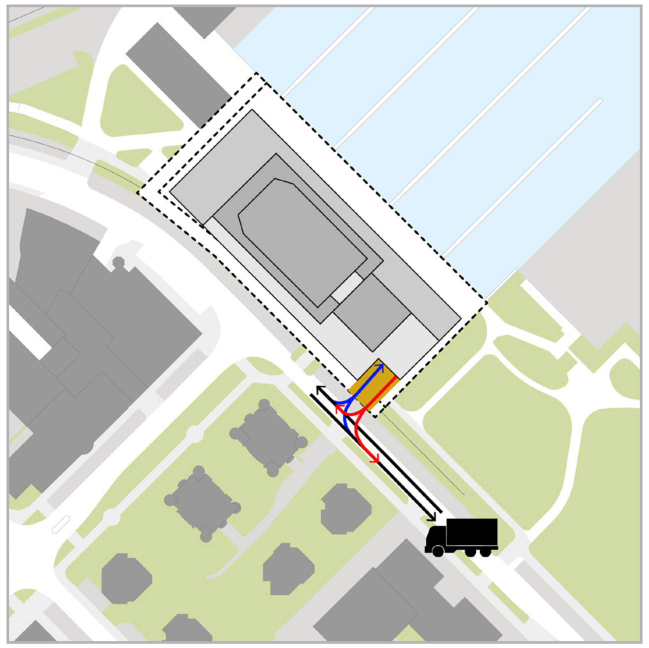
R Theaterplatz

Only a single loading dock can be located in the pedestrian area to the south of the site. When a truck is parked, the truck will occupy a portion of the public space. Trucks can park through a reversing manoeuvre along the south wall of the theatre.
The street network in the surrounding area is less accessible for trucks because of narrower streets and limits to 20t capacity.



G Inseli

The loading dock area would likely be located in the south-eastern corner of the site, accessed from Alpenquai, as this is the area of the Back of House cluster in the test massing. In the test massing, the ability to move large materiel from the loading dock to the Small Venue may potentially be constrained due to the width of the site. The site would allow for the truck dock to be fully integrated in the building volume. Trucks can access the dock by reversing into the bay.

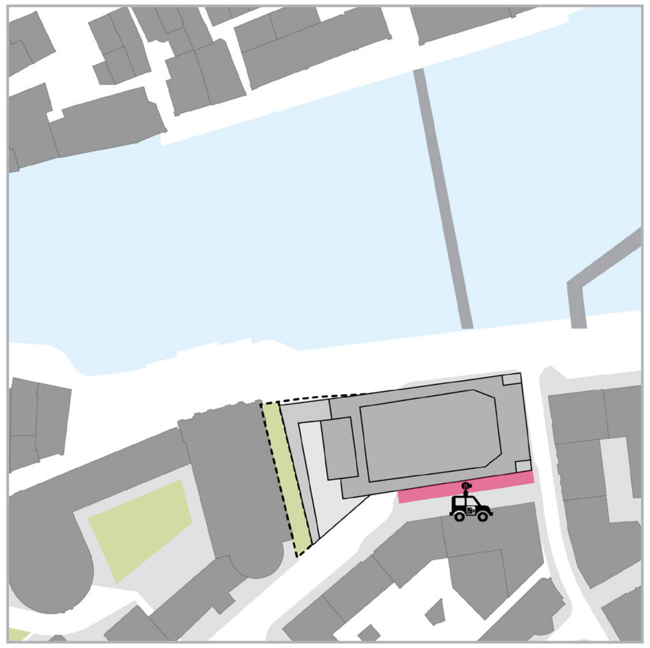


G Motorboothafen

The loading dock area would likely be located in the southern corner of the site, accessed from Alpenquai, as this is the area of the Back of House cluster in the test massing. An alternate massing has this arrangement flipped in which case, access would be from the north-west corner of the site. In the test massing, access to both Large Venue and Small Venue would be possible without constraint. The site would allow for the truck dock to be fully integrated in the building volume. Trucks can access the dock by reversing into the bay.

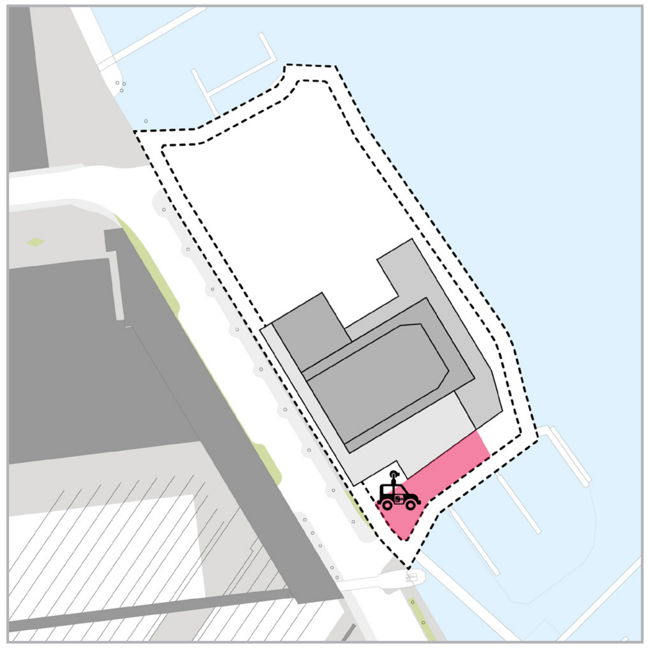
03. Availability of space for the specialised broadcast and recording vehicles

Ability to accommodate external broadcast and recording trucks in a way that allows multi-cable connections to the Facility and line-of-sight to satellites



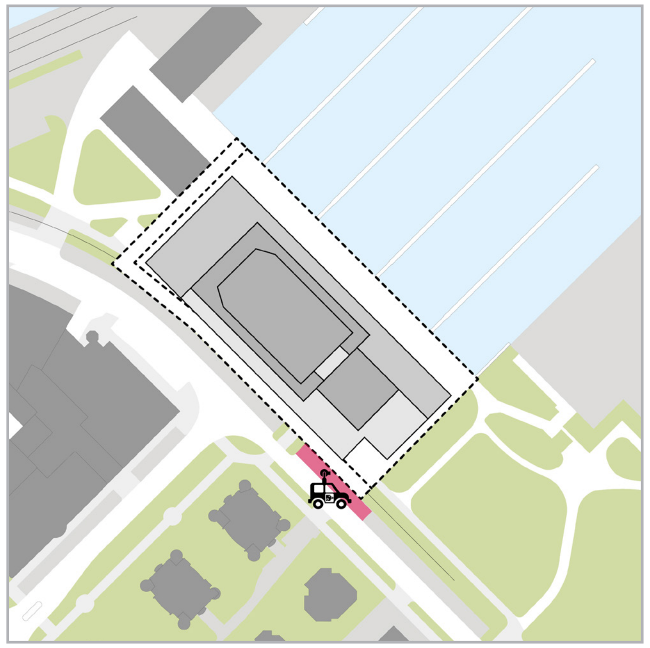
R | Theaterplatz

Specialised broadcast and recording vehicles could only be accommodated to the south of the site. The presence of broadcast and recording vehicles would impede access to the truck dock for full sized trucks.



G | Inseli

In Inseli, broadcast and recording vehicles could be accommodated to the south of the site, which is an optimal location operationally. There, they would be adjacent to the loading dock area, but in a different space, so that the two operations could happen at the same time. The area is located along the rear façade of the New Theatre, where it would not disrupt the use of a public space near the foyers.



A | Motorboothafen

In Motorboothafen, broadcast can be located along Alpenquai, occupying a dedicated zone, normally used for public parking. Trucks would be further removed from the building, potentially cause a circulation hazard on the side walk, and be a temporary disruption of the normal functions of the road parking.

4.2.2 Artist Experience

For purpose of this Site Assessment, artist experience will be analysed by means of the following three criteria and nine evaluation parameters.

D. International Platform for Creative Experimentation

01. Proximity to relevant art and cultural assets and possible operational synergies for artists
02. Proximity to accommodation and retail or leisure facilities
03. Temporary expandability

E. Quality of Performance and Rehearsal Spaces

01. Area available compared to the optimal massing
02. Appropriateness of the shape
03. Quality of space planning and circulation

F. Quality of Support Spaces

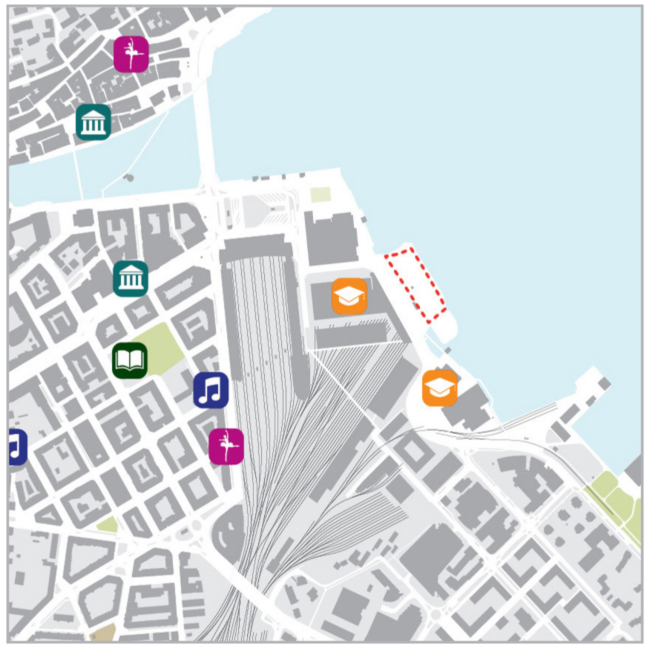
01. Area available compared to the optimal massing
02. Appropriateness of the shape
03. Quality of space planning and circulation

01. Proximity to relevant art and cultural assets and possible operational synergies for artists

Geographical proximity and potential for creative collaboration between and around venues and institutions

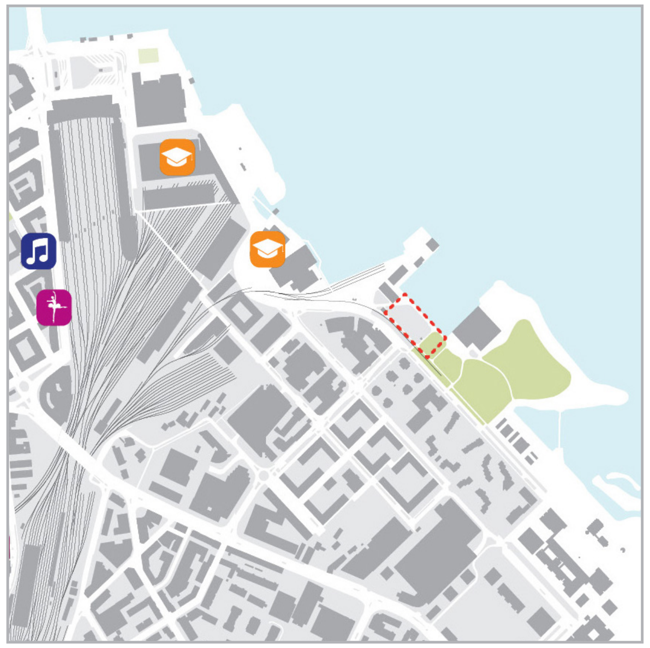
G Theaterplatz

Theaterplatz is sufficiently close to the KKL to support operational and artistic collaboration. Within the immediate area from Theaterplatz, there is a wide variety of community cultural assets that also suggests the potential of other collaborations — eg, dance and music schools, municipal and the university library with its public park — on a creative level or in education.



G Inseli

Inseli is characterized by the close proximity to the KKL. The New Theatre here would effectively create a cultural cluster — all with modern architecture — each facility serving as a platform for leading arts organizations of Lucerne. Inseli is also close enough to the city centre and its museums and schools, to serve as part of an attractive and lively environment for artists, potentially even enhancing the role of the KKL, which currently feels somewhat isolated.



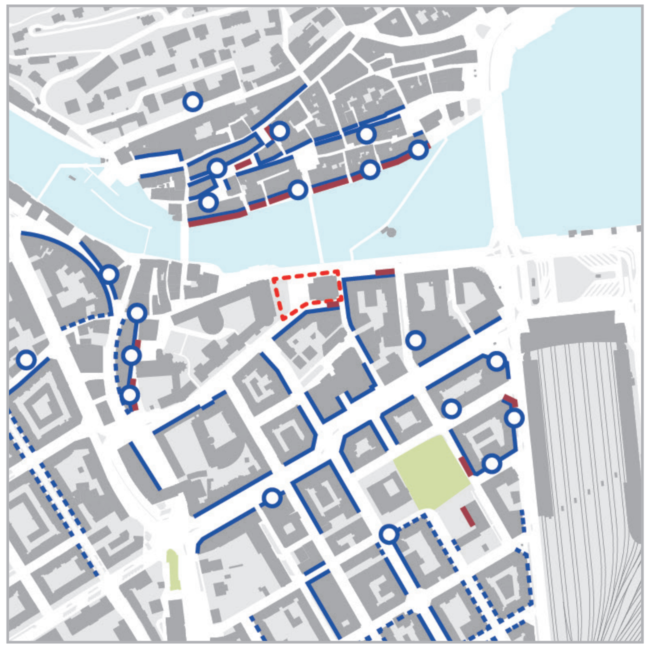
R Motorboothafen

Motorboothafen is in a residential area, far away from the cultural assets located in the city centre, and effectively separated from it by the railway tracks. With the exception of the spacious park, which could potentially host more creative events as a result of placing the New Theatre here, there is low likelihood of this site supporting operational synergy with existing institutions or inspiring creative collaboration.

Music School	Museum
Dance School	Library
Theater	University

02. Proximity to accommodation and retail or leisure facilities

Distance, typology and quality of artist support facilities in the surrounding area

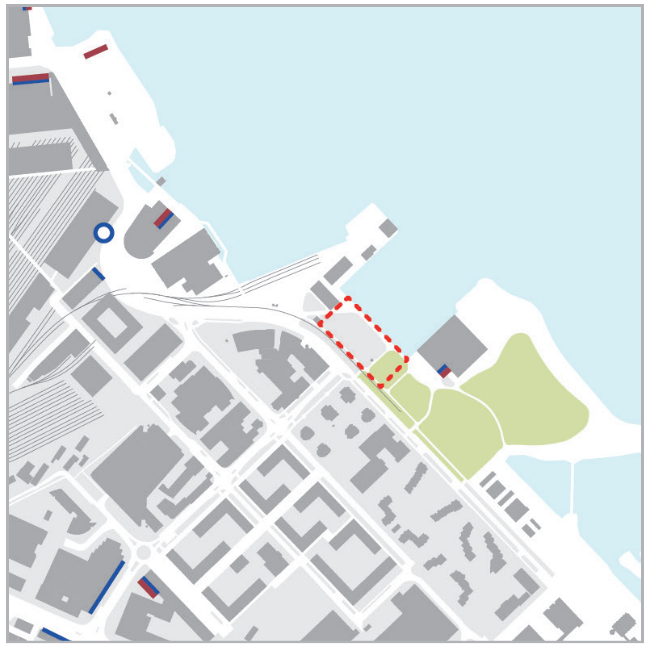


G Theaterplatz

Theaterplatz is located in the historic and commercial core of the city, and it is surrounded by many retail activities, such as shops, bars, and restaurants. The street front around the theatre is active, especially in the piazzas and along the river. Many hotels are located in the city centre to the north of the river while others are located in the vicinity of the theatre.

A Inseli

Inseli is located just outside the perimeter of the historic centre, where most of the tourist accommodation and complementary facilities in Lucerne are. A link to the centre could be created as a connected extension via the KKL, and could have a positive impact on the liveliness of the eastern side of the KKL.



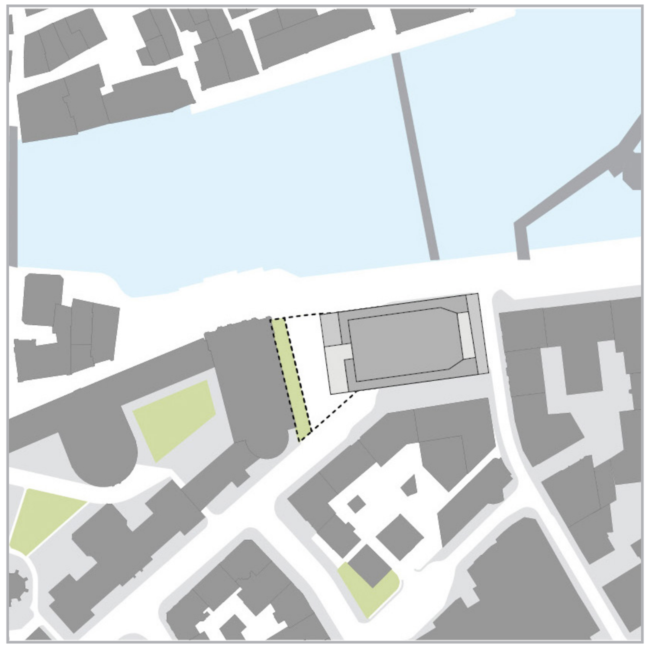
R Motorboothafen

Motorboothafen is poor in terms of visitor accommodation and retail facilities of relevance. The site is effectively separated from the vibrancy of the city centre due to the distance from the train station. Though the park is attractive, this site would not support artists well with accommodation or leisure activities typical of the international visiting artists' experience of Lucerne .

- Active front
- Semi-active front
- Terraces
- Accommodation

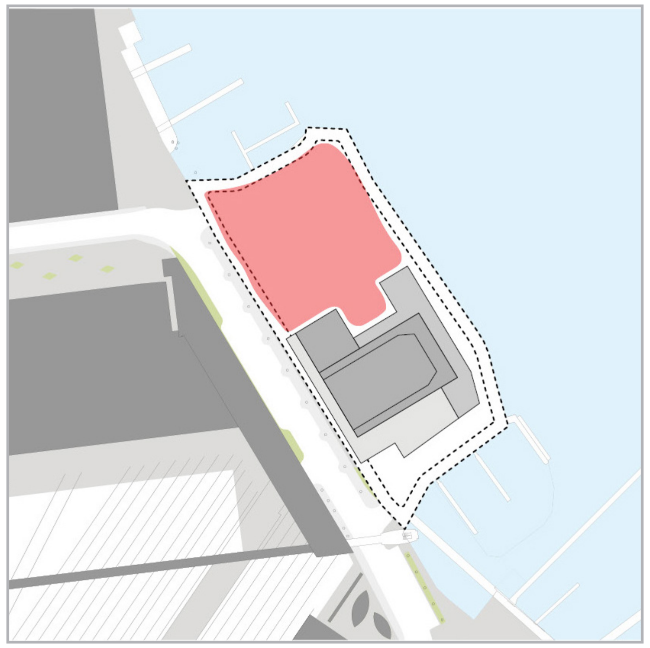
03. Temporary expandability

Ability to expand activities of the New Theatre to the exterior of the Facility



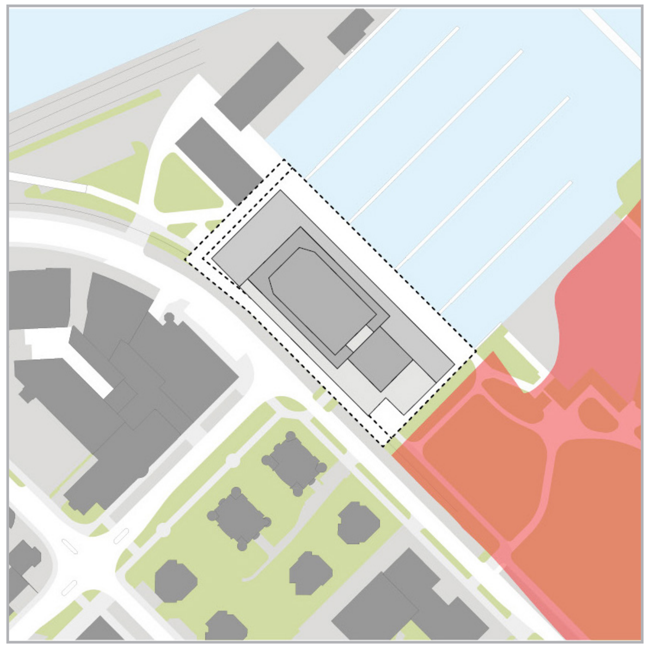
R | Theaterplatz

Theaterplatz is the smallest site among the three and fitting in the New Theatre effectively occupies the entire available site. Located in a densely packed area of the historic city, this site bears significant constraints to the temporary use of external associated spaces or façade surfaces for artistic activity or content.



G | Inseli

This site has a strong potential for supporting temporary artistic activities in the park, north of the New Theatre. Not only is there sufficient area for such activities, the test massing creates an urban space which invites its use. Furthermore, as Inseli park is already used as an external venue for concerts, such activity would also be seen as a natural extension of the park's current identity.



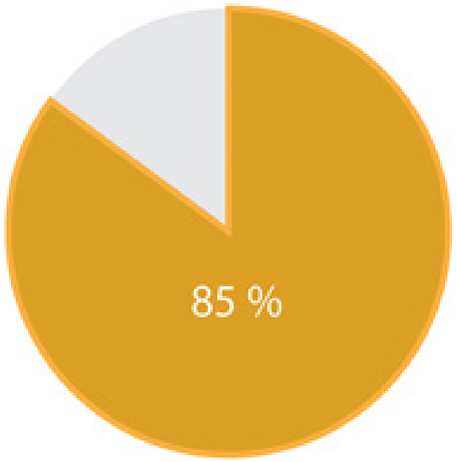
G | Motorboothafen

On Motorboothafen, the New Theatre would be the first step towards a regeneration of a wider area linking it to the city and KKL. The park is able to support temporary usage for artistic events. Future development of the area to the north may create additional exterior space for activities. However, the relationship to the park does not create an urban space in the way that would happen in Inseli.

E | Quality of Performance and Rehearsal Spaces

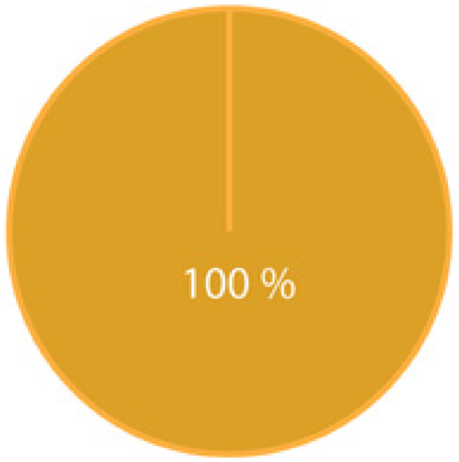
01. Area available compared to the optimal massing

Can the total area required in the Technical Concept be accommodated on-site?



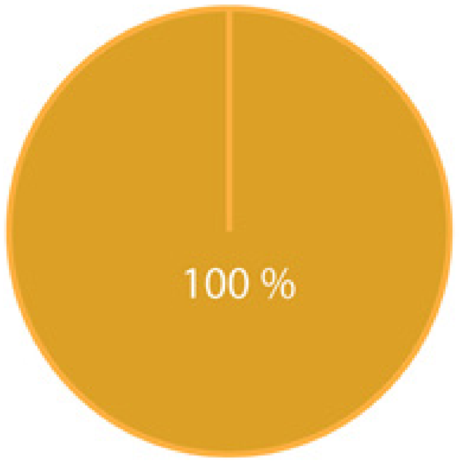
A | Theaterplatz

The Large Venue, the actual performance space, has the same dimensions in each of the three massing options. However, in Theaterplatz, the limited available footprint and the need to leave public space next to the church inhibit the possibility to accommodate a full side or rear stage, Small Venue. A reduced size rear stage, Studio, has been included. The third small room — the Studio, a rehearsal room — has been included on the seventh floor of the building.



G | Inseli

In Inseli, the area is sufficient to accommodate all the requirements of the Technical Concept for the New Theatre and includes the Large Venue, a full side or rear stage, named Small Venue, and the smaller rehearsal rooms, the Studios.

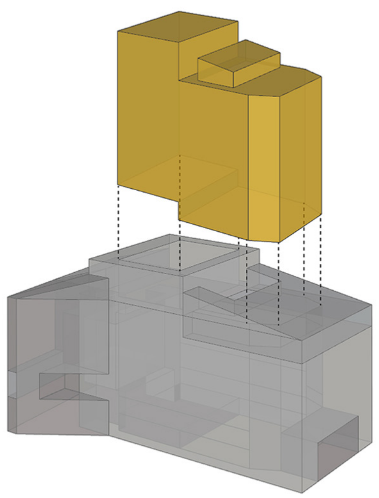


G | Motorboothafen

In Motorboothafen, the area is sufficient to accommodate all the requirements of the Technical Concept for the New Theatre and includes the Large Venue, a full side or rear stage, named Small Venue, and the smaller rehearsal rooms, the Studios.

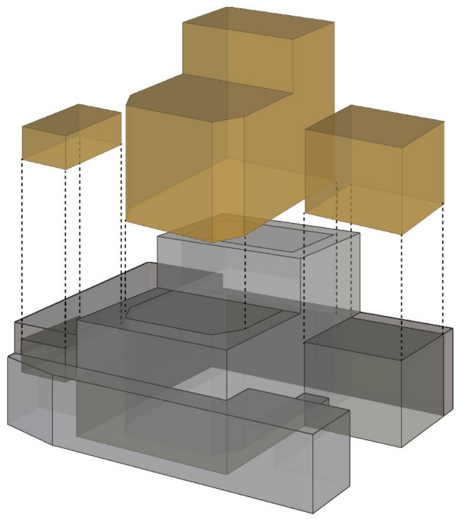
02. Appropriateness of the shape

Arrangement of Performance and Rehearsal Spaces compared to the optimal massing



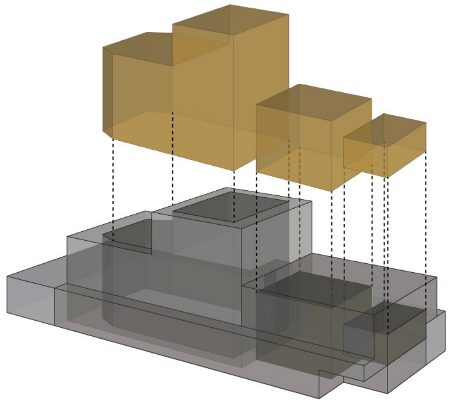
R Theaterplatz

In Theaterplatz, the (size and) shape of the site is unsuitable and the layout of the key spaces cannot achieve the functional relationships that are operationally optimal. The location of the third space — the Studios — above the Large Venue audience area will place challenges in terms of organization of circulation, as well as managing access for simultaneous public events.



G Inseli

Inseli is the only site among the three is able to accommodate the Small Venue in the optimal position, allowing the greatest flexibility for performances and rehearsals of complex works, as well as simultaneous usage of different productions. The smaller rehearsal rooms — the Studios — are also in a good position with direct connection with the Back of House, as well as being part of the central foyer area.

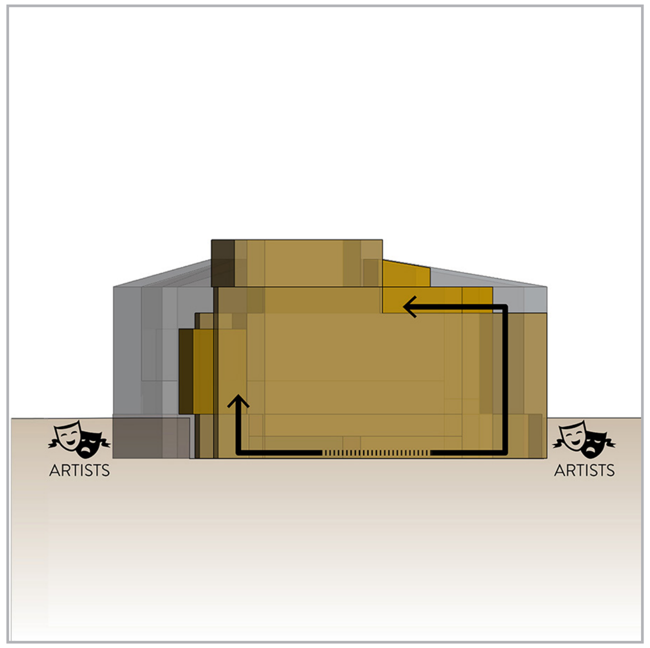


A Motorboothafen

The relatively narrow rectangular shape of the site does not allow for accommodation of the optimal Salle Modulable massing. Instead, the Small Venue is placed to the rear of the Large Venue as a rear stage, complicating usage for complex productions. More critically, it is likely that the load-in / load-out distance from the truck dock to the Large Venue would be longer and therefore have an impact on the operational viability of the Large Venue.

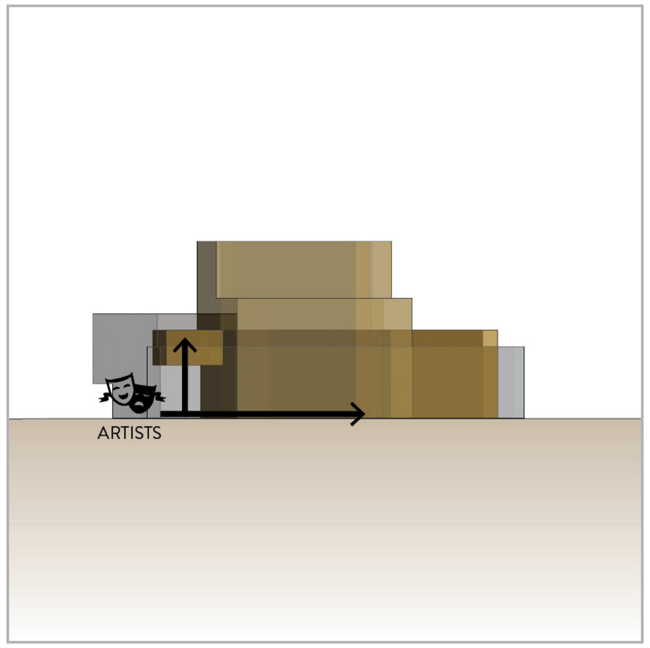
03. Quality of space planning and circulation

Appropriateness of internal circulation and connectivity between Performance and Rehearsal Spaces of the New Theatre



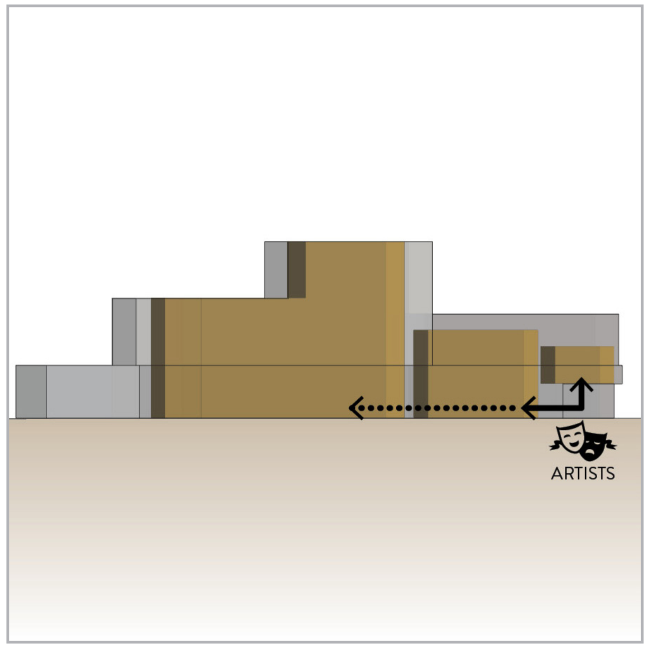
R | Theaterplatz

In Theaterplatz, there will be challenges in circulation dynamics for artists and technical staff, with far less program being able to be accommodated at the same level as the Large Venue stage. Moreover, the narrowness of the site will mean that artist support spaces will be arrayed over more levels, putting more pressure on the vertical circulation in the Facility.



G | Inseli

In Inseli, the layout of the Large Venue, the Small Venue, and the Studio is similar to the optimal massing. As a result, this site offers the highest likelihood of operationally effective circulation and space planning between spaces.

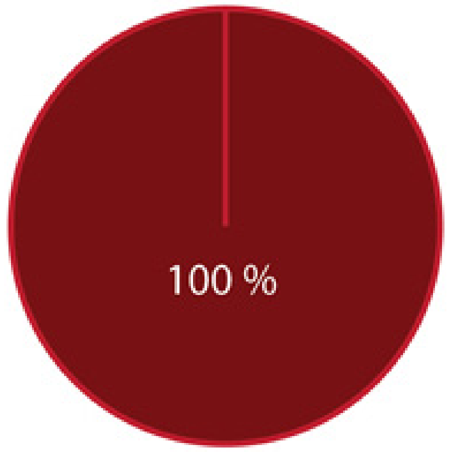


G | Motorboothafen

The placement of the Small Venue as a rear stage are creating longer distances between the Studio and the Large Venue, however, still allowing for effective circulation for operations.

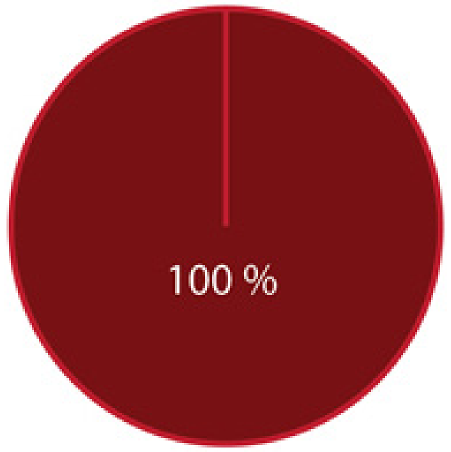
01. Area available compared to optimal massing

Can the total area required in the Technical Concept be accommodated on-site?



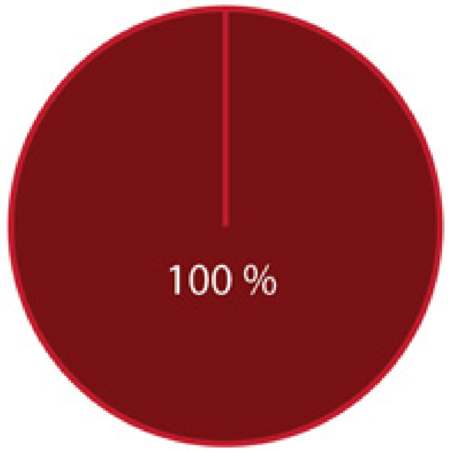
A | Theaterplatz

In terms of adequacy of the Back of House, Theaterplatz reveals the most serious weaknesses among the three sites. While the space requirements of the Technical Concepts can be accommodated, a lack of area at-grade results in the Back of House spaces being mainly located in the basement, except for a small portion (just 24% of the area in the optimal massing).



G | Inseli

In Inseli, the area is sufficient to accommodate all the requirements of the Technical Concept and the optimal massing in terms of support spaces. Among the three sites, Inseli is also the option with the largest area at-grade — 80% of the area suggested in the optimal massing, (or 90% considering the loading dock driveway area, which is part of the volume in the Massing Study). Arup evaluates that the redistribution of Back of House area up or down, can be accommodated without compromise to the quality of the support spaces.



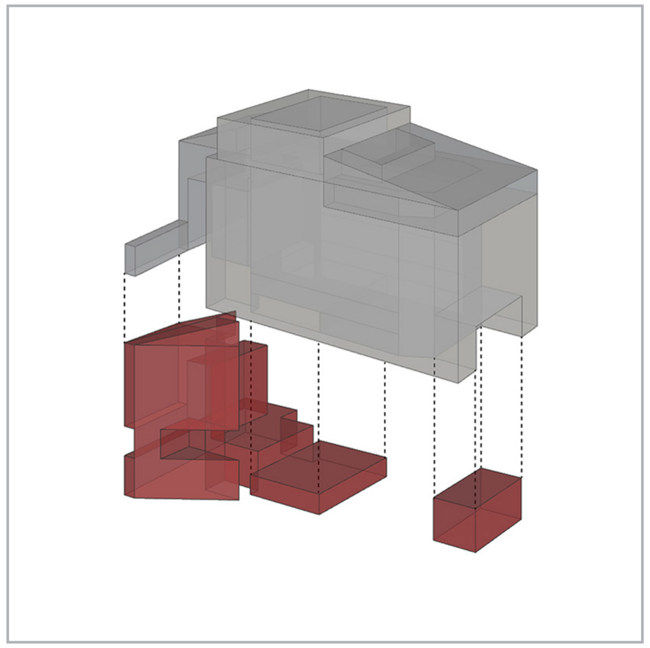
G | Motorboothafen

The Massing Study in Motorboothafen shows that the site area is sufficient to accommodate all the requirements of the Salle Modulable Technical Concept. The site allows 70% of the area suggested in the optimal massing to be at-grade (or 80% considering the loading dock driveway area, which is part of the volume in the Massing Study). Arup evaluates that the redistribution of Back of House area up or down, can be accommodated without compromise to the quality of the support spaces.

F | Quality of Support Spaces

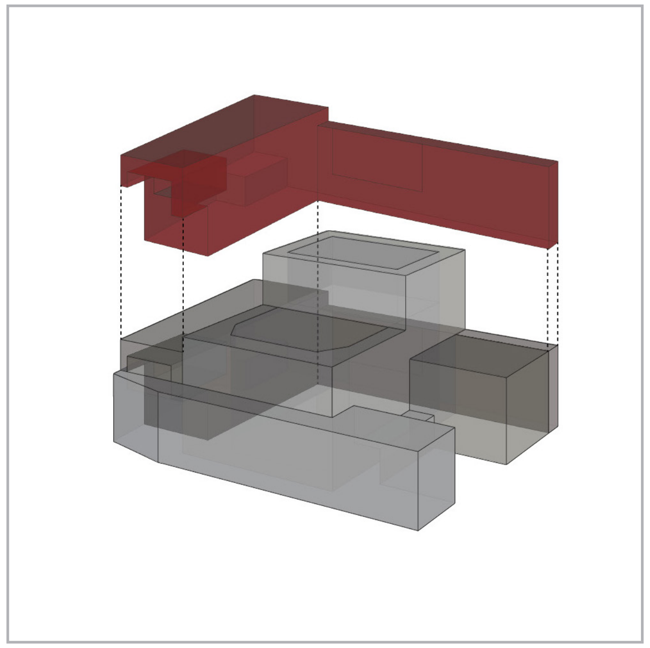
02. Appropriateness of the shape

Support spaces layout compared to the optimal massing



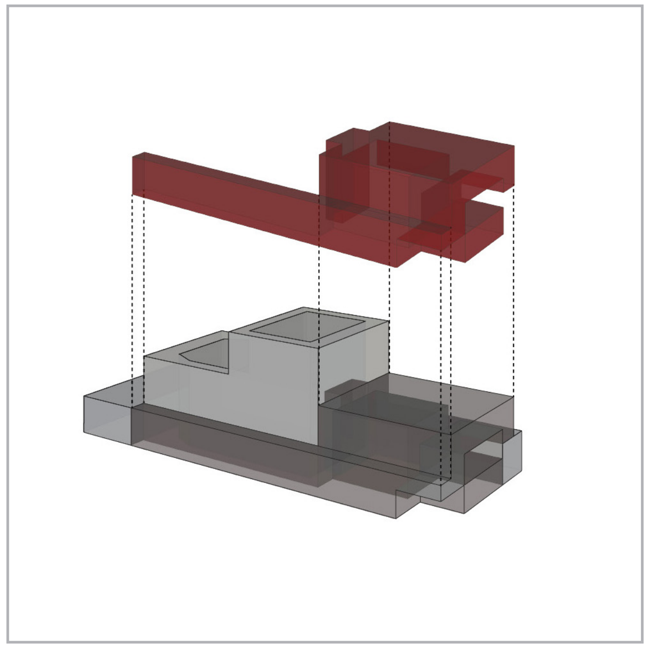
R Theaterplatz

A lack of footprint area distributes the Back of House area for Theaterplatz primarily over two basement levels. This generates weaknesses in terms of connectivity between the support spaces and the Large Venue stage. Limited natural lighting and ventilation conditions in the basement decrease the quality of such spaces, specifically that of the dressing rooms.



G Inseli

In Inseli, the rectangular shape of the area allows the future designers different alternatives to distribute the Back of House area and achieve high quality spaces. The space organization of the Back of House area is close to the optimal massing, although it is arrayed mostly on one side of the Large Venue, creating a greater likely distance from dressing rooms to the Small Venue. Two open façades would create good air quality and lighting conditions.

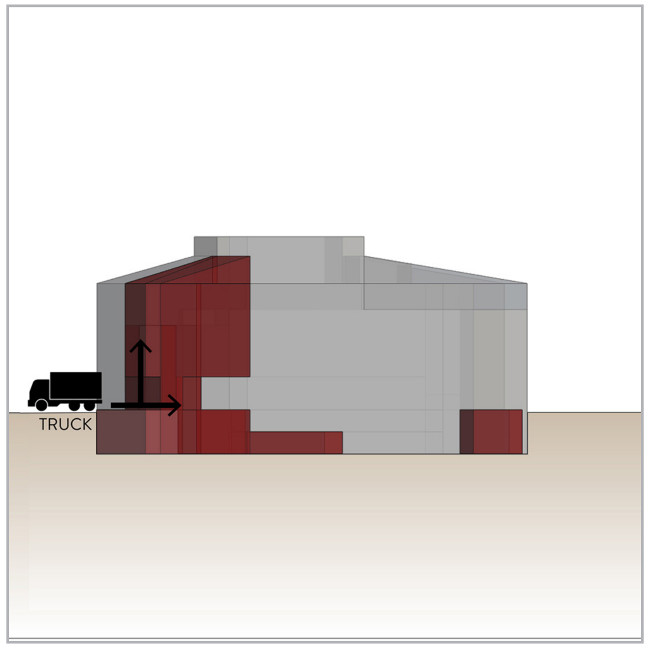


A Motorboothafen

The rectangular shape of the area allows different configuration of the Back of House area, also in terms of internal distribution (dressing rooms, storage rooms, workshops, offices, etc.), limited however by a centric side stage.

