

THE EXPERIENCE OF PERFORMANCE

THROUGH AN ACOUSTICAL LENS

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INTERIOR ARCHITECTURE AND DESIGN
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*“YOU CAN’T RECOVER MEMORIES
OF A MISSING EVENT”*

- BETTY HILL

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PROJECT OVERVIEW

AT SOME POINT IN OUR LIVES WE HAVE ALL EXPERIENCED A LIVE PERFORMANCE IN SOME CAPACITY, WHETHER THIS MEANS MUSICAL OR THEATRICAL. THE THING THAT WE DON'T ALWAYS NOTICE IS WHAT MADE A PERFORMANCE MEMORABLE BESIDES THE ARTISTS. THIS TENDS TO BE BECAUSE MOST PEOPLE ONLY TAKE NOTICE TO THE VISUALS OF THE INTERIOR, BUT NOT ALWAYS DO THEY NOTICE HOW THE ACOUSTICS OF THE SPACE HAVE BEEN CURATED BECAUSE THE RESULTS DO NOT TAKE ON A PHYSICAL FORM. MY THESIS WILL BE CONCENTRATED ON HOW TO CURATE AN ACOUSTICALLY FOCUSED SPACE THROUGH SOUND MANIPULATION AND MATERIALITY, WHILE WORKING IN CONJUNCTION WITH THE CONCEPT OF IMMERSIVE EXPERIENCES OF THE INTERIOR AND HOW THE BUILDING ITSELF CAN BE AN ASPECT OF THE OVERALL PERFORMANCE.

LITERATURE REVIEW

Introduction

In this literature review, I will be discussing the concepts and decisions that go into designing for the experience of performance. The way that a performance is delivered can range from musically focused to theatrical, but the important thing that all types of performance have in common is how it will be perceived and experienced by the audience. The way that sound is absorbed and reflected plays a huge role in how we connect with the performance. This can elevate the experience if done correctly or hinder it, if it is poorly designed or not fully considered through all of the facets that go into the process. I am interested in this topic because when we think about interiors, usually the visuals are the first thing that comes to mind, but in reality, there are other senses that are affected, and sound is one of the most important among them. I will discuss how the manipulation of the audio can change the experience and how it can be done, also how this reflects back on the listener. Lastly, I will show how the acoustics, interior architecture, procession, and feel of a space can all work cohesively and create a truly unique experience during a performance.

Design for Performance

When looking at a performative space, it is important to understand why people want to be at that particular location. This can be examined in more than one way, the actual event that is being held there, or how the location itself creates an experience that is something new and interesting for the inhabitants. The combination of the two is what can draw us to a location. A successful performative space that is not just aesthetically appealing but one that invites you in to stay for a while and take advantage of all that it has to offer. The patrons are there not just for the entertainment but for the experience. These ideas are expressed in Harold Proshansky's article "Place-Identity." While the article is not strictly talking about place identity in terms of performative space, the concepts carry over in a similar way through his connections of house and home and/or neighborhood and community.¹ A performative space is a place for community, and the design should reflect that in it, since it is a place where different people commune for a common interest. Also, in terms of musical/theatrical performance, there can be a strong emotional and psychological connection. Proshansky states that

¹ Proshansky, Harold M, Abbe K Fabian, and Robert Kaminoff. "Place-Identity: People, Place, and Space Reader," 1983.

“One is simply comfortable in certain kinds of physical settings, prefers particular spaces, kinds of lighting, furniture arrangements, number of people in a room for a party, number of people in an office and so on. This ‘not in awareness’ property of place-identity insofar as its content and influence are concerned is an important significant feature of its role in shaping the behavior and experience of the person in given physical settings.”²

The way that a space is designed for a performance should not just be considered from the performer’s perspective but from the community that is sharing the location. This is important because the essence of a live performance, a lot of the time, can be intimate, and to not fully acknowledge and embrace that would be in poor design.