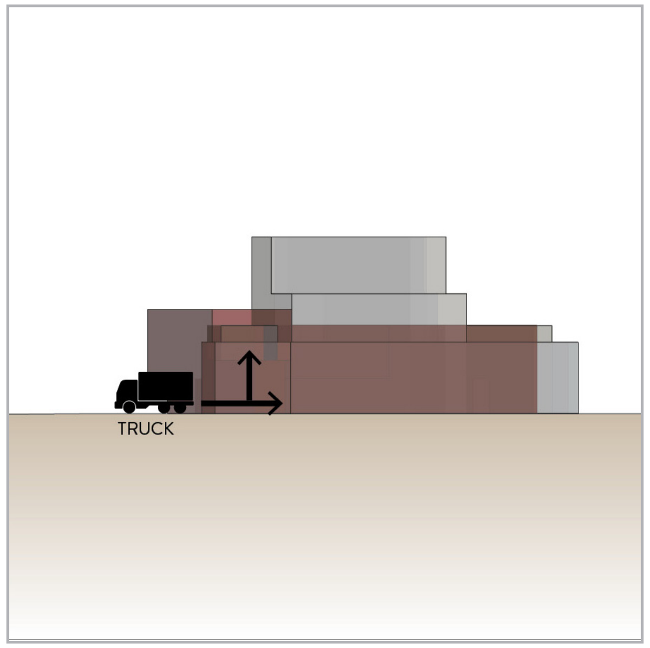
03. Quality of space planning and circulation

Appropriateness of internal circulation and connectivity between support spaces and the Performance and Rehearsal Spaces



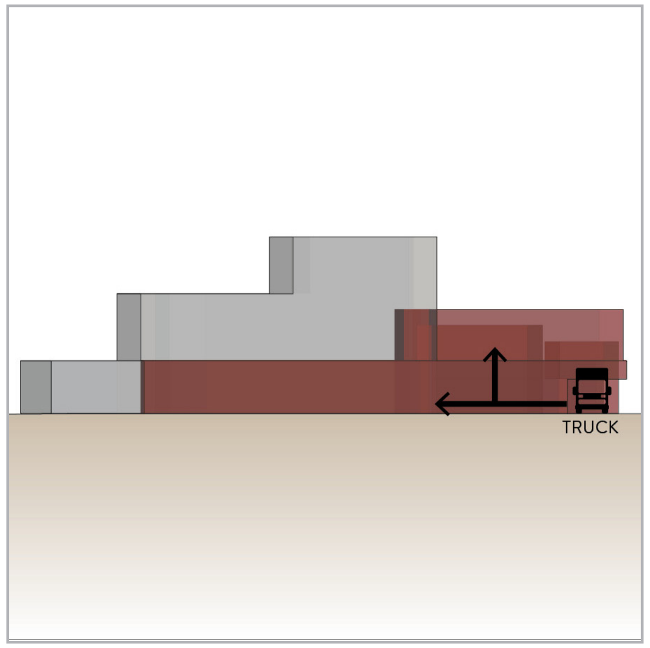
R | Theaterplatz

In Theaterplatz, Back of House support spaces will mostly be located on two levels in the basement, placing greater pressure on vertical circulation, and requiring additional lifts and staircases. The Large Venue and the Small Venue will be directly accessible from the loading dock.



G | Inseli

In Inseli, the layout of the Large Venue, the Small Venue and the Studios is similar to the optimal massing. As a result, this site offers the highest likelihood of operationally effective circulation and connectivity between support spaces and the Performance and Rehearsal Spaces. In contrast to the optimal layout however, the Back of House areas are likely to be clustered on one side of the Large Venue creating longer distances for artists to circulate to the Small Venue.



A | Motorboothafen

In Motorboothafen, the placement of the Small Venue as a rear stage create longer distances between the support spaces and the Large Venue and likely less efficient space planning.


Image: CC - Jun Seita (Flickr)

4.2.3 Audience Experience

For the purpose of this Site Assessment, audience experience will be analysed by means of the following three criteria and nine evaluation parameters.

G. Quality of the foyer

01. Area available compared to the optimal massing
02. Appropriateness of shape
03. Quality of space planning and circulation

H. Standard of quality and charm

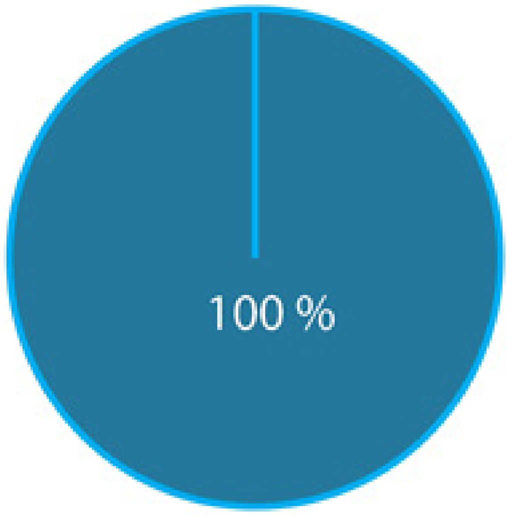
01. Relationship between indoor and outdoor leisure facilities
02. Attractiveness of pedestrian experience
03. Relationship with the urban and natural context

I. Universal accessibility

01. Adequacy of the path from the railway station
02. Quality and maintenance level of urban environment
03. Accessibility for children, elderly and disabled people

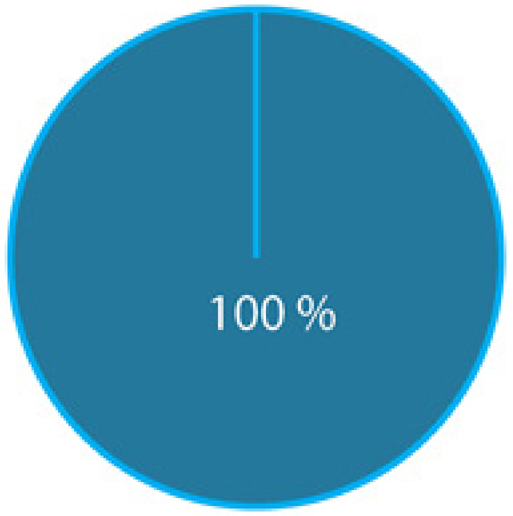
01. Area available compared to the optimal massing

Quantitative and qualitative considerations on the foyer as a result of the footprint of the building in the site



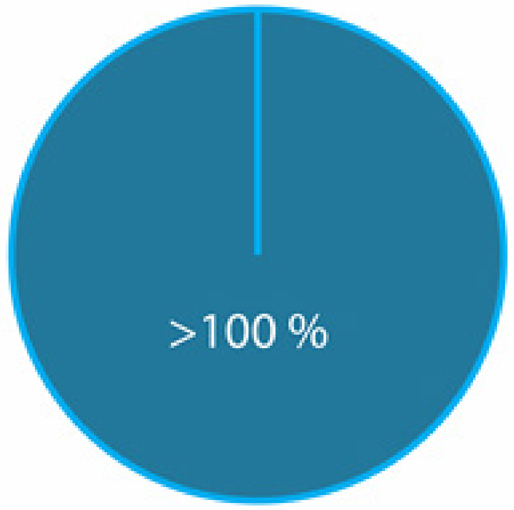
G | Theaterplatz

An innovative arrangement of placing the foyer on multiple levels at the rooftop level solves the lack of surface area available at-grade and potentially creates a unique and interesting experience for visitors. Attracting visitors to use the foyer during the day however will be impeded. Even if the required area can be accommodated, the resulting spaces may not achieve good distribution and experiential quality.



G | Inseli

In Inseli, the surface area available for the foyer matches the optimal massing of the New Theatre. In addition, the volume gives the designers the possibility to add floor area at four other levels, allowing for optimal direct connections to be created with other spaces — such as a small rehearsal space, the Studios.



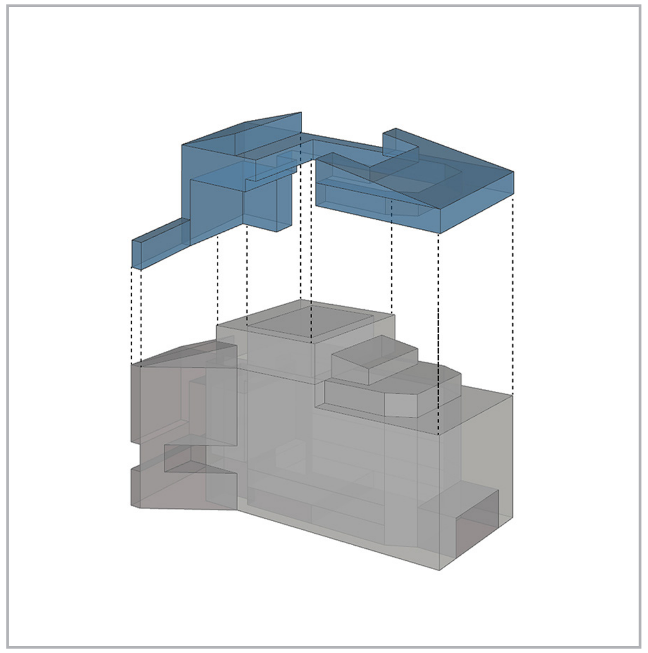
G | Motorboothafen

In Motorboothafen, the surface area available for the foyer exceeds the optimal massing of the New Theatre. In addition, the volume gives the designers the possibility to add floor area at three other levels. However, the nature of the site creates the requirement that the foyer be elongated, and the extra foyer area is likely to be necessary.

G | Quality of the Foyer

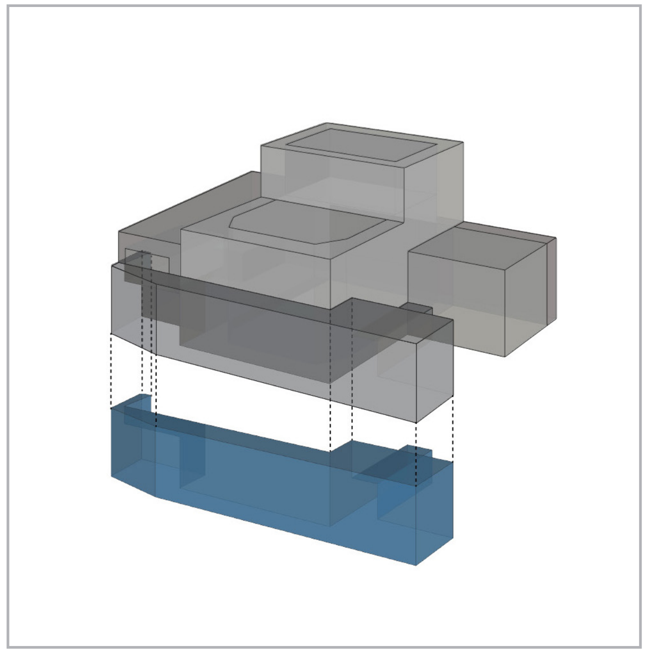
02. Appropriateness of the shape

Foyer spaces layout compared to the optimal massing



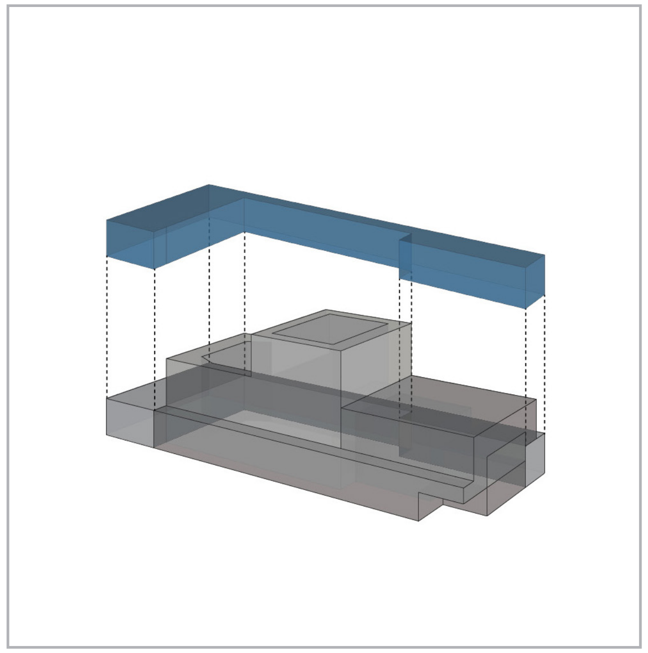
A | Theaterplatz

In Theaterplatz, the foyer is at the rooftop level. Even though it is an innovative architectural solution, it has negative consequences in terms of layout. To meet the maximum height constraints, the roof — that defines the volume shape of the foyer — is pitched. The fly tower further divides the foyer into two parts which restricts its ability to accommodate large audiences. Some of the spaces available are constricted in terms of height, and it is likely that audience experience will suffer due to pressures on vertical circulation.



G | Inseli

In Inseli, the foyer has an optimal shape that allows a multiplicity of possible distribution options and offers efficient access to the Large Venue, to rehearsal and to support spaces on the proper axis. A façade along the lakeshore allows the foyer to potentially be defined by its relationship with the surrounding landscape. The northern part of the foyer volume creates an open air space, that will invite innovative indoor/outdoor usage related to the artistic activities in the Facility.

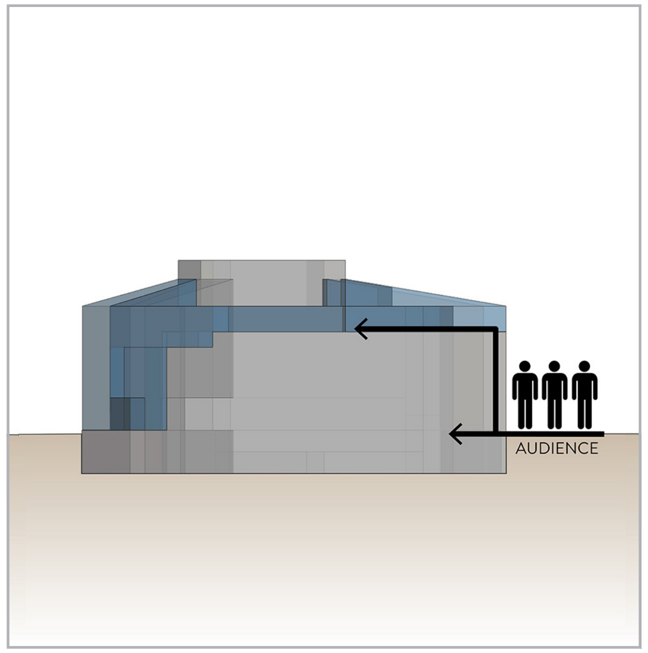


A | Motorboothafen

The shape of the foyer area is more restrictive than Inseli but still allows different design solutions for the foyer. Compared to Inseli, the relatively unconstrained nature of the site creates the potential for architectural solutions that are more creative, potentially allowing greater and different interactions with the park. However, the arrangement of the foyer, and the necessity for it to interface with both north and south ends of the site, creates the possibility of long connecting foyer areas that will be challenging in terms of vibrancy and efficient design.

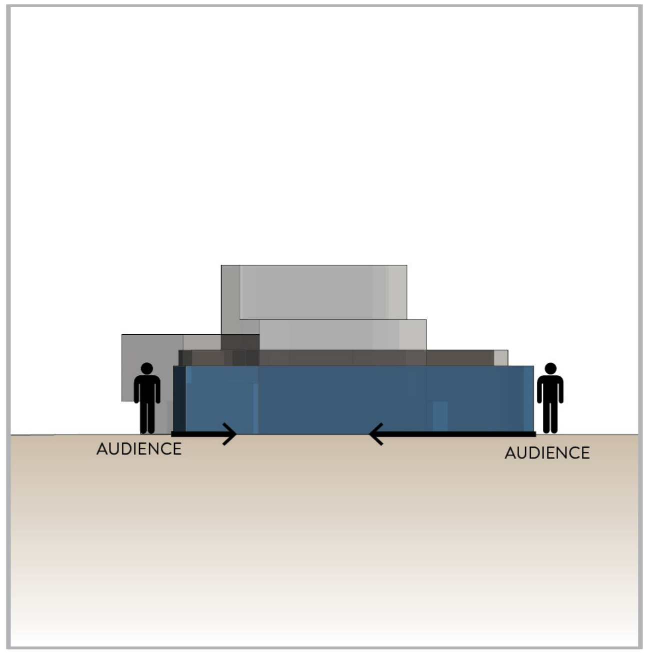
03. Quality of space planning and circulation

Appropriateness of internal circulation and connectivity with other spaces of the New Theatre



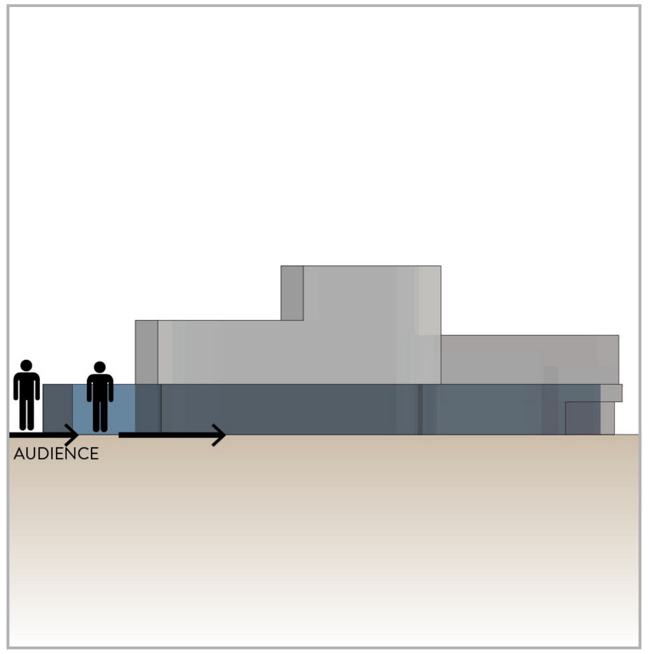
R | Theaterplatz

The circulation of audience in Theaterplatz will be a critical issue. With the foyer located at the rooftop level, audiences will be required to come into the Facility at grade, brought up to the rooftop level, and then brought down into the Large Venue. This places significant pressure on the number and quality of the vertical circulation systems. Outgoing movement after performances are likely to be less of a problem as many will be able to exit directly to the outside at grade.



G | Inseli

In Inseli, the shape of the site will allow the foyer to be arranged appropriately for effective and efficient audience circulation.

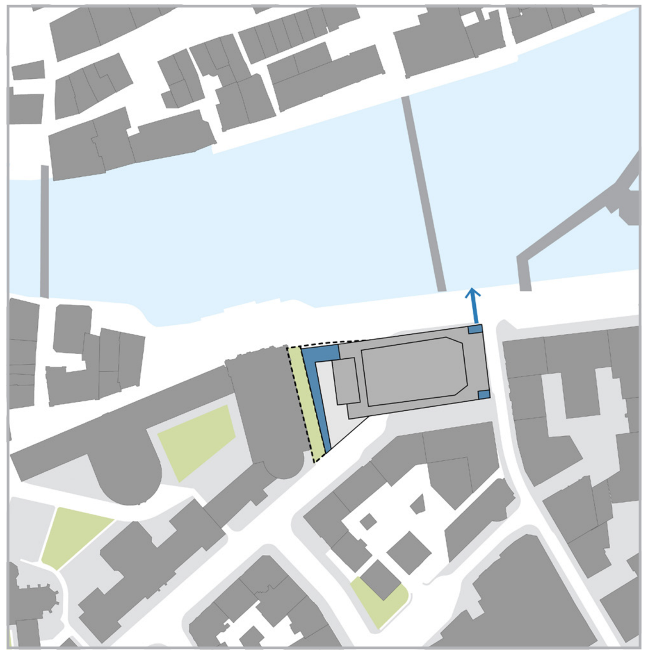


G | Motorboothafen

In Motorboothafen, the shape of the site and the need to interface with both north and south ends of the site will prove more challenging in terms of circulation within the foyer and will likely result in needing more construction area. At the same time, the site would allow designers more freedom and creativity to explore how the circulation would interact with the surrounding environment and the landscape, which could enhance the audience circulation experience.

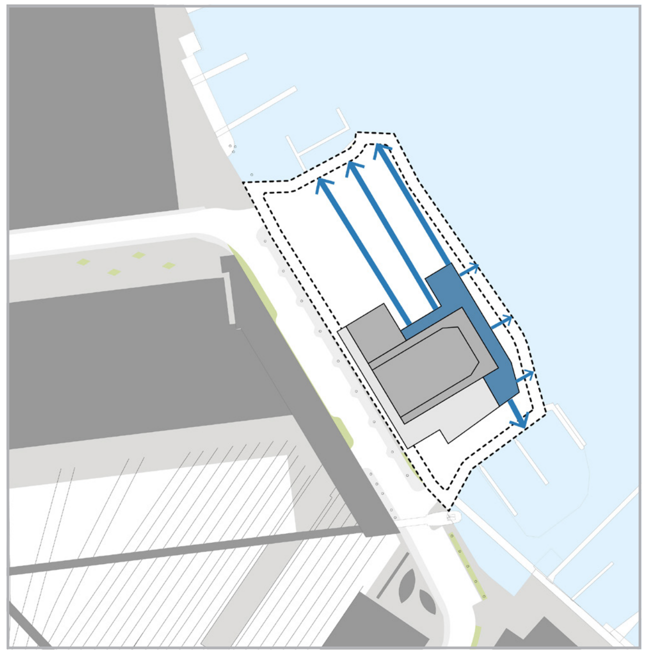
01. Relationship between indoor and outdoor leisure facilities

Experiential connection between the foyer and outdoor spaces/landscape



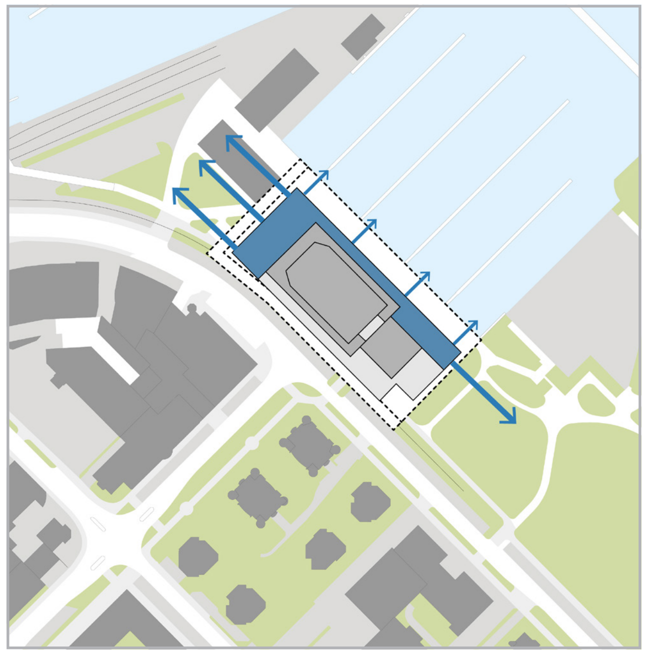
A | Theaterplatz

In Theaterplatz, the foyer at the rooftop level generates a new perspective of the riverfront, taking the audience and international visitors to see the historic centre from above. However, this type of foyer may have difficulty attracting usage outside of performance times, and will prove challenging in terms of the circulation experience before and after performances. The constrained nature of the site and the focus of foyer experience at the rooftop level are restricting the potential for an experiential connection at street level.



G | Inseli

Inseli has great potential for generating relationships between indoor and outdoor facilities. The foyer has a direct relationship with the park and with the Small Venue and together, creative connections between indoor and outdoor space usage can be explored. The project proposes that the foyer serve as a 'living room' for the community. On this site, a sense of 'place' is created between the New Theatre and the KKL, making the entire cluster of cultural buildings a focal point for the community and creating a centre of gravity for Lucerne.



G | Motorboothafen

In Motorboothafen, the foyer establishes a good relationship with the existing leisure outdoor facilities. Located along the lake, close to Ufschötti Park and a small marina, the site has good potential of creating an indoor space that communicates well with the surrounding landscape. The size and nature of the site will give architects more freedom to creatively explore innovative experiential connections between the foyer and outdoor spaces.

02. Attractiveness of pedestrian experience

Qualitative considerations on the nature of the urban environment and pedestrian paths

G | Theaterplatz

The walking environment around Theaterplatz is very attractive. Coming from the station, after having crossed a main road, the atmosphere becomes gradually pedestrian friendly. To the north of the site, on the opposite side of the river, there is a charming pedestrian area, a commercial centre full of facilities for visitors. Equally attractive and vibrant is the approach from the south-west with restaurants and historic charm.

A | Inseli

The walking environment around Inseli is characterized by the park, the piazza in front of and to the side of the KKL and the lake. While establishing an attractive relationship with the surrounding landscape, Inseli is poor in terms of the variety of facilities offered. It also means that throughout the day there may be a fluctuating density of people, and that it may be less populated during the night when there are no special events.

R | Motorboothafen

The path along the lakeshore from Inseli to Motorboothafen is not attractive. Lighting at a minimum would need to be improved when using for evening events to increase the perception of security. The path / access to the site needs significant improvement and innovative thinking to create a walking experience that is coherent with the international visitor's experience of Lucerne.

03. Relationship with the urban and natural context

Physical and visual connections with the built environment and nature

G Theaterplatz

Theaterplatz is immersed in the historic city. The landscape is an urban landscape crossed by the river with its bridges and riverbanks. The New Theatre would be located along the river. The natural landscape is in the background.

G Inseli

Compared to Theaterplatz, Inseli is located just outside the historic core of Lucerne, which becomes its background. It can provide a connected experience to Europaplatz, which has been shaped by the design of the KKL. Facing the lake, Inseli is charmed by a wide horizon. The natural landscape of Inseli is part of the visitor experience thanks both to the park and to the views that it offers.

A Motorboothafen

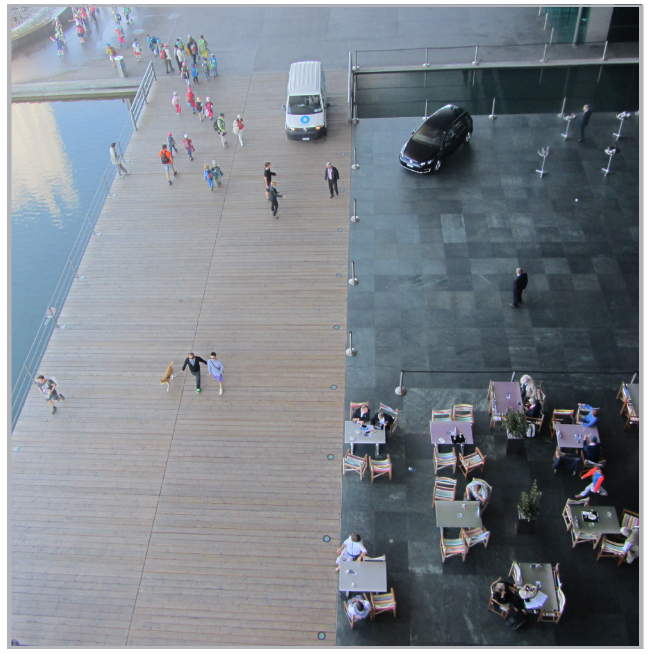
Motorboothafen has no visual relationship with the historic city. In addition, the buildings in the surroundings do not generate an urban landscape with a strong character, which is a key part of the international visitor's experience of Lucerne. The site is fully integrated into the natural landscape.

01. Adequacy of the path from the railway station

Evaluation of walkability, accessibility and security of the environment for all social and age groups

G | Theaterplatz

Theaterplatz is well connected to the station, and the path is quite straight, and pleasant. There are just a few weaknesses: to arrive from the station, it is necessary to cross a wide and congested road (or use the underground tunnel); then the path continues on a sidewalk along the riverbank.



G | Inseli

Inseli is close to the station and the path is mainly in a pedestrian area shaped by the KKL, which offers high quality modern spaces and urban furniture (around the café, in particular).

R | Motorboothafen

The path to reach Motorboothafen is partially pedestrian. It goes across a high quality pedestrian area in the first part around the KKL, which is followed by a long and narrow open air walkway. This walkway overpasses a small lonely industrial area. There are a few steps and a slope increase that may prove challenging in terms of universal accessibility.

02. Quality and maintenance level of urban environment

Livability of public spaces, design quality of pavements and street furniture — need for upgrading of surrounding areas

G Theaterplatz

In the historic centre, the materials used for urban design purposes and the street furniture are characterized by very high quality, and are well maintained. Together with the historic buildings the urban design in this area creates a pleasant urban environment.

A Inseli

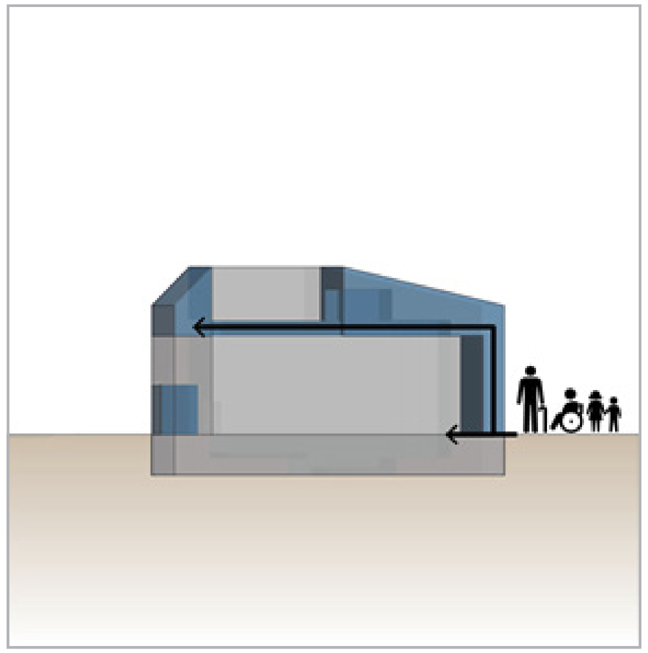
Redeveloped approximately 15 years ago, the street furniture and materials in the surroundings of Inseli (primarily KKL) are of high quality and well maintained. The space between the KKL and the New Theatre should be redeveloped as part of this project to give a coherent and unified character to the entire environment creating a sense of a protected and enjoyable environment enhancing the attractiveness of Inseli as a urban focal point. However, the building to the west of the site should be redeveloped to complement the experience.

R Motorboothafen

Although many of the buildings around the site were built recently, the public spaces were poorly designed. The open air pedestrian walkway is of very low design quality and is made of relatively poor materials as it was built as a functional connection only.

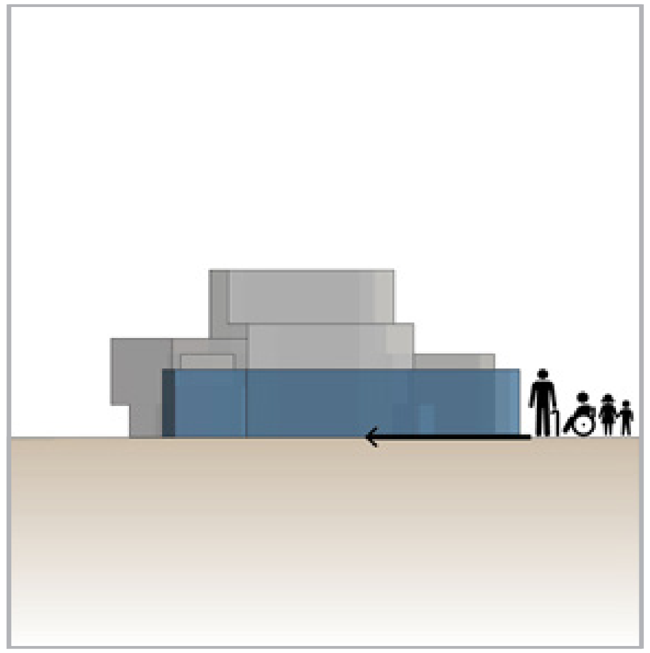
03. Accessibility for children, elderly and disabled people

Presence of barriers or challenges to accessibility



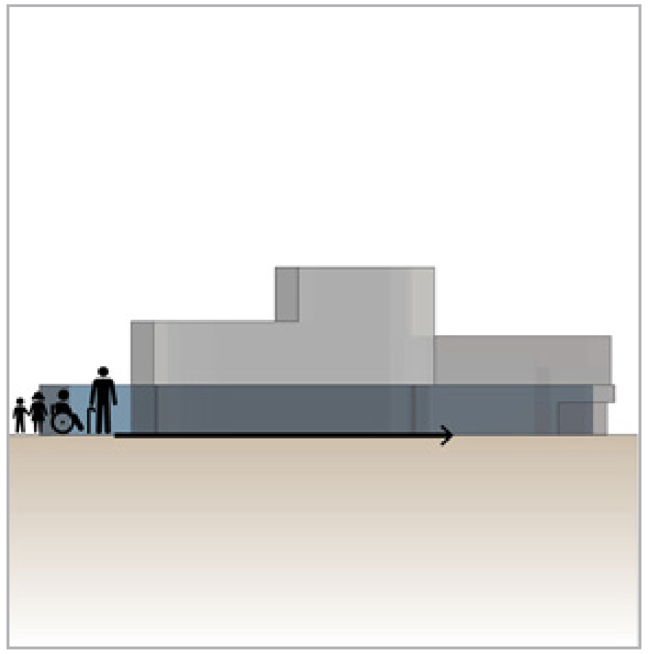
A | Theaterplatz

In Theaterplatz, the vertical circulation will pose increased challenges in designing and operating a building that is universally accessible for all the categories of people. Risks due to high pressure of vertical circulation systems could result in challenges to accessibility and may cause higher operating costs. In terms of the accessibility levels of the surroundings, Theaterplatz is in the historic centre, which is highly accessible.



G | Inseli

Inseli can easily be planned to be universally accessible. The foyer is primarily at ground level, and will be connected through a redesigned park area to a pedestrian area (KKL) which is universally accessible.



G | Motorboothafen

Motorboothafen, with its foyer at the ground level, can be accessible for all the groups of users. However, the surroundings have low design quality, and the path from the station and from the historic centre has a few steps that reduce accessibility.

4.2.4 Community Expectation

For purpose of this Site Assessment, community expectation will be analysed by means of the following criterion and three evaluation parameters.

J. Urban environment attractiveness

01. Environmental quality and impact (air, noise, biodiversity etc.)
02. Potential benefit for the local economy (business activities, services etc.)
03. Connectivity, permeability and security of public spaces

01. Environmental quality and impact (air, noise, biodiversity etc.)

Analysis of key environmental indicators (CO2 emissions, critical noise, and green areas)

Note: Environmental quality and impact were analysed but not scored against specific criteria.

CO_2 emissions due to heating private buildings

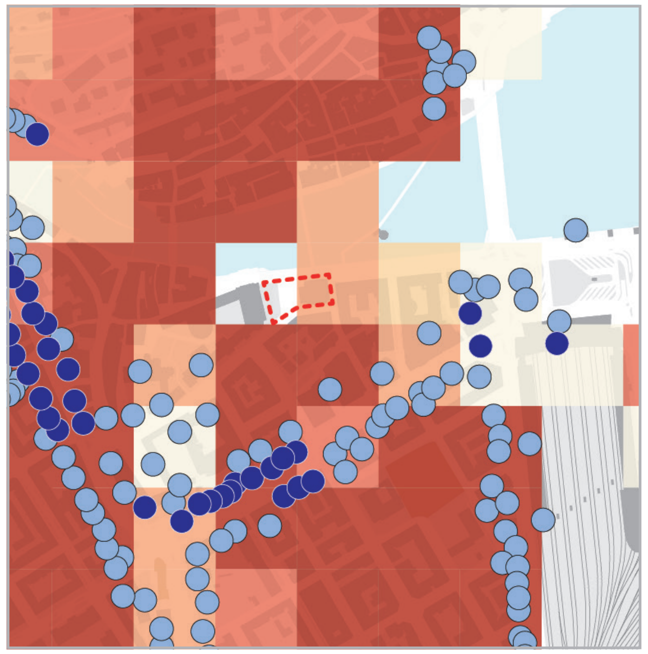
- <25 Mg/ha
- 25-50 Mg/ha
- 50-100 Mg/ha
- 100-150 Mg/ha
- >150 Mg/ha

Noise

- Value of critical noise
- Value of critical noise exceeded

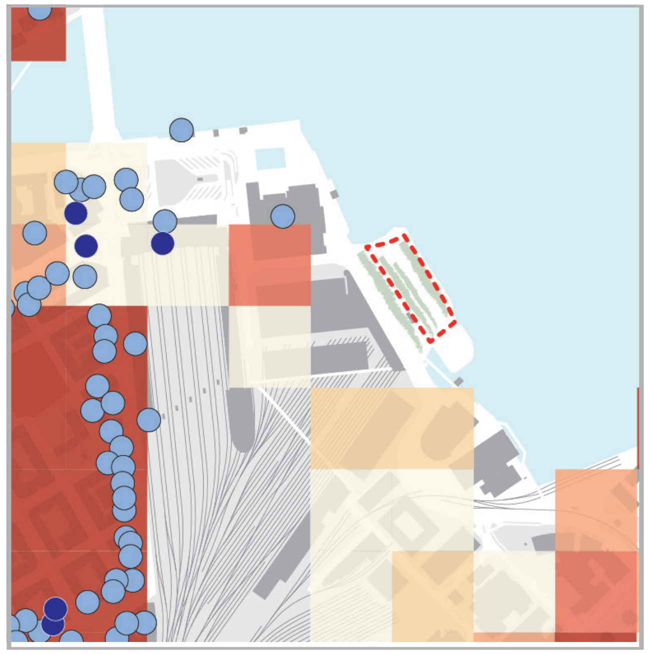
Biodiversity

- Green area



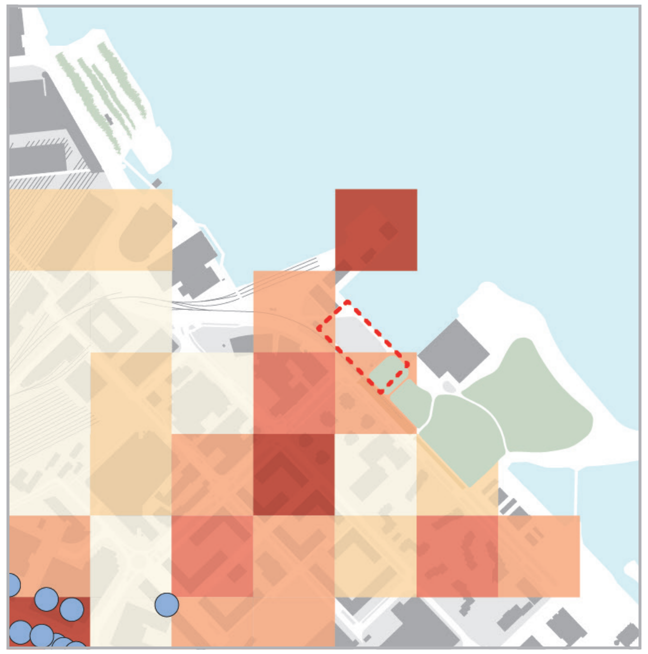
Theaterplatz

Being in the city centre, Theaterplatz is significantly impacted by air and noise pollution. Biodiversity is low because it is mainly an urban area with few green zones.



Inseli

Both air and noise pollution are low at Inseli, a site isolated from the main road network through the railway station. Due to its proximity to the lake and trees, biodiversity is high.

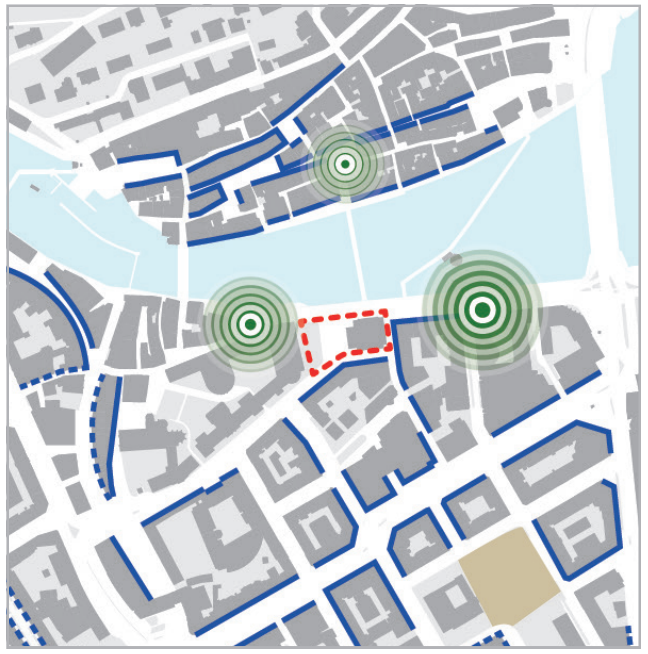


Motorboothafen

Faced along a residential area, noise pollution at Motorboothafen is low. The air pollution map shows a slightly polluted environment, especially along Alpenquai road. Biodiversity is available due to the site's proximity with the lake and the park.

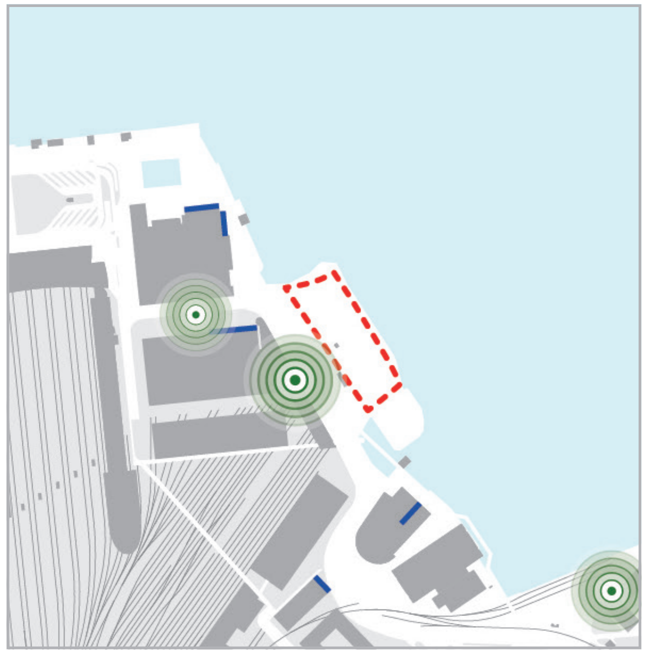
02. Potential benefit for the local economy (business activities, services etc.)

Analysis of the potential positive impact that the New Theatre would have on area business activities and services



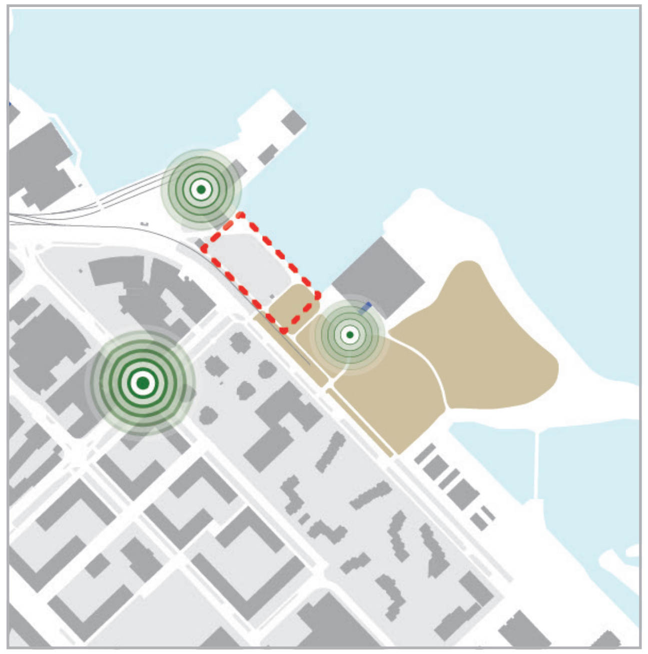
G | Theaterplatz

The city centre in which Theaterplatz is located serves as the commercial centre of the city, offering a wide range of existing activities and retail shops to which the New Theatre would add economical attractiveness. Less developed areas such as part of Bahnhofstrasse closer to the train station could benefit considerably from the New Theatre.



A | Inseli

Commercial facilities around the Inseli site are low, limiting the impact the New Theatre would have on this site economically. The nature of an office building environment around the site does not provide for extensive potential to enhance the commercial context.



G | Motorboothafen

Motorboothafen is a residential area, remote from the main commercial and cultural attractions of the city. The site however borders the park and partially confines with a private yacht club whose facilities could benefit from a regeneration of the area. Urban development of the connecting pathway between Inseli and Motorboothafen could bear potential benefits to the local economy. A new theatre at this site creates the potential for a full redevelopment of this currently undeveloped area.

Active front | Potential benefit
Semi active front

03. Connectivity, permeability and security of public spaces

Analysis of crucial quality features of public spaces in the surrounding of the sites and their potential with a New Theatre

A | Theaterplatz

Theaterplatz is well connected with other attractive and secure areas of the city and surrounded by a variety of public spaces. The piazza in front of the site currently poses a centre of gravity for the people in Lucerne. The New Theatre on Theaterplatz must be permeable, due to its location, in front of the bridges that connect two parts of the historic centre. However, the massing would bring in criticalities for the community, reducing a public area and the permeability of the site.

G | Inseli

Inseli is well connected to the KKL, to the university, and to the city centre through the piazza in front of the KKL. The path to reach the area is safe and secure and there is an attractive and permeable green area with trees on-site. Currently, the site is not very well connected to areas that are located to the south-east, but thanks to the New Theatre the site could gain in terms of permeability and connectivity.

A | Motorboothafen

Motorboothafen is poorly connected to the city centre, or other attractive functions in the surroundings. The area around and leading to the site currently is unsafe at night, especially the open air pedestrian walkway. However, the site has the potential to be more permeable due to its proximity to the park.

Image: CC - Casey Hugelfink (Flickr)

4.2.5 Planning for Efficient Operations

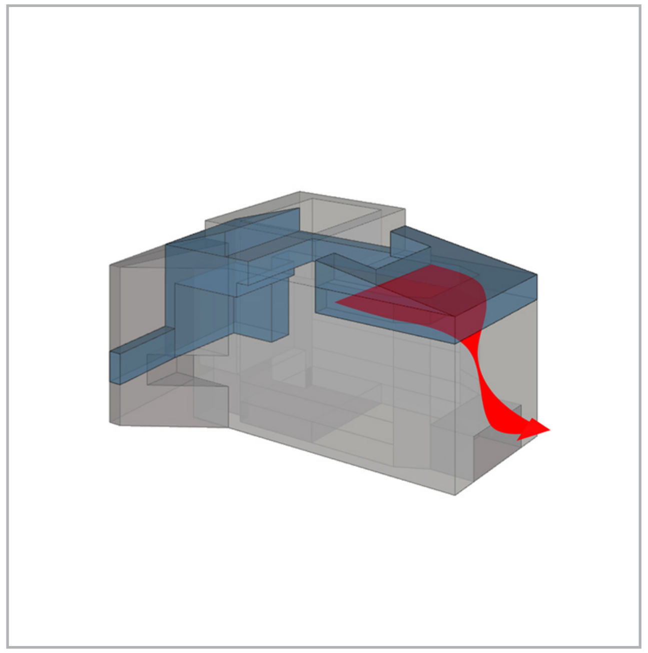
For purpose of this Site Assessment, planning for efficient operations will be analysed by means of the following criterion and three evaluation parameters.

K. Efficient and safe operations

01. Emergency egress
02. Construction costs
03. Operational costs

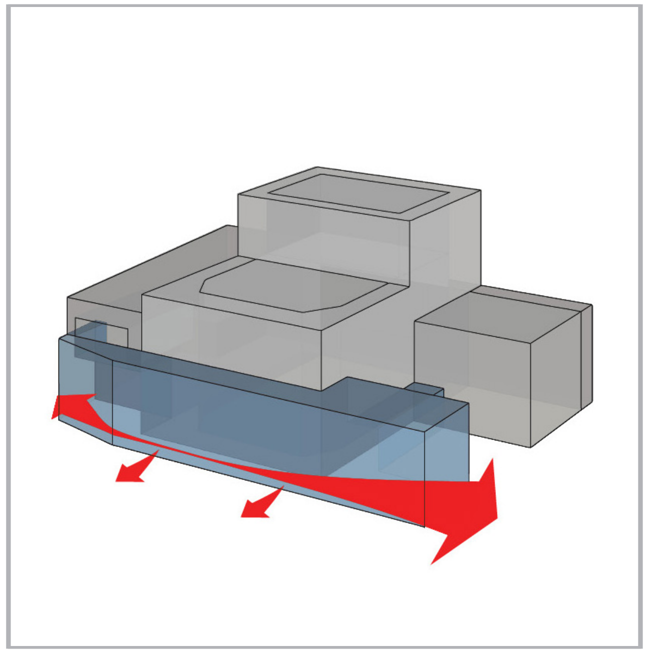
01. Emergency egress

Evaluation of emergency evacuation routes for audiences



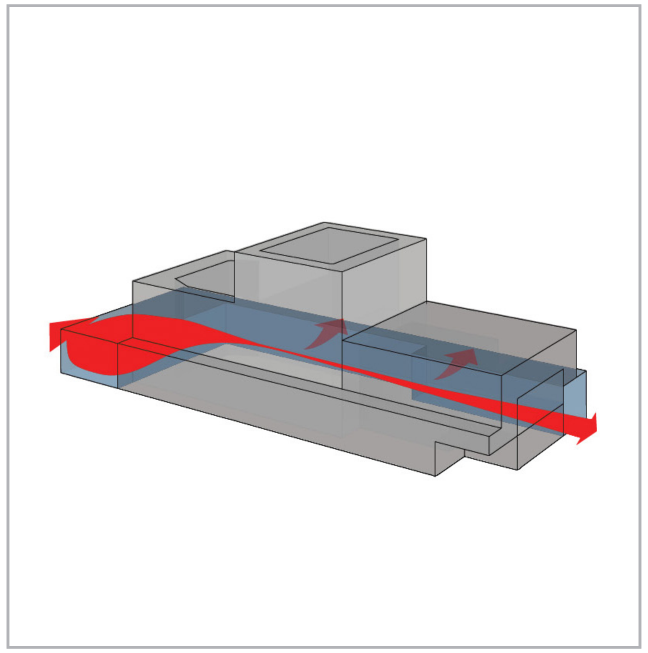
A | Theaterplatz

In Theaterplatz, the foyer would be located at the rooftop level. To accommodate emergency evacuation from this space, this massing would need include greater allowances for vertical circulation, and a generally higher risk to operations and design. Emergency egress from the Large Venue or Small Venue could occur directly to the exterior at grade. Artist support spaces would be below grade, which will also require separate vertical circulation allowances and design complexity.



G | Inseli

In Inseli, the longitudinal distribution of the volume of the foyer facilitates evacuation of the building in case of emergencies. Emergency egress from the Large Venue or Small Venue could happen directly to the exterior at grade.



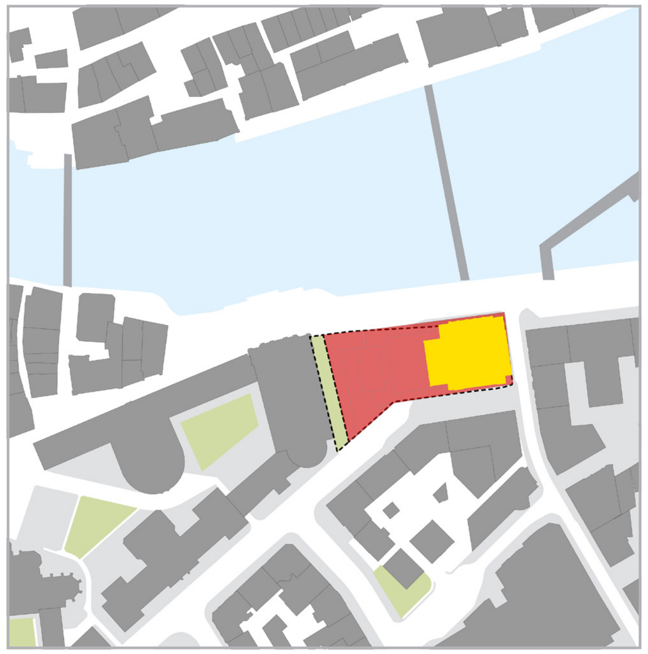
G | Motorboothafen

In Motorboothafen, the longitudinal distribution of the foyer guarantees the ease to plan evacuation operations. Emergency egress from the Large Venue or Small Venue could happen directly to the exterior at grade.

02. Construction costs

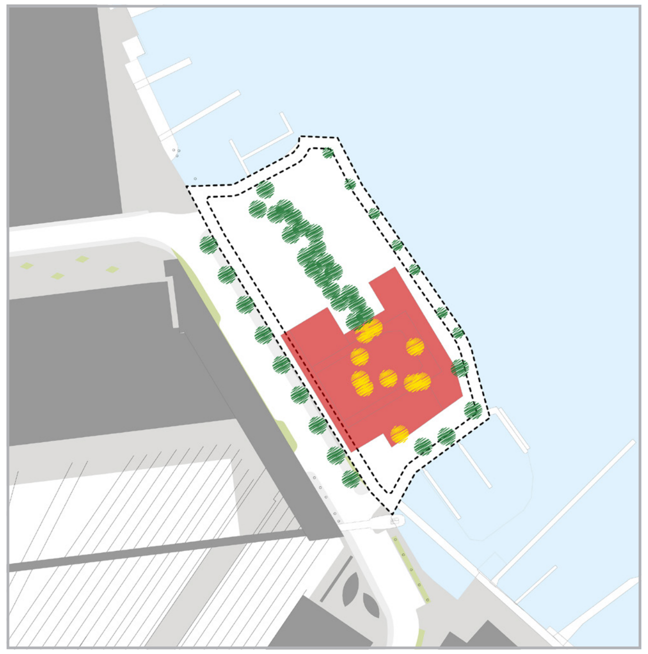
Main costs to build the New Theatre due to the site (demolitions, digging works)

Demolition	Trees
Construction	Trees to be eradicated



R Theaterplatz

Site-specific cost drivers for Theaterplatz include the demolition of the current Luzerner Theater as well as the structural need to dig two basement levels. Temporary housing of the Luzerner Theater has not been considered as part of this assessment.



G Inseli

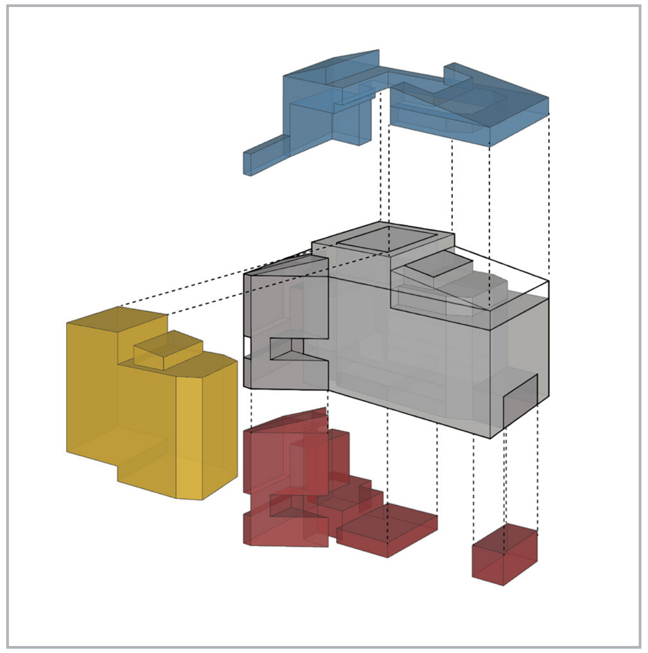
A site-specific cost driver for Inseli is the clearance of at least 10 trees of Inseli Park. Further cost associated with the potential relocation of underground utilities are to be reviewed.

G Motorboothafen

In Motorboothafen, a site-specific cost driver is the clearance of at least 14 trees. Further cost associated with the potential relocation of underground utilities are to be reviewed.

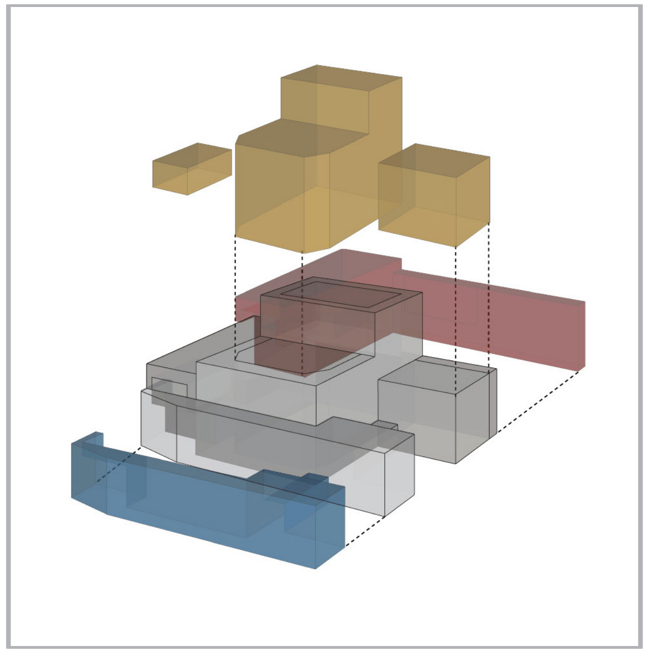
03. Operational costs

Analysis of massing impact on operational efficiency and cost



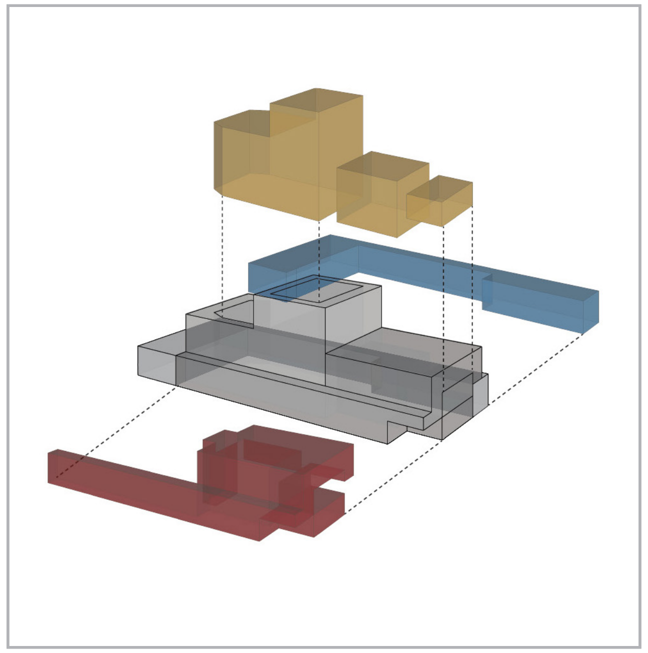
R Theaterplatz

The massing solution found for Theaterplatz is entirely different from the optimal massing. The volumes of the three functional groups (Venue, Back of House and foyer) are assembled vertically. As a consequence, operations will be less efficient and likely require significantly more staff and time.



G Inseli

The proposed massing at Inseli corresponds closely to the optimal massing. Venue, Back of House and foyer are in a similar relationship to each other. However, the majority of the Back of House areas are on one side of the fly tower, instead of being centred between it and the side stage. Consequently, technical operations could be slightly less efficient than in the optimal massing.



A Motorboothafen

The proposed massing in Motorboothafen is similar to the optimal one but key spaces are further apart, creating longer circulation distances and generally less compact clustering. There will therefore be a negative impact on efficiency of operations. The location of the Small Venue in the middle of the Back of House, limits the range of space planning options, and increases the difficulty to plan efficient foyer and technical operations.

4.3 | Assessment Summary

			THEATERPLATZ	INSELI	MOTORBOOTHAFEN
CONTEXT	A LOCATION	01. Potential of integration with int'l visitor's experience of Lucerne and its cultural heritage	G	G	R
		02. Walking distance from the railway station	G	G	R
		03. Potential to create a visual landmark that integrates with the urban and natural landscape	A	G	A
	B CONNECTED EXPERIENCE	01. Proximity to relevant performing arts assets and potential for operational synergies	A	G	R
		02. Influence on the reputation of the New Theatre Lucerne	A	G	A
		03. Integration in the urban fabric: visibility and potential synergies with public spaces	A	G	A
	C ACCESSIBILITY	01. Availability of sufficient road access and parking for visitors	A	G	A
		02. Loading dock area for trucks	R	G	G
		03. Availability of space for the specialised broadcast and recording vehicles	R	G	A
ARTIST EXPERIENCE	D INTERNATIONAL PLATFORM	01. Proximity to relevant art and cultural assets and possible operational synergies for artists	G	G	R
		02. Proximity to accommodation and retail or leisure facilities	G	A	R
		03. Temporary expandability	R	G	G
	E PERFORMANCE & REHEARSAL SPACES	01. Area available compared to the optimal massing	A	G	G
		02. Appropriateness of the shape	R	G	A
		03. Quality of space planning and circulation	R	G	G
	F SUPPORT SPACES	01. Area available compared to the optimal massing	A	G	G
		02. Appropriateness of the shape	R	G	A
		03. Quality of space planning and circulation	R	G	A

			THEATERPLATZ	INSELI	MOTORBOOTHAFEN
AUDIENCE EXPERIENCE	G QUALITY OF THE FOYER	01. Area available compared to the optimal massing	G	G	G
		02. Appropriateness of the shape	A	G	A
		03. Quality of space planning and circulation	R	G	G
	H STANDARD OF QUALITY & CHARM	01. Relationship between indoor and outdoor retail and leisure facilities	A	G	G
		02. Attractiveness of pedestrian experience	G	A	R
		03. Relationship with the urban and natural context	G	G	A
	I UNIVERSAL ACCESSIBILITY	01. Adequacy of the path from the railway station	G	G	R
		02. Quality and maintenance level of urban environment	G	A	R
		03. Accessibility for children, elderly and disabled people	A	G	G
COMMUNITY EXPECTATION	J URBAN ENVIRONMENT ATTRACTIVENESS	01. Environmental quality and impact (air, noise, biodiversity etc.)			
		02. Potential benefit for the local economy (business activities, services etc.)	G	A	G
		03. Connectivity, permeability and security of public spaces	A	G	A
EFFICIENCY	K EFFICIENT & SAFE OPERATIONS	01. Emergency egress	A	G	G
		02. Construction costs	R	G	G
		03. Operational costs	R	G	A

5 | Conclusion

Both the Massing Study in Section 3 as well as the Site Assessment in Section 4 recommend the Inseli site as the preferred site for the New Theatre Lucerne. Whereas Motorboothafen could have accommodated a massing in line with the space requirements of the Technical Concept, the site's location and its current pedestrian connection to the city centre do not allow for a full integration with the Lucerne experience on this site. The site therefore is not a feasible option for the New Theatre. The site of the existing theatre, Theaterplatz, is not a feasible option as the limited size of the site does not allow for an operationally viable layout of the New Theatre.

The Inseli site permits an operationally efficient layout of the New Theatre and allows for an excellent integration of the New Theatre into the context of buildings and open spaces around the site. The proposed massing on the site was developed with the intent of not only maintaining but more importantly upgrading the park area on the Inseli site and thus enhancing the entire community experience. The location of the site and its proximity to Lucerne's major cultural assets allows for a full integration of the New Theatre with the artistic experience in Lucerne and opens up the opportunity of creating an attractive cultural cluster together with the adjoining KKL.


Image: Google Earth

Construction Cost Model | **Chapter 2**

ARUP

Table of Contents

1 | Introduction

The aim of this chapter is to provide Stiftung Salle Modulable a programme-level estimate for the construction costs associated with the developed Technical Concept for the New Theatre Lucerne (see Volume I).

This chapter documents the estimates undertaken, including the process applied and the key assumptions made. It also outlines the limits of the estimate and potential remaining cost risks.

Image: CC - Nicki Mannix (flickr)

2 | Approach and Methodology

Performing arts facilities are among the most complicated of building types. Though often small, their complexity surpasses high-level cost estimation that would be reliable in other building types.

For this reason, Arup has engaged two specialist subconsultants to undertake the cost modelling for the New Theatre Lucerne.

Venue Consulting (Venue) of St. Petersburg, Florida, is a specialised firm that provides cost modelling and control for performing arts facilities. Venue's database of knowledge and cost details is second to none in the industry, which allows them to model the future building before it is designed based on historical data.

As a local partner, Arup has also engaged B+P Baurealisation AG (B+P) of Zurich to provide input into the process in terms of the local cost of labour, materials and products, as well as preferred construction methods and presentation.

2.1 Approach

Using the Concept Framework as a basis, Arup developed a Technical Concept which describes key characteristics of the New Theatre and defines the absolute, minimal, maximal, approximate and aspirational requirements of the project. The Technical Concept will serve as a design brief for the architectural design process.

The Technical Concept includes a Schedule of Accommodations, listing all net areas required for the building functionality, from the Performance and Rehearsal Spaces, lobbies, circulation and hospitality, through to the technical and plant areas of the building (see Volume I, Chapter 1, Appendix C).

This chapter considers costs associated with the delivery of a building based on this Schedule of Accommodations, including design, procurement and construction.[1]

Costs of operation beyond construction completion are considered in the Strategic Business Plan and Operations Model (Chapter 3). Further limits to the estimate in this chapter are described in Section 4.

1 As described by Phases 1–5 in Swiss Society of Engineers and Architects (SIA standard) 112.

2.2 Methodology

Due to the unique aspects of theatre construction, which range from unusual room heights and geometries to acoustic requirements for structure, services and finishes, an estimation approach based on per-area or per-volume benchmark costs, as seen for cost estimates in other sectors, is not feasible for the New Theatre Lucerne. Therefore, the calculation herein follows a more detailed bottom-up estimation process, based on the defined Schedule of Accommodations.

A distinction is explicitly made between an estimate based on a space programme, such as the aforementioned Schedule of Accommodations, rather than based on a particular design.

When estimating on the basis of a space programme, geometries and quantities have to be assumed in the abstract. It is expected that initial costs will evolve throughout the design process and, based on the Architectural Design, will vary depending on their design choices. To create a building which corresponds to the Technical Concept and the Concept Framework, a "design / pricing" allowance is included in the space programme approach to allow for such cost evolution and to cover additional design development and progression beyond the minimum required in the Schedule of Accommodations.

The aim of a space-programme-based cost estimation is to provide a budget figure within which the Facility can be constructed.

Performing arts facilities are among the most complicated of building types. Though often small, their complexity surpasses high-level cost estimation that would be reliable in other building types.

2.2.1 The New Theatre Cost Estimation Approach

The estimation process utilised for the New Theatre Lucerne was an iterative multistep process. Arup worked together with Venue and B+P to provide a reliable estimate. Figure 1 outlines the methodology used.

In a first step, the Schedule of Accommodations, which considers a building's net areas, was analysed and adjusted to account for the building's secondary areas, called non-programmed net areas, such as Front of House and Back of House circulation, plant spaces, wall thickness, voids and other unusable space. From this calculation a gross floor area for the Facility was determined which serves as the basis for the cost model. This is detailed in Section 3.1.

These gross areas were then analysed for their functionality. Functionality considerations include height of the rooms and building, required adjacencies, acoustical requirements, performance equipment and likely site factors. These functional requirements and assumptions are documented in Section 3.2.

In a second step, cost data typical for the local Swiss construction market as well as advice on regionally typical construction processes were obtained from local sources to populate the cost model. Venue worked together with B+P to obtain market-appropriate unit prices and cost assumptions and, upon completion, to review the final cost estimate.

Together, this information forms a typical construction cost estimate.

Separate calculations were made for the performance equipment and soft costs, such as design fees, loose fittings and fixtures, permits, and other fee costs. In sum, the construction cost estimate together with estimates made for performance equipment and soft costs define the total project cost estimate.

The process detailed here was refined iteratively as work on the Technical Concept (Volume I) and Site Analysis (Volume II, Chapter 1) progressed, incorporating new data as they became available.

Throughout this chapter, costs are presented in the structure used for the calculation.[2] For presentation in Switzerland, the budget is also presented in the main cost groups as defined by SN 506 511 Baukostenplan Hochbau (eBKP-H) in Section 3.3.4.

2 A structure used by Venue, similar to ASTM Uniformat II.

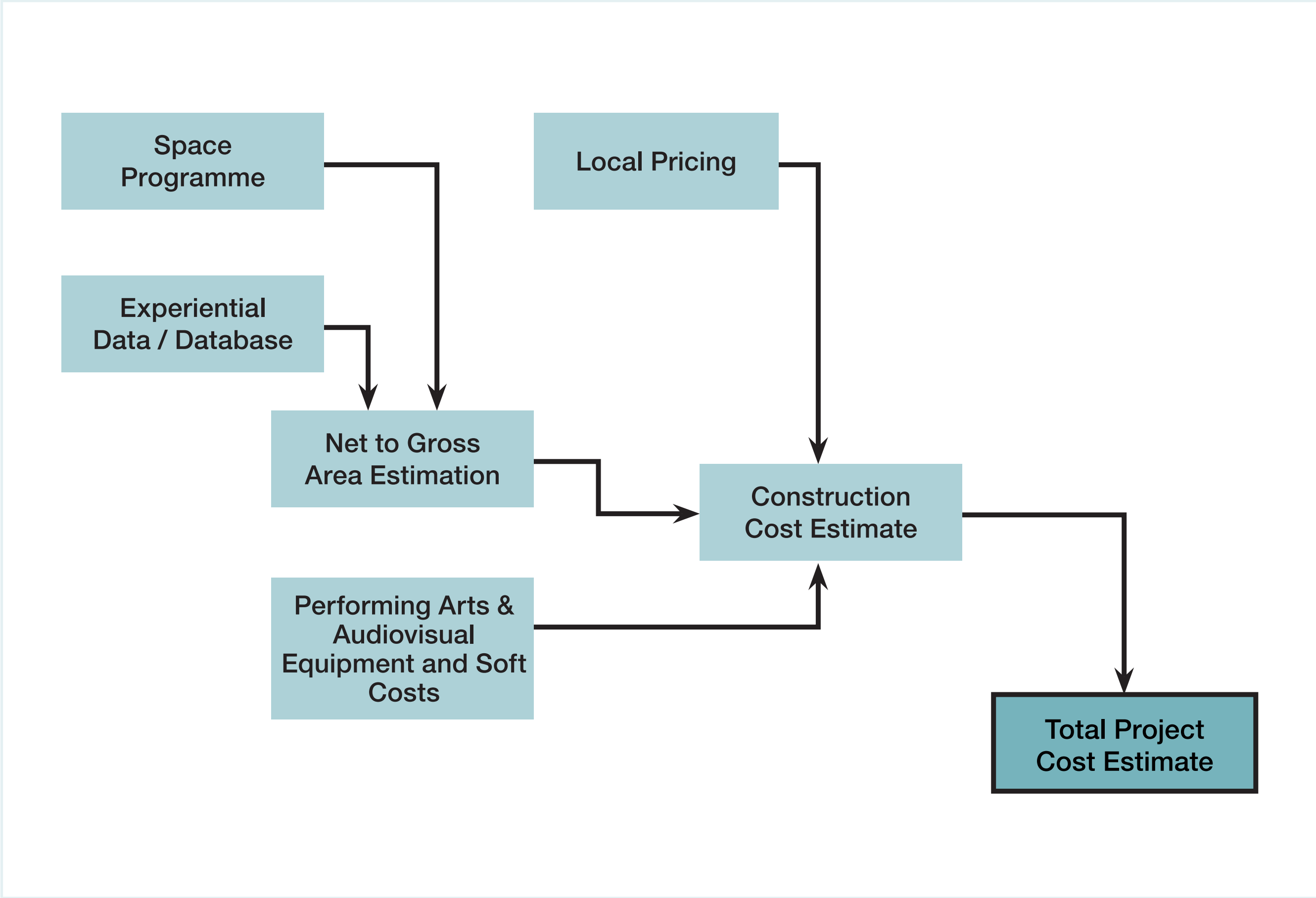


Fig 1. Cost model estimation process flow chart

3 | Cost Model

Following the structure of the aforementioned process, this section describes the cost model adopted to calculate a cost estimate based on the Technical Concept. The model includes an overview of the calculation undertaken to extrapolate the building's gross area. It presents the key definitions and assumptions for each cost category and provides the findings of the budget figures developed.

The following topics are covered in greater detail in this section:

3.1 Net-to-Gross Area Analysis

In a net-to-gross area analysis, the net areas defined in the Schedule of Accommodations are adjusted for a specific grossing factor to account for the building's secondary areas, such as Front of House and Back of House circulation, plant spaces, structures, wall thickness and unusable space. The grossing factor was determined by Arup's specialist cost consultant and relies on historical data and consideration of the specific requirements of this Technical Concept. A grossing factor varies per space and typically ranges from 10% to 55% of the assumed net area; in this calculation, an average grossing factor of 14% for the programmed spaces as per the Schedule of Accommodations was applied. Including other required spaces in addition to the programmed spaces, a net area of 6,688m² results in a gross area of 13,317m².

Table 1 shows a summary of the net-to-gross calculation undertaken, with average factors for each top-level programme area. For illustration, space categories are also summarised according to the definitions in Swiss Society of Engineers and Architects (SIA) 416 Areas and Volumes of Buildings (Table 2). Full details of the net-to-gross calculation are available in Appendix A.

#	Programme Space Name	Net m²	Factor	Gross m²	Gross-up
1.0	Exterior of Building	0	0.00	0	0
2.0	Foyer (Wandelhalle) / Arrival Area	1,376	1.12	1,546	170
3.0	Large Venue	2,385	1.13	2,706	321
4.0	Small Venue	314	1.17	367	53
5.0	Large Venue Technical Support	276	1.25	345	69
6.0	Large Venue Storage	368	1.10	406	38
7.0	Studios	431	1.15	495	64
8.0	Artist Support Spaces	520	1.17	610	90
9.0	Venue Management	202	1.12	225	23
10.0	Technical Offices and Staff Support	206	1.14	234	28
11.0	Workshops	110	1.15	126	16
12.0	Make-up and Wig Workshop and Laundry	111	1.14	126	15
13.0	Artist/Staff Entrance	37	1.14	42	5
14.0	Loading Dock and Receiving	199	1.11	220	21
15.0	Building Operations	153	1.10	169	16
16.0	Circulation	0	0.00	0	0
A	**Total of Programmed Spaces**	**6,688**	**N/A**	**7,617**	**929**

Table 1. Net-to-gross calculation summary table – programmed spaces

#		Programme Space Name	Net m²	Factor	Gross m²	Gross-up
Other Required Spaces		Public Circulation	-	-	1,250	-
		Back of House Circulation	-	-	2,590	-
		Mechanical and Electrical	-	-	1,330	-
		Unusable/Inaccessible	-	-	530	-
		Plenum	-	-	-	-
B		**Total of Other Required Spaces**	**-**	**-**	**5,700**	**-**
A+B		**OVERALL TOTAL**			**13,317**	

Table 1. Net-to-gross calculation summary table (cont'd) – other spaces

	Programme Space Name	Area (m²)
HNF	Main Usage Space	3,926
NNF	Secondary Usage Space	1,386
NF	**Usage Space (HNF+NNF)**	**5,312**
VF	Circulation Space	5,216
FF	Plant Space	1,330
NGF	**Usable Area (NF+VF+FF)**	**11,858**
KF	Building Space (eg, walls, columns, parapets, shafts, chimneys, recesses and any other non-usable spaces)	1,459
GF	**Gross Floor Area (NF+NGF+KF)**	**13,317**

Table 2. Net-to-gross calculation summary table

3.2 Definitions and Assumptions

To ensure the features required by the Technical Concept and Concept Framework are reflected in the budget, the assumptions outlined in this section are applied. The assumptions stated below provide an overview of the cost categories and their definitions used to develop the cost estimate.

All assumptions are documented in detail in Venue's cost report under Appendix A.

A - Substructure

The preferred location for the New Theatre Lucerne, as defined and recommended in Chapter 1: Site Analysis, is the Inseli site. Like all sites considered, the recommended site is characterised by complex and difficult to predict ground conditions. These stem partially from the proximity to the lake, but primarily from the hydrogeology prevalent in the area.

The cost estimate in this chapter considers the preliminary findings of geotechnical consultants, Keller+Lorenz, for the site.

Based on Keller+Lorenz's[3] desktop study report,

3 Keller+Lorenz Report 104742.A Salle Modulable: Mögliche Standorte, dated 8.6.2015.

To ensure the features required by the Technical Concept and Concept Framework are reflected in the budget, the assumptions outlined in this section are applied.

allowances have been included for pile foundations and a diaphragm wall of approximately 15m depth to account for the expected groundwater flows.[4]

The building is assumed to extend between 6m and 8m below grade, in order for the overall height to remain within height restrictions given by the City of Lucerne. For these areas, costs of excavation, basement waterproofing and drainage have been allowed for as necessary for construction below the groundwater table.

Arup notes that the cost of the substructure is highly impacted by engineering design choices to be made by the Architectural Design Team. Arup recommends that the design team be required to carry out a detailed geotechnical study that includes borings during the design process to confirm the assumptions and recommendations made by Keller+Lorenz.

The results of the Keller+Lorenz desktop study have led to an increase in cost of approximately SFr7m in comparison to the assumptions developed earlier in the study by Arup's specialist and local cost consultants based on general information available and historical experience.

4 Report 104742.A *Salle Modulable: Mögliche Standorte*, dated 8 June 2015.

Arup has incorporated the higher additional cost in the output of the study. For the purposes of Feasibility Confirmation, Arup recommends that this cost item be adjusted based on the results of the detailed geotechnical study and the engineering design approach of the Architectural Design Team.

B – Shell and Structure

Floors, roofs, attic slabs and catwalks have been assumed to be concrete and structural-steel-framed to a quality required in order to achieve the acoustical rating set in the Technical Concept.

An allowance for structural discontinuities has been made. It will be necessary to structurally decouple areas of the building for acoustical reasons to avoid structure-borne transmission of vibration.

The exterior walls will be blockwork covered with a cladding finish. As with all finishes, the specific nature of the cladding has been left to the future architect. A range of materials were considered for the purposes of setting an appropriate cost per square meter. The range was selected with the intent to be sufficient to both meet the expectations of a landmark structure designed with restraint and compare positively with the KKL located nearby.

For 10% of the total exterior skin area, a glass curtain wall has been allowed for — this corresponds to the foyer area (front and sides).

Allowances have been made for some shading elements, canopies and terraces, all of which may be part of the future design.

For the roof area, a green roof as depicted in Figure 2 has been allowed for, this being a common and sustainable feature.

Fig 2. Green roof examples

Image: CC - Tom Mrazek (flickr)

C – Interiors

In compliance with the requirements of the Technical Concept and allowing for a level of finishes comparable to the KKL, the internal finishes have been assumed as generally high quality but of an industrial type.

Floor materials have been defined as follows: concrete for the foyer; concrete with underlay, vinyl or similar for Back of House circulation; and wood for the performer rooms, offices, lounges etc.

To ensure the acoustical qualities defined in the Technical Concept are achieved, the materials allowed for in the performance spaces are massive masonry with a layer of finish material. The finish material has been defined by comparing finishes that would have the necessary characteristics for the acoustical requirements, assuming that this will be the subject of later design discussion. Box-in-box construction is also assumed where acoustically necessary.

Some architectural complexity in the façade and the foyer structure is allowed for, but not defined in detail, as this will also depend on the architect. Singular architectural expressions, such as the KKL roof, have not been allowed for in the cost stated herein.

D – Mechanical & Electrical Services

To fulfil the requirements of the Concept Framework of creating a world-class performing arts venue of the highest quality, acoustics and background noise criteria are of primary concern for the New Theatre. Achieving the background noise criteria defined in the Technical Concept will depend in part on eliminating the noise caused and transmitted by the building systems into noise-critical spaces such as the Performance and Rehearsal Spaces.

Mechanical equipment, including plumbing, drainage, fire protection, heating, ventilation, air conditioning and controls, has been allowed for to specifications necessary to achieving these criteria and are in line with the specific requirements defined in the Technical Concept.

The detailed assumptions for building systems are extensively described in Appendix A.

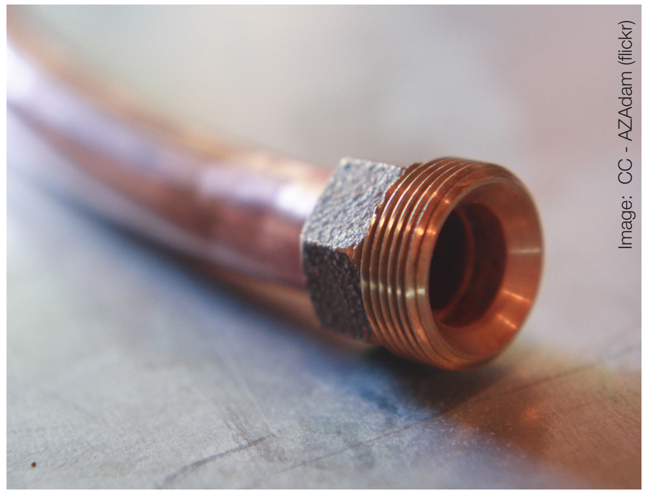


Image: CC - AZAdam (flickr)

E – Performance & Audiovisual Equipment

An appropriate allowance has been included for all performance and audiovisual equipment necessary to meet the requirements of the Technical Concept. The total project cost defined in Section 3.3.4 includes an allowance for a base level of performance and audiovisual equipment required at opening of the New Theatre, in compliance with the Concept Framework. An additional amount for equipment not required at opening but recommended for full success of the Venue is considered as an additional cost item, also defined in Section 3.3.4.

For more information on base and deferred performance and audiovisual equipment see Section 3.3.2 and Volume I, Chapter 1, Appendix D: Specialised Performance Equipment Systems.

F – Demolition & Temporary Construction

Costs associated with demolishing structures, surface and landscape features within the building footprint plus 1m have been allowed for. These include removal of existing asphalt paving, soft-scaping and protection of certain trees that are to remain.

Costs associated with site works outside of the 1m building perimeter are not considered part of the building construction cost and are shown as an additional cost item in Section 3.3.4.

G – General Requirements

General requirements cover the temporary installations necessary to undertake building work which are shared by all trades on-site, such as scaffolding, cranage and protection of finished work.

H – Utilities

This item covers the cost of connecting the water, drainage, electrical and communication utilities in the building. Fees to connect the utilities to the providers are covered in item M – Incidental Costs and Provisional Items as described below.

An allowance to relocate all existing services shown on the cadastral utilities land register for the site (Leitungskataster, dated April 2015) which fall in the building footprint has been included.

I – Design/Pricing Allowance

As described in Section 2.2, a design/pricing allowance is an allowance to capture the design development based on the programme itself. It includes features which cannot be assumed in detail at this stage of the process and features which the architect will define.

This allowance considers ongoing design detailing that will occur throughout the architectural design process until drawings are complete. It allows for quantity measurement and pricing adjustments.

The design / pricing allowance ultimately reflects the fact that this is a cost model without a design and should not be reduced.

J – Contractor General Conditions

This item shows costs associated with establishing and running the building site, such as site offices, fencing, hoarding, toilets, refuse collection and communication equipment.

K – Design Costs

Design costs are the professional fees of the design team, comprising the architect, building engineers, acoustic consultants and other required specialists.

Design team fees are freely negotiable in Switzerland and range from 20% to 30%. For a project of this type and complexity, design fees have been estimated at 25% of construction cost, based on international benchmarks and in consultation with Arup's local partner and the City of Lucerne. The fees are in line with SIA standards 102, 103 and 108.

L – Copy & Model Costs for Design Team

Included in this cost item is a typical allowance for ancillary expenses for the design team, including copy costs, modelling and samples, as is common in Switzerland.

M – Incidental Costs & Provisional Items

This cost items includes an allowance for incidental building cost, such as the Building Permit, utility connection fees and insurances (in Switzerland, these are the third-party liability insurance *Bauherrenhaftpflichtversicherung* and building insurances during construction: *Bauwesenversicherung* and *Bauzeitversicherung*).

N – Contingencies

A contingency of 5% has been allowed for costs associated with the typical construction process. Compared to international benchmarks and considering the novelty of the building proposed, this may appear low; however, if the process recommendations in Chapter 4: Strategic Project Process Plan are followed, it is to be assumed that the Detailed Design will be fully developed and costed before works are tendered, allowing for a high level of cost certainty.

This allowance is in addition to the design/pricing allowance (cost category I).

No contingency has been included for the risks described in Section 5 or any exclusions as stated in Section 4.

O – Value Added Tax (MwSt)

Value-added tax (VAT) has not been considered in this estimate. Based on the proposed organisational structure of the owner, the Building Foundation, Arup has been advised that VAT would not be applicable.

P – Loose Fittings, Fixtures & Equipment

An allowance of 2% of construction cost has been made to cover loose fittings, fixtures and equipment. This encompasses incidental furniture, fixtures and equipment which is not fixed or built into the building. Not included in this allowance are office and IT equipment or consumable supplies.

Q – Miscellaneous Items

Allowances have been included for a final site clean-up and for site guarding during construction.