Experience of Performance

After looking at what it is that makes for good design in a performative space, the next thing that we see develop from that is the actual results of how people interact within it. These ideals are looked at on a more real life approach in the article by computer scientist and researcher, Ekin Gedik, PhD. In his article, the statistics and responses of the community in a performative space are analyzed and charted in real-time by using wristband technology. The study was conducted as follows,

“Each audience member wore a single tri-axial accelerometer and proximity sensor embedded inside a smart sensor pack. Using these sensor data, we developed a novel approach to predict audience members’ self-reported experience of the performances in terms of enjoyment, immersion, willingness to recommend the event to others, and change in mood. The proposed method uses an unsupervised method to identify informative intervals of the event, using the linkage of the audience members’ bodily movements, and uses data from these intervals only to estimate the audience members’ experience. We also analyze how the relative location of members of the audience can affect their experience and present an

² Proshansky, Harold M, Abbe K Fabian, and Robert Kaminoff. “Place-Identity: People, Place, and Space Reader,” 1983.

automatic way of recovering neighborhood information based on proximity sensors. We further show that the linkage of the audience members' bodily movements is informative of memorable moments which were later reported by the audience."³

This approach is important to understand how exactly people experience a performance. It is not just their opinions or immediate reactions after leaving a show, he was gathering information on their experience in real-time based on location. With many different pieces of research being received from this, we can actually see very quickly what was working in the performance space he was analyzing and what was not. With the location aspect of the wristbands, it can also be analyzed where areas of interest are in an interior space and why exactly people are drawn to a certain thing.

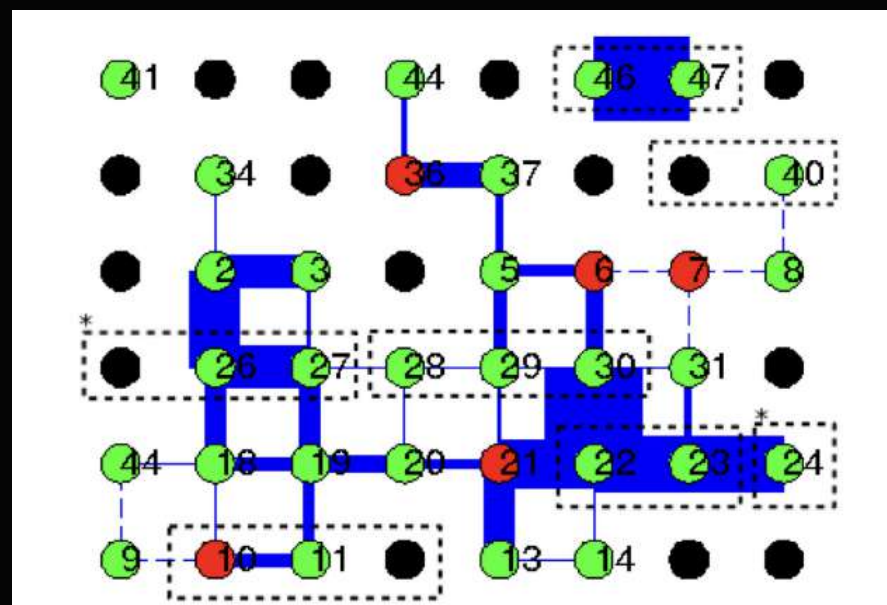


Figure 1.

Figure 1 came from Gedik's study where the interior was mapped. Based on where individuals were sitting, Gedik assigned each individual a color, and was able to infer who enjoyed the performance versus who did not based on where they were seated in the venue.⁴ Other research gathered shows where people did not sit and also the flow of pathways that most people took inside the venue. In respect to interior architecture and design this is an extremely helpful tool.

³ Gedik, Ekin, Laura Cabrera-Quiros, Claudio Martella, Gwenn Englebienne, and Hayley Hung. "Towards Analyzing and Predicting the Experience of Live Performances with Wearable Sensing."

⁴ Gedik, Ekin, Laura Cabrera-Quiros, Claudio Martella, Gwenn Englebienne, and Hayley Hung. "Towards Analyzing and Predicting the Experience of Live Performances with Wearable Sensing."