Image: CC - KAren Mardahl (flickr)

3.3 Cost Estimate

The cost estimate is separated into construction building costs, performance and audiovisual equipment cost, and soft costs, as each of these components are estimated differently. The construction building cost and the performance and audiovisual equipment cost together form the total construction cost.

3.3.1 Construction Building Cost

The construction building cost has been developed based on the cost categories defined in Section 3.2 and follows the methodology outlined in Section 2.

Table 3 shows a summary of the construction building cost as estimated from the Schedule of Accommodations and using the definitions and assumptions outlined above.

A detailed bottom-up cost estimation for each of these categories can be found in Appendix A.

In addition to the construction building cost, Table 3 includes cost for performance and audiovisual equipment as part of the total construction cost. These costs are described further in Section 3.3.2.

	Item	Cost (SFr)
A	Substructure	14,405,000
B	Shell	26,135,000
C	Interiors	24,320,000
D	Mechanical and Electrical Services	22,290,000
E	Base Performance and Audiovisual Equipment	17,905,000
F	Demolition and Temporary Construction	145,000
G	General Requirements	2,050,000
H	Utilities	1,610,000
I	Design/Pricing Allowance	8,890,000
J	Contractor General Conditions	1,410,000
	Total Construction Cost (2015 SFr)	**119,160,000**

Table 3. Total construction cost, including performance and audiovisual equipment

3.3.2 Performance and Audiovisual Equipment

The cost estimate for performance and audiovisual equipment is based on the Technical Concept and the required base performance and audiovisual equipment described therein (Volume I, Chapter 1, Appendix D). Estimates are based on current market pricing data.

In line with the recommendation of the Technical Concept, the building construction cost estimate includes cost for the base equipment required for opening of the New Theatre in the value of SFr17.9m.

While the equipment within this budget is in compliance with the Concept Framework, Arup recommends in the Technical Concept to consider additional performance and audiovisual equipment to be installed at a later time for full success of the New Theatre. The portions of the performance equipment systems which have been deferred for later purchase are detailed in the Specialised Performance Equipment Systems (Volume I, Chapter 1, Appendix D). Total cost for the deferred equipment amounts to an additional SFr13.3m and are not included in the total construction cost outlined in Table 3.

Infrastructure for the deferred equipment and the associated cost, however, is included in the total construction cost for performance and audiovisual equipment in the estimate shown in Section 3.3.1 and will be provided for as part of construction of the Facility.

An overview of base and deferred performance and audiovisual equipment cost can be seen in Section 3.3.4.

3.3.3 Soft Costs

Soft costs are costs indirectly associated with the delivery of the building, such as professional fees, permits, contingencies, cleaning, security and loose furniture, fixtures and equipment.

In this estimate, soft costs encompass cost categories K to Q as defined in Section 3.2 and shown in Table 4.

As described in Section 3.2, VAT has been excluded from this estimate due to the assumed organizational owner structure (Building Foundation).

	Item	Cost (SFr)
K	Design Costs	28,925,000
L	Copy and Model Costs for Design Team	870,000
M	Permits, Fees and Insurance	3,574,800
N	Contingency	5,960,000
O	Value Added Tax	excluded
P	Loose FF&E	2,385,000
Q	Miscellaneous Items	300,000
	Total Soft Costs (2015 SFr)	**42,014,800**

Table 4. Soft costs

Soft costs are costs indirectly associated with the delivery of the building, such as professional fees, permits, contingencies, cleaning, security, and loose furniture, fixtures and equipment.

3.3.4 Final Cost Estimate

The final cost estimate includes the construction building cost estimation, an allowance for performance and audiovisual equipment cost, and the associated soft cost.

Table 5 shows the total cost figure proposed as the project budget, considering the definitions, assumptions and exclusions outlined in Sections 3 and 4. Based on the Schedule of Accommodations defined in the Technical Concept, Arup is estimating the total project cost of the New Theatre to be SFr161.17m.

Table 6 includes additional scope which Arup recommends to be considered in the further project development but are not required for compliance with the Concept Framework and the Technical Concept. These can be broken down into deferred performance and audiovisual equipment related cost items and site specific cost items.

With regards to the site specific cost items, Arup recommends that during the Design Phase a detailed geotechnical study be carried out to confirm the assumptions made in the desktop study provided by Keller+Lorenz.

eBKP-H Cost Structure

The presentation of cost (categories) used throughout this chapter is in line with a typical performing arts venue cost estimation and considers those specific cost items required for this type of facility. For presentation in Switzerland, this section translates the previously used cost structure into the cost structure typically used for construction projects in Switzerland, the Baukostenplan Hochbau (eBKP-H).
Table 7 shows the total project costs in the main groups of the eBKP-H structure, as defined by SN 506 511 Baukostenplan Hochbau (eBKP-H). Minor deviations in total cost are the result of rounding.

	Item	Cost (SFr)
	Construction Costs	119,160,000
	Thereof Performance and Audiovisual Equipment Costs	17,905,000
	Soft Costs	42,014,800
	Total Project Cost (2015 SFr)	**161,174,800**

Table 5. Total cost summary

	Item	Cost (SFr)
Optional additional items	Demolition and Siteworks outside of the building footprint (including all associated soft costs)	2,485,050
	Deferred Performance and Audiovisual Equipment	13,308,500

Table 6. Additional options

	Item	Cost (SFr)
B	Vorbereitung	15,862,000
C	Konstruktion Gebäude	18,503,200
D	Technik Gebäude	23,977,204
E	Äussere Wandbekleidung Gebäude	9,382,300
F	Bedachung Gebäude	1,925,400
G	Ausbau Gebäude	19,802,918
H	Nutzungsspezifische Anlagen Gebäude	19,894,338
I	Umgebung Gebäude	770,000
J	Ausstattung Gebäude	2,735,000
V	Planungskosten	29,795,000
W	Nebenkosten	3,674,800
Y	Reserve, Teuerung	14,850,000
	Total Costs (2015 SFr)	**161,173,000**

Table 7. Total cost summary in eBKP-H structure

4 | Limits and Exclusions

As agreed in discussions with SMF throughout the process of the Strategic Planning and Feasibility Study, certain cost items were excluded from the total costs described in this chapter.

Limits and exclusions include the following categories:

- construction-related
- site conditions
- client's staff/activities
- operational

4.1 Construction-Related

Construction-related limits and exclusions are as follows:

- site purchase costs (eBKP-H main group A)
- VAT (MwSt) – 8% (eBKP-H main group Z)
- client's Project Manager (PM) – a client-side PM team; Arup estimates a rough order of magnitude of SFr4.6m over 9 years for PM services; it is assumed that this PM will be contracted to the Building Foundation and will manage the project from design through construction completion and financial close-out of the project
- inflation and prediction of building market price development (eBKP-H group Y); all costs are shown as 2015 tender Swiss francs

4.2 Site Conditions

The following costs associated with site conditions are excluded:

- costs associated with removal or treatment of contaminated soil or other hazardous materials
- costs associated with building foundations, waterproofing and hydrogeological conditions beyond those allowed for as described in Section 3.2

4.3 Client's Staff/Activities

The following costs related to the client's staff/activities are excluded:

- client contingency, for design, programme or requirement changes made at a later stage other than pricing/design allowance or construction contingency
- any costs of financing the projects, including costs of capital, costs associated with fundraising or other activities
- any SMF or project company staff costs, including any public relations work
- any consultants outside of the design team
- ground breaking, topping off and pre-opening expenses
- any costs associated with endowments or subsidies
- any costs associated with undertaking an architectural competition

4.4 Operational

The following operational costs are excluded:

- any costs for service and maintenance contracts
- spare parts, except for those included in the performance and audiovisual equipment
- testing and inspecting expenses
- costs for third-party commissioning (ie, commissioning not undertaken by the equipment supplier)
- extended warranties or guarantees

5 | Risks

The following section outlines areas where Arup sees noteworthy cost risks, principally divided into two categories: organisational and process risks and technical risks. In this section, Arup has summarised these, rated them according to likelihood and possible impact (following the scheme in the table to the right) and proposed steps to mitigate them.

Likelihood Rating	Impact Rating
Likely	Very Significant
Possible	Significant
Unlikely	Not Significant

Table 8. Risk ratings

5.1 Organisation and Process

Risk	Impact/Consequence	Likelihood of risk occurring	Potential size of impact	Mitigation
Non-optimised Project Organisation for the Type of Project	An unusual project organisation could, if roles and responsibilities aren't clear, lead to additional coordination efforts, causing net extra costs, either in additional fees or rework.	Possible	Significant	Ensure alignment between proposed organisation and budget. Ensure roles and responsibilities are clear to all parties and correctly reflected in contracts.
Risk Pricing	Inappropriate procurement may lead to contractors increasing their bids to absorb perceived risks in the design or execution.	Possible	Very Significant	Ensure procurement strategy and interfaces are clear during procurement. Employ structures common in the local market.
Conditional Public Approval	Public acceptance, planning approval or funds may be tied to additional cost items, including temporary works or permanent changes to adjacent public space.	Likely	Significant	Ensure clarity on inclusions/exclusions to budget at all times. Allow for checking and feedback from cost consultant during decision-making process.
Changes in the Requirements from the Users	Changed user requirements may necessitate the inclusion of additional space, changes in space quality or other additional cost items.	Possible	Very Significant	Ensure a robust change management process is in place to identify and quantify changes as well as flag the need for additional funding early.

Table 9. Organisational cost risks; a number of risks of higher cost are associated with the choices regarding the project organisation and process

5.2 Technical Risks

Risk	Impact/Consequence	Likelihood of risk occurring	Potential size of impact	Mitigation
Architectural Responses in Competition Not in Line with Budget	The construction building cost is most sensitive to changes in the gross space programme, ie, changes in the efficiency of how the spaces are arranged in the building, as well as changes to the cost of finishes, particularly of the external envelope.	Likely	Very Significant	Designs presented in the competition should be evaluated early and independently for space efficiency and cost.
Novel Concept	The uniqueness of the concept may be associated with unforeseen costs. No particular contingency has been allowed for this.	Likely	Significant	Allow for adequate design time and reviews to ensure the design has reached an adequate level of maturity before execution.
Ground Conditions	Although the available information[1] on the ground conditions, geology and hydrogeology of the site has been considered for this report, there remains substantial uncertainty about the actual ground situation, in particular the soil behaviour under load and the hydrology when interfered with during construction. 1 Keller+Lorenz Report 104742.A Salle Modulable: Mögliche Standorte, dated 8.6.2015	Likely	Very Significant	Arup recommends further study as part of the design process and if necessary.

Table 10. Technical risks; key risks identified with the technical execution of the New Theatre

Construction Cost Model | **Appendices**

ARUP

Appendix A | Venue Report

A1 Introduction

Arup commissioned the cost consulting firm Venue to provide cost consulting services through the programming phase of the Stiftung Salle Modulable New Theatre Lucerne project, specifically for the Inseli site. As a result, the following pages contain the final report that Venue provided.

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Lucerne, Switzerland

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INSELI SITE OPTION

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Basis

ARUP commissioned Venue to provide cost consulting services through the programming phase of the Stiftung Salle Modulable New Theatre project for the INSELI SITE. Venue submits this programme estimate as a cost model to assist the team align program, quality and budget.

ARUP space list V11 forms the basis of this estimate.

Financial Summary

The estimated total project cost, excluding the demolition and landscaping, for the New Theatre is CHF 161.1 million in current September 2015 tender Swiss Francs for the Base Space List for the Inseli Site. The following is a breakdown of costs:

Option	*Construction Cost*	*Soft Cost*	*Total Project Cost*
Program 11	CHF 119.16 million	CHF 42.01 million	CHF 161.17 million

Building Summary

Gross floor area of 13,317 m² comprising:

- Theatre with varying seat configurations
- Large staging/rehearsal space
- Studio spaces
- Support spaces
- Public Circulation
- Back-of-House Circulation
- Mechanical and electrical
- Unusable/inaccessible

Gross floor area clarification: technical galleries, wire rope grid, perimeter catwalks and exterior programme areas are not included in the gross floor area.

Estimate Methodology

ARUP net space list V11 was analyzed and adjusted for the required grossing factor (the inclusion of area for lobbies and public circulation, structure/walls etc., back-of-house circulation, mechanical/electrical spaces, unusable spaces, etc.), yielding a gross floor area for the new facility. A cost model was next developed based on the function of areas contained in the gross floor area program, and other building, performance equipment, acoustical and site conditions taken into consideration. Concept design sketches for the aduitorium were also referenced. It should be noted that this is a program driven budget principally based on functional areas and is not meant to reflect any particular overall building design except for the auditorium design.

With regard to the Inseli site fit, it should be noted that the building footprint was calculated based on the net area required at the main audience and loading dock floor level, to which the grossing factor was applied. The stage level was set at 1m above grade and no restriction was made with regard to the height of the building, again for cost model purposes.

For pricing and market conditions information, Venue liaised with a Swiss pricing partner and obtained current unit prices.

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Estimate Inclusions

- Sub-Structure
- Shell
- Interiors
- Mechanical & Electrical Services
- Performance and AV Equipment
- General Requirements
- New Utilities
- Relocation of any main city existing utilities
- Café/Bar and café kitchen all shell space
- Design/Pricing Allowance
- Contractor General Conditions
- Design Costs
- Copy and model costs
- Incidental costs
- Contingencies
- Owner purchase loose fixtures/fittings/equipment
- Miscellaneous items

Estimate Exclusions

- Inflation
- Value Added Tax/MwSt
- Soil borings, geotech, site and utility surveys
- Contaminated soil treatment and disposal
- Hazardous materials abatement and disposal
- Testing/inspections expenses
- Third party commissioning
- Sole sourced equipment or systems
- Service and maintenance contracts
- Ground conditions variances
- Hard and soft landscaping
- Any demolition on site ouside of bldg footprint + 1m
- Spare parts
- Financing
- Fundraising
- Public relations
- Legal fees and expenses
- Stiftung Salle Modulable staff expenses
- Stiftung Salle Modulable overall project contingency
- Groundbreaking, topping off & pre-opening expenses
- Endowment/Subsidies/Client Contingency

Definitions and Assumptions

The following helps define the terminology and assumptions in this report:
A - Sub-Structure : pile foundations, basement & pit excavation; dewatering; diaphragm wall.
B - Shell comprises:
- ***Structure*** : concrete and structural steel framed floor and roof; attic slab; catwalks; acoustic criteria is N1.
- ***Exterior Enclosure*** : exterior cladding to block backup; curtainwall to 10% of exterior skin area; 100% green roof; shading; canopies; terraces.

C - ***Interiors*** : high quality but industrial type finishes; performance space materiality to be primarily massive masonry with layer of acoustically defined finish material; some architectural complexity in the façade and foyer structure; concrete flooring for foyer; concrete with underlayment or concrete with vinyl or similar finish for back-of-house circulation; wood flooring for performer rooms, offices, lounges etc.

D Mechanical and Electrical Services comprises:

•***Mechanical*** includes plumbing & drainage, fire protection, heating, ventilating, air conditioning & controls - specifically –

Heating, Ventilating, Air Conditioning (H.V.A.C.):

The mechanical H.V.A.C. system estimate includes for a water-cooled chilled water plant comprising central, high efficiency water cooled chillers, 2 number @ 900 kW and 1 number at 350 kW, 2,150kW total capacity complete with matching capacity adiabatic cooling towers to provide chilled water to serve the building. Condenser and chilled water loops will be provided with primary circulation pumps complete with VFD's. Chilled water piping will be extended to air handling units and space cooling units throughout utilizing fully redundant secondary circulation pumps complete with VFD's; independent hot water boiler plant comprising central high efficiency condensing style hot water boilers (with acid neutralization and primary heating water pumps), 3 number @ 1,750kW total capacity will be utilized to provide hot water to serve the building. Hot water heating piping will be extended to air handling units, inslab heating in non-performance areas and/or perimeter radiation at high heat loss areas and space heating units throughout utilizing fully redundant secondary circulation pumps complete with VFD's.

Ventilation and cooling air will be delivered to all occupied areas of the building via 10 number custom central indoor mounted air handling units, Fanwall (fan array) type with VFD's and enthalpy heat recovery wheels, totaling 103,000 L/s and supplemented with localized spot cooling units to suit special purpose needs. Custom constant variable volume AHU's with noise-critical acoustic overhead air distribution system will serve the performance and rehearsal areas to an N1 noise criterion and secondary rehearsal/studio spaces to a PNC 20 noise criterion. Similarly, air distribution to lobby and support spaces will be provided via conventional overhead air distribution via linear bar and/or sidewall diffusers near various gathering areas and along exterior curtain walls, with variable volume terminal boxes with reheat coils to suit the specific zone space temperature / humidity environmental needs. Generally air will be supplied to the spaces via a network of sheetmetal ducts to and from the respective air handling units supply air diffusers within the space. Duct will be lined with internal 25mm - 50mm thick duct liner depending on location and area served. Ceiling voids (where available) will be utilized to convey return air to main riser shaft locations. A smoke control system consisting of rooftop exhaust fans and makeup air supply is required for the auditorium (estimated capacity 45,000 L/s). A smoke control system consisting of rooftop exhaust fans and makeup air supply is required for the stage pyrotechnics smoke control (estimated capacity 10,500 L/s). 24/7 Control / dimmer/amp / piano storage rooms shall have independent auxiliary special environmental cooling / conditioning systems to maintain precise temperatures and humidity. A welded steel grease exhaust will be provided for café kitchen. A dust collection / paint spray booth exhaust system will be provided for the workshop.

Plumbing and Drainage:

The plumbing and drainage estimate includes for electronically activated plumbing fixtures; domestic hot water will be provided via central natural gas fire high efficiency water heaters with distribution through building with domestic hot, cold and recirculation potable water piping to fixtures, fittings and HVAC systems throughout; domestic water storage tank, triplex booster/distribution pump and softener will be provided; gravity flow sanitary & grease waste (and vent) collection system from fixtures, fittings, floor drains and equipment throughout connected to site sanitary services as well as grease interceptor for café kitchen; full flow storm drainage with roof drains complete with collection piping connected to site services. A permanent dewatering system complete with weeping tiles, pumping stations and interconnecting piping will be provided. Natural gas piping will be installed to serve boilers, domestic hot water heaters, air handling unit humidifiers and café kitchen equipment.

Fire Protection:

The building will be fully fire sprinkler protected with quick response wet and/or dry system to local codes and regulations, for light ordinary hazard coverage. Standpipe with fire hose valves will be included at each egress stair at each level, as well as each side of theatre stage to meet code requirements. Fire extinguishers will also be provided throughout. Fire water booster pump assemblies will be provided to boost both standpipe and sprinkler systems independently. A fire water storage tank will be provided.

Controls and Automation:

A central building management and control system will be provided to optimize energy conservation and comfort and to control, report and alarm mechanical systems. The system will be web based using DDC technology and will have central head end computer work station within the building. Ventilation rates will be controlled by main duct run mounted carbon dioxide sensors throughout the facility. The system will control boiler plant, chiller plant, AHU's, unitary heaters, VAV terminals and the like.

General:

All systems / services will be located and routed for acoustic sensitivity and noise transfer elimination.

• ***Electrical*** includes services and distribution, lighting, devices and controls, systems and ancillaries and performance equipment accommodation – specifically –

Distribution & Services:

The local Utility will provide a new HV feed to a customer owned substation with main HV switchgear feeding two 2000KVA power transformers. The secondary 3000A 230/400V underground feeder will feed a normal power double ended 3000A 23/400V main switchboard with two main ACBs and a tie ACB. Emergency power will be supplied by a 1000KW diesel generator located on the roof in a sound attenuated enclosure. Various 230/400V distribution panels will provide power to feed the production dimmer racks and rigging equipment. Power connection to new mechanical equipment will be from 400V mechanical distribution panels. 230/400V panels will provide power to the lighting and devices throughout the facility. A building and technical grounding systems will be provided for theatre as will a lightning protection system tied into the building perimeter ground loop.

Systems and Ancillaries:

A two stage addressable fire alarm EVAC system, security access and CCTV, communications and PA will be provided. A complete conduit and wiring system for the production equipment and AV will be provided.

Lighting, Devices and Heating:

Lighting will generally be provided using LED recessed and decorative fixtures. These fixtures will be fed from the normal and emergency power lighting panels. In sound sensitive areas ballasts will be remote mounted in ballast enclosures. Lighting control will generally be provided using a central LV control panel interfaced with the production dimming systems, local occupancy sensors and daylight harvesting in non-production areas. New devices will be installed to meet general maintenance and specialty requirements for production facilities and there will be an energy control system. Wiring for dimmer circuits will be run from the dimmer racks to the outlets in the theatre areas with the rigging power circuitry. Power wiring and connections to the heating components of the mechanical equipment will be provided.

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E - Performance and AV Equipment includes:
- theatre equipment; audience seating; production lighting; audio-visual - budget by Arup.

F - Demolition & Temporary Construction - includes for the removal of existing asphalt paving, softscaping, existing building and protection of certain trees that are to remain on site, within the building footprint area + 1m.

G - General Requirements includes for contractor scope such as scaffolding to the auditorium and lobby to be shared by trades, cranage and protection of finishes.

H - Utilities includes an allowance mechanical and electrical uitility work that may be required.

I - Design/Pricing Allowance is for ongoing design detailing that will occur until drawings are complete and for quantity measurement and pricing adjustments. This allowance must include for ongoing ARUP concept design development of the auditorium.

J - Contractor General Conditions & Compensation includes all site and head office overhead expenses for the contractor e.g. on-site management, supervision, engineering, layout, administration, temporary facilities and toilets, dumpsters and trash removal, communications equipment, staff vehicles, etc.

K - Design Costs includes for professional fees and expenses for the design team which would include the architect, structural, mechanical, electrical and civil engineers, theatre consultant, acoustician, façade consultant, elevator consultant, food service consultant, lighting consultant, code consultant, cost consultant, geotech consultant, graphics consultant, landscape architect and others depending on the design and what specialist consultants are required.

L - Copy & Model Costs includes an allowance for the design team.

M - Incidental Costs and Provisional Items includes for permits, fees, Bauherrenhaftpflichtversicherung, Bauwesenversicherung and Bauzeitversicherung.

N - Contingencies include for construction variations such as coordination conflicts on the drawings and other minor errors and omissions that may occur during the construction phase of the project (Owner changes not included). Inflation to tender date is excluded as directed, This usually covers normal price increases that will likely occur between now and the projected tender date.

O - Value Added Tax/MwSt is excluded as directed.

P - Loose FF&E includes incidental furniture, fixtures and equipment that is not fixed or built into the building.

Q - Miscellaneous Items includes for general and final clean-up and security.

Note: Venue has no control over the cost of labour, materials or equipment, the contractor's tender prices, competitive/negotiated tendering, or market conditions. Whilst Venue cannot warrant that bids or negotiated prices will not vary from any estimate prepared, we do however use our best endeavors to ensure that our estimate closely reflects the anticipated tender cost.

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Estimate Summary INSELI SITE OPTION 18 October 2015

	ITEM		AMOUNT	
A	Sub-Structure		CHF 14,405,000	
B	Shell		CHF 26,135,000	
C	Interiors		CHF 24,320,000	
D	Mechanical & Electrical Services		CHF 22,290,000	
E	Performance & AV Equipment		CHF 17,905,000	
F	Demolition & Temporary Construction		CHF 145,000	bldg footprint +1m demo only
G	General Requirements		CHF 2,050,000	
H	Utilities		CHF 1,610,000	
I	Design/Pricing Allowance	10%	CHF 8,890,000	
J	Contractor General Conditions		CHF 1,410,000	
	TOTAL CONSTRUCTION COST IN CURRENT 2015 TENDER SWISS FRANCS		***CHF 119,160,000***	*CHF 8948 /m²*
K	Design Costs	25.0%	CHF 28,925,000	
L	Copy & Model Costs for Design Team	3%	CHF 870,000	
M	Incidental Costs & Provisional items			
	- permits, fees		CHF 3,074,800	
	- insurance, guarantee		CHF 500,000	
N	Contingencies:			
	- inflation		CHF 0	excluded
	- construction variations	5.0%	CHF 5,960,000	
	- client		CHF 0	excluded
O	Value Added Tax/MwSt		CHF 0	excluded
P	Loose FF&E	2.0%	CHF 2,385,000	
Q	Miscellaneous Items:			
	- complete general and final clean-up		CHF 200,000	
	- security		CHF 100,000	
	TOTAL PROJECT COST IN CURRENT 2015 TENDER SWISS FRANCS		***CHF 161,174,800***	*CHF 12103 /m²*

Overall Gross Floor Area ***13,317 m²***

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Elemental Summary — **18 October 2015**

	ELEMENT		Total	CHF per m²	%
A	SUB-STRUCTURE		CHF 14,405,800	CHF 1,081.76	13%
	A1.1 Excavation	CHF 7,407,000		CHF 556.21	
	A1.2 Foundations	CHF 4,860,000		CHF 364.95	
	A1.3 Slab-on-Grade	CHF 1,638,000		CHF 123.00	
	A1.4 Basement Walls	CHF 500,800		CHF 37.61	
B	SHELL		CHF 26,134,500	CHF 1,962.49	24%
B1	Superstructure	CHF 13,758,800		CHF 1,033.18	13%
	B1.1 Structural Concrete	CHF 50,000		CHF 3.75	
	B1.2 Structural Steel	CHF 13,508,800		CHF 1,014.40	
	B1.3 Other Structure	CHF 0		CHF 0.00	
	B1.4 Miscellaneous Structure	CHF 200,000		CHF 15.02	
B2	Exterior Enclosure	CHF 12,375,700		CHF 929.32	12%
	B2.1 Roofing	CHF 1,325,000		CHF 99.50	
	B2.2 Exterior Walls	CHF 5,852,200		CHF 439.45	
	B2.3 Exterior Windows & Curtainwall	CHF 3,552,500		CHF 266.76	
	B2.4 Exterior Doors	CHF 296,000		CHF 22.23	
	B2.5 Miscellaneous Exterior	CHF 1,350,000		CHF 101.37	
C	INTERIORS		CHF 24,318,000	CHF 1,826.09	23%
C1	Partitions & Doors	CHF 7,158,600		CHF 537.55	7%
	C1.1 Partitions	CHF 5,246,600		CHF 393.98	
	C1.2 Interior Doors	CHF 1,912,000		CHF 143.58	
C2	Vertical Movement	CHF 3,260,000		CHF 244.80	3%
	C2.1 Stairs	CHF 1,715,000		CHF 128.78	
	C2.2 Lifts	CHF 1,545,000		CHF 116.02	
C3	Interior Finishes & Fixtures	CHF 13,899,400		CHF 1,043.73	13%
	C3.1 Public & Performance Spaces	CHF 9,988,100		CHF 750.03	
	C3.2 Back-of-House Spaces	CHF 3,911,300		CHF 293.71	
D	MECHANICAL & ELECTRICAL SERVICES		CHF 22,290,916	CHF 1,673.87	21%
D1	Mechanical	CHF 13,106,015		CHF 984.16	12%
	D1.1 Plumbing & Drainage	CHF 1,961,640		CHF 147.30	
	D1.2 Fire Protection	CHF 850,450		CHF 63.86	
	D1.3 Heating, Vent, Air Cond	CHF 9,525,385		CHF 715.28	
	D1.4 Controls	CHF 768,540		CHF 57.71	
D2	Electrical	CHF 9,184,901		CHF 689.71	9%
	D2.1 Services & Distribution	CHF 3,096,800		CHF 232.54	
	D2.2 Lighting, Devices & Controls	CHF 2,982,701		CHF 223.98	
	D2.3 Systems & Ancillaries	CHF 3,105,400		CHF 233.19	
E	EQUIPMENT		CHF 17,903,144	CHF 1,344.38	17%
E1	Performance/AV Equipment & Seating	CHF 17,903,144		fr. 1,344.38	17%
	E1.1 Performance Equipment & Seating	CHF 15,103,613		CHF 1,134.16	
	E1.2 AV Equipment	CHF 2,799,531		CHF 210.22	
E2	Miscellaneous Equipment	CHF 0		fr. 0.00	0%
	E2.1 Miscellaneous Equipment	CHF 0		CHF 0.00	
F	DEMOLITION & TEMPORARY CONSTRUCTION		CHF 143,500	CHF 10.78	0%
	F1.1 Demolition	CHF 143,500		CHF 10.78	
	F1.2 Temporary Construction	CHF 0		CHF 0.00	
G	GENERAL REQUIREMENTS		CHF 2,050,000	CHF 153.94	2%
	G1.1 Equipment & Rentals	CHF 1,900,000		CHF 142.67	
	G1.2 Project Overhead Items	CHF 150,000		CHF 11.26	
	TOTAL BUILDING ELEMENTAL COSTS		CHF 107,245,860	CHF 8,053.30	100%
		GROSS FLOOR AREA	13,317.00	m²	
H	SITEWORKS & UTILITIES		CHF 1,610,000		
	H1.1 Siteworks	CHF 0			
	H1.2 Mechanical Utilities	CHF 680,000			
	H1.2 Electrical Utilities	CHF 930,000			
	TOTAL SITWORKS & UTILITIES		CHF 1,610,000		

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Mechanical Estimate Summary

Gross Floor Area 13,317 m2

18 October 2015

Description Element\Sub-Element	Specialty Sub Break down	Sub Element Total	Element Total	$ per m2 Sub Element	$ per m2 Element	% Element	Remarks
D1 Mechanical							
D1.1 Plumbing & Drainage			CHF 1,961,640		CHF 147.30	15.0%	
D1.11 - Plumbing Fixtures		CHF 321,739		CHF 24.16			
D1.12 - Domestic Water		CHF 595,162		CHF 44.69			
D1.13 - Sanitary Waste & Vent		CHF 332,925		CHF 25.00			
D1.14 - Storm		CHF 331,600		CHF 24.90			
D1.15 - Natural Gas		CHF 93,219		CHF 7.00			
D1.16 - Specialty Systems:		CHF 31,439		CHF 2.36			
D1.16.1 - Provisions for Sustainable Features	CHF 31,439						
D1.16.2 - Water Feature	CHF 0						
D1.16.4 - Seismic Restraints	CHF 0						
D1.17 - Miscellaneous Works and General Accounts		CHF 255,556		CHF 19.19			
D1.2 Fire Protection			CHF 850,450		CHF 63.86	6.5%	
D1.21 - Standpipe		CHF 234,755		CHF 17.63			
D1.22 - Sprinklers		CHF 604,445		CHF 45.39			
D1.23 - Specialty Systems		CHF 0		CHF 0.00			
D1.24 - Fire Extinguisher		CHF 11,250		CHF 0.84			
D1.25 - Miscellaneous Works and General Accounts		CHF 0		CHF 0.00			
D1.3 Heating, Ventilation & Air Conditioning			CHF 9,525,385		CHF 715.28	72.7%	
D1.31 - Liquid Heat Transfer (Heating)		CHF 908,696		CHF 68.24			
D1.32 - Liquid Heat Transfer (Cooling)		CHF 1,771,739		CHF 133.04			
D1.33 - Humidification		CHF 10,000		CHF 0.75			
D1.34 - Air Distribution		CHF 4,238,771		CHF 318.30			
D1.35 - Exhaust Systems		CHF 93,219		CHF 7.00			
D1.36 - Specialty Systems		CHF 0		CHF 0.00			
D1.37 - Support Systems and Works		CHF 1,259,896		CHF 94.61			
D1.37.1 - Noise and Vibration Isolation	CHF 347,400						
D1.37.2 - Mechanical Wiring and Starters	CHF 0						
D1.37.3 - Balancing and Commissioning	CHF 133,170						
D1.37.4 - Workshop Exhaust	CHF 43,478						
D1.37.5 - Auditorium Smoke Evacuation	CHF 127,174						
D1.37.6 - Stage Pyrotechnics Smoke Control System	CHF 29,674						
D1.37.7 - Innovative Energy Solutions	CHF 579,000						
D1.38 - Miscellaneous Works and General Accounts		CHF 1,243,064		CHF 93.34			
D1.4 Controls			CHF 768,540		CHF 57.71	5.9%	
D1.41 - Controls and Automation		CHF 768,540		CHF 57.71			
D1.42 - Miscellaneous Works and General Accounts		CHF 0		CHF 0.00			
Total (D1) Mechanical			CHF 13,106,015		CHF 984.16	CHF per m2	

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Electrical Estimate Summary

Gross Floor Area 13,317 m2

18 October 2015

Description Element\Sub-Element	Sub Element Total	Element Total	CHF per m2 Sub Element	CHF per m2 Element	% Element	Remarks
D2 Electrical						
D2.1 Service & Distribution		CHF 3,096,800		CHF 232.54	33.7%	
D2.11 - L.V. Switchboard	CHF 600,000		CHF 45.06			
D2.12 - Emergency Power	CHF 360,000		CHF 27.03			
D2.13 - Distribution	CHF 220,000		CHF 16.52			
D2.14 - Feeders	CHF 700,000		CHF 52.56			
D2.15 - Motor Controls & Wiring	CHF 330,000		CHF 24.78			
D2.16 - Miscellaneous	CHF 540,000		CHF 40.55			
D2.17 - General Requirements	CHF 346,800		CHF 26.04			
D2.2 Lighting, Devices & Heating		CHF 2,982,701		CHF 223.98	32.5%	
D2.21 - Lighting	CHF 1,856,291		CHF 139.39			
D2.22 - Branch Devices & Wiring	CHF 688,110		CHF 51.67			
D2.23 - Heating	CHF 0		CHF 0.00			
D2.24 - General Requirements	CHF 438,300		CHF 32.91			
D2.3 Systems & Ancillaries		CHF 3,105,400		CHF 233.19	33.8%	
D2.31 - Fire Alarm System	CHF 306,888		CHF 23.04			
D2.32 - Security System	CHF 345,249		CHF 25.93			
D2.33 - Communications	CHF 315,839		CHF 23.72			
D2.34 - Telecom/Broadcasting	CHF 1,534,440		CHF 115.22			
D2.35 - Miscellaneous	CHF 255,740		CHF 19.20			
D2.36 - General Requirements	CHF 347,244		CHF 26.08			
Total Building (D2) Electrical		CHF 9,184,901		CHF 689.71	100.0%	
H1.3 Electrical Utilities						
H1.3 Electrical Utilities		CHF 930,000		CHF 69.84		
H1.31 - Site - Power	CHF 700,000		CHF 52.56			
H1.32 - Site - Communications	CHF 30,000		CHF 2.25			
H1.33 - Site - Lighting	CHF 200,000		CHF 15.02			
H1.34 - Site - General Requirements	CHF 0		CHF 0.00			
Total (H1.3) Electrical Utilities		CHF 930,000		CHF 69.84	CHF per m2	

Stiftung Salle Modulable - New Theatre
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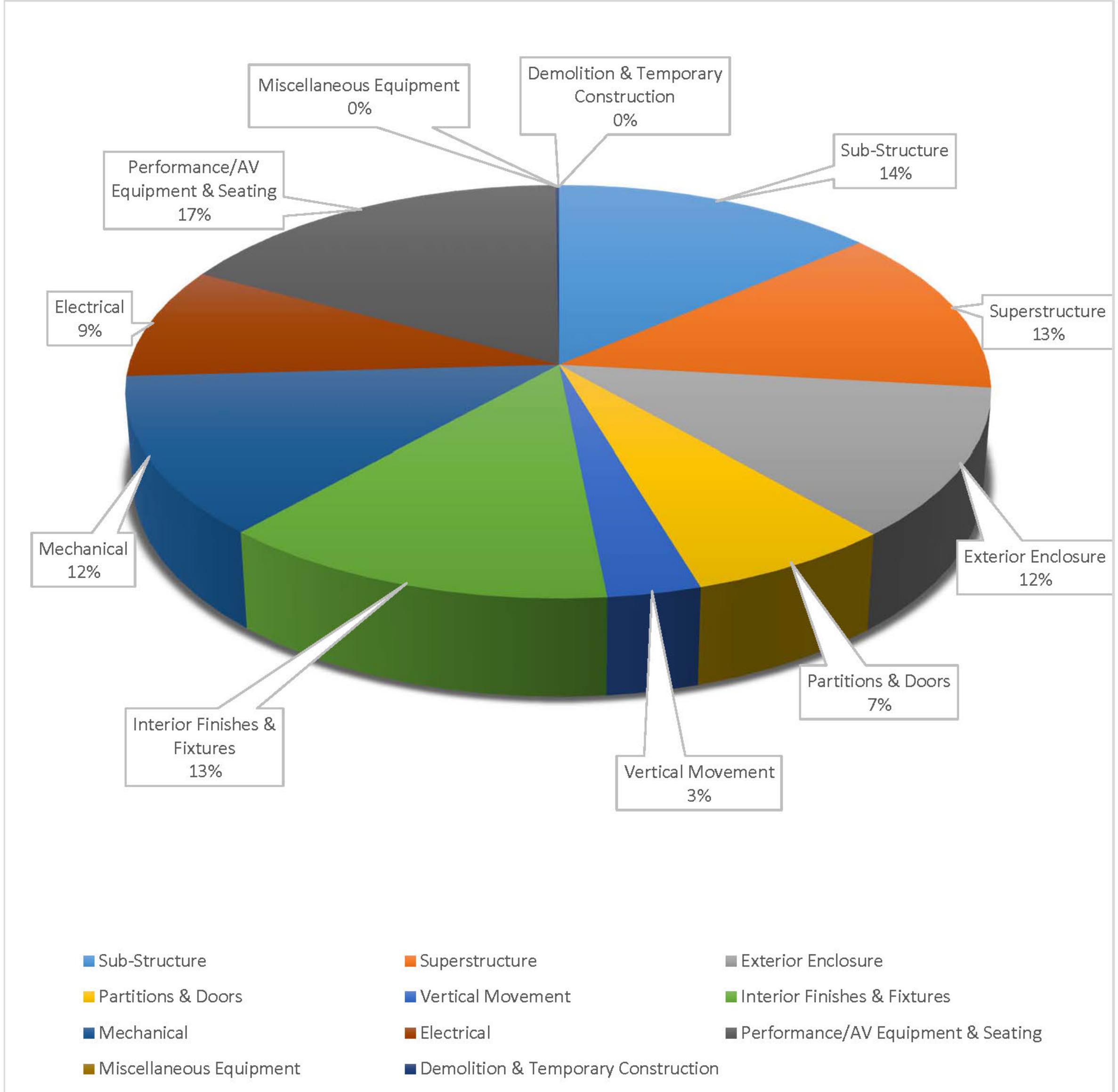
Building Cost Elementary Summary **18 October 2015**

Elemental Summary Pie Chart



Detailed Estimate

Stiftung Salle Modulable - New Theatre

Lucerne, Switzerland

Programme Estimate Version 11

18 October 2015

venue.
the bottom line

venue.
the bottom line

Stiftung Salle Modulable - New Theatre
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Detailed Estimate — *18 October 2015*

	Description	Programme Estimate Quantity	Unt	Rate	Amount	Remarks
	A1 Substructure					
9.	***A1.1 Excavation***					
11.	Excavate and stockpile					
12.	- soil	41,100	m³	30.00	1,233,000	
13.	- unknown ground conditions	allowance			200,000	
15.	Backfill with stockpiled material				0	all imported fill
17.	Haul excess material offsite	41,100	m³	20.00	822,000	
19.	Contaminated soil removal				0	excluded
21.	Imported backfill	3,600	m³	70.00	252,000	
23.	Diaphragm wall	4,000	m²	1,100.00	4,400,000	
25.	Dewatering	allowance			500,000	
29.	***Total for Section A1.1 Excavation***				***CHF 7,407,000***	
32.	***A1.2 Foundations***					
34.	Foundations	allowance			4,680,000	including piles
36.	Premium for acoustic joint in foundations	allowance			0	
38.	Elevator pits:					
39.	- public	2	ea	30,000.00	60,000	
40.	- boh/service	2	ea	30,000.00	60,000	
41.	- freight	1	ea	60,000.00	60,000	
45.	***Total for Section A1.2 Foundations***				***CHF 4,860,000***	
48.	***A1.3 Slab-On-Grade***					
50.	600mm slab-on-grade:					
51.	- basement level	3,900	m²	420.00	1,638,000	incl waterproofing
53.	250mm slab-on-grade:					
54.	- grade level	0	m²	0.00	0	
56.	Acoustic isolation joints				0	
59.	***Total for Section A1.3 Slab-On-Grade***				***CHF 1,638,000***	

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Stiftung Salle Modulable - New Theatre

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Detailed Estimate — **18 October 2015**

No.	Description	Quantity	Unt	Rate	Amount	Remarks
		Programme Estimate				
61.	**A1.4 Basement Walls**					
63.	Concrete wall, 300mm thick, waterproofing, drainage sheet, reinforcing:					
64.	- straight	1,565	m²	320.00	500,800	
65.	- curved					
67.	Acoustic isolation joints				0	
70.	**Total for Section A1.4 Basement Walls**				**CHF 500,800**	

B1 Superstructure

No.	Description	Quantity	Unt	Rate	Amount	Remarks
74.	**B1.1 Structural Concrete**					
76.	Housekeeping pads	allowance			50,000	
79.	**Total for Section B1.1 Structural Concrete**				**CHF 50,000**	
82.	**B1.2 Structural Steel**					
84.	Concrete and structural steel framed floor/roof structure	13,317	m²	732.50	9,754,700	
86.	Attic slabs to stage and auditorium	1,055	m²	350.00	369,300	
	Rigging steel:					
89.	- stage	449	m²	510.00	229,000	
90.	- auditorium	690	m²	365.00	251,900	
92.	Catwalks	423	m	2,150.00	910,100	
94.	Wire rope grid	497	m²	400.00	198,800	
96.	M&E roof dunnage	allowance			50,000	
98.	Acoustic premiums:					
99.	- jack-up slabs	700	m²	350.00	245,000	50% of M&E rooms
101.	Acoustic isolation joints	allowance			300,000	
103.	Miscellaneous metals	allowance			850,000	
105.	Fireproofing	allowance			350,000	
107.	Intumescent paint to structural steel				0	
109.	AESS steel/detail premium				0	
112.	**Total for Section B1.2 Structural Steel**				**13,508,800**	

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Stiftung Salle Modulable - New Theatre

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Detailed Estimate — **18 October 2015**

No.	Description	Quantity	Unt	Rate	Amount	Remarks
		Programme Estimate				
114.	**B1.3 Other Structure**					
					0	
119.	**Total for Section B1.3 Other Structure**				**CHF 0**	
122.	**B1.4 Miscellaneous Structure**					
124.	Firesafing at slab edges	allowance			200,000	
127.	**Total for Section B1.4 Miscellaneous Structure**				**CHF 200,000**	

B2 Exterior Enclosure

No.	Description	Quantity	Unt	Rate	Amount	Remarks
132.	**B2.1 Roofing**					
134.	Skylights				0	
136.	Green roofing	3,420	m²	350.00	1,197,000	
138.	Sloping roofing				0	
140.	Smoke hatches				0	mech ventilation included
142.	Temporary roofing				0	assumed not required
144.	Access ladders and hatches	allowance			50,000	
146.	Rough carpentry	allowance			78,000	
149.	**Total for Section B2.1 Roofing**				**CHF 1,325,000**	
152.	**B2.2 Exterior Walls**					
154.	Exterior cladding	6,600	m²	600.00	3,960,000	allowance
156.	Back-up to exterior cladding:					
157.	- 240mm block walls with insulation and dampproofing	6,600	m²	205.00	1,353,000	
159.	Rear of parapets	215	m²	250.00	53,800	
161.	Copings	430	m	280.00	120,400	
163.	Louvres	allowance			75,000	
165.	Caulking & sealing	allowance			185,000	

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Stiftung Salle Modulable - New Theatre
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Detailed Estimate — **18 October 2015**

	Description	Quantity	Unt	Rate	Amount	Remarks
167.	Acoustic isolation joints	allowance			105,000	
169.	Lintels, sills, etc	elsewhere			see misc metals	
171.	Mock-ups	elsewhere			see general requirements	
175.	**Total for Section B2.2 Exterior Walls**				**CHF 5,852,200**	
178.	**B2.3 Exterior Windows & Curtainwall**					
180.	STC glazing	50	m²	3,500.00	175,000	
182.	Curtainwall	1,100	m²	2,000.00	2,200,000	
184.	Punched windows	800	m²	800.00	640,000	
186.	Shading to glazing (measured elsewhere):					50% of glazed areas
187.	- curtain wall	550	m²	650.00	357,500	
188.	- punched windows	400	m²	450.00	180,000	
192.	**Total for Section B2.3 Exterior Windows & Curtainwall**				**CHF 3,552,500**	
195.	**B2.4 Exterior Doors**					
197.	Doors					
198.	- glazed	20	lvs	10,000.00	200,000	
199.	- metal	8	lvs	2,000.00	16,000	
200.	- overhead	4	ea	15,000.00	60,000	
201.	- automatic door openers	4	ea	5,000.00	20,000	
204.	**Total for Section B2.4 Exterior Doors**				**CHF 296,000**	
207.	**B2.5 Miscellaneous Exterior**					
209.	Canopies	allowance			500,000	
211.	Terraces	allowance			350,000	
213.	Soffits	allowance			100,000	
215.	Window washing system/fall arrest	allowance			250,000	
217.	Exterior signage	allowance			150,000	
220.	**Total for Section B2.5 Miscellaneous Exterior**				**CHF 1,350,000**	

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Stiftung Salle Modulable - New Theatre
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Detailed Estimate — **18 October 2015**

	Description	Quantity	Unt	Rate	Amount	Remarks
C1	**Partitions & Doors**					
224.	**C1.1 Partitions**					
226.	STC glazing	50	m²	3,500.00	175,000	allowance
228.	Operable partitions	280	m²	775.00	217,000	
230.	Glazed	300	m²	600.00	180,000	
232.	Grout filled block walls	7,100	m²	190.00	1,349,000	
234.	Block walls	5,200	m²	140.00	728,000	
236.	Block/gypsum	4,370	m²	150.00	655,500	
238.	Premium for additional block wythe:					
239.	- auditorium, stage & rehearsal performance areas	3,200	m²	120.00	384,000	
241.	Premium for box-in-box construction:					
242.	- rehearsal room	1,260	m²	270.00	340,200	
243.	- recording, other PNC 15 spaces	770	m²	270.00	207,900	
245.	Acoustical detail at junction of steel columns and block walls	allowance			750,000	
247.	Acoustic isolation joints	allowance			190,000	
249.	Firesafing	allowance			70,000	
252.	**Total for Section C1.1 Partitions**				**CHF 5,246,600**	
254.	**C1.2 Interior Doors**					
256.	Oversized STC overall size 4m wide x 4m high	4	prs	85,000	340,000	
258.	Glazed doors	14	lvs	10,000	140,000	
260.	STC rated doors	42	lvs	6,500	273,000	
262.	Gasket and sealed	200	lvs	3,600	720,000	
264.	Balance	164	lvs	2,250	369,000	
266.	Automatic door openers	4	ea	5,000	20,000	
268.	Fire shutters	allowance			50,000	
271.	**Total for Section C1.2 Interior Doors**				**CHF 1,912,000**	

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Stiftung Salle Modulable - New Theatre

Programme Estimate Version 11

Detailed Estimate | **18 October 2015**

	Description	Quantity	Unt	Rate	Amount	Remarks
	C2 Vertical Movement					
275.	**C2.1 Stairs**					
277.	Feature/monumental				0	
279.	Public	8	flts	90,000.00	720,000	
281.	Auditorium	allowance			120,000	
283.	Upgraded back-of-house stair	1	flts	50,000.00	50,000	
285.	Fire exiting	33	flts	25,000.00	825,000	
289.	**Total for Section C2.1 Stairs**				**CHF 1,715,000**	
292.	**C2.2 Lifts**					
294.	Public, 6 stop, 15m rise, front openings	2	ea	300,000.00	600,000	glass elevators
296.	Boh, 4 stop, 16m rise, front openings	1	ea	150,000.00	150,000	
298.	Service, 4 stop, 15m rise, front openings	1	ea	225,000.00	225,000	
300.	Freight, 3 stop, 10m rise, front openings	1	ea	500,000.00	500,000	
302.	Premium for cab allowances				0	
304.	Handicapped lifts	2	ea	35,000.00	70,000	
307.	**Total for Section C2.2 Lifts**				**CHF 1,545,000**	
	C3 Interior Finishes & Fixtures					
312.	**C3.1 Public & Performance Spaces**					
314.	Large venue performance area	449	m²	1,550.00	696,000	
315.	Large venue auditorium/lifts	1,139	m²	1,015.00	1,156,100	
	Small venue	295	m²	2,610.00	770,000	
317.	Public lobbies/circulation	2,068	m²	1,470.00	3,040,000	
318.	Retail	55	m²	1,040.00	57,200	
319.	Café & bar	152	m²		0	shell space
320.	Public restrooms	187	m²	1,250.00	233,800	

venue.

venue.
the bottom line

Stiftung Salle Modulable - New Theatre

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Detailed Estimate | **18 October 2015**

	Description	Quantity	Unt	Rate	Amount	Remarks
322.	Performance equipment accommodation					
323.	- large hall	allowance			200,000	
324.	- small venue	allowance			50,000	
325.	- other spaces	allowance			50,000	
326.	- finishes to lift wagons	allowance			250,000	
327.	- finishes to acoustical reflector ceiling panels	allowance			550,000	
328.	- finishes and railings to seating accommodation	allowance			2,550,000	
329.	- premium for finishes to guillotine doors	allowance			130,000	
330.	- premium for parapet to catwalks				255,000	
333.	**Total for Section C3.1 Public & Performance Spaces**				**CHF 9,988,100**	
336.	**C3.2 Back-of-House Spaces**					
338.	Box office/coats	102	m²	780.00	79,600	
339.	Dimmer rooms	58	m²	115.00	6,700	
340.	Control rooms	295	m²	1,760.00	519,200	
341.	Recording booth/suite	13	m²	1,825.00	23,700	
342.	Studio Spaces/Divisible Group Dressing Rooms	524	m²	1,075.00	563,300	
343.	Media/conductor's rehearsal /dressing rooms	226	m²	945.00	213,600	
344.	Café kitchen	55	m²		0	shell space
345.	Kitchenettes	22	m²	710.00	15,600	
346.	Quick change/BOH toilets and locker rooms	306	m²	860.00	263,200	
347.	Offices/lounges	617	m²	375.00	231,400	
348.	Workshops/loading/receiving	465	m²	155.00	72,100	
349.	Storage/chair wagon storage/traproom	1,839	m²	130.00	239,100	
350.	BOH circulation/S&LL's	2,590	m²	235.00	608,700	
351.	MEP spaces	1,330	m²	220.00	292,600	
352.	Unusable/inaccessible	530	m²		0	
354.	Loading dock equipment	3	ea	20,000.00	60,000	
356.	Blackout shades					
357.	- rehearsal rooms	50	m²	350.00	17,500	
359.	Restroom accessories	allowance			185,000	
360.	Interior signage	allowance			200,000	
361.	Donor signage	allowance			excluded	
362.	Acoustical isolation	allowance			225,000	
363.	Rough carpentry	allowance			95,000	
367.	**Total for Section C3.2 Back-of-House Spaces**				**CHF 3,911,300**	

venue.

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11

Detailed Estimate 18 October 2015

Description	Quantity	Unt	Rate	Amount	Remarks
D1 Mechanical					
371. **D1.1 Plumbing & Drainage**					
373. **D1.11 - Plumbing Fixtures**				321,739	
375. Water conserving, commercial quality plumbing fixtures and fittings (total 185 no) will be provided including:	1	ea	321,739.13	321,739	
376. - Water closets with electronic no touch flush valves					
377. - Urinals with electronic no touch flush valves					
378. - Lavatories with electronic no touch faucets					
379. - Janitor / Utility sinks - mop basins in custodial closets					
380. - Showers in change rooms					
381. - Hand wash-up sinks					
382. - Counter sinks					
383. - Dual level drinking fountains - refrigerated					
384. - Rough-in connections to above fixture					
386. **D1.12 - Domestic Water**				595,162	
388. Domestic cold water will be extended from the incoming water service to the building with central water meter / backflow preventer to fixtures and fittings throughout, mechanical HVAC systems and general interior and exterior hose bibb coverage. All domestic hot, recirculation and cold water piping will be thermally insulated. Domestic hot water will be extended from central natural gas hot water heaters system to serve plumbing fixtures and fittings throughout.	13,317	m2	30.00	399,510	
390. A domestic water storage tank, triplex booster pumpset and water softener system will be provided	1	ea	195,652.17	195,652	
392. **D1.13 - Sanitary Waste & Vent**				332,925	
394. A complete system of sanitary waste and vent collection will be provided to serve plumbing fixtures, floor drains and equipment throughout. Service will be connected to outlet to site sanitary sewer. Drainage unable to flow by gravity will be pumped via a duplex sewage ejector. A localized grease interceptor will be included for the cafe kitchen.	13,317	m2	25.00	332,925	
396. **D1.14 - Storm**				331,600	
398. A complete systems of roof/storm water drainage will be provided to collect rainwater from roofs. Piping will be organized to be outside sound and water sensitive areas such as main hall and electronic equipment rooms.	13,317	m2	17.39	231,600	
400. A permanent dewatering system will be complete with weeping tiles, pumping stations and interconnecting piping	1	ea	100,000	100,000	

Stiftung Salle Modulable - New Theatre
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Detailed Estimate 18 October 2015

Description	Quantity	Unt	Rate	Amount	Remarks
402. **D1.15 - Natural Gas**				93,219	
404. A complete system of natural gas will be provided to serve hot water boilers, domestic hot water heaters, café kitchen cooking equipment and AHU steam humidifiers. Piping will extend from PRV / meters provided by local gas utility to equipment	13,317	m2	7.00	93,219	
407. **D1.16 - Specialty Systems:**					
409. No work required					
412. **D1.16.1 - Provisions for Sustainable Features**				31,439	
414. Provision for water conservation technologies and water sources to sustainable features such as green walls	1	ea	31,439.00	31,439	
516. **D1.17 - Miscellaneous Works and General Accounts**				255,556	
518. Supervision, site office, head office overheads, submittals, clean up, small tools, rentals and the like, rigging and preparation of 3D co-ordination drawings	1	ea	255,556.00	255,556	
521. **Total for Section D1.1 Plumbing & Drainage**				CHF 1,961,640	
523. **D1.2 Fire Protection**					
525. **D1.21 - Standpipe**				234,755	
527. A complete system of standpipe and fire hose cabinets will be provided throughout the building.	13,317	m2	15.00	199,755	
529. A fire water booster pump assembly will be provided to boost service pressure for the sprinkler standpipe @ 15.7 L/s (250gpm) fed from the central fire water storage tank	1	ea	35,000.00	35,000	
532. **D1.22 - Sprinklers**				604,445	
534. A new municipal water source fire main c/w double check backflow preventer assembly will be supplied to serve the building. Alarm check valve(s) & zone flow alarms will be provided to create zoned coverage consistent to code and fire alarm coverage.	1	ea	29,935.00	29,935	
536. Fire water storage tank (also serves standpipe)	1	ea	100,000.00	100,000	

Description	Quantity	Unt	Rate	Amount	Remarks
538. The building will be fully fire sprinkler protected with quick response wet and/or dry system to local codes and regulations, for light ordinary hazard coverage. Generally heated areas will be protected with wet systems coverage and areas subject to potential freezing and/or physical damage will be protected with dry systems coverage.	13,317	m2	30.00	399,510	
540. The incoming water service is not considered adequate in both size and pressure / flow rate. A fire water booster pump assembly will be provided to boost service pressure @ 47.3 L/s (750gpm)	1	ea	75,000.00	75,000	
543. ***D1.23 - Specialty Systems***				0	
545. Preaction / gaseous fire protection systems will not be provided.					
548. ***D1.24 - Fire Extinguisher***				11,250	
550. Individual fire extinguishers will be provided to meet local codes and regulations. Extinguishers will be surface mounted in secondary areas and in cabinets in common (public) areas.	45	ea	250.00	11,250	
553. ***D1.25 - Miscellaneous Works and General Accounts***				0	
555. Supervision, site office, head office overheads, submittals, clean up, small tools, rentals and the like, rigging and preparation of 3D co-ordination drawings				Included above	
559. ***Total for Section D1.2 Fire Protection***				***CHF 850,450***	

Description	Quantity	Unt	Rate	Amount	Remarks
562. ***D1.3 Heating, Vent, Air Cond***					
564. ***D1.31 - Liquid Heat Transfer (Heating)***				908,696	
566. Central high efficiency condensing style hot water boilers (with acid neutralization and primary heating water pumps), 3no, 1,750kW total capacity will be utilized to provide hot water to serve the building. Hot water heating piping will be extended to air handling units, inslab heating in non-performance areas and/or perimeter radiation at high heat loss areas and space heating units throughout utilizing fully redundant secondary circulation pumps c/w VFD's. Air and expansion control and chemical pot feeder will be provided.	1,750	kW	519.25	908,696	

Description	Quantity	Unt	Rate	Amount	Remarks
569. ***D1.32 - Liquid Heat Transfer (Cooling)***				1,771,739	
571. Central, high efficiency water cooled chillers, 2no @ 900 kW and 1no at 350 kW, 2,150kW total capacity/w matching capacity adiabatic cooling towers to provide chilled water to serve the building. Condenser and chilled water loops will be provided with primary circulation pumps c/w VFD's. Chilled water piping will be extended to air handling units and space cooling units throughout utilizing fully redundant secondary circulation pumps c/w VFD's. Air and expansion control and chemical pot feeder will be provided.	2,150	kW	824.06	1,771,739	
574. ***D1.33 - Humidification***				10,000	
576. Piano storage room(s) will be provided with independent wall mounted electric steam humidifiers	1	ea	10,000.00	10,000	
578. Each AHU will be provided with an electric to steam humidifier included in D1.34 below					
581. ***D1.34 - Air Distribution***				4,238,771	
583. Ventilation and cooling air will be delivered to all occupied areas of the building via 10no custom central indoor mounted air handling units, Fanwall (fan array) type with VFD's and enthalpy heat recovery wheels, totaling 103,000 L/s and supplemented with localized spot cooling units to suit special purpose needs. Custom constant variable volume AHU's with noise-critical acoustic overhead air distribution system will serve the Performance and Rehearsal areas to an N1 noise criterion. Similarly air distribution to lobby and support spaces will be provided via conventional overhead air distribution via linear bar and/or sidewall diffusers near various gathering areas and along exterior curtain walls, with variable volume terminal boxes with reheat coils to suit the specific zone space temperature / humidity environmental needs. Generally air will be supplied to the spaces via a network of sheetmetal ducts to and from the respective air handling units supply air diffusers within the space. Duct will be lined with internal 1" - 2" thick duct liner depending on location and area served. Ceiling voids (where available) will be utilized to convey return air to main riser shaft locations.	103,000	L/s	41.15	4,238,771	
585. Generally, air will be recirculated to conserve energy, with adequate outside air introduced to ensure proper outdoor air volumes are maintained as well as making up sufficient air to exhaust system such as washrooms and cafe kitchens.					
587. Fire/smoke dampers will be provided at all shafts and 2-hour rated walls					

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Description	Quantity	Unt	Rate	Amount	Remarks
589. **D1.35 - Exhaust Systems**				93,219	
591. Central washroom / locker exhaust system with roof mounted exhaust fan, exhaust sheetmetal ductwork and grilles. Exhaust air will be exhaust via a heat reclaim device. Café kitchen will be provided with welded steel exhaust duct and matching fan. Kitchenette's will be ducted to general exhaust.	13,317	m2	5.00	66,585	
593. Mechanical and electrical rooms will be provided with inline exhaust fan, intake and exhaust louvers, exhaust sheetmetal ductworks and grilles.	13,317	m2	2.00	26,634	
596. **D1.36 - Specialty Systems**				0	
598. No work required					
601. **D1.37 - Support Systems and Works**					
603. **D1.37.1 - Noise and Vibration Isolation**				347,400	
605. Vibration isolators and ductwork silencers will be provided to ensure quiet operation and to ensure noise levels from operation do not exceed N1 in the performance areas and control rooms, PNC20 in the studio/rehearsal areas and PNC25 - 40 in other occupied spaces. Duct lagging, vinyl wrap, sound traps and the like will be included where necessary. Vibration isolation will be applied to all hydronic piping and sheetmetal ductwork serving acoustic sensitive areas.	13,317	m2	26.09	347,400	
608. **D1.37.2 - Mechanical Wiring and Starters**				0	
610. VFD's and motor starters included with equipment costs above. Installation and Line and Load side wiring by Electrical Contractor				0	
613. **D1.37.3 - Balancing and Commissioning**				133,170	
615. The HVAC systems will be balanced to design flow rates and equipment placed into prime operating condition via enhanced commissioning practices.	13,317	m2	10.00	133,170	
618. **D1.37.4 - Workshop Exhaust**				43,478	
Provisions for workshop dust collection, paint spray booth exhaust system, etc. to meet owner's requirements.	1	ea	43,478.26	43,478	

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Description	Quantity	Unt	Rate	Amount	Remarks
623. **D1.37.5 - Auditorium Smoke Evacuation**				127,174	
625. A smoke control system consisting of rooftop exhaust fans and makeup air supply is required for the auditorium. (estimated capacity 45,000 L/s; smoke modeling by others will be required to determine actual size). Fans will be acoustically treated to prevent noise break-in / out.	1	ea	127,173.91	127,174	
628. **D1.37.6 - Stage Pyrotechnics Smoke Control System**				29,674	
630. A smoke control system consisting of rooftop exhaust fans and makeup air supply is required for the stage. (estimated capacity 10,500 L/s; smoke modeling by others will be required to determine actual size). Fans will be acoustically treated to prevent noise break-in / out.	1	ea	29,673.91	29,674	
633. **D1.37.7 - Innovative Energy Solutions**				579,000	
635. Provision for design development of sustainable and energy conserving technologies such as natural ventilation, thermal chimneys, passive heating and cooling systems and the like. Exact applications to be studied and developed during the design stages	1	ea	579,000.00	579,000	
703. **D1.38 - Miscellaneous Works and General Accounts**				1,243,064	
705. Supervision, site office, head office overheads, submittals, clean up, small tools, rentals and the like, rigging and preparation of 3D co-ordination drawings	1	ea	1,243,064	1,243,064	
708. **Total for Section D1.3 Heating, Vent, Air Cond**				CHF 9,525,385	
710. **D1.4 Controls**					
712. **D1.41 - Controls and Automation**				768,540	
714. A new Building Automation System (BAS) will be provided consisting of direct digital controls. The BAS will control and monitor all HVAC systems and equipment, and various plumbing, fire protection and electrical systems where required. System will allow operators to start and stop equipment and will automatically control zone temperatures, air and water flow rates. System and system graphics will allow full monitoring, trending and reporting of set points, equipment control and alarm functions. Damper and valve actuators will be electric/electronic type with direct digital control (DDC). Ventilation rates will be controlled by carbon dioxide sensors (demand ventilation) throughout the facility. Approximately 820 points of control.	1	ea	768,540	768,540	

No.	Description	Quantity	Unt	Rate	Amount	Remarks
716.	**D1.42 - Miscellaneous Works and General Accounts**				**0**	
718.	Supervision, site office, head office overheads, submittals, clean up, small tools, rentals and the like, rigging and preparation of 3D co-ordination drawings				Included in above rates	
722.	**Total for Section D1.4 Controls**				**CHF 768,540**	

D2 Electrical

No.	Description	Quantity	Unt	Rate	Amount	Remarks
727.	**D2.1 Services & Distribution**					
729.	**D2.11 - L.V. Switchboard**				**600,000**	
731.	The incoming 3000A secondary feeders will terminate in a 3000A 230/400V double ended main switchboard with main and tie ACB and molded case distribution breakers feeding the main distribution and mechanical panels.	1	ea	600,000.00	600,000	
734.	**D2.12 - Emergency Power**				**360,000**	
736.	A self contained 1000 kW diesel powered generator will be provided to supply back-up power in the case of normal power outages. The main 2000A 230/400V emergency switchboard will feed life safety lighting through 230/400V panels and critical distribution equipment will feed mechanical loads 400V mechanical distribution panels and production equipment through 230/400V panels	1	ea	360,000.00	360,000	
738.	**D2.13 - Distribution**				**220,000**	
740.	Normal power will be provided to non critical loads with mechanical equipment fed from 400V distribution panels, lighting and devices fed from 230/400V lighting and power panels. 230/400V power will be connected to the production equipment and dimming panels.	1	ea	220,000.00	220,000	
742.	Distribution and power panels will be arranged and located in close proximity to the equipment that they feed while accommodating the need to ensure no sound transmission into				0	
745.	**D2.14 - Feeders**				**700,000**	
747.	Feeders will be run in conduit and routed to ensure no sound transmission into the performance areas.	1	ea	700,000	700,000	

No.	Description	Quantity	Unt	Rate	Amount	Remarks
749.	**D2.15 - Motor Controls & Wiring**				**330,000**	
751.	The electrical division will install loose starters provided by the mechanical division and load and line side wiring for mechanical equipment. Final terminations to any vibrating equipment will be done using flexible conduit and stranded conductors to eliminate sound transmission.	1	ea	330,000.00	330,000	
754.	**D2.16 - Miscellaneous**				**540,000**	
756.	A building grounding system to meet code requirements, and technical grounding system to meet the requirements of the production equipment shall be provided.	1	ea	50,000.00	50,000	
758.	A lightning protection system shall be provided.	1	ea	100,000.00	100,000	
760.	Testing and commissioning of equipment	1	ea	70,000.00	70,000	
762.	250KW photovoltaic array mounted on the roof	1	ea	320,000.00	320,000	
764.	**D2.17 - General Requirements**				**346,800**	
766.	Supervision, site office, head office overheads, submittals, premium of loss of productivity time, small tools, rentals and the	1	:um	346,800	346,800	
770.	**Total for Section D2.1 Services & Distribution**				**CHF 3,096,800**	

No.	Description	Quantity	Unt	Rate	Amount	Remarks
773.	**D2.2 Lighting, Devices & Controls**					
775.	**D2.21 - Lighting**				**1,856,291**	
777.	General					
779.	Lobby, circulation lighting using recessed and decorative wall mounted LED fixtures	2,283	m2	247.70	565,501	
781.	FOH lighting using suspended and surface mounted decorative LED fixtures. Ballasts to be remote mounted in ballast enclosures	1,254	m2	209.00	262,090	
783.	Support, office lighting using recessed direct/indirect fluorescent fixtures	1,022	m2	121.00	123,664	
785.	BOH lighting using suspended LED fixtures. Ballasts to be remote mounted in ballast enclosures.	4,660	m2	94.75	441,541	
787.	Service area lighting using suspended and surface mounted LED fixtures	3,568	m2	55.00	196,243	

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	Description	Quantity	Unt	Rate	Amount	Remarks
789.	Exit lights and emergency lighting control will be provide to meet code requirements. Emergency battery units with be provided in mechanical and electrical rooms.	12,787	m2	20.90	267,252	
792.	**D2.22 - Branch Devices & Wiring**				688,110	
794.	Lobby, circulation devices and lighting control using central LV control and dimming	2,283	m2	50.90	116,206	
796.	FOH devices and lighting control using central LV control and dimming interfaced with the production system	1,254	m2	56.10	70,350	
798.	Support, office devices and lighting control using central LV control, occupancy sensors and daylight sensors	1,022	m2	36.30	37,099	
800.	BOH devices and lighting control	4,660	m2	74.40	346,709	
802.	Service area devices and lighting control using central LV control and occupancy sensors	3,568	m2	33.00	117,746	
805.	**D2.23 - Heating**				0	
807.	Not required					
810.	**D2.24 - General Requirements**				438,300	
812.	Supervision, site office, head office overheads, submittals, premium of loss of productivity time, small tools, rentals and the	1	:um	438,300	438,300	
815.	**Total for Section D2.2 Lighting, Devices & Controls**				CHF 2,982,701	
818.	**D2.3 Systems & Ancillaries**					
820.	**D2.31 - Fire Alarm System**				306,888	
822.	A single stage addressable fire alarm EVAC system will be provided in the facility to suit local code requirements. System will include central panel, annunciator, speakers/horns/strobes, heat/smoke detectors, pull stations... throughout.	12,787	m2	24.00	306,888	
824.	**D2.32 - Security System**				345,249	
826.	A security access and CCTV system shall be provided to suit the end user needs. It is assumed that this system will monitor exterior doors, provide access through security doors only and provide cameras to monitor the building perimeter only.	12,787	m2	27.00	345,249	

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	Description	Quantity	Unt	Rate	Amount	Remarks
828.	**D2.33 - Communications**				315,839	
830.	General					
832.	The electrical division will provide an infrastructure raceway system to accommodate a CAT 6 structured cabling system with horizontal and backbone cabling throughout the facility to meet the clients requirements. Telephony and active hardware will be provided by others.	12,787	m2	24.70	315,839	
834.	Clock					
836.	A clock system will not be required. Time will be displayed by the information screens and/or PC devices.					
839.	**D2.34 - Telecom/Broadcasting**				1,534,440	
841.	The electrical division will provide a complete empty conduit infrastructure for Tele conferencing and Tele broadcasting system-equipment cost included in Architectural estimate	12,787	m2	120.00	1,534,440	
843.	Audio/Visual - Performance					
845.	The electrical division will provide a complete empty conduit infrastructure system to accommodate the requirements of the production equipment provided by the production equipment provider.					
848.	**D2.35 - Miscellaneous**				255,740	
850.	Miscellaneous systems such as two way voice "airphones" and bells/alarms, etc. are provided to suit end user needs, for areas such as loading docks, mechanical rooms and the like.	12,787	m2	20.00	255,740	
853.	**D2.36 - General Requirements**				347,244	
855.	Supervision, site office, head office overheads, submittals, premium of loss of productivity time, small tools, rentals and the	1	:um	347,244	347,244	
859.	**Total for Section D2.3 Systems & Ancillaries**				CHF 3,105,400	

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Description	Quantity	Unt	Rate	Amount	Remarks
E1 Equipment					
865. **E1.1 Performance Equipment & Seating**					
867. **Large Venue**					
868. Theatre Equipment - Grid Level	allowance			4,570,779	per ARUP
Adjustable Acoustics	allowance			1,842,656	per ARUP
870. Theatre Equipment - Stage Level	allowance			5,367,501	per ARUP
871. Production Lighting	allowance			1,490,735	per ARUP
872. Audience Seating	allowance			667,318	per ARUP
873. Fire safety curtain - (ADD Alternate)	allowance			147,612	per ARUP
875. **Small Venue**					
876. Stage Equipment				368,000	per ARUP
877. Production Lighting				264,526	per ARUP
878. Folding seats				166,558	per ARUP
880. **Dressing Room/Studio spaces**					
881. Theatre Equipment				137,964	per ARUP
882. Production Lighting				79,964	per ARUP
883. Audience Seating				0	per ARUP
885. Shipping, taxes, tariffs, UL or CE testing, etc	allowance			0	not required
889. **Total for Section E1.1 Performance Equipment & Seating**				15,103,613	
892. **E1.2 AV Equipment**					
894. Large Venue	allowance			2,799,531	
896. Small Venue	allowance			0	
898. Dressing Room/Studio spaces	allowance			0	
900. Shipping, taxes, tariffs, etc	allowance			0	not required
903. **Total for Section E1.2 AV Equipment**				CHF 2,799,531	
E2 Miscellaneous Equipment					
908. **E2.1 Miscellaneous Equipment**					
910. Food service equipment	allowance			0	shell space
912. Refuse equipment				excluded	
914. Loose furniture, fixtures and equipment				excluded	

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Description	Quantity	Unt	Rate	Amount	Remarks
916. Retail/café equipment				excluded	
918. Furnishings				excluded	
920. Small inventory				excluded	
922. Textiles				excluded	
924. Art				excluded	
				0	
928. **Total for Section E2.1 Miscellaneous Equipment**				CHF 0	
F1 Demolition & Temporary Construction					
934. **F1.1 Demolition**					bldg footprint area only
936. Hardscaping removal	1,485	m2	65.00	96,500	
Softscaping clearing	990	m2	15.00	14,900	
Tree removal	9	ea	1,000.00	9,100	
Building demolition and removal	allowance			11,500	
Tree protection	allowance			11,500	
948. **Total for Section F1.1 Demolition**				CHF 143,500	
951. **F1.2 Temporary Construction**					
				0	
956. **Total for Section F1.2 Temporary Construction**				CHF 0	
G General Requirements					
962. **G1.1 Equipment & Rentals**					
964. Scaffolding	allowance			800,000	
966. Cranage	allowance			1,100,000	
969. **Total for Section G1.1 Equipment & Rentals**				CHF 1,900,000	

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	Description	Programme Estimate Quantity	Unt	Rate	Amount	Remarks
971.	**G1.2 Project Overhead Items**					
973.	Winter protection/temporary heating	allowance			in gen cond	
975.	Snow removal during construction	allowance			in gen cond	
977.	Temporary protection of finishes	allowance			150,000	
979.	Non-trade items:					
980.	- cleaning	allowance			in gen cond	
981.	- mock-ups	allowance			0	included in design fees
982.	- sediment control	allowance			in gen cond	
983.	- construction fence	allowance			in gen cond	
984.	- temporary roads	allowance			0	
985.	- street cleaning	allowance			in gen cond	
986.	- attic stock	allowance			excluded	
989.	**Total for Section G1.2 Project Overhead Items**				CHF 150,000	

H Sitework & Utilities

	Description	Quantity	Unt	Rate	Amount	Remarks
994.	**H1.1 Siteworks**					
996.	Siteworks including hard and soft landscaping, entrance steps and ramps, fences & gates and landscaping features	allowance			0	see separate estimate
998.	Outdoor amphitheatre/projection space				0	excluded
1000.	*Miscellaneous*					
1002.	Signage	allowance			in above	see separate estimate
1004.	Marquee signage	allowance			in above	see separate estimate
1006.	Bollards	allowance			in above	see separate estimate
1008.	Bike racks	allowance			in above	see separate estimate
1011.	**Total for Section H1.1 Siteworks**				CHF 0	
1014.	**H1.2 Mechanical Utilities**					
1016.	**H1.21 - Water**				30,000	
1018.	New incoming water service from adjacent street and lateral to building c/w isolation ground box valve	1	ea	30,000.00	30,000	
1020.	Note: Municipal street fire hydrant coverage will be adequate to serve the building					

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	Description	Programme Estimate Quantity	Unt	Rate	Amount	Remarks
1023.	**H1.22 - Sanitary**				30,000	
1025.	New sanitary service from adjacent street and lateral to building c/w manhole at point of connection	1	ea	30,000.00	30,000	
1028.	**H1.23 - Storm**				50,000	
1030.	New incoming storm service from adjacent street and lateral to building c/w manhole at point of connection	1	ea	50,000.00	50,000	
1033.	**H1.24 - Natural Gas**				0	
1035.	Incoming natural gas service by local gas utility at no capital cost to project					
1038.	**H1.25 - Specialty Systems**				20,000	
1040.	Irrigation					
1042.	Provision for irrigation systems to trees, plantings and shrubs	1	ea	20,000.00	20,000	
1045.	**H1.26 - Miscellaneous Works and General Accounts**				550,000	
1047.	Provision for overall site development to suit landscaping and pedestrian pathway themes	1	ea	350,000.00	350,000	
2119.	Provision for utility relocations based on drawing Leitungskatataster_Inselki_15_04 including both Mechanical and Electrical Relocations	1	ea	200,000.00	200,000	
1053.	**Total for Section H1.2 Mechanical Utilities**				CHF 680,000	
1056.	**H1.3 Electrical Utilities**					
1058.	**H1.31 - Site - Power**				700,000	
1060.	The new main service will consist of a 2x 2000KVA HV substation fed from the Utility grid via an underground concrete encased ductbank. The 2x3000A 230/400V secondary feeders will be run via an underground ductbank from the substation to the new main switchboard.	1	ea	650,000.00	650,000	
1062.	Allowance for Utility cabling and connection charge	1	ea	50,000.00	50,000	

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	Description	Quantity	Unt	Rate	Amount	Remarks
		Programme Estimate				
1065.	**H1.32 - Site - Communications**				**30,000**	
1067.	A concrete encased 3-75mm ductbank will be provided for incoming communications cabling to a POP room. Incoming cables will be provided by service provider.	1	ea	30,000.00	30,000	
1070.	**H1.33 - Site - Lighting**				**200,000**	
1072.	An allowance for site LED lighting including pole mounted parking fixtures, pedestrian height pole laneway fixtures, steplights and bollard fixtures	1	:um	200,000.00	200,000	
1075.	**H1.34 - Site - General Requirements**				**0**	
1077.	Included in above rates					
1081.	***Total for Section H1.3 Electrical Utilities***				***CHF 930,000***	

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Mechanical Estimate Summary

Grass Floor Area 13,317 m2

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Description Element\Sub-Element	Specialty Sub Break down	Sub Element Total	Element Total	$ per m2 Sub Element	$ per m2 Element	% Element	Remarks
D1 Mechanical							
D1.1 Plumbing & Drainage			***CHF 1,961,640***		***CHF 147.30***	***15.0%***	
D1.11 - Plumbing Fixtures		CHF 321,739		CHF 24.16			
D1.12 - Domestic Water		CHF 595,162		CHF 44.69			
D1.13 - Sanitary Waste & Vent		CHF 332,925		CHF 25.00			
D1.14 - Storm		CHF 331,600		CHF 24.90			
D1.15 - Natural Gas		CHF 93,219		CHF 7.00			
D1.16 - Specialty Systems:		CHF 31,439		CHF 2.36			
D1.16.1 - Provisions for Sustainable Features	CHF 31,439						
D1.16.2 - Water Feature	CHF 0						
D1.16.4 - Seismic Restraints	CHF 0						
D1.17 - Miscellaneous Works and General Accounts		CHF 255,556		CHF 19.19			
D1.2 Fire Protection			***CHF 850,450***		***CHF 63.86***	***6.5%***	
D1.21 - Standpipe		CHF 234,755		CHF 17.63			
D1.22 - Sprinklers		CHF 604,445		CHF 45.39			
D1.23 - Specialty Systems		CHF 0		CHF 0.00			
D1.24 - Fire Extinguisher		CHF 11,250		CHF 0.84			
D1.25 - Miscellaneous Works and General Accounts		CHF 0		CHF 0.00			
D1.3 Heating, Ventilation & Air Conditioning			***CHF 9,525,385***		***CHF 715.28***	***72.7%***	
D1.31 - Liquid Heat Transfer (Heating)		CHF 908,696		CHF 68.24			
D1.32 - Liquid Heat Transfer (Cooling)		CHF 1,771,739		CHF 133.04			
D1.33 - Humidification		CHF 10,000		CHF 0.75			
D1.34 - Air Distribution		CHF 4,238,771		CHF 318.30			
D1.35 - Exhaust Systems		CHF 93,219		CHF 7.00			
D1.36 - Specialty Systems		CHF 0		CHF 0.00			
D1.37 - Support Systems and Works		CHF 1,259,896		CHF 94.61			
D1.37.1 - Noise and Vibration Isolation	CHF 347,400						
D1.37.2 - Mechanical Wiring and Starters	CHF 0						
D1.37.3 - Balancing and Commissioning	CHF 133,170						
D1.37.4 - Workshop Exhaust	CHF 43,478						
D1.37.5 - Auditorium Smoke Evacuation	CHF 127,174						
D1.37.6 - Stage Pyrotechnics Smoke Control System	CHF 29,674						
D1.37.7 - Innovative Energy Solutions	CHF 579,000						
D1.38 - Miscellaneous Works and General Accounts		CHF 1,243,064		CHF 93.34			
D1.4 Controls			***CHF 768,540***		***CHF 57.71***	***5.9%***	
D1.41 - Controls and Automation		CHF 768,540		CHF 57.71			
D1.42 - Miscellaneous Works and General Accounts		CHF 0		CHF 0.00			
Total (D1) Mechanical			***CHF 13,106,015***		***CHF 984.16***	***CHF per m2***	

Venue / A.W. Hooker Associates Ltd.