Manipulation of Sound

Sound manipulation is one of the most important parts of this thesis project. As stated earlier, sound in an enclosed space can transform the overall experience. This can be done by containing the sound or reflecting it in certain ways that allows for different exposure depending on location. That, in combination with materiality, can make a huge difference in how the audio moves. In a study performed and recorded in an article by Yifan Zhu, an acoustical researcher, an approach to analyze these happenings was conducted. Zhu used the principles of origami-shaped structures to see how sound is transmitted through different arrangements on a small scale, by using reconfigurable metamaterials.⁵ Metamaterials are synthetic composite materials with a structure such that it exhibits properties that are not usually found in natural materials. Figure 2 provides a look at how they constructed these origami metamaterials and how they situated them for the investigation.

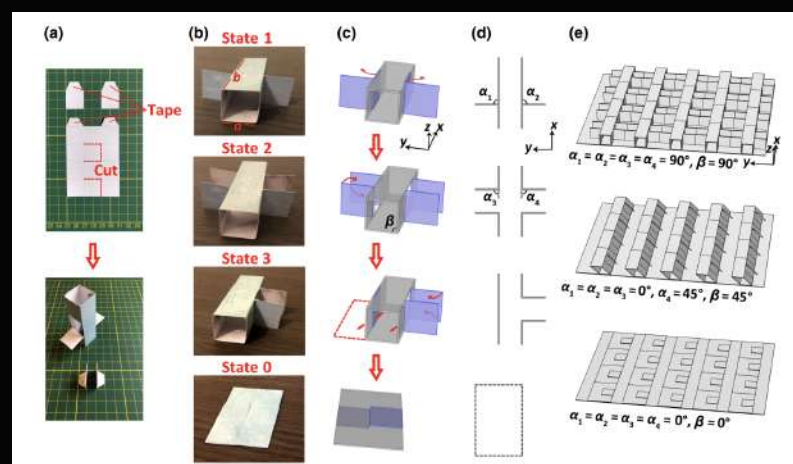


Figure 2.

With this investigation we can see on a small scale how to better interact with audio. From the research the goal was to find different solutions of noise control and sound field control.⁶ It was successful in that it gave perspective to different ways to incorporate this technique; Zhu states,

⁵ Zhu, Yifan, Fan Fei, Shiwang Fan, Liyun Cao, Krupali Donda, and Badreddine Assouar. "Reconfigurable Origami-Inspired Metamaterials for Controllable Sound Manipulation."

⁶ Zhu, Yifan, Fan Fei, Shiwang Fan, Liyun Cao, Krupali Donda, and Badreddine Assouar. "Reconfigurable Origami-Inspired Metamaterials for Controllable Sound Manipulation."

“various tailored functionalities, including acoustic focusing, beam splitting, localization, and one-way transmission. In each design, we use combinations of different states of tunable origami-based unit cells to demonstrate numerically and experimentally specific functionalities. We explore the sound wave manipulation ability of origami-inspired metamaterials, presenting a simple configuration, tunable structure, multifunctionality, and a lightweight.”⁷

Using a material for structural purposes that can actually be “tuned” is a very intriguing proposition. Expanding the meaning of immersive to include how the actual space can be incorporated, opens up possibilities of how environment, including the sound that is originating from the space can contribute to the performers as well as audience experience.⁸

Acoustical Experience and How Sound Is Perceived

We have all been in different spaces that give a special experience that is catered to sound. This can be how it uses reflectivity or absorption to make the person feel more immersed in a space. These can range from your typical music venues or on a more vast scale of an old cathedral. We can also look at it from the perspective of a small contained space that does not allow for much acoustical resonance. Behind these different settings there was consideration for the senses past sight. In a study by Alan Brown and Jennifer Novak questions about the fundamental impact of live performance were investigated. From the research gathered, which was a series of questionnaires given to people attending live events before and after the start of the event, several outcomes were formed.⁹ It was noted that it is not always just the space that can reflect how well the experience was for the venue goers but that it goes beyond that and that sometimes it changes how the “sound” or performance is perceived by the crowd.¹⁰ They broke down the analysis into three separate categories,

⁷ Zhu, Yifan, Fan Fei, Shiwang Fan, Liyun Cao, Krupali Donda, and Badreddine Assouar. “Reconfigurable Origami-Inspired Metamaterials for Controllable Sound Manipulation.”