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Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Electrical Estimate Summary

Gross Floor Area 13,317 m2

18 October 2015

Description Element\Sub-Element	Sub Element Total	Element Total	CHF per m2 Sub Element	CHF per m2 Element	% Element	Remarks
D2 Electrical						
D2.1 Service & Distribution		CHF 3,096,800		CHF 232.54	33.7%	
D2.11 - L.V. Switchboard	CHF 600,000		CHF 45.06			
D2.12 - Emergency Power	CHF 360,000		CHF 27.03			
D2.13 - Distribution	CHF 220,000		CHF 16.52			
D2.14 - Feeders	CHF 700,000		CHF 52.56			
D2.15 - Motor Controls & Wiring	CHF 330,000		CHF 24.78			
D2.16 - Miscellaneous	CHF 540,000		CHF 40.55			
D2.17 - General Requirements	CHF 346,800		CHF 26.04			
D2.2 Lighting, Devices & Heating		CHF 2,982,701		CHF 223.98	32.5%	
D2.21 - Lighting	CHF 1,856,291		CHF 139.39			
D2.22 - Branch Devices & Wiring	CHF 688,110		CHF 51.67			
D2.23 - Heating	CHF 0		CHF 0.00			
D2.24 - General Requirements	CHF 438,300		CHF 32.91			
D2.3 Systems & Ancillaries		CHF 3,105,400		CHF 233.19	33.8%	
D2.31 - Fire Alarm System	CHF 306,888		CHF 23.04			
D2.32 - Security System	CHF 345,249		CHF 25.93			
D2.33 - Communications	CHF 315,839		CHF 23.72			
D2.34 - Telecom/Broadcasting	CHF 1,534,440		CHF 115.22			
D2.35 - Miscellaneous	CHF 255,740		CHF 19.20			
D2.36 - General Requirements	CHF 347,244		CHF 26.08			
Total Building (D2) Electrical		CHF 9,184,901		CHF 689.71	100.0%	
H1.3 Electrical Utilities						
H1.3 Electrical Utilities		CHF 930,000		CHF 69.84		
H1.31 - Site - Power	CHF 700,000		CHF 52.56			
H1.32 - Site - Communications	CHF 30,000		CHF 2.25			
H1.33 - Site - Lighting	CHF 200,000		CHF 15.02			
H1.34 - Site - General Requirements	CHF 0		CHF 0.00			
Total (H1.3) Electrical Utilities		CHF 930,000		CHF 69.84	CHF per m2	

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis 18 October 2015

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
	SUMMARY OF SPACES				
1.0	Exterior of Building	0	0.00	0	
2.0	Foyer (Wandelhalle) / Arrival Area	1,376	1.12	1,546	
3.0	Large Venue	2,385	1.13	2,706	galleries not incl in net to gross calcs
4.0	Small Venue	314	1.17	367	rope grid not incl in net to gross calcs
5.0	Large Venue Technical Support	276	1.25	345	
6.0	Large Venue Storage	368	1.10	406	
7.0	Studio Spaces	520	1.17	610	
8.0	Performer Spaces	431	1.15	495	
9.0	Venue Management	202	1.12	225	
10.0	Technical Offices and Staff Support	206	1.14	234	
11.0	Workshops	110	1.15	126	
12.0	Makeup and Wig Workshop and Laundry	111	1.14	126	
13.0	Artist / Staff Entrance	37	1.14	42	
14.0	Loading Dock and Receiving	199	1.11	220	
15.0	Building Operations	153	1.10	169	
16.0	Circulation	0	0.00	0	
	Total of Programmed Spaces	**6,688**	**1.14**	**7,617**	
Other Required Spaces					
	Public circulation			1,250	
	Back-of-House circulation			2,590	
	Mechanical And Electrical			1,330	
	Unusable/Inaccessible			530	
	Plenum				not required
	Total Of Other Required Spaces			**5,700**	
Overall Total		**6,688**	**1.99**	**13,317**	
1.0	**Exterior of Building**				
	Outdoor gathering space			0.00	
	Marquee, or other large scale illuminated signage			0.00	
	Digital poster frames			0.00	
	Public taxi drop-off / pick-up zone			0.00	
	Parking and drop-off for mobility-impaired			0.00	Consider if same dropoff can be used for taxi and mobility impaired
	Parking for general public			0.00	Parking spaces include a number of spaces with charging points for electric cars
	Parking for buses			0.00	
	Parking for facility staff			0.00	

venue. the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis **18 October 2015**

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
	Additional parking for trucks and miscellaneous delivery vehicles			0.00	
	Parking for broadcast and recording remote vehicles			0.00	
	Public transportation access points			0.00	
	Bicycle stands			0.00	
	Access to front of house and backstage for:			0.00	
	* Ambulance			0.00	
	Access to backstage loading dock for:			0.00	
	* 2 performance-related trucks			0.00	Should be weather mitigated area (not necessarily indoors but under cover)
	* 1 catering truck / delivery van (not located near performance loading dock)			0.00	Should be weather mitigated area (not necessarily indoors but under cover)
	* 1 garbage truck			0.00	
	Total Exterior of Building			***0.00***	
2.0	***Foyer (Wandelhalle) / Arrival Area***				Public space welcoming to public during the day, and serving as the primary gathering space for audiences before and after performances, as well as during intermission. Includes support spaces such as Coat and Bag Check, as well as Bars and Public Toilets. The Foyer is primarily located at grade with 25% at upper levels.
2.1	Weather Vestibule	24.00	1.10	26.00	At all public entry points
2.2	Foyer (wandelhalle)	720.00	1.10	792.00	Distribute on three levels (grade -1 for toilets; mezzanine at grade +2; some foyer at approximately grade +5 for 1st balcony (or equivalent). Includes poster and promotional brochure display areas, indoor art/educational/information exhibition and display areas, queuing areas, latecomer's area(s) with TV and audio monitors, ticket control stations, and program niches.
2.3	Event Area				100m² included in foyer area at grade -1 or grade +2. Assumes 15m² for a stage, 50m² for seating, and 35m² tech support.
2.4	Box Office / Information Service Area	9.00	1.10	10.00	Counter area and space required for each position. Does not include queuing area
2.5	Box Office Work Area	20.00	1.10	22.00	Open work area immediately behind the service area for box office staff

venue.

venue. the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis **18 October 2015**

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
2.6	Box Office Manager's Office	8.00	1.10	9.00	
2.7	Box Office Storage	10.00	1.10	11.00	
2.8	House Manager's Office	16.00	1.10	18.00	House Manager is responsible for all services that interact directly with visitors including Box Office, ushers, Coat and Bag Check, and Bar services.
2.9	Coat and Bag Check	83.33	1.10	92.00	Locate at grade -1. Based on 10m² per 108 coats at 100% occupancy of Large Venue. May also be used as storage space / distribution point for Assistive Listening System Headset distribution / collection. Includes area for 0.75m deep counter and internal circulation. Does not include
2.10	Bar and Café	138.40	1.10	152.00	Assume 38.4m² area for counter service (or equivalent) for 480 persons (60% of capacity of large performance space) with 30 sec. per transaction, 15 minute intervals and 2.4m² per person served. Does not include audience queuing area.
2.11	Outdoor Terrace				***50m² not incl in net to gross calcs***
2.12	Café Kitchen	50.00	1.10	55.00	Requires electrical infrastructure for kitchen, plumbing for dishwashing; grease trap; glassware racks; general storage. Must be located outside of acoustical joint of performance spaces. 10m² of the space is required to store empty bottles.
2.13	Café Storage	10.00	1.10	11.00	Must be located outside of acoustical joint of performance spaces.
2.14	Retail	50.00	1.10	55.00	Could be childcare facility. Includes storage. May include toilet facility
2.15	ATM Niche			0.00	
2.16	Public Toilets	144.00	1.30	187.00	Toilet facilities for 100% capacity of Large Performance Venue sized according to the Consultant's international best practice experience. Barrier Free Access and no doors to the toilet area. Distributed 75% on grade -1 level and rest on 1st balcony level or equivalent
2.17	Casual Front-of-House Staff Locker Area	19.20	1.15	22.00	Changing area with lockers for casual FOH staff.
2.18	First Aid Rooms	14.00	1.10	15.00	Serves both FOH and BOH.
2.19	First Aid Rooms Toilets	5.00	1.40	7.00	Handicap accessible

venue.

venue. the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis — **18 October 2015**

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
2.20	Staff Toilets	5.00	1.40	7.00	Unisex and handicap accessible. Distributed throughout foyer levels for easy access for usher staff.
2.21	Foyer General Storage	30.00	1.10	33.00	Storage for Tensator barriers, carpet runners, posters, folding tables and chairs, etc.
2.22	Electrical Room - Foyer Technical Storage	20.00	1.10	22.00	Storage for audio visual & other technical equipment, incl permanent Audio Visual rack for Foyer & Outdoor Gathering Space needs
	Total Foyer (Wandelhalle) / Arrival Area	***1,375.93***	***1.12***	***1,546.00***	
3.0	***Large Venue***				
3.1	Audience Seating Area (seating capacity is variable depending on vonfiguration)	700.00	1.15	805.00	Includes Audience Seating areas. Audience seating distributed over flat floor area and seating galleries. 3m clear height working area. Allow 3m for rigging structure. Total 20m to underside of building structure. 14m to underside of wire rope grid
3.2	Audience area Wire Rope Grid and Perimeter Catwalk			0.00	Clear height of wirerope grid area to underside of building structure is 6m. ***Not incl in net to gross calculations***
3.3	Public Sound and Light Locks			0.00	Area included in Public / Front-of-House circulation.
3.4	Performance Area	390.22	1.15	449.00	16m + 2.9m + 2.9m width and 15m + 2.9m depth. Clear height of wirerope grid area to underside of building structure is 6m. 10m height of "proscenium" opening. Minimum clear of 22.5m to underside of wirerope grid. 3m clear height working area. Allow 3m for rigging structure. Total 28.5m to underside of building structure.
3.5	Performance Area Wirerope Grid				381.5m² included in gross ***Not incl in net to gross calculations***
3.6	Technical Galleries				2m wide on 3 levels, on 3 sides of the room. 312m² included in gross ***Not incl in net to gross calculations***
3.7	Primary Followspot Booth	23.00	1.45	33.00	Full time sound isolated booths for followspots
3.8	Auxiliary Followspot Booth	16.00	1.45	23.00	Auxiliary locations for followspots to be operated from on opposite sides of the performance space when the hall is not in proscenium mode.

venue. the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis — **18 October 2015**

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
3.9	Trap Room	72.00	1.10	79.00	Forestage and Audience Area Lift Pit accessed through this space.
3.11	Forestage Lift 1			0.00	As per drawings
3.12	Forestage Lift 2			0.00	As per drawings
3.13	Audience Area Lift 1			0.00	As per drawings
3.14	Audience Area Lift 2			0.00	As per drawings
3.15	Lift Pit	303.80	1.10	334.00	At 1.5m depth below trap room level. Ensure access when lifts are at trap room level
3.16	Chair Wagon Storage	580.00	1.10	638.00	Stores all wagons from Forestage Lifts, Audience Seating Lifts, and parterre seating. Organized on two levels below audience area. Upper level steel structure only with catwalks for accessibility.
3.17	Machine Room (Rigging)	300.00	1.15	345.00	Room includes a 3m² sound lock vestibule.
3.18	Personnel Performance Area Sound and Light Locks			0.00	Area incl in Back-of-House circulation.
3.19	Trap Room Level Sound and Light Locks			0.00	Area incl in Back-of-House circulation.
3.20	Load-in Performance Area Sound and Light Locks			0.00	Area incl in Back-of-House circulation.
	Total Large Venue	***2,385.02***	***1.13***	***2,706.00***	
4.0	***Small Venue***				OPTION 2
4.1	Small Venue	232.50	1.15	267.00	14m + 0.75m + 0.75m width and 14m + 1m depth. 8m high door opening; Minimum clear height of 8.5m to underside of wire rope grid level. Total clear height of 11.5m to underside of structure
4.2	Niche for retractable seating risers	24.75	1.15	28.00	
4.3	Electrical Rooms - Dimmer	14.00	1.25	18.00	
4.4	Lighting Control Room	14.00	1.25	18.00	
4.5	Sound Control Room	14.00	1.25	18.00	
4.6	Public Sound and Light Locks			0.00	Area included in Public / Front-of-House circulation.
4.7	Catwalks			306.00	Clear height of area to underside of building structure is 2.5m. ***Not incl in net to gross calculations***
4.8	Personnel Performance Area Sound and Light Locks			0.00	Area included in Back-of-House circulation.
4.9	Offstage Toilets	5.00	1.40	7.00	
4.10	Load-In Performance Area Sound and Light Locks			0.00	Area included in Back-of-House circulation.
4.11	Small Venue Technical Storage	10.00	1.10	11.00	Storage for AV and other technical equipment, incl permanent AV rack.
	Total Staging/Rehearsal Space	***314.25***	***1.17***	***367.00***	

venue. the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis **18 October 2015**

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
5.0	***Large Venue Technical Support***				
5.1	Electrical Room - Building Wide Sound Video and Communications	18.00	1.20	22.00	Holds electrical equipment for the Production Sound System, Public Address System, Intercom System, Show Relay System, and Patching
5.2	Electrical Rooms - Dimmer	14.00	1.25	18.00	Holds electrical equipment for the Production Lighting System
5.3	Projection / Sound Video Communications Equipment Room	40.00	1.20	48.00	Distributed. Non-operable windows
5.4	Lighting / Subtitling / Video Control Room	42.00	1.25	53.00	Distributed
5.5	Sound Control Room	42.00	1.25	53.00	Distributed
5.6	Production Control	28.00	1.20	34.00	Distributed
5.7	Control Suite Toilets	10.00	1.40	14.00	Unisex. Located outside of acoustic isolation joint.
5.8	Stage Manager's Station			0.00	Area included in performance space.
5.9	Quick Change Rooms	12.00	1.10	13.00	Opens directly to rear or side stage through vestibule
5.10	Quick Change Toilets	10.00	1.40	14.00	In immediate proximity to stage entrances
5.11	Broadcast Control Rooms	40.00	1.25	50.00	
5.12	Electrical Room - Broadcast Equipment	10.00	1.25	13.00	
5.13	Recording Booth	10.00	1.25	13.00	Doubles as a practice room.
	Total Large Venue Technical Support	***276.00***	***1.25***	***345.00***	
6.0	***Large Venue Storage***				
6.1	Sound Video Communications Equipment Storage	25.00	1.10	28.00	Storage for performance area equipment.
6.2	Lighting Equipment Storage	37.00	1.10	41.00	
6.3	Platform, Riser and Seating Storage	200.00	1.10	220.00	Provide space for 2 personnel lifts. Assumes door if contiguous with performance space. Requires step-less access to performance area
6.4	Stage and Rigging Equipment Storage	40.00	1.10	44.00	
6.5	Grid Level Equipment Storage	40.00	1.10	44.00	
6.6	Piano Storage and Maintenance	26.25	1.10	29.00	Space for 3 pianos - 8.75m² per piano (2.5m x 3.5m) minimum. Temperature and humidity control. Obstruction free access to Performance Spaces, Trap Room and Foyer. Requires step-less access to
	Total Large Venue Storage	***368.25***	***1.10***	***406.00***	

venue. the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis **18 October 2015**

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
7.0	***Studio Spaces***				
7.1	Studio Spaces/Divisible Group Dressing Rooms	456.00	1.15	524.00	With mobile clothing racks, mobile furniture, mobile make-up counters, area rugs, floor lamps. Pipe grid in one room for use as wavefield synthesis rehearsal room. All rooms with resilient stage floor type construction. At least one room publicly accessible through controllable corridor from public foyer. No box in box construction
7.2	Toilets	64.00	1.35	86.00	Includes 1 standalone handicap toilet with shower, 1 group of 5 male toilets, and 1 group of 10 female toilets. 1 basin per toilet
	Total Large Venue Storage	***520.00***	***1.17***	***610.00***	
8.0	***Performer Spaces***				Spaces for artists performing or rehearsing in venue
8.1	Media / Guest Reception Rooms	30.00	1.10	33.00	
8.2	Principal Dressing Rooms - Single	66.00	1.25	83.00	Dressing room for single artist including toilet and shower Also to be usable as practice rooms. Layout will allow for upright piano.
8.3	Conductor's Dressing Room	22.00	1.25	28.00	Dressing room for single artist including single toilet and shower. Located at pit level
8.4	Conductor's Rehearsal Studio	24.00	1.20	29.00	With access from Conductor's Dressing Rooms and one of the Principal Dressing Rooms.
8.5	Principal Dressing Rooms - Quad	44.00	1.20	53.00	Also to be usable as practice rooms. Layout will allow for upright piano
8.6	Dressing Room Storage Room	50.00	1.10	55.00	
8.7	Makeup Room	32.00	1.10	35.00	
8.8	Production Offices	20.00	1.10	22.00	
8.9	Lounge (Green Room)	103.00	1.10	113.00	Capacity for 75% of stage artists.
8.10	Lounge Warming Kitchen	20.00	1.10	22.00	For use by caterers. Serves Lounge (Green Room)
8.11	Exterior Smoking Area	20.00	1.10	22.00	Weather-protected outdoor area connected to Lounge with space for 20 persons, as allowable by code. ***Not incl in net to gross calculations***
8.12	Road Case Storage	20.00	1.10	22.00	At Trap Room level
	Total Performer Spaces	***431.00***	***1.15***	***495.00***	

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the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis — **18 October 2015**

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
9.0	**Venue Management**				
9.1	Director office	20.00	1.10	22.00	
9.2	Director's secretary with reception area	30.00	1.10	33.00	
9.3	Management team office	71.50	1.10	79.00	
9.4	Finance office	30.00	1.10	33.00	
9.5	Conference rooms	30.00	1.10	33.00	
9.6	Plotter, photocopier & storage	10.00	1.10	11.00	
9.7	Staff toilets	10.00	1.40	14.00	2 unisex, handicapped accessible
	Total Workshops	**201.50**	**1.12**	**225.00**	
10.0	**Technical Offices and Staff Support**				
10.1	Technical Team Office	52.00	1.10	57.00	
10.2	Technical Director's Office	20.00	1.10	22.00	
10.3	Conference Rooms	30.00	1.10	33.00	
10.4	Plotter, Photocopier, and Storage	11.00	1.10	12.00	
10.5	Visiting Company Production Space	39.00	1.10	43.00	
10.6	Stage Crew Locker Rooms	24.00	1.15	28.00	Lockers only. Minimum 2 basins with mirrors, no toilets or shower. For men and women.
10.7	Staff Toilets	30.00	1.30	39.00	Men: 3 basins, 1 Toilet, 1 showers with dry area and handicap accessibility. Women: 2 basin, 1 toilets, 1 showers with dry area & handicap accessibility.
	Total Technical Offices and Staff Support	**206.00**	**1.14**	**234.00**	
11.0	**Workshops**				
11.1	Carpentry Workshop	30.00	1.10	33.00	Workshop spaces for use by Lucerne Theatre
11.2	Sound Equipment Workshop	20.00	1.10	22.00	
11.3	Lighting Workshop	20.00	1.10	22.00	
11.4	Props Workshop	20.00	1.10	22.00	
11.5	Staff Toilets	20.00	1.35	27.00	Men: 1 basins, 1 Toilet, 1 shower with dry area and handicap accessibility. Women: 1 basin, 1 toilet, 1 shower with dry area and handicap accessibility.
	Total Workshops	**110.00**	**1.15**	**126.00**	
12.0	**Makeup and Wig Workshop and Laundry**				
12.1	Makeup (and wigs) Workshop	36.00	1.10	40.00	Vented to exterior.
12.2	Spraying room (wigs)	20.00	1.10	22.00	Vented to exterior.
12.3	Makeup and Wig Storage	25.00	1.10	28.00	
12.4	Wardrobe Laundry	20.00	1.10	22.00	Vented to exterior.

venue.
the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis — **18 October 2015**

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
12.5	Staff Toilets	10.00	1.40	14.00	Men: 1 basins, 1 Toilet, 1 shower with dry area and handicap accessibility. Women: 1 basin, 1 toilet, 1 shower with dry area and handicap accessibility.
	Total Makeup and Wig Workshop and Laundr	**111.00**	**1.14**	**126.00**	
13.0	**Artist / Staff Entrance**				This entrance is the only exterior entrance to the Back of House and offices
13.1	Security Office	20.00	1.10	22.00	
13.2	Stage Door Reception Area	12.00	1.10	13.00	Include weather vestibule. Include security barrier (or controlled door) to Back of House spaces
13.3	Staff / Visitor Toilets	5.00	1.40	7.00	Handicap accessible. Outside of security zone
	Total Artist / Staff Entrance	**37.00**	**1.14**	**42.00**	
14.0	**Loading Dock and Receiving**				
14.1	Dock Manager / Security Station	4.50	1.10	5.00	
14.2	Interior Loading Zone 1 (Performance Delivery)	77.40	1.10	85.00	Loading dock 1.2m above driving surface. Includes berths / dock doors. Include hydraulic dock levelers, articulated flood lamps. Each berth 4.3m wide by 6m deep, minimum (includes dock leveler at 2.4m long). Minimum clear height: 3.8m from deck. (2 12m trucks + 1 delivery van)
14.3	Interior Loading Zone 1 - Receiving Area	50.00	1.10	55.00	Minimum clear height: 3.8m
14.4	Holding / Receiving Lock-up	30.00	1.10	33.00	Minimum clear height: 3.8m
14.5	Freight Lift			0.00	Minimum interior cab dimensions: 6.4m by 3m from lowest pit level to Technical Grid. Area included in Back of House circulation
14.6	Interior Loading Zone 2 (Catering and Other De	12.00	1.10	13.00	Loading dock 0.6m above driving surface. Provide articulated flood lamps. Berth 3m wide by 4m deep, minimum. Minimum clear height: 2.4m from deck.
14.7	Trash Rooms	10.00	1.10	11.00	With direct opening to driveway for garbage truck access.
14.8	Refrigerated Garbage Rooms	10.00	1.1	11.00	
14.9	Toilets	5.00	1.40	7.00	Unisex, mobility-impaired accessible.
	Total Loading Dock and Receiving	**198.90**	**1.11**	**220.00**	

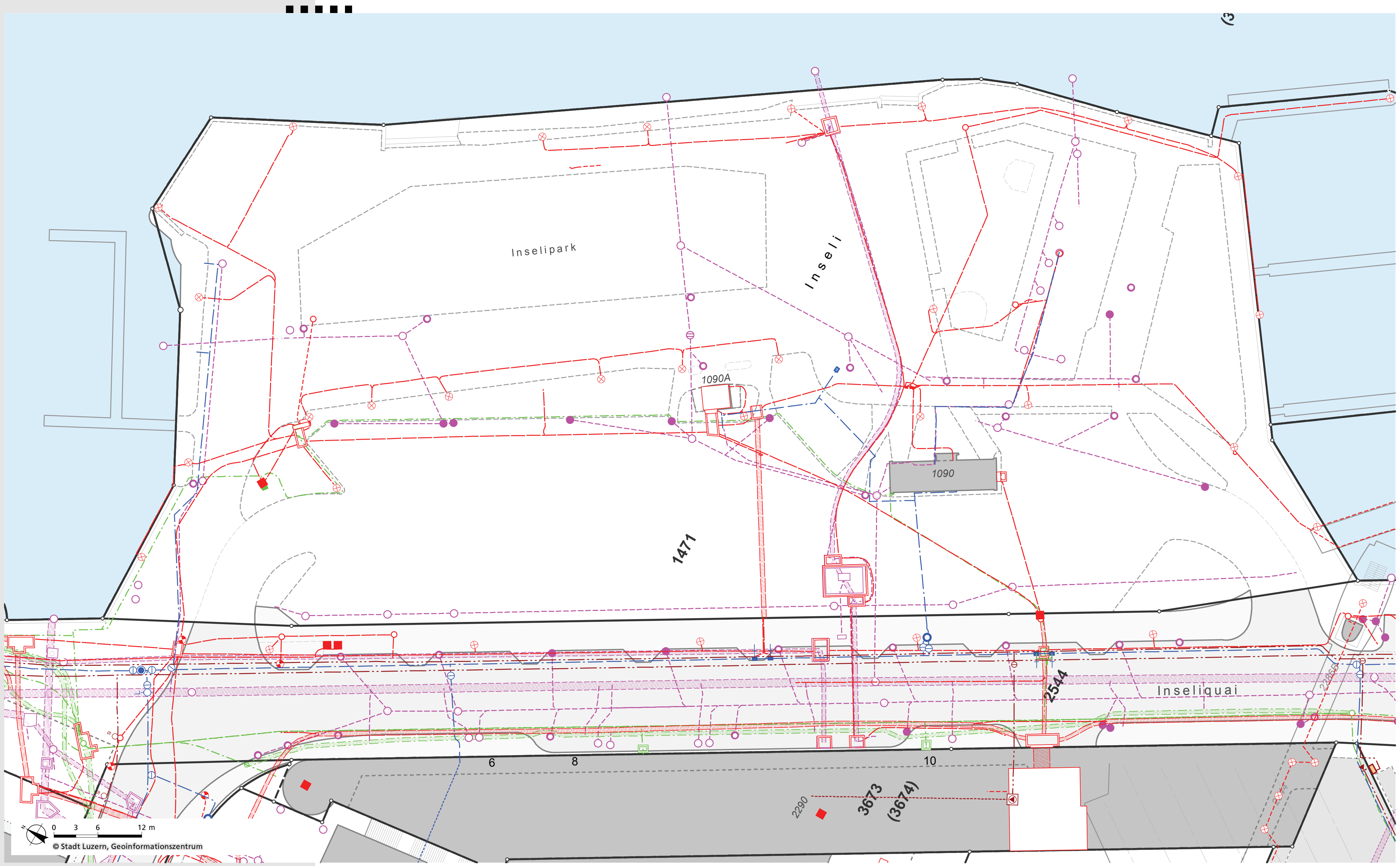
venue. the bottom line

Stiftung Salle Modulable - New Theatre
Programme Estimate Version 11
Programme Net To Gross Area Analysis ***18 October 2015***

	Programme Space Name	Net Prog	Multi	Gross m²	Notes
15.0	***Building Operations***				Area allocations to be adjusted according to operational
15.1	Facility Operations Offices	35.00	1.10	39.00	
15.2	Fire Control Gear Rooms	30.00	1.10	33.00	
15.3	Fire Team Room	20.00	1.10	22.00	Connected to fire control gear room
15.4	Facility Operations Storage	50.00	1.10	55.00	
15.5	Cleaner's Rooms	6.00	1.10	7.00	Three 2m² rooms distributed throughout building according to operational requirements
13.8	Recycling Rooms	12.00	1.10	13.00	One 3m² room per floor.
15.6	Mechanical, Electrical and Plumbing Rooms			0.00	
15.7	Inaccessible Space			0.00	Includes mechanical and electrical duct risers/shafts and poché space
15.8	Air Plena			0.00	
	Total Building Operations	***153.00***	***1.10***	***169.00***	
16.0	***Circulation***				***This area is architecturally Design Dependent - To Be adjusted as Design Proceeds.***
16.1	Public Circulation			0.00	
16.2	Back-of-House Circulation			0.00	Includes technical offices, admin offices, control Rooms, cable pass corridor / tunnel, basement, pit level, performer assembly, loading dock and primary MEP spaces. Secure / no public access. Technical spaces require 2.4m wide corridors (clear)
	Total for Front-of-House and Public Spaces			***0.00***	

venue. ***Page 42***

Appendix B | Leitungskataster Inseli



Dieser Planausdruck hat nur informativen Charakter. Verbindliche Auskünfte erteilt ausschliesslich das Geoinformationszentrum der Stadt Luzern.

Stadt Luzern
Geoinformtationszentrum

Leitungskataster der Stadt Luzern

Massstab ca. 1:500

Druckdatum: 21.04.2015
Person: Wyser Philipp

Legende

genau	ungenau	
		Gas (ewl/EGZ)
		Wasser (ewl)
		Elektro (ewl)
		Abwasser
		Fernmeldeanlage
		Kabelfernsehen
		Heizfernwärme
		übrige Leitungen

ARUP

Table of Contents

The purpose of the Strategic Business Plan and Operations Model is to provide a preliminary estimate of the costs involved in operating and maintaining the New Theatre Lucerne by the quality parameters identified in the Concept Framework for the first 10 years of the Facility’s operation.

Disclaimer

The information contained in this section is supplied to any person, other than our client, on the condition that Arup and any employee of Arup are not liable for error, or inaccuracy contained therein whether negligently caused or otherwise, or for any loss or damage suffered by any person due to such error, omission, or inaccuracy, as a result of such supply. This review takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Much of the analysis in this Strategic Business Plan and Operations Model is based on the benchmarking of other performing arts venues, in addition to a desktop review of secondary sources. We have satisfied ourselves, so far as possible, that the information presented in our report is consistent with published information and the information provided to us, however, we have not sought to establish the reliability of the sources by reference to other specific evidence.

We emphasise that the forward-looking projections, forecasts or estimates are based upon interpretations or assessments of available information at the time of writing. The realisation of the prospective financial information is dependent upon the continued validity of the assumptions on which it is based. Actual events frequently do not occur as expected, and the differences may be material. For this reason, we accept no responsibility for the realisation of any projection, forecast, opinion or estimate.

Findings are time-sensitive and relevant only to current conditions at the time of writing. We will not be under any obligation to update the report to address changes in facts or circumstances that occur after the date of our report that might materially affect the contents of the report or any of the conclusions set forth within.

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1 | Introduction

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1.1 Objective

The purpose of the Strategic Business Plan and Operations Model is to provide a preliminary estimate of the costs involved in operating and maintaining the New Theatre Lucerne by the quality parameters identified in the Concept Framework for the first 10 years of the Facility's operation.

The analysis has been guided by the Concept Framework (Volume I, Chapter 1, Section 2) throughout, particularly the aspects directly related to the operation and maintenance of the Facility, as noted below:

- "a uniquely flexible theatrical environment that affords artists a world-class platform for performance and creative experimentation"
- "a high quality of artist/technical support by experienced staff"
- "the standard of quality and charm associated with the Kultur- und Kongresszentrum Luzern (KKL)"

As a result, Arup has effectively ring-fenced the costs required to operate and maintain the building to achieve these quality parameters, thereby separating them from any operating costs required for artistic content, which have not been estimated in this analysis.

The information presented in this chapter will inform decisions on the annual level of subsidy and rental income that may be required to operate the Facility.

1.2 Approach and Methodology

Arup's approach and methodology for the Strategic Business Plan is detailed in Table 1. It has been heavily influenced by the requirement to ensure a high quality of experience and excellent ongoing management and maintenance of the proposed facility. The shape and structure of the operating organisation is considered central to achieving these purposes. The operating organisation must contain a high-performing management team alongside the appropriate number of highly trained and experienced staff to ensure it achieves its mandate in relation to the quality of experience and quality of asset management. Appropriate maintenance budgets will also be required. These principles have guided the approach to forecasting operating costs and are the reason the governance structure is considered a critical element to the Strategic Business Plan.

Section Number	Section Title	Section Content
2	Governance Structure for the New Theatre Lucerne	The work undertaken on the governance structure for the New Theatre Lucerne is primarily concerned with the entity charged with operating and maintaining the theatre building. This section provides general information on the different roles in the operation and maintenance of a performing arts venue. It then considers in detail the governance structure of the KKL, the named benchmark venue within the Concept Framework, before recommending two potential governance structures for the New Theatre.
3	Cost Estimation Approach and Baseline Assumptions	This section outlines the approach used to estimate the annual costs required to operate and maintain the theatre building, and the annual level of capital reserve required for a long-term capital investment programme. This includes all baseline assumptions used within the estimation process.
4	Summary of Results and Sensitivity Testing	This section presents the results of the cost estimation modelling, in addition to sensitivity testing of key assumptions.
5	Conclusions and Next Steps	This section presents the conclusions of Arup's work, in terms of the potential level of annual costs which will need to be met by subsidy and rental income. It also proposes methods by which the annual cost could be funded, in view of the difference between existing available subsidy, potential rental income and projections.
6	Key Risks	This section presents the key process and outcome risks involved in the Strategic Business Plan.

Table 1. Chapter approach

2 | Governance Structure for the New Theatre Lucerne

This section identifies the different roles required to operate and maintain a performing arts venue and identifies the different possible relationships between the building owner, the building operator and the artistic user within a venue. Potential governance structures which may be appropriate for the New Theatre Lucerne are considered alongside any implications they present for the calculation of operating costs.

2.1 Typical Operating Roles within Performing Arts Venues

Through benchmarking of performing arts venues internationally, Arup identified three primary roles involved in the operation of a performing arts venue. These are highlighted in Figure 1. Different organisations can assume one or more roles simultaneously. For example, one single entity could own and operate the building, whilst leaving the production of artistic content to other organisations. The exact responsibilities of each role may vary, but the descriptions shown in Figure 1 provide an outline of what might typically be expected.

As can be seen in Figure 2, each of these roles can be assumed by separate entities (as in Option D)

Owner

Owns all major fixed assets including the building and most technical and performance equipment. Responsible for large-scale capital maintenance, repair and replacement projects.

Operator

Operates the building and owns minor fixed assets necessary for the management and administration of the venue. Responsible for small-scale maintenance and repairs.

Artistic User

Produces artistic content for performances.

Fig 1. Roles within a performing arts venue

or can be arranged in different combinations (as in Options A–C). Different possible combinations are presented in Figure 2, with each light green box representing an organisation and each dark green box representing a role. These combinations are the building blocks of different governance structures.

As is evident within the four combinations presented in Figure 2, the relationship between each organisation can vary from a contractual to a more cooperative joint venture approach. For example, in Option C, an artistic user might be permanently based at a venue and have a very strong cooperative relationship with the building operator, despite being legally separate from the organisation that runs the venue. Alternatively, the venue could rent out the space on a temporary basis to various different artistic users throughout the year. In between these two examples are a number of other arrangements that are venue-specific. There is no single correct governance structure, and each venue tends to have a bespoke structure that suits the unique needs of that venue and local stakeholders.

In Section 2.3 Arup identifies the governance structure assumptions used to inform the Strategic Business Plan and Operations Model.

2.2 Local Example: Governance Structure of the KKL

KKL is the most internationally recognised performing arts venue in Lucerne. The KKL Luzern Foundation owns the theatre building itself, and according to its annual financial statements, the purpose of the organisation is to ensure that the building and technical equipment is maintained in a "proper condition." This is similar to the owner role identified earlier in this section. The governing body of the foundation is the Board of Trustees, composed of representatives from the local arts community, business leaders and city officials.

A separate operating company — KKL Luzern Management AG — operates the venue. Although the KKL Luzern Foundation and KKL Luzern Management AG are legally separate organisations, the KKL Luzern Foundation holds the majority stake in KKL Luzern Management AG. This majority holding means that while the organisations are legally separate, they coordinate in most matters. The responsibilities of KKL Luzern Management AG is similar to the operator role identified earlier.

KKL Luzern Management AG rents the venue to artistic and non-artistic users for a specific number of days each year. Hirers will then use the venue for a specified period. Figure 3 shows a high-level visual representation of this governance structure.

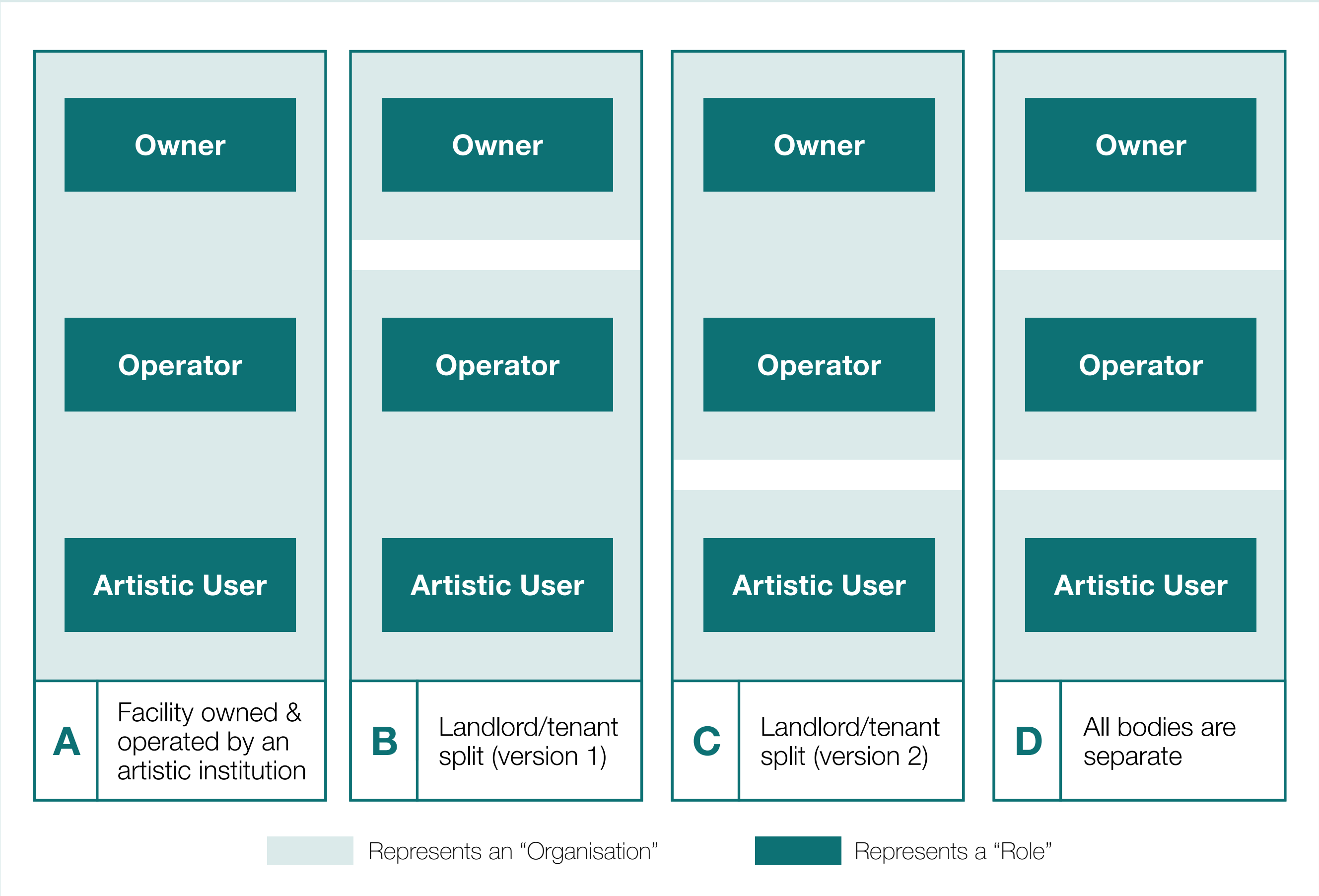


Fig 2. Performing arts roles and possible governance structures within a performing arts venue

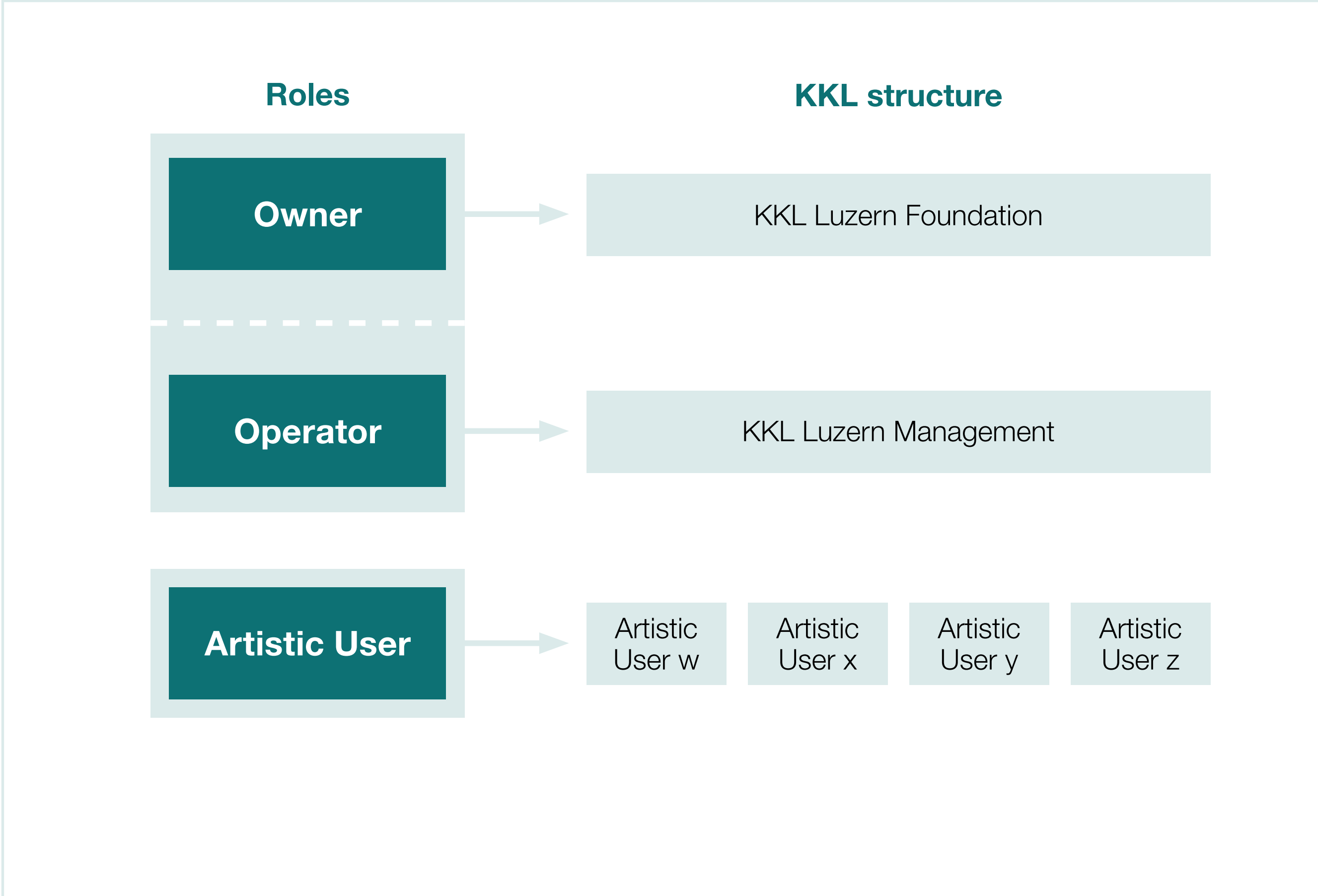


Fig 3. Simplified KKL governance structure

2.3 Potential Governance Structures for New Theatre Lucerne

Based on research, Arup has identified two potential recommended governance structures for the New Theatre Lucerne, shown in Figure 4. Option 1 is a similar governance structure to that employed by the KKL, whereby artistic users and the venue operator are legally separate organisations. Option 2 presents a situation closer to the current Luzerner Theater model, whereby operation and maintenance of the building and artistic production are undertaken by the same organisation.

2.3.1 Implications of Governance Structure on the Cost Estimation

The governance structure of the New Theatre Lucerne is yet to be determined and remains under discussion. The final decision is likely to have implications for the operating costs of the Facility. For example, duties and costs could be replicated if the artistic user and operator of the building are legally separate organisations. On the other hand, if the operator and artistic user are the same organisation, one could expect that building operations would be of secondary importance to artistic production and therefore may not be provided at the optimal quality level.

In order to meet the quality parameters defined for the New Theatre Lucerne, the Strategic Business Plan assumes a structure similar to Option 1, whereby the building operator and artistic user are separate. With this approach, Arup has been able to identify and ring-fence all operating and maintenance costs for the building and exclude any artistic production-related costs. However, although Option 1 is the preferred scenario for the purpose of this business plan, it should be noted that this option may not necessarily result in a separate operator entity — a scenario could be envisaged whereby the operator role is a business unit in an artistic organisation.

The impacts of the uncertainty around governance structure are noted within Section 6.

Cost estimates and all other content within this chapter consider only the responsibilities of the operator and owner of this Facility and exclude all artistic costs. This is demonstrated in Figure 5.

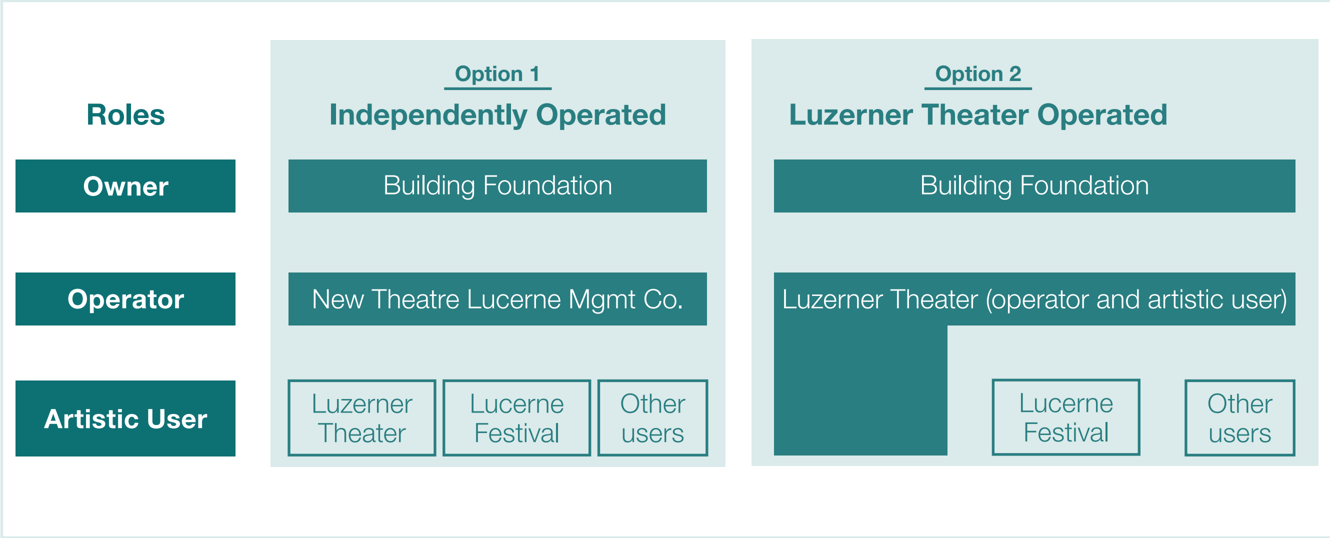


Fig 4. Potential governance structures for the New Theatre Lucerne

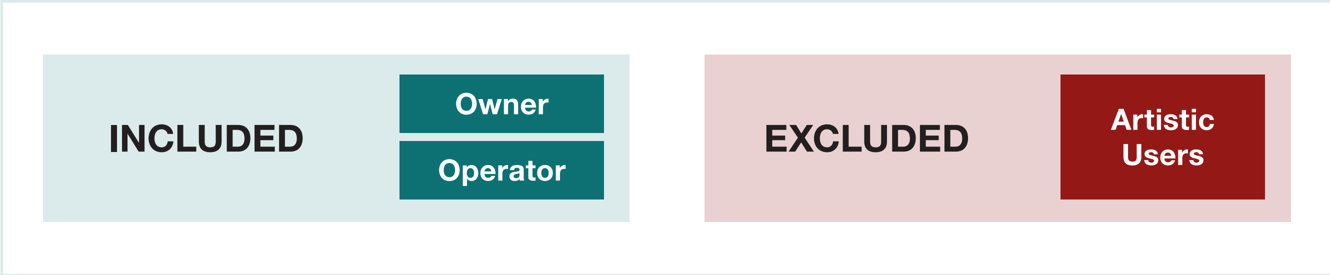


Fig 5. Approach to costs included within the operating model

3 | Cost Estimation Approach and Baseline Assumptions

This section sets out the approach and baseline assumptions used to estimate the total costs associated with the operation of the New Theatre Lucerne to the high level of quality described within the Concept Framework. It outlines the approach to determining the annual operating budget required for the Facility, as well as the likely level of capital reserve contribution required annually for a long-term capital investment programme.

3.1 Approach to Cost Estimation

The work herein is based on a detailed benchmarking analysis of a variety of local, Swiss and international performing arts venues. Extensive consultation sessions were also held with key local stakeholders including Neue Theater Infrastruktur (NTI), specifically the Luzerner Theater and Lucerne Festival as well as the KKL.

The focus of this report is on the costs of owning and operating the Facility. These costs have been segmented into operating costs and a capital reserve contribution, each of which is defined below.

Operating costs are costs incurred in the day-to-day operation of the Facility. They have been calculated by combining staff-related and non-staff-related costs, including in-year day-to-day repairs and maintenance. The capital reserve contribution represents funds set aside each year that will be used to pay for a proportion of large-scale capital repair, replacement and improvement projects. Together, operating costs and the capital reserve contribution encompass the total annual budget required for operating the New Theatre Lucerne. This is illustrated in Figure 6.

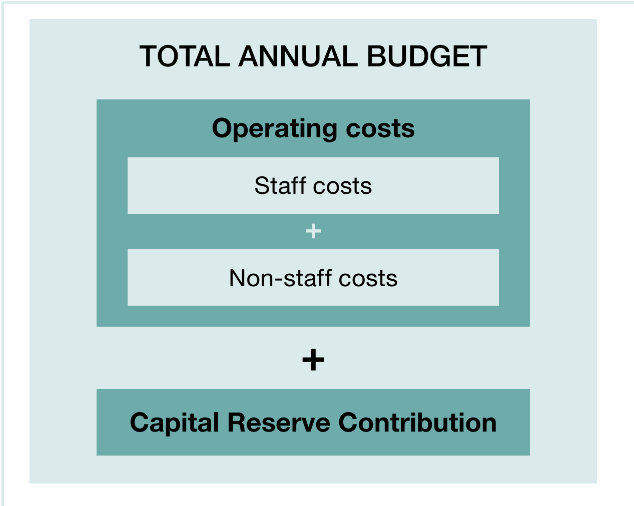


Fig 6. Total budget for the Facility

3.2 Baseline Assumptions

The work in this report has been based on certain assumptions regarding the Facility — namely building design and building function. These are detailed in Table 2. The cost estimates herein will vary if any of these parameters change. General cost modelling assumptions are included in Section 4.

3.2.1 Building Design Assumptions

N.B. Arup's cost estimate does not take into account any site-specific operating costs, incurred due to Facility location.

Item	Assumption
Facility opening year	2024
Construction cost	SFr119m (2015 prices) *(Including performance equipment costs)*
Total project cost	SFr161m (2015 prices)
Capital performance equipment costs	Base level SFr17.9m (2015 prices) *(Including performance equipment costs)*
Large Venue max seating capacity	1,154
Gross floor area	13,317m²

Table 2. Primary building design assumptions

Item	Assumption
Schedule of Accommodations	Large Venue (1,154 seats), Small Venue (200 seats), Studios, public space, café area, administrative offices
Utilisation	80% utilisation of main hall (excluding maintenance days)
Rentable days	336 rentable days
Opening days/hours	Open 7 days per week, including public holidays. Opening hours of 9am to a typical closing time of 11pm
Usage of public/community space	Assumption that this is a cost-neutral activity
Usage of food and beverage space	Assumption that food and beverage operations are outsourced and this is primarily a cost-neutral activity. Estimate has budgeted for one staff member tasked with coordination and management of catering. Assumption that fit-out and maintenance will be the responsibility of the Contractor.

Table 3. Primary building design assumptions

3.2.2 Building Function and Usage Assumptions

The cost estimates herein are based on a variety of assumptions regarding building function and utilisation. The New Theatre Lucerne will be a multipurpose performing arts venue. It is intended to be a world-class facility that hosts high-quality performances and events as well as provides public space and a lively café area to be used by the community. The variety of uses of the Facility will require a certain flexibility in operations which has been incorporated within the assumed staffing plan and cost estimates.

Usage of the Performance Space

The Large Venue will be the main attraction at the New Theatre Lucerne; however, the Small Venue and Studios will also be available for hire. These flexible spaces will cater for a range of activities from performances to corporate events. The operating and staffing plans herein assume that the Large Venue will be hired by a range of users for approximately 80% of the year (excluding maintenance days). Within the rentable days an allowance has been included for preparation and tear-down for performances and events. Arup has developed a flexible staffing plan that uses casual staff to match the fluctuations in usage anticipated for a facility of this nature.

Opening Hours and Maintenance Days

Most performing arts venues close for an annual maintenance period each year to conduct major repairs and improvements. The KKL, for example, is normally closed for two to four weeks during February each year. The management of the KKL elect to close in February because this represents the period of lowest usage, a busy time for local tourism and the carnival period. Arup recommends that the New Theatre Lucerne should have a similar maintenance period of no more than 29 days per annum.

Outside of this maintenance period, it is anticipated that the Facility will be open to the public every day, including public holidays. Normal opening hours are assumed to be 9am to a typical closing time of 11pm, and later on certain performance nights. This broad opening schedule is required to meet the Concept Framework of the New Theatre as being a "locally relevant… urban environment… [where people are] drawn to stay and spend time."

Animating the Public Space

In order to create a vibrant atmosphere and engage and attract visitors, public spaces in the Facility (particularly the foyer) will have a rolling programme of activities. This could include, but not be limited to, activities such as exhibitions, film screenings or poetry readings. If the Facility has outdoor space, this could be used for additional activities. These types of activities will help to make the space more attractive to existing and new audiences and would animate the available space in the Facility.

It is assumed that this will be a cost-neutral activity for the purposes of the model herein, with costs met by rental charges and/or sponsorship and fundraising from organisers of such events. Any decisions or programming in this regard will need to align with the New Theatre's Concept Framework and the stakeholder-agreed artistic and programming philosophy adopted for the Facility.

Food and Beverage

A lively café area will be important to creating a successful Facility, as it should attract regular patrons. Food and beverage provision is likely to include a public-facing café, in addition to service during show intermissions, catering for events and canteen food for management and performance staff.

A critical assumption made regarding the food and beverage strategy at the New Theatre Lucerne is that this service will be outsourced. This is to minimise the revenue risk for the New Theatre Lucerne and simplify the operations for the owner and operator of the building. The decision to outsource these services means that an operator will need to procure a suitable food and beverage contractor to fulfil the catering needs of the Facility and its patrons. It also means that, on the whole, food and beverage staff are not included in the assumed staffing plan. However, it does assume that the building operator will hire one member of staff, who would act as a contract manager and coordinator between the building operator, the users of the Facility and the food and beverage contractor.

As a result of outsourcing, the only food-and-beverage-related revenue in the cost estimate is the rental income for renting the space. Arup has not made any provision for any other source of revenue such as a percentage of the Contractor's revenue. It is assumed that the outsourced company would be responsible for purchasing food and beverage equipment and for fit-out, repairs, maintenance and consumables relating to the kitchen.

This outsourcing model reduces the downside revenue and profit risk for the New Theatre's building owner, but the building owner would not benefit from any upside in food and beverage operations over and above their rental charge.

3.2.3 General Cost Estimation Assumptions

The cost estimation encompasses a 10-year period in line with the scope of the Strategic Planning and Feasibility Study, with the New Theatre opening in the year 2024. Costs have been segmented into three periods: Year 0 or the "pre-opening" year, Year 1 or "start-up" year, and Years 2-10 or "full operating" years.

The estimated operating costs exclude interest, taxes, depreciation, amortization and any other financing or accounting costs.

3.3 Staff-Related Cost Assumptions

This section details the approach and assumptions made in relation to the organisational structure and staffing plan for the New Theatre Lucerne. It then details the methodology used to calculate staff costs for the Facility.

3.3.1 Approach

Arup has worked with industry experts, theatre designers and key local stakeholders to determine an appropriate operating structure and plan that will satisfy the high quality of service requirements set out in the Concept Framework (Volume I, Chapter 1, Section 2.2) and provide sufficient operational flexibility to service the Facility.

3.3.2 Organisational Structure

The organisational chart in Figure 7 provides an indication of the basic functions that will be required from staff to run the New Theatre. The organisation has been structured into five main departments:

- executive office
- commercial department
- customer service department
- operations department
- technical department

Executive Office

It is assumed that the person charged with running the organisation will sit within an executive office as the chief operating officer (COO). Each department will have a manager who will report directly to the COO.

The COO will be in charge of the overall operation and maintenance of the Facility and will be responsible for the success of the Facility. The COO will report directly to the Board of Trustees and be supported by an executive assistant. The COO will be expected to have relevant experience within the industry managing venues and large teams within high-quality organisations.

Commercial Department

The commercial department will run the back office business support functions and financial management for the organisation. It will include finance, IT, administrative support, human resourcing, marketing and public relations staff.

The marketing and public relations team will support the marketing efforts of the Facility users and promote the activities happening at the Facility. This will include, but will not be limited to, producing performance programmes and maintaining digital media for the Facility.

Customer Service Department

The customer service team will be in charge of all aspects of visitor-facing operations. It will include the following functions:

- Box office and information desk staff will be present in the foyer to provide information to visitors coming into the Facility and to sell tickets to performances.
- The events and production liaison function will act as a coordinating body between the Facility and any artistic users, or parties looking to rent the Facility. The liaison function will also ensure that the user's experience of renting the Facility is seamless.
- A catering co-ordinator will act as a contract manager and coordinator between the building operator, the users of the Facility and the food and beverage contractor, to ensure that the food and beverage service provided is of a standard that the Facility and the user expect and is specified in the contractual agreement between the Facility and the food and beverage company.
- Other Front of House staff will check tickets and guide visitors through the public spaces in the Facility.

Operations Department

The operations department will be focused on the Back of House activities of securing, cleaning and maintaining the building to a high standard of quality.

The building maintenance team will be in charge of maintaining the building and equipment on a day-to-day basis. This will involve small-scale repairs and a detailed understanding of the operation of all technical and non-performance plants and equipment.

The security team will be in charge of the safety and security of the building. It will oversee any additional security services required by artistic users, which will be outsourced and charged back to artistic users directly.

The cleaning staff will maintain all areas of the theatre to a high standard of cleanliness and hygiene.
The stage door staff will provide first contact for

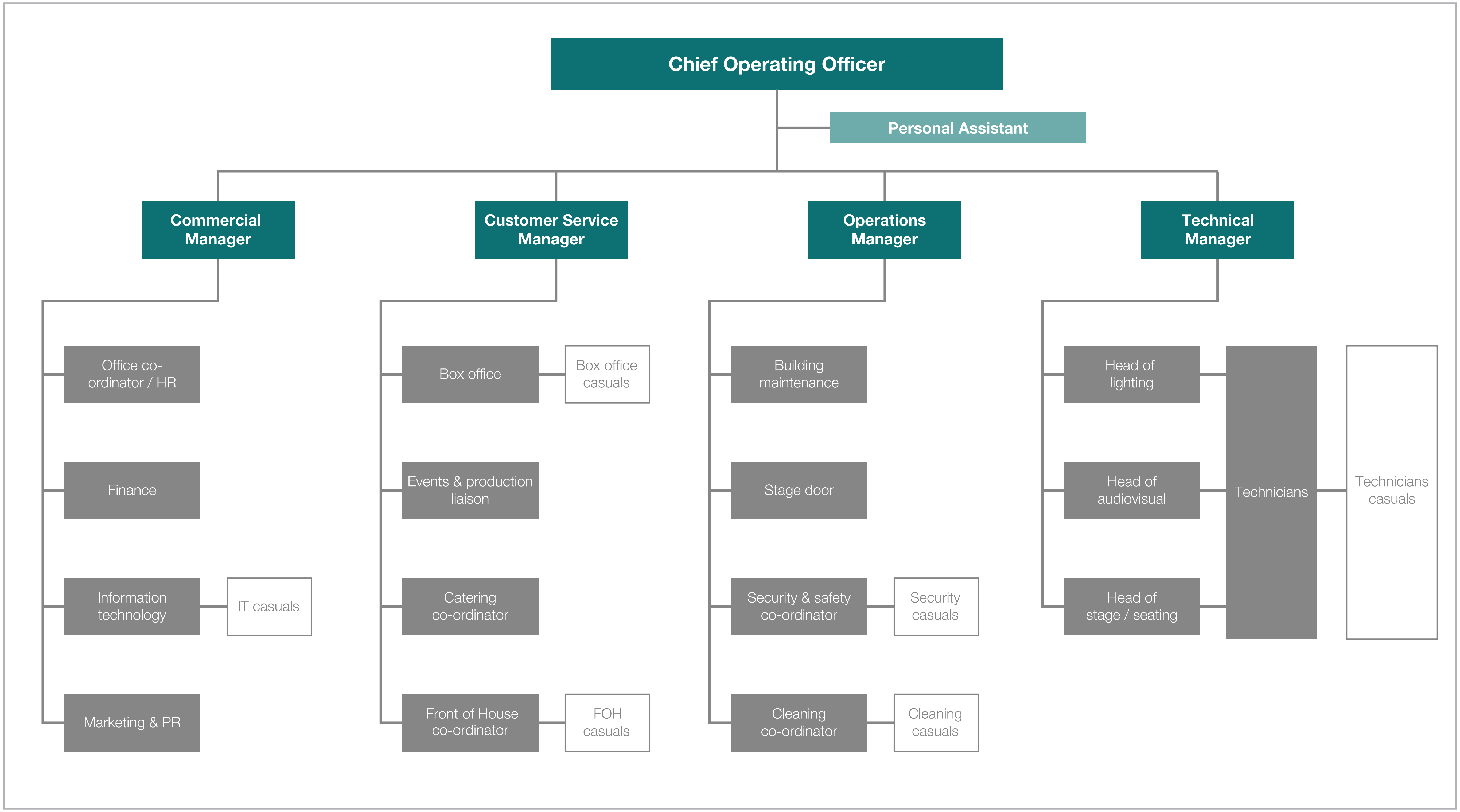


Fig 7. Proposed organisational structure for the New Theatre Lucerne

members of the visiting performers. They will ensure communication between theatre staff and the visiting company prior to and throughout the performance.

Technical Department

The technical team will be in charge of the performance equipment within the Facility and provide support services to artistic users for performances or other events. The technical department will be divided into three key areas of responsibility: lighting, audiovisual, and stage/seating. Each of these will be led by a senior member of staff, supported by a pool of permanent and casual technicians. The technical manager and the technical heads will be responsible for liaising with any additional technical staff employed by the artistic users. The technical department will also be responsible for overseeing and securing any additional technical staff required by the artistic users, although all additional staff will be charged back to the artistic user directly.

Approach to Casuals and Permanent Staffing

This analysis assumes a balance of casual and permanent staff that reflects the long hours and fluctuations in event cycles typical to performing arts venues. The general approach has been to allocate jobs as permanent when the position is senior or where the hours are within a typical working day, eg, the finance department. Positions such as Front of House that require more flexibility in working hours will be supported by a mixture of permanent and casual staff. This approach of having both permanent and casual staff builds a degree of flexibility into the staffing plan that allows for efficiency and effectiveness (ie, not having an oversupply of staff during down times, such as maintenance periods, but also having the ability to ramp up for busy periods when the Facility has multiple and varied events taking place).

NB: As detailed previously, the staffing plan excludes food-and-beverage and artistic staff.

Whilst all food and beverage services will be outsourced, the staffing plan includes an in-house member of staff to coordinate and manage the relationship with the third-party vendor providing the food and beverage services.

The staffing plan excludes non-technical artistic staff, which would be associated with the artistic user identified in the previous chapter; this might include staff such as actors, artistic directors or orchestral staff. The hirer's own technical staff are also excluded from any calculations.

3.3.3 Outline of Staffing Plan Content

Table 4 outlines which staff roles and functions have been included and excluded in the staffing plan, and outlines the usage of casual staff and the outsourcing of specific functions.

3.3.4 Staff Numbers

These staffing assumptions (Table 5) have been made based on extensive consultation with the project team, technical professionals and industry experts. Arup also consulted with local artistic users, venues and city officials. The numbers presented here represent what Arup considers to be a minimum number of staff required to provide the level and quality of experience outlined within the Concept Framework for the Facility, given the governance structure assumptions discussed in Section 2.

Based on these assumptions and the organisational structure and staffing plan outlined in the previous sections, Arup has estimated that the New Theatre Lucerne will need a minimum of 49 full-time equivalent (FTE) staff to operate the Facility.[1] This figure excludes food and beverage staff and artistic staff.

The actual numbers of staff on the payroll is likely to be higher than 49 as some staff, particularly casual staff, will be part time. Occasionally, some events may require additional security, technical or cleaning staff outside of normal event requirements. It is assumed that these occasional additional staff will be charged directly to the event user and are not accounted for in the staffing plan.

The staff numbers are summarised in Table 6.

1 In Year 1 and Year 2 only 47 FTE are accounted for. All other years it is 49 FTE.

Staff type	Included or excluded in staffing plan	Staff provided in-house or outsourced to a third party	Staffed by permanent or casual staff
Security and safety	Included	In-house	Mixture of permanent & casual
Administrative	Included	In-house	Permanent staff
Front of House & box office	Included	In-house	Mixture of permanent & casual
Food & beverage	Excluded	Outsourced (ex. in-house F&B manager)	Outsourced (ex. in-house F&B manager)
Cleaning	Included	In-house	Mixture of permanent & casual
Maintenance	Included	In-house	Permanent staff
Technicians	Included	In-house	Mixture of permanent & casual
IT	Included	In-house	Mixture of permanent & casual
Finance & commercial	Included	In-house	Permanent staff
Marketing	Included	In-house	Permanent staff
Artistic	Excluded	N/A (supplied by artistic user)	N/A (supplied by artistic user)

Table 4. Summary of basis of staffing plan

Item	Assumption
Casual staff	Full-time equivalent numbers for casual staff have been calculated based on provision of support services to artistic users during events and general staffing for when the Facility is open to the public. These casual staff are in addition to the permanent staff already at the Facility.
Basic everyday provision of staff	General staffing includes at least one security guard on duty every day between 9am to midnight, at least one member of staff covering the box office/information desk everyday 9am to typically around 11pm and a cleaning team.
Basic level of service offered with venue hire	In addition to casual and permanent staff mentioned above, a basic level of service offered with venue hire will be a technical crew to assist before and during the show and a Front of House team. Additional cleaning, box office and security staff can be paid for on request.
Lucerne Festival	The model assumes that Lucerne Festival will supply its own Front of House staff during its operation of the Facility, which is the historical precedent and as requested by that organisation.

Table 5. Headline staff modelling assumptions

Type of Staff	Staff numbers (FTE)	Proportion of total staff (FTE)
Permanent staff	28	57%
Casual staff	21	43%
Total staff	**49**	**100%**

Table 6. Summary of total staff numbers expressed in FTE

Staff costs are typically the single largest cost item for a performing arts venue. Total staff costs consist of staff salaries and staff overheads.

3.3.5 Staffing Costs Assumptions

Overview

Staff costs are typically the single largest cost item for a performing arts venue. As illustrated in Figure 8, total staff costs consist of staff salaries and staff overheads. Staff overheads are other costs directly associated with staff for the New Theatre Lucerne, such as the costs of social security payments, benefits, recruitment and training.

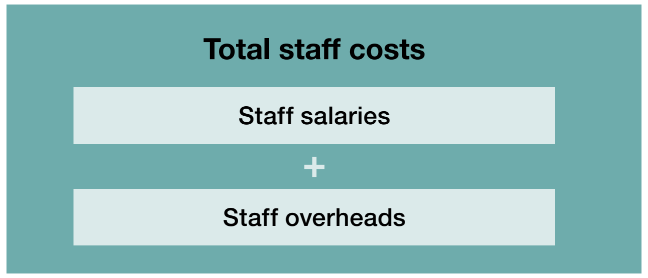


Fig 8. Methodology for calculating total staff costs

Staff Salaries

New Theatre Lucerne salaries are based on numerous sources including job-specific salary statistics from the Swiss Federal Statistical Office, salaries paid at the KKL and information from Business Development Lucerne, a group that assists in the establishment of new businesses in the Lucerne area.

Arup collected salary information from these sources for each staff position identified. From the range of salaries collected from these sources, a base salary figure was determined. Initial estimates of staff salaries were then reviewed by both Theater Werk Luzern and the Lucerne Festival. Each organisation critiqued the salary levels based on its knowledge of local wages, and following this review, a final salary figure was determined. This process was undertaken for both permanent staff based on annual salaries and casual staff wages based on an hourly wage figure.

Salary Growth

Historically, annual salaries in Switzerland have grown faster than inflation. According to the Swiss Federal Statistical Office, between 2000 and 2014 the average salaries across the country increased at a rate of 0.69% above Consumer Price Index (CPI) inflation.

Table 7. Omitted for publication

In nominal terms this is equivalent to approximately a 2.69% pay increase each year.[2] In the model herein, it is assumed that salaries will increase at a rate of approximately 1% more than the historical average, in order to maintain a competitive package and aid staff retention. Therefore, in this model, salaries increase each year by 1.69% in real terms throughout the 10-year period, which is equivalent to a 3.69% annual pay

2 http://www.bfs.admin.ch/bfs/portal/en/index/themen/03/04/blank/data/02.html

increase assuming an average inflation rate of 2% per annum over the 10-year period.

Annual Salary Costs

Salary costs are calculated using the methodology highlighted in Figure 9 which combines permanent and casual staff.

Staff Overheads

The staff overhead cost category includes costs to the business related directly to staff (excluding salaries). This comprises social security contributions, pensions, benefits, training and a level of contingency. Figure 10 depicts the estimation methodology.

Social security, pensions and benefits for staff have been calculated at 20% of salary costs (both casual and permanent). This percentage is based on consultation with other local employers within the Lucerne performing arts industry. Staff training and recruitment have been calculated at 8% of salary costs (both casual and permanent) over the modelled period. Additional staff recruitment and training costs have also been factored into the pre-opening and start-up period (Year 0 and Year 1 costs). These costs

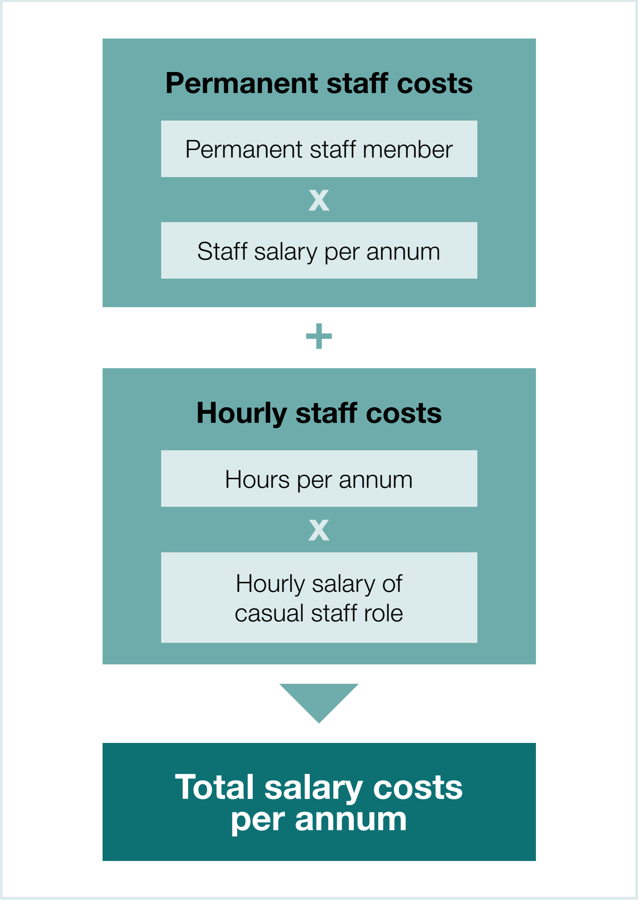


Fig 9. Total salary cost methodology

Fig 10. Total staff overheads methodology

are to account for the mass recruitment of staff prior to opening of the New Theatre and any volatility above normal recruitment levels that is likely to occur during the first year of operations. The pre-opening period recruitment and training costs have been calculated based on the application of the assumptions in Table 8.

Pre-opening cost category	Percentage of salary allowance
Senior staff recruitment	30%
Mid-level staff recruitment	15%
Normal staff recruitment	10%
All staff training	5%

Table 8. Pre-opening recruitment training assumptions

Staff recruitment and training in the start-up year are also elevated above the normal 8% figure, with 15% of salary costs being allocated to train and recruit during this first year of operation.

Staff contingency is calculated as being equal to 10% of staff salary costs on an annual basis; however, a greater allowance has been provided for the pre-opening and start-up periods to account for volatility in staff costs and any additional or unexpected staff cost items. An allocation of 20% of salary costs has made during the pre-opening period, and a buffer of 15% has been applied to the start-up period (Year 1 of operation).

3.4 Non-staff-related Cost Assumptions

This section considers the methodology and approach applied for the calculation of all non-staff-related costs that are likely to be incurred by the New Theatre Lucerne.

3.4.1 Approach

Non-staff costs are divided into four main categories, plus contingency. Figure 11 shows these categories and an outline of the methodology used to calculate the costs for each. The rest of this section provides a more detailed methodology of cost estimates for each category.

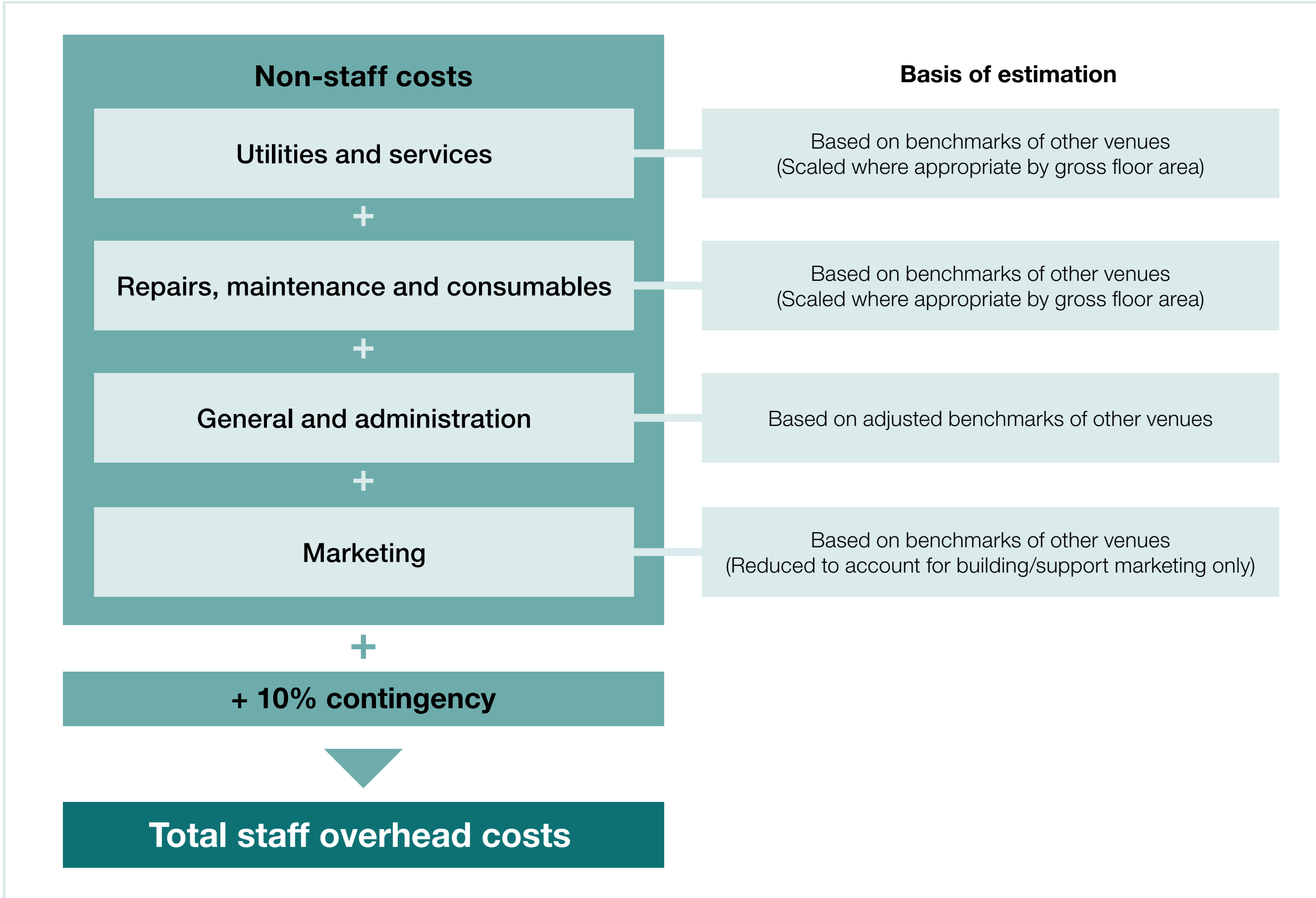


Fig 11. Non-staff operating cost methodology

3.4.2 Utilities and Services

The utilities and services cost category is broken down into the line items presented in Table 9.

Item	Assumption
Energy, water and waste	Includes all gas, electricity, water supply, waste water and disposal costs incurred in the building.
Cleaning	The model assumes day-to-day cleaning will be provided in house. This line item includes all non-staff costs associated with cleaning of the Facility and any specialist cleaning services that need to be hired in.
Security	The model assumes a base level of security which is provided in-house. This line item includes all non-staff costs associated with the safety and security of the building and guests. It assumes that any additional security needed above normal levels would be charged directly to the user at cost and is not accounted for in the model.
Contingency	A 10% contingency has been applied to utilities and services to account for unforeseen costs.

Table 9. Utilities and service assumptions

Energy, water, waste, cleaning and security costs were all estimated using a benchmarking approach. The base cost figure is calculated by taking historical financial data from the KKL, the existing Luzerner Theater and Opernhaus Zürich and then normalising these to 2015 prices.[3] These figures were then scaled based on the gross floor area of each venue, and an average was taken to give an approximation of the annual costs based on the gross floor area of the New Theatre Lucerne. It is assumed that in real terms these costs will remain constant over the study period.

3.4.3 Repairs, Maintenance and Consumables

The repairs, maintenance and consumables (R&M) category includes in-year day-to-day R&M of both the building and technical or performance equipment. R&M costs are made up of the following three line items:

- R&M related to the building
- R&M related to technical or performance equipment
- R&M contingency

The cost calculations for R&M exclude capital investment for substantial overhaul and replacement of the building or performance and technical equipment. These exclude substantial projects that will be covered by a capital investment budget, which would be wholly or partially funded by the capital reserve contribution discussed later in this section. R&M related to food and beverage equipment is also excluded and is assumed to be covered by the outsourced food and beverage contractor.

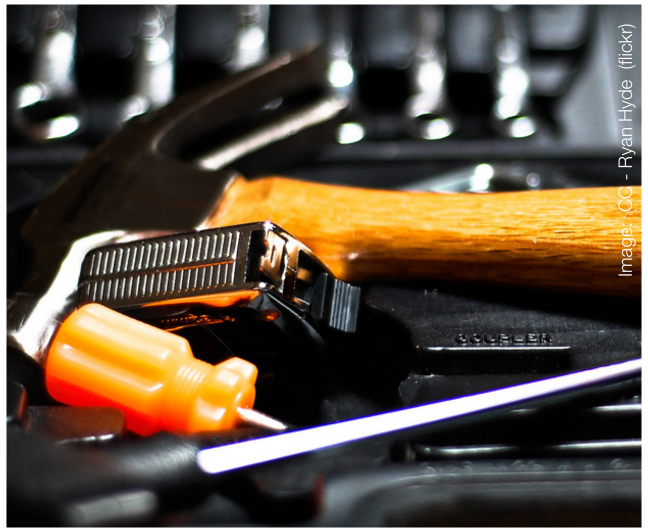
Calculation Methodology

Building R&M and performance equipment R&M have been modelled separately within the calculations. Both types of R&M are estimated using a benchmarking approach. The costs associated with each type of R&M were identified in historical R&M data from the KKL, the existing Luzerner Theater and Opernhaus Zürich. These historical figures were converted into 2015 prices and scaled by gross floor area. An average of these figures gives an inferred cost of maintaining the building and equipment at the New Theatre.

3 For non-staff security costs only, KKL and the existing Luzerner Theater were used as benchmarks because data for Opernhaus Zürich were unavailable.

In addition to building and equipment R&M costs, a contingency was applied to the costs category. This contingency is calculated as 10% of all other R&M costs.

R&M tends to increase faster than general CPI inflation. Using historical construction cost inflation data from Switzerland as a proxy for maintenance and repairs inflation, it is assumed that the costs of conducting R&M will increase at a rate of 0.89% above CPI per annum over the 10-year model period.



3.4.4 General and Administration

The general and administration costs category includes the following smaller cost items:

- insurance
- general office materials
- staff travel and accommodation
- telecommunications and internet
- IT
- postage / courier
- bank charges
- auditors/accountant fees
- board fees
- legal fees
- consultant fees
- other fees
- general and administration contingency

Estimate of General and Administration Costs

General and administration costs are estimated, where possible, by applying an average of historical data from other local performing arts benchmarks. These include the KKL, the existing Luzerner Theater and Opernhaus Zürich. All historical financial information has been normalised to 2015 prices. It is assumed that, in real terms, general and administration costs remain constant over the study period, except in the first year of operation, when many of the costs have been scaled up by between 10 to 25%. An example of this is the consultant fee category, where costs have been increased by 25% above the average cost allocation in Year 1, to account for increased consultancy fees associated with the start-up period, when additional professional advice and services may be required.

In the case of IT, a cost per FTE staff number has been assumed. According to the *IT Spending & Staffing Benchmarks 2015/2016* report by Computer Economics, the costs of providing IT is approximately US$6,847 per FTE per year.[4] This figure has been converted to Swiss francs and applied to the Facility. A 10% contingency on general and administration costs has also been applied within the model across the entire 10-year forecast period.

3.4.5 Marketing

The marketing costs category includes all non-staff marketing, advertising and public relations costs.

It is anticipated that the New Theatre's marketing costs would be lower than those of the current Luzerner Theater. This reduction takes into account the fact that the model assumes that the New Theatre will have a reduced marketing remit, compared with the marketing department at the current Luzerner Theater for example, which has in-house artistic content to promote in addition to the general programme of the venue.

Marketing expenditure for New Theatre was calculated by converting historical Luzerner Theater marketing spend into 2015 prices and then reducing it by 25% to account for the fact that the New Theatre will have reduced marketing responsibility.

It has also been assumed that marketing costs will be 25% higher in the first year of operation, to account for opening events and other promotional activities. Beyond the first year, it is assumed that, in real terms, marketing costs remain constant over the study period. Lastly, an additional 10% contingency has also been applied to marketing to account for any unforeseen marketing-related expenses.

4 http://www.computereconomics.com/temp/ISS2015Ch01Exec-Sum92651.pdf

3.5 Capital Reserve Contribution Assumptions

The capital reserve contribution represents the amount of money transferred into a dedicated capital reserve each year, to help fund large-scale overhaul, replacement and improvement of building, performance and technical equipment in the long term.

The New Theatre Lucerne requires a capital reserve contribution so that in future years the organisation is sufficiently funded to maintain the quality of building and equipment at the original design specifications. The funds contributed to the capital reserve may not cover all future large-scale improvement works required by the Facility; however, this analysis has taken a prudent approach to ensure that the figure is large enough to cover a reasonable level of capital replacement in the long term.

Estimate of Capital Reserve Contribution

The capital reserve contribution has been designed to account for the contribution of costs associated with four specific capital expenditure items:

- the cost of replacing performance equipment
- the purchasing of brand-new equipment not previously owned
- the long-term overhaul of the building
- contingency

Figure 12 explains how each of these four components have been combined to calculate the overall capital reserve contribution for the project. Estimates assume that the cost of repairs and purchasing performance equipment will increase at 0.87% above CPI inflation per annum. 0.87% is the historical average real annual growth in Switzerland's construction price index 1999–2014 according to the Swiss Federal Statistical Office.[5]

5 www.bfs.admin.ch/bfs/portal/de/index/themen/05/05.html

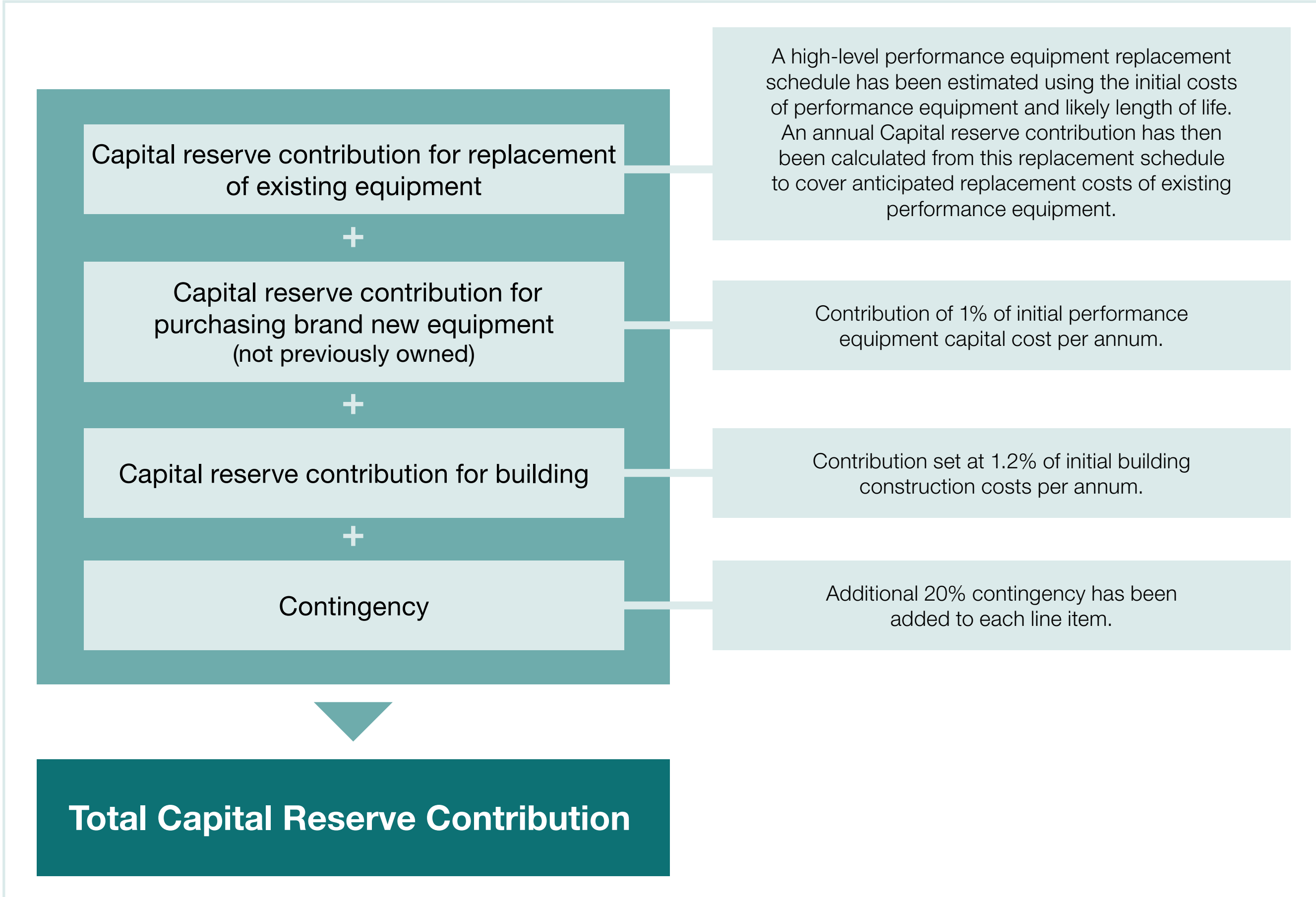


Fig 12. Capital reserve contribution methodology

3.6 Pre-Opening Assumptions and Approach

Whilst the methodology presented thus far has focused primarily on the first 10 years of operation for the New Theatre Lucerne, a number of costs are likely to be incurred in advance of the opening year of operations. These pre-opening costs are different from the ongoing annual operating costs as they include one-off costs associated with starting up a business.

3.6.1 Pre-opening Costs

Pre-opening costs are likely to include the following:

- initial recruitment activities to cover the cost of recruitment of key staff prior to opening
- establishment of governance structure and appointment of trustees and senior staff
- staff costs related to the “start-up team”
  - The start-up team will consist of key personnel such as the COO, department managers, core functions such as marketing and finance and possibly additional temporary staff who have strong industry experience and prior expertise in the establishment of new business operations. The start-up team will be lean and will be supported through the acquisition of consultancy services as required (see below).
- provisions for the purchase and installation of IT systems and training costs such as
  - HR, payroll, finance and accounting systems
  - IT hardware and equipment for office based staff
  - systems instillation and support contracts
- utilities and services charges for use and operation of the Facility in advance of the official public opening — This includes the cover of utilities (energy, waste and water bills), security and cleaning in the months leading up to the public opening of the Facility.
- marketing co-ordination and materials in advance of the opening of the Facility
- general offices materials
- advisory, consulting and legal fees for start-up activities to provide assistance to the start-up team
- staff travel and accommodation for promotional activities in advance of the Facility launch
- office space rental for a short period in advance of the office spaces within the Facility being available

Loose fixtures and fittings for the office areas of the Facility have been accounted for within the capital cost estimates for the project and hence are not incorporated in the start-up cost estimates.

These start-up costs will be heavily dependent on the governance structure selected for the operation of the New Theatre Lucerne and will also depend on how quickly and well in advance the organisation is mobilised. Start-up costs will be incurred in addition to the construction costs of the building in advance of the opening of the Facility.

Due to the highly uncertain nature of these cost items, they have been estimated by applying a scaling factor to the annual operating costs associated with the Year 2-10 period of operations.