⁸ Zhu, Yifan, Fan Fei, Shiwang Fan, Liyun Cao, Krupali Donda, and Badreddine Assouar. “Reconfigurable Origami-Inspired Metamaterials for Controllable Sound Manipulation.”

⁹ Brown, Alan S, and Jennifer L Novak. “Assessing the Intrinsic Impacts of a Live Performance.” *Wolf Brown*, January 2007.

¹⁰ Brown, Alan S, and Jennifer L Novak. “Assessing the Intrinsic Impacts of a Live Performance.” *Wolf Brown*, January 2007.

“The intrinsic impacts derived from attending a live performance can be measured, that different types of performances create different sets of impacts, and that an audience member’s ‘readiness-to-receive’ the art affects the impacts received. The study develops a simple measurement tool to assess impact, provides an analytical framework for considering the results, and suggests how performing arts presenters might begin to use this information to select programs that create specific benefits for their constituents.”¹¹

This study opens up the possibility of other facets of performance. Specifically, the audio can overshadow more traditional aspects, such as visuals.¹²

Performance Precedents

An interior space that is a unique location, that has considered a lot of the ideas mentioned in this paper so far, such as interior immersion that is received by the audience not just through acoustically focused design, is Sleep No More. It is an immersive theatrical experience in New York City. It takes place in an entire building. You progress through the rooms and floors, which cater to a different environmental experience for a specific performative aspect. And although, the performance piece does not focus on acoustics, the ideals behind multiple intimate spaces presenting different, and fully immersive environments, is a large connecting narrative of my thesis. The space allows people to freely move from room to room and be immersed in a very specifically designed space. (See figure 3.)

¹¹ Brown, Alan S, and Jennifer L Novak. “Assessing the Intrinsic Impacts of a Live Performance.” *Wolf Brown*, January 2007.

¹² Brown, Alan S, and Jennifer L Novak. “Assessing the Intrinsic Impacts of a Live Performance.” *Wolf Brown*, January 2007.



Figure 3

Conclusion:

There are many aspects that go into designing an acoustical interior space that can deliver a successful and immersive performance. The main things that came to light from the literature is that, what is guiding the experience is it is not just the sound and materiality, but how people receive the information. From the study with the sensing wrist bracelets, it is apparent that people are particular about how they enjoy a space. That, in turn, will yield whether they have a “good experience or bad.” This means that the performance was enjoyable from an auditorial experience but also how they felt in the physical space. This is also reflected in how comfortable a person may feel in the space as well. It is through those aspects, and the actual acoustical performance of the space, that will work in conjunction with each other and be a successful environment for performance.