3.6.2 Phasing

The phasing of the activities in advance of the opening of the New Theatre Lucerne to the public will be an important consideration and is likely to significantly impact the cost estimates for the pre-opening period. It is assumed that all of the pre-opening costs are incurred in Year 0, although some of these costs may be incurred earlier than a year prior to opening of the Facility.

A possible phasing of pre-opening activities over a one-year period prior to the opening of the Facility is presented in Table 10. This phasing assumes that the Board of Trustees has been appointed prior to Year 0.

> A number of costs are likely to be incurred in advance of the opening year of operations. These pre-opening costs are different from the ongoing annual operating costs as they include one-off costs associated with starting up a business.

Activities	YR 0, Q1	YR 0, Q2	YR 0, Q3	YR 0, Q4
Design and construction				
Appoint COO				
Appoint remaining start-up team				
Engage consultants for governance, branding, operational readiness, etc.				
Engage potential food and beverage contractor				
Staff training				
Plan launch event				

Table 10. Phasing of key pre-opening tasks

Indicates when key activities should take place

4 | Summary of Results and Sensitivity Testing

4.1 Overview

This section presents the cost modelling results and sets out the anticipated cost of operating the New Theatre Lucerne over the forecast horizon. All of the results are based on the assumptions outlined within the previous sections of this report.

The results present anticipated annual operating costs and capital reserve contributions for the New Theatre over the first 10 years of operation (the forecast horizon for this study). As detailed previously, this analysis concentrates on three primary time periods within this horizon: Year 0 or the "pre-opening" year, Year 1 or the "start-up" year and Years 2–10 or "full operation" years.

Each constituent cost item is then presented in turn, including operating costs — made up of staff costs and non-staff costs — capital reserve contributions, and pre-opening costs.

4.2 Summary of Costs

The average total annual operating cost for the New Theatre Lucerne in 2015 prices is forecast to be approximately SFr11.8m over the first 10 years of operation (pre-opening costs are dealt with separately, later in this section). This figure represents the total costs for the Facility, on average per year over 10 years, and includes operating costs (staff and non-staff costs) and capital reserve contributions.[6]

Figure 13 shows the breakdown of the SFr11.8m into cost categories during Years 1–10. Average annual operating costs represent SFr8.8m, whilst the average annual capital reserve contribution is estimated at SFr3.0m per year, which is roughly a quarter of total costs. The operating costs are made up of both staff and non-staff costs.

Time Period	Average annual operating cost (SFr millions)	Capital reserve contribution (SFr millions)	Total operating cost (SFr millions)
Year 0	4.3	0	4.3
Year 1	8.9	2.9	11.8
Year 2-10	8.8	3.0	11.8

Table 11. Summary of average annual operating costs across phases of operation (Figures are rounded to SFr0.1m)

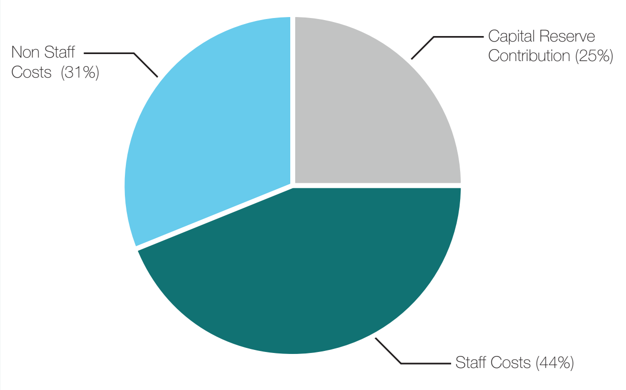


Fig 13. Average 10-year operation cost breakdown

6 Total costs excludes taxation, interest, depreciation, amortization and other financing costs. It also excludes additional site-specific costs that might occur because of the location of the Facility.

Figure 14 shows the growth of costs over the 10-year forecast horizon, at approximately 1.3% real increase per year. At present, the Facility has no major expansion plans within its first 10 years. If the Facility expands or has higher than anticipated occupancy, some costs may increase beyond what is presented here.

As can be seen in Figure 14, there is little change in the value of cost categories over time. The start-up period (Year 1) exhibits a higher than average cost, due to the inclusion of higher cost assumptions related to staff (recruitment and training in start-up period) and non-staff costs (higher start-up period marketing, contingency and general and administration allowances).

Table 12 shows how forecast costs change between the first year of operation and the 10th year. The pre-opening year is excluded as that is discussed in more detail in Section 4.3.

In the first year of operation, staff costs represent 43%

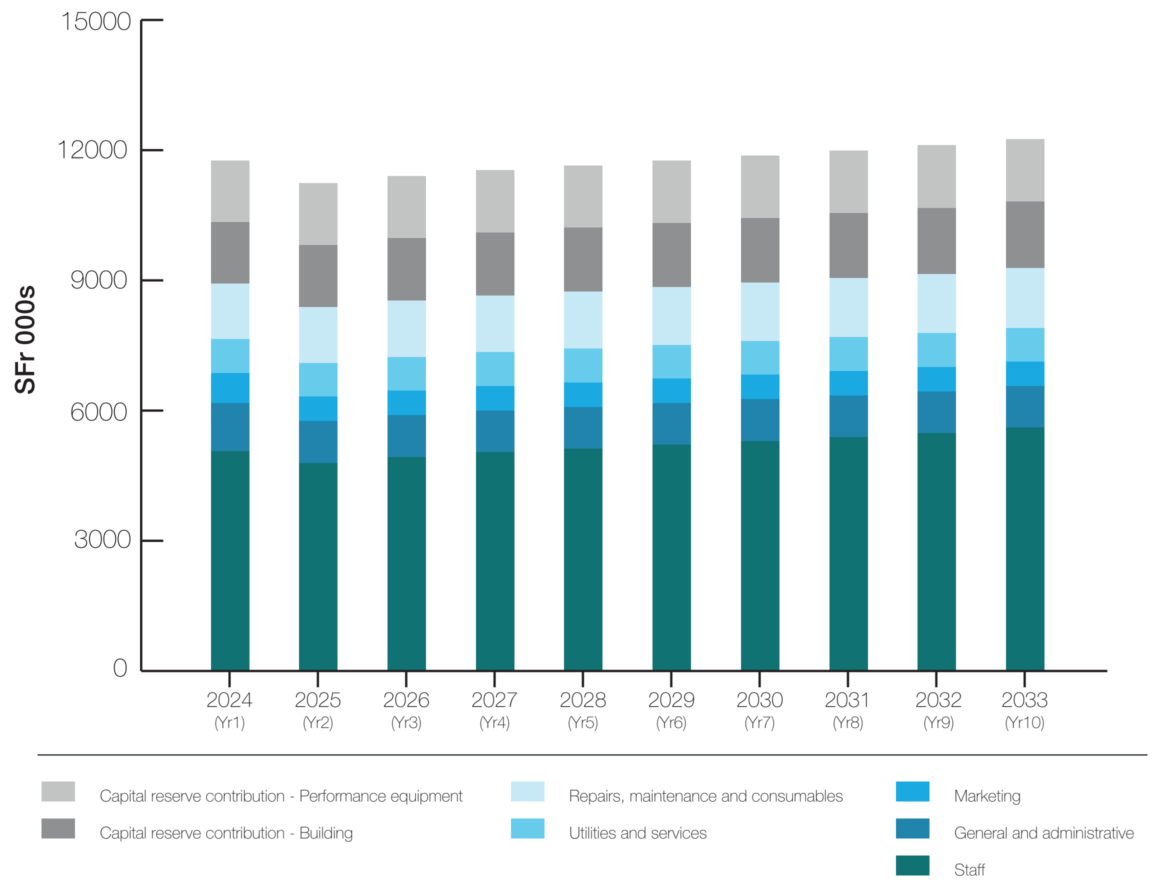


Fig 14. Forecast total operation cost (real 2015 prices)

of total costs, with non-staff costs accounting for roughly one-third of total costs. By the end of the forecast period (Year 10) staff costs grow in proportion to represent 45% of the total costs for the Facility, whilst non staff costs decline in proportion to 30%. The capital reserve contribution remains constant as a percentage of total costs, consistently representing a quarter of the total operating cost.

Cost estimates exclude taxation, interest, depreciation, amortization and other financing costs. They also exclude additional site-specific operational costs that may be incurred due to the specific location of the Facility. These cost exclusions may be significant and should be factored in during the Design Phase and future updates to the business plan.

Cost item	Year 1		Year 10		10 year average	
	(SFr m)	%	(SFr m)	%	(SFr m)	%
Staff	5.1	43	5.6	45	5.2	44
Non staff costs	3.9	33	3.7	30	3.7	31
Capital reserve contribution	2.9	24	3.0	25	3.0	25
Total	**11.8**	**100**	**12.3**	**100**	**11.8**	**100**

Table 12. Total cost forecasts (real 2015 prices) (Note: Totals may not add due to rounding.)

The average total annual operating cost for the New Theatre Lucerne in 2015 prices is forecast to be approximately SFr11.8m over the first 10 years of operation. This figure represents the total costs for the Facility, on average per year over 10 years, and includes operating costs (staff and non-staff costs) and capital reserve contributions.

4.3 Operating Cost in Year 0 (Pre-opening)

As outlined within the methodology section of this report, pre-opening period (or Year 0) costs associated with the establishment of the New Theatre Lucerne have been estimated as business operations (ie, the costs associated with the establishment of the business, not the costs associated with the building or construction of the Facility).

It is estimated that these will range between SFr3.8m to SFr5.5m (in 2015 prices). A range has been presented to account for the uncertainty associated with these costs, which will be dependent on the governance approach adopted by the organisation and the ability of the key project stakeholders to mobilise and co-ordinate in the establishment of the new organisation. The breakdown of the SFr3.8m to SFr5.5m is illustrated in Figure 15.

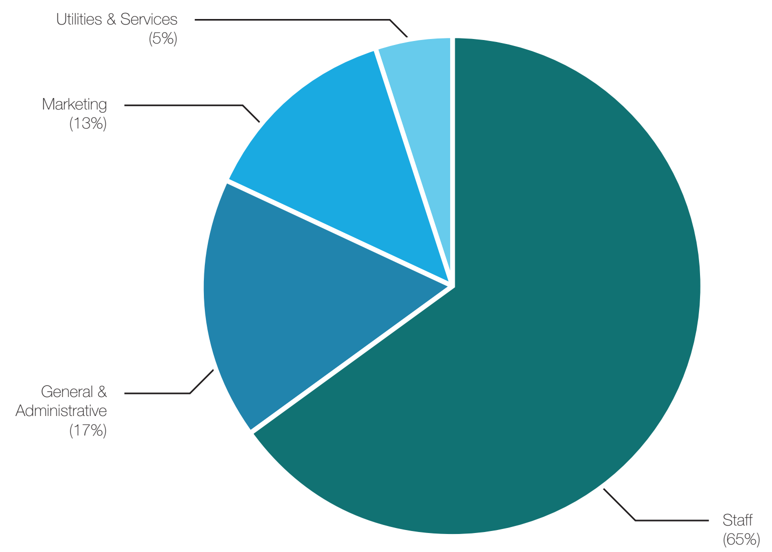


Fig 15. Pre-opening (Year 0) cost breakdown

4.4 Operating Cost in Year 1 (Start-up Year)

As detailed within the methodology section of this chapter, the operating costs in the first year of operation (the start-up year) are anticipated to be higher than average, in order to account for the increased operational activity associated with the launch of a new business and a new facility. Both staff and non-staff costs are greater during this period, resulting in the Year 1 results of SFr8.9m being 6.5% above the Year 2 results and 0.8% above the 10-year average.

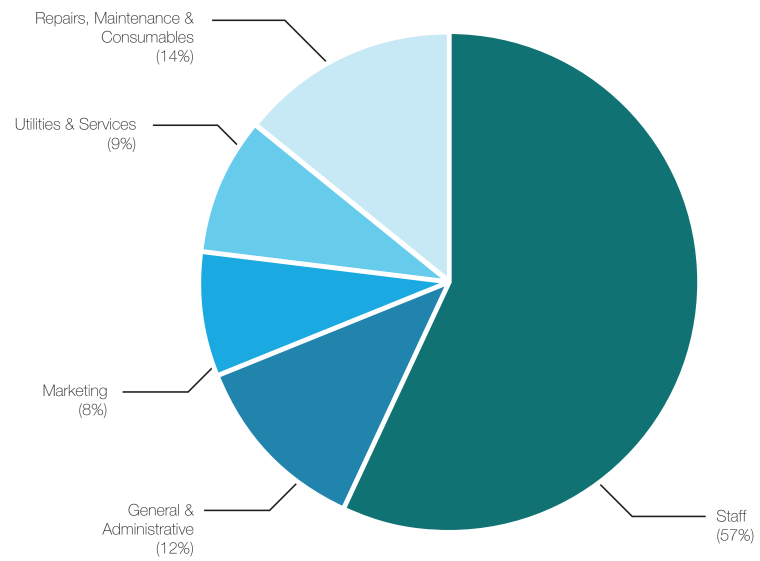


Fig 16. Start-up year 1 cost breakdown

4.5 Operating Costs in Years 2–10

4.5.1 Staff Costs

Staff cost is the largest cost category forecast for the New Theatre Lucerne, representing on average 44% of the total cost over the first 10 years of operation. Average staff costs over this period are estimated to be approximately SFr5.2m (in 2015 prices). Staff costs are a combination of salaries and other costs directly related to staffing, as outlined in Figure 17.

Overall staff salaries (both permanent and casual) make up the majority of staff costs, accounting for approximately 72% on average over the first 10 years of operation. In Year 1, average staff salaries will be approximately SFr72,000 per annum in 2015 prices.[7] The national average salary for Switzerland in 2014 was SFr87,000 according to the OECD.[8] The lower figure considered in this analysis is primarily due to the number of low-wage Front of House jobs that are required to run a venue of this nature.

Table 13 gives staff costs at years 1 and 10.

7. Calculation is staff salaries divided by number of staff = SFr 3,373,000 / FTE 47 (Year 1) = 72k

8. Accessed 16th September 2015 – OECD - https://stats.oecd.org/Index.aspx?DataSetCode=AV_AN_WAGE

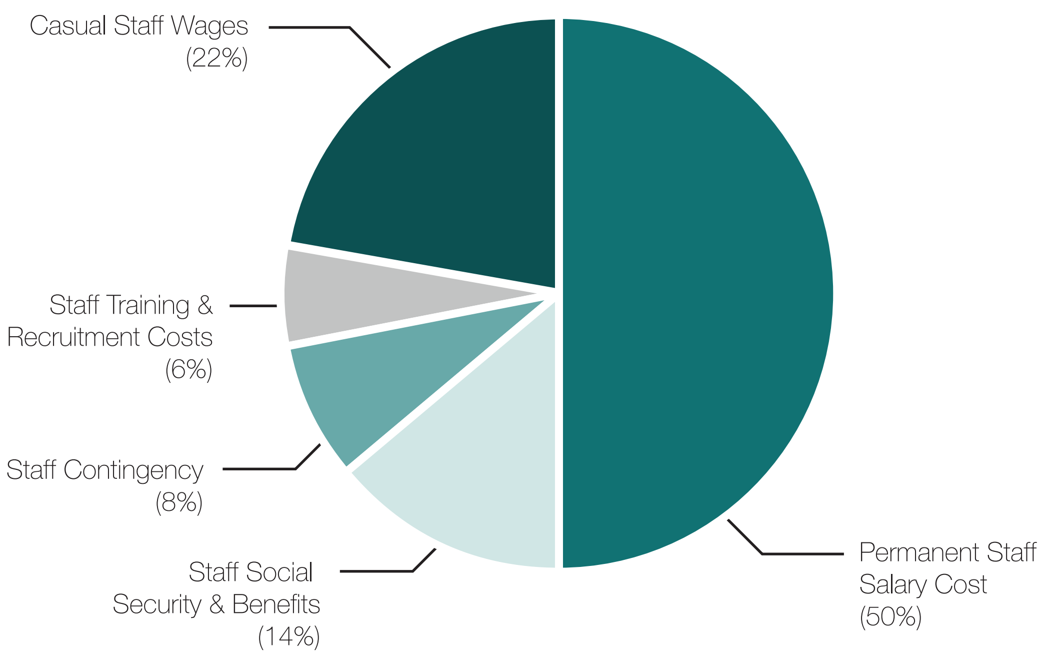


Fig 17. Annual staff cost average 10-year breakdown (percentage based on 10-year average)

Costs grow over time, with the exception of staff contingency, which starts high because of the uncertainty in the new operation and the possible requirement to hire in temporary staff. After the first year, staff contingency reduces but remains substantial. Overall, excluding inflation, staff costs grow at 1.9% per year over the 10-year period.

4.5.2 Non-Staff Costs

Annual non-staff costs over the forecast horizon are estimated to be approximately SFr3.7m (in 2015 prices) on average. The non-staff costs combined represent approximately 31% of total costs on average over the first 10 years of operations and are made up of R&M, utilities and services, marketing, and general and administrative. Figure 18 presents a breakdown of how costs are split across these items. The largest cost item is R&M, which represents around 36% of non-staff costs.

Overall, in real terms, non-staff costs remain fairly static or grow slightly over the 10-year forecast horizon. As detailed in previous sections, some costs such as marketing and general and administration costs are slightly higher in Year 1 however, to account for the extra activity, such as extra venue marketing, which may occur in the opening year.

Cost item	Year 1		Year 10		10 year average	
	(SFr m)	%	(SFr m)	%	(SFr m)	%
Salaries	3.4	67	4.1	72	3.7	72
Social security & benefits	0.7	13	0.8	14	0.7	14
Training & recruitment	0.5	10	0.3	6	0.3	6
Contingency	0.3	7	0.4	7	0.4	8
Total	**5.1**	**100**	**5.6**	**100**	**5.2**	**100**

Note: Totals may not add due to rounding

Table 13. Staff cost forecasts (real 2015 prices)

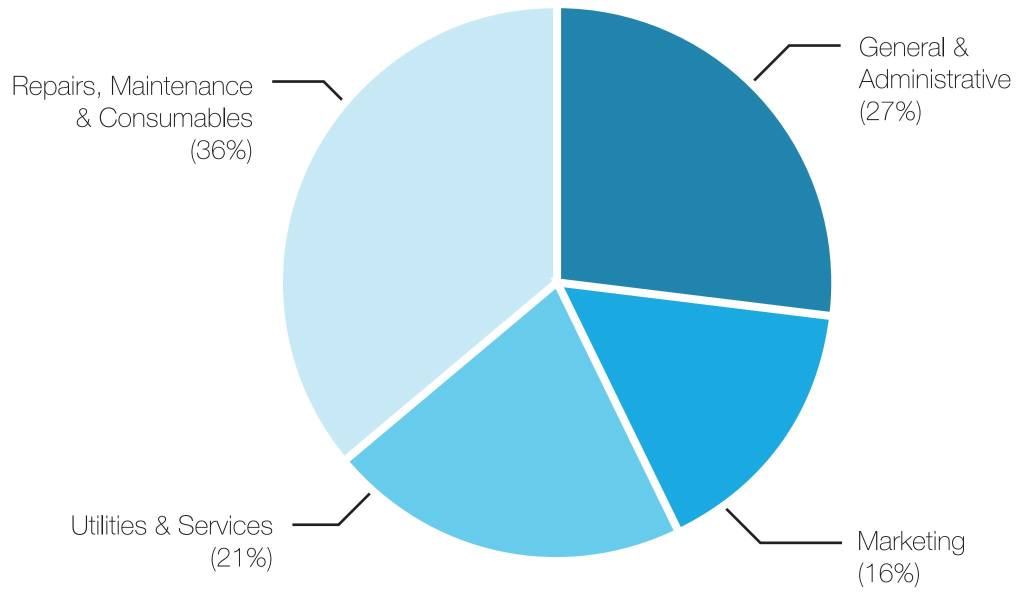


Fig 18. Annual non-staff cost average 10-year breakdown (percentage breakdown is based on 10-year average)

4.6 Capital Reserve Contribution

Arup recommends that the New Theatre Lucerne should contribute annually to a capital reserve fund, which can be used to pay for long-term replacement and repairs of performance equipment and the building.

It is estimated that if the Facility contributed an average SFr3.0m per annum in 2015 prices each year, sufficient funding would accumulate to cover the following future requirements:

- replacement of all existing base performance equipment at the end of its useful economic life
- creation of a pool of SFr2.3m over the next 10 years for investment in extra brand-new (previously not owned) performance equipment
- creation of a pool of SFr15.3m over the next 10 years for investment in major structural repairs and improvement to the building

In the specialised performance equipment list of the Technical Concept, additional deferred performance equipment has been identified beyond the base performance equipment used in the calculations above. If all performance equipment, including the deferred equipment, is factored into the calculations of capital reserve contribution then the recommended contribution would increase by SFr0.9m, from SFr3.0m to SFr3.9m. A discussion on the implication of the capital reserve contribution can be found in Section 5.

4.7 Sensitivities

All figures discussed within this report have represented the base case, excluding deferred cost. This section considers the risks associated with such cost assumptions and presents a scenario analysis which considers a low case (where costs are lower than those anticipated) and a high case (where costs are higher than anticipated).

The high and low case use the same methodology as the base case but factor in a percentage adjustment to the base case figures. Each cost line item has been assessed individually to determine the likely adjustment that is reasonable and required in order to be prudent. Each has then been adjusted within a range of + or - 5% to 30%, depending on the risk level associated that specific cost item. The only line item which has been treated differently within the scenario modelling is equipment cost. For this line item, both low and base case scenarios assume application of the base equipment costs per requirements of the Technical Concept, whilst the high case scenario presents the maximum cost estimate incorporating both base equipment costs and all additional, deferred equipment.

	LOW CASE	BASE CASE	HIGH CASE
Staff costs	4.4m	5.2m	7.3m
Non-staff costs	3.0m	3.7m	4.4m
Capital reserve contribution	1.7m	3.0m	4.4m
Total costs	9.2m	11.8m	16.0m

Note: Shows average 10 year costs in 2015 prices, rounded to the nearest SFr0.1m; totals may not add up due to rounding.

Fig 19. Sensitivity Results

The results in Figure 19 create a possible range of costs between SFr9.2m and SFr16.0m for the average operating cost over the 10-year period. The wide spread of SFr6.8m between the low case and the high case is considered appropriate at this early stage in the design process. Subsequent business plans will seek to present a more realistic estimate of costs as the design progresses and there is more certainty regarding the building form, governance structure and operational requirements for the New Theatre.

5 | Conclusions and Next Steps

5.1 Annual Operating Budget for the New Theatre Lucerne

Initial cost estimates indicate that operating and maintaining the New Theatre Lucerne (excluding the capital reserve contribution of approximately SFr3.0m) will cost an average of SFr8.9m each year over the first 10 years of operation (in 2015 prices). This is the cost estimated based on achieving the standards of quality in experience and asset management as outlined within the Concept Framework. It represents the cost of staff- and non-staff-related expenses and includes day-to-day maintenance, but excludes any required capital reserve contributions.

As Figure 20 demonstrates, the operating subsidy for any venue represents the differential between the operating costs and the operating revenues. The scope of this work involved forecasting the operating costs associated with the New Theatre Lucerne. Operating revenues can only be predicted with assumptions; it is anticipated that the New Theatre Lucerne will have strong revenue-generating potential, due to the anticipated high quality of the Facility and service offering, its focus on offering "world-class performances" and its aspiration to be "locally relevant" and a "centre of gravity, where people are drawn to stay and spend time". Potential revenue sources are discussed in more detail within this section; it is anticipated that the operating subsidy required to run the Facility will be less than operating costs forecast within this study. It is unlikely however that the New Theatre will be able to cover all operating costs from self-generated revenue alone.

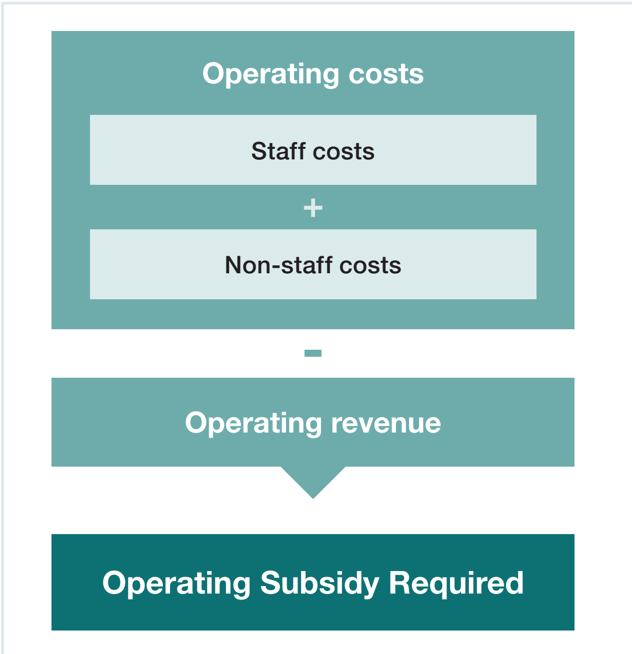


Fig 20. Operating subsidy calculation methodology

5.1.1 Potential Revenue Sources

Whilst the forecasting of revenue lies outside the scope of this work, it is important to understand potential revenue sources in order to understand the likely impacts on the level of subsidy required to fund the New Theatre Lucerne.

Potential sources of revenue for the Facility could include the following:

- rental income from artist users and other organisations hiring the Facility or individual spaces
- concession income from the outsourced food and beverage contract
- commission on ticket sales
- merchandise sales
- margins on the procurement of additional staffing requirements for special events

It is advised that the City and Canton, Facility operator, local stakeholders and designers work together to maximise the revenue-generating potential of the Facility, as this will help to reduce pressure on the need for increased subsidy to the New Theatre in the future. In order to fully understand the subsidy required for the Facility, detailed calculations of possible self-generated income sources should be carried out during future business planning phases.

Image: CC - George Rex (flickr)

5.1.2 Benchmarking Performing Arts Subsidies

Whilst calculation of a subsidy is difficult without the forecast of revenue streams, Arup has undertaken benchmarking to understand the level of subsidy provided to other performing arts venues both locally and internationally.

All benchmark venues examined as part of the research required some level of operating subsidy from public or private sources to support day-to-day operations (ie, almost all venues have an annual operating deficit). Figure 21 approximates the percentage of income that was derived from subsidies and donations for a wide range of performing arts venues around the world.

Although some of the venues are not directly comparable to the Facility (due to different governance structures and modes of operation — see the following section), Figure 21 suggests that the level of subsidy generally required for performing arts venues can range from approximately 30% to 85% of income. The average value of subsidy as a proportion of income across the benchmarked venues was 56%. Notably, the current Luzerner Theater had the highest percentage of subsidisation of the venues benchmarked, receiving 86% of its 2011/12 income in the form of government subsidy (Beiträge Zweckverband). In contrast, the KKL receives no operational subsidy from the government or regional sources, but a contribution towards only the construction and renovation of the building (capital repairs).

5.1.3 Governance Structure and Subsidy

Different governance structures may lead to different subsidy requirements for performing arts venues. As was discussed in Section 2 of this chapter, different combinations of the three roles of operator, owner and artistic user can lead to very different organisation relationships, and changes in the size and nature of an organisation can have significant implications on its costs and the required subsidy level. A receiving house is likely to have a leaner staff than a production house, and therefore may require lower subsidy levels. However, this raises the issue of separation of subsidy for different purposes.

Performing arts organisations are usually heavily subsidised, and commonly, subsidy is earmarked for certain purposes within the organisation. Subsidy is often allocated to specifically cover the cost of artistic production. Likewise, many organisations receive subsidy for the specific purpose of undertaking particular operational or capital repairs and maintenance projects.

In order to deliver on the Concept Framework established for the New Theatre and maintain the quality of the building and equipment, it is proposed to separate operations of the Facility from any artistic production. In line with this assumption, it is crucial to ring-fence a subsidy to maintain the quality of the Facility. In this way, subsidy will be provided directly to artistic users to fund the production of artistic content, as well as directly to the building operator to help support the operations of a new, improved and state-of-the-art facility capable of hosting a "world-class quality of performance experience in opera, musical theatre, dance and drama". Subsidy provided in this way will also reduce the risk of a decline in service level at the Facility in the future.

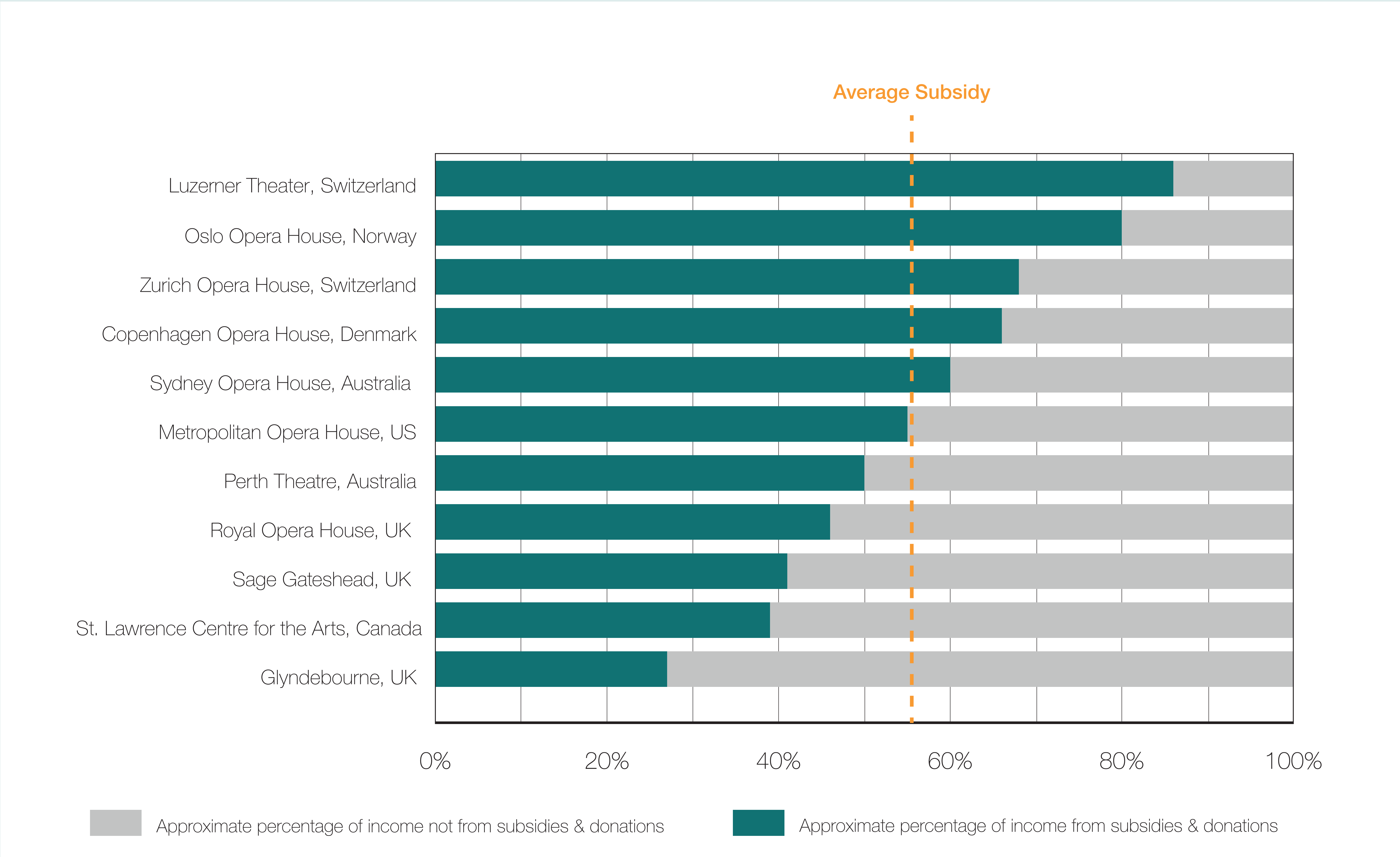


Fig 21. Benchmarking subsidy levels *(Note: Includes contributions from government, organisations or individuals in the form of grants, subsidies, donations, contributions, bequests and other types of contributions.)*

5.2 Long-Term Capital Investment Funding

Over time, performance equipment will need replacement and the building will require major improvements and repairs, which will require substantial capital investment. The capital reserve contribution will partially fund long-term capital investment, but other sources of investment may be required, depending on how much building capital expenditure is expected.

The annual SFr3.0m capital reserve contribution estimated in this study will not cover the funding required to completely replace the building in the long run, but it will set aside a substantial amount of money to contribute to future large-scale building investments and replacement of new performance equipment.

As Section 4 illustrated, the SFr3.0m capital reserve contribution is intended to cover the following:

- replacement of all existing base performance equipment at the end of its useful economic life
- creation of a pool of SFr2.3m over the next 10 years for investment in extra brand-new (not previously owned) performance equipment
- creation of a pool of SFr15.3m over the next 10 years for investment in major structural repairs and improvement in the building

A capital reserve contribution is only one of a number ways to fund capital investment expenditure. Funding could also come from other sources (such as fundraising campaigns), which could be used in addition to the capital reserve contribution or as a partial replacement for the capital reserve contribution. Other sources of funding are likely to be some form of subsidy, bequest or endowment. Examples of alternative funding sources may include donations or sponsorship by individuals or private organisations. An additional government subsidy, either through direct subsidy or through alternative paths, such as lottery grant funding may also be possible.

Alternative methods of finance, such as public-private partnerships could also be considered; however, they are less common in the performance arts industry and would likely require the generation of a consistent and substantial revenue stream in order to prove viable.

Previous benchmarking carried out by Arup on modern theatre funding mechanisms showed that all 30 benchmarked venues required some level of additional funds from governments, sponsors, donors or lottery funding to pay for capital investment projects. This highlights that funding long-term projects has been a consistently difficult area for performing arts venues and will be an important consideration for the New Theatre Lucerne.

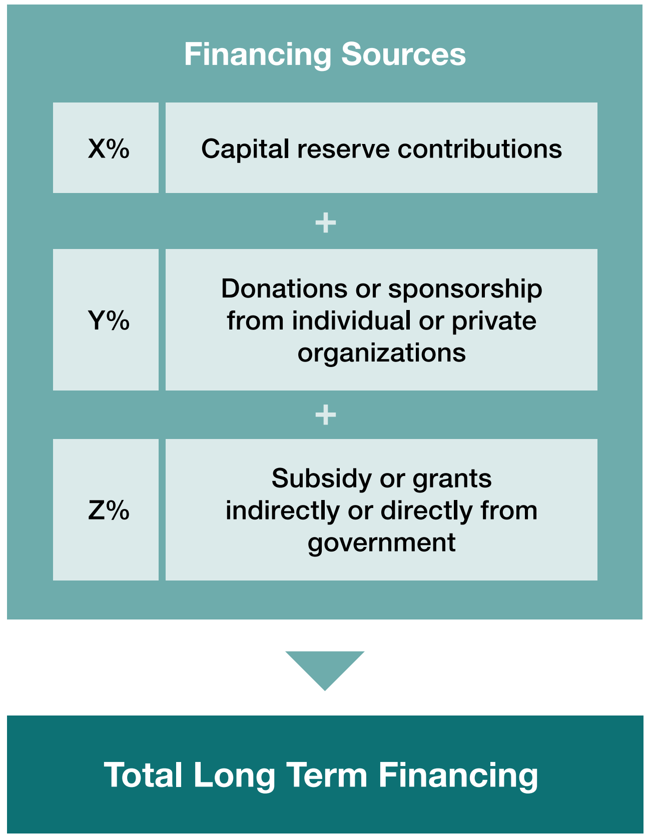


Fig 22. Options for securing long-term finance

5.3 Summary / Key Characteristics

Arup's analysis suggests that the New Theatre Lucerne will require on average SFr8.8m annually to cover the cost of operations over the first 10 years of its existence and roughly SFr3.0m per year to cover the contribution towards capital reserves. Combined, this suggests that the Facility will require on average SFr11.8m annually to cover costs. If the New Theatre were fully subsidised, this would suggest that an annual subsidy of SFr11.8m would be required; however, as indicated earlier in this section, it is unlikely that the Facility will require 100% subsidisations. Both the benchmarking results and the likelihood of positive revenue generation within the Facility support this assertion.

The forecast operating costs, and hence the level of subsidisation for the Facility, are highly dependent on the assumptions regarding quality of experience, quality of asset management and maintenance, and the proposed governance structure presented in Section 2. The level of subsidy will also be directly impacted by any positive revenue generation on-site. Hence it is difficult to provide greater detail or clarity on the level of subsidisation related to the New Theatre Lucerne beyond the figures presented herein.

For the purpose of compliance with the Concept Framework, Arup recommends that the operating model of the New Theatre Lucerne take the following key characteristics into consideration:

- a governance structure that allows the operations of the New Theatre to be ring-fenced from the artistic production of any content present within the Facility
- a long-term funding strategy which ensures the ongoing upkeep of a high-quality Facility; this may include a capital reserve contribution sufficient to cover a reasonable degree of the capital replacement costs for the building and specialised equipment (as defined in the Technical Concept)
- a minimum number and quality of (non-artistic technical and support) staff as outlined in the Strategic Business Plan and Operation Model (based on the staff roles and salary levels shown in Table 14 and Table 15)

Type of Staff	Staff numbers (FTE)	Proportion of total staff (FTE)
Permanent staff	28	57%
Casual staff	21	43%
Total staff	**49**	**100%**

Table 14. Types and minimum number of staff recommended

Role	**Average starting salary FTE** (000s SFr / annum)
COO	160
Management (excl COO)	96
All other permanent staff	79
Average casual staff rate	24 SFr/hour

Table 15. Roles and salary levels recommended (based on 2015 prices, assuming a 2024 opening date)

The minimum number and quality of staff to meet the quality requirements of the Concept Framework as shown in Table 14 and Table 15 are based on the governance model in this Strategic Business Plan. They have been determined based on assumptions in relation to four key parameters which include the following:

- hours of operation – The Strategic Business Plan assumes operation hours of 9am to a typical closing time of 11pm, 7 days per week and including public holidays.
- utilisation (days of operation) – Whilst the exact programming of the New Theatre is yet to be determined, this Strategic Business Plan requires an estimate of the utilisation to take place in order to inform the staffing structure. It is assumed that the New Theatre would be utilised 80% of the time (excluding maintenance days) in some capacity.
- the macroeconomic climate – Assumptions regarding salary levels were benchmarked against the KKL, informed by statistical data and cross-referenced with various stakeholders within the industry. These salary levels were determined based on the information within the current economic climate. Should any macroeconomic shocks occur, they could significantly influence wages, requiring a review of the salary levels assumed herein.
- size and function – Staffing levels are based on assumptions regarding venue offering (see Section 3.2), including the size of performance space, one café and bar area, a box office function etc. Should the size and function of the Venues change significantly over the course of the project, this Strategic Business Plan would require an update.

Each of these parameters drives the assumptions around quality and number of staff. Should any of them deviate greatly from that assumed within this Strategic Business Plan, the plan will require an update and the characteristics related to staff number and quality would be open for interpretation.

A variation of these key characteristics may be considered if the operation entity can propose an alternative solution that can be demonstrated to provide an equivalent level of quality of experience for artists and audience, as well as economic viability.

The next steps for subsequent business plans will be to more accurately forecast costs based on revised building designs and specifications, and to forecast potential revenue generation for the Facility.


Image: CC - TedxAmsterdam (flickr)

6 | Key Risks

The New Theatre Lucerne is currently at feasibility and site-selection stage. Understandably, estimation of the operating costs associated with the Facility at this early stage involves a large degree of uncertainty, and Section 4 reflects this sensitivity. To further highlight the risks associated with estimating the operating costs and potential subsidy level required for the Facility, Arup has identified a number of key risks which will require mitigation. Table 16 outlines the key risks which Arup has identified.

Risk	Impact/consequence	Likelihood of risk occurring	Potential size of impact	Mitigation
Organisational structure changes significantly from proposal	Significant increase or decrease in operating costs as a result of changes in staff numbers. This would affect both staff and non-staff costs.	Likely	Very Significant	Monitor and review impact on operations cost of any proposed changes to operating structure.
Hiring of key staff slower or more expensive than predicted	Risk to concept, vision and service quality if the operation isn't efficient and effective and already well managed in advance of the Facility opening date. Risk of compromised opening of the New Theatre.	Possible	Very Significant	Appoint management team in a timely manner. Continuously review impact of schedule changes on operations
Food and beverage services are not outsourced but managed with in-house resources	Increased staff numbers in terms of additional food and beverage staff would significantly impact the forecast staff costs. It would also lead to higher capital expenditure for the fit-out of the gastronomy kitchens and expose the Facility operator to increased risk. In-house food and beverage services also have the potential to offset the increased costs via increased revenue generation opportunities. The risk associated with this revenue would now be on the venue operator rather than the food and beverage contractor.	Possible	Very significant	Undertake cost-benefit analysis to determine whether the risk and costs associate with in-house operation outweigh those of outsourced operations.
Delay in Facility opening date	Increased operating costs due to delay and loss of potential revenue-generating opportunities during delay period. Delay may also trigger additional expenses such as contractual penalties which have not been accounted for in the current operational forecasts.	Possible	Significant	Appoint operational readiness consultants to ensure timely launch of Facility.
Deferred capital expenditure on performance equipment	A delay in the purchase of performance equipment may limit the quality of experience at the Facility and may lead to reputational damage, which could impact future revenue generation potential for the New Theatre.	Possible	Significant	Target fundraising for performance equipment costs.
Cost escalation	An escalation of costs above that forecast via the historic benchmarking would lead to higher-than-forecast operating costs. This would put increased pressure on revenue generation or require additional subsidy.	Possible	Significant	Regularly review and update business plan to ensure updated costs are understood. Include contingency within the strategic business plan.
Negotiation of contract with food and beverage provider is complex or delayed	Lack of appointment of a high-quality food and beverage contractor may put at risk the quality of service supplied at the Facility and attainment of the quality levels outlined in the vision and mission. Furthermore, a delay in appointment is likely to lead to increased operational and transactional costs.	Unlikely	Significant	Engage food and beverage contractors early and involve the future contractor in the decision making process.
Skilled staff shortage – lack of skilled technical or managerial staff to fill key positions	This would lead to higher-than-anticipated recruitment costs for the Facility, and should the required staff not be found in time, it may jeopardise the quality of service outlined for the New Theatre in the vision and mission.	Unlikely	Significant	Appoint skilled recruitment company and recruit all staff early.

Table 16. Key risks