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PRECEDENT STUDY

WALT DISNEY CONCERT HALL



PRECEDENT STUDY

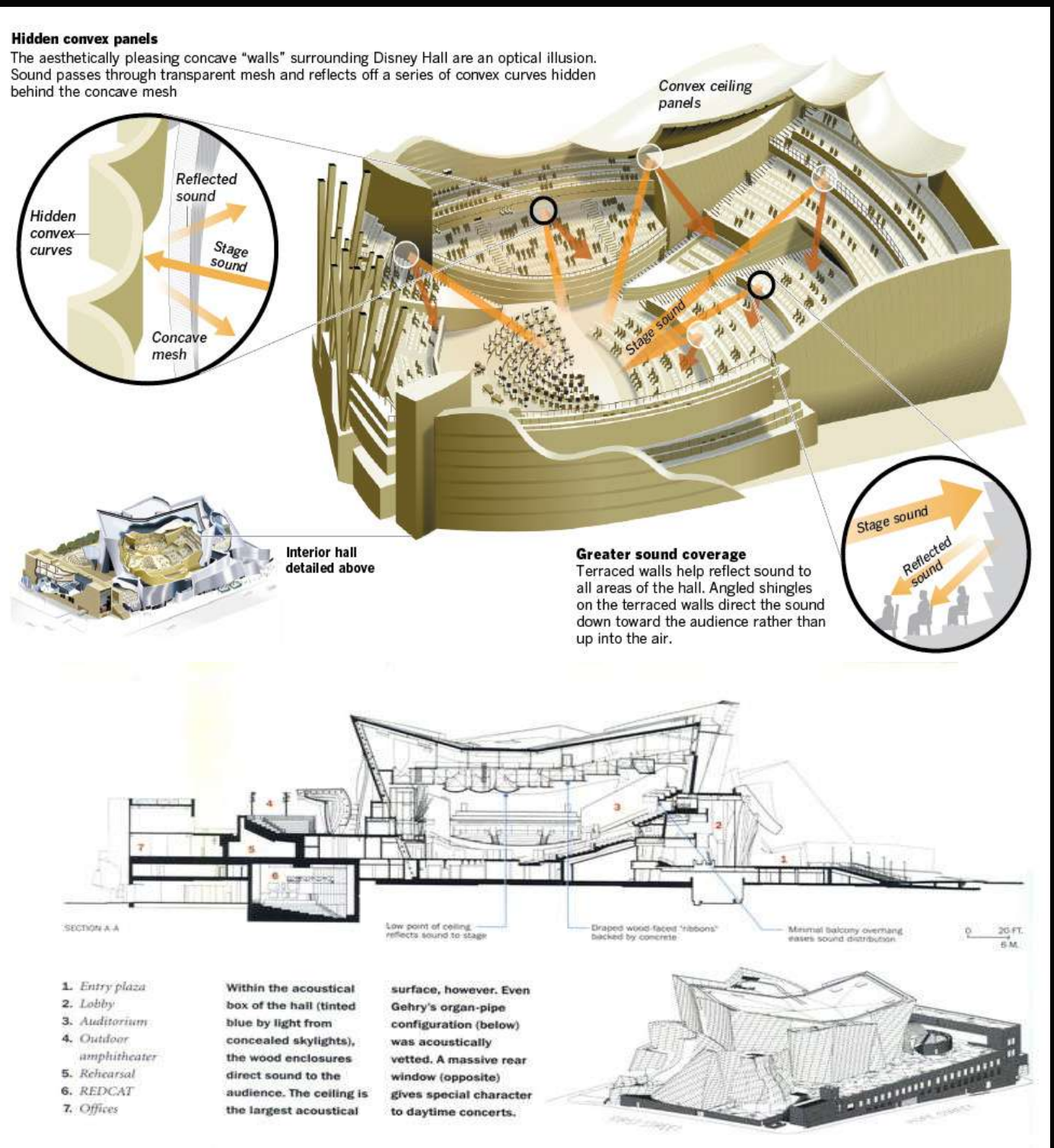
WALT DISNEY CONCERT HALL

ACOUSTICAL DETAILS:

- DESIGNED WITH THE MINDSET THAT THE CONCERT HALL IS AN EXTENSION OF THE MUSICIAN'S INSTRUMENT
- PERFORMED ACOUSTIC TESTS ON A 1/10TH SCALE MODEL
- "EVERYTHING HAD TO BE REDUCED BY THE SAME AMOUNT...THE FREQUENCY OF SOUND BE INCREASED TENFOLD TO REDUCE THE WAVELENGTH TO A TENTH OF NORMAL, AND THE MODEL WAS FILLED WITH NITROGEN TO EXPEL THE OXYGEN AND WATER VAPOR THAT ABSORB HIGH-FREQUENCY SOUNDS."
- SOUND HAD TO BE CONSIDERED THROUGH THE 6,134 PIPE ORGAN THAT SITS BEHIND THE STAGE.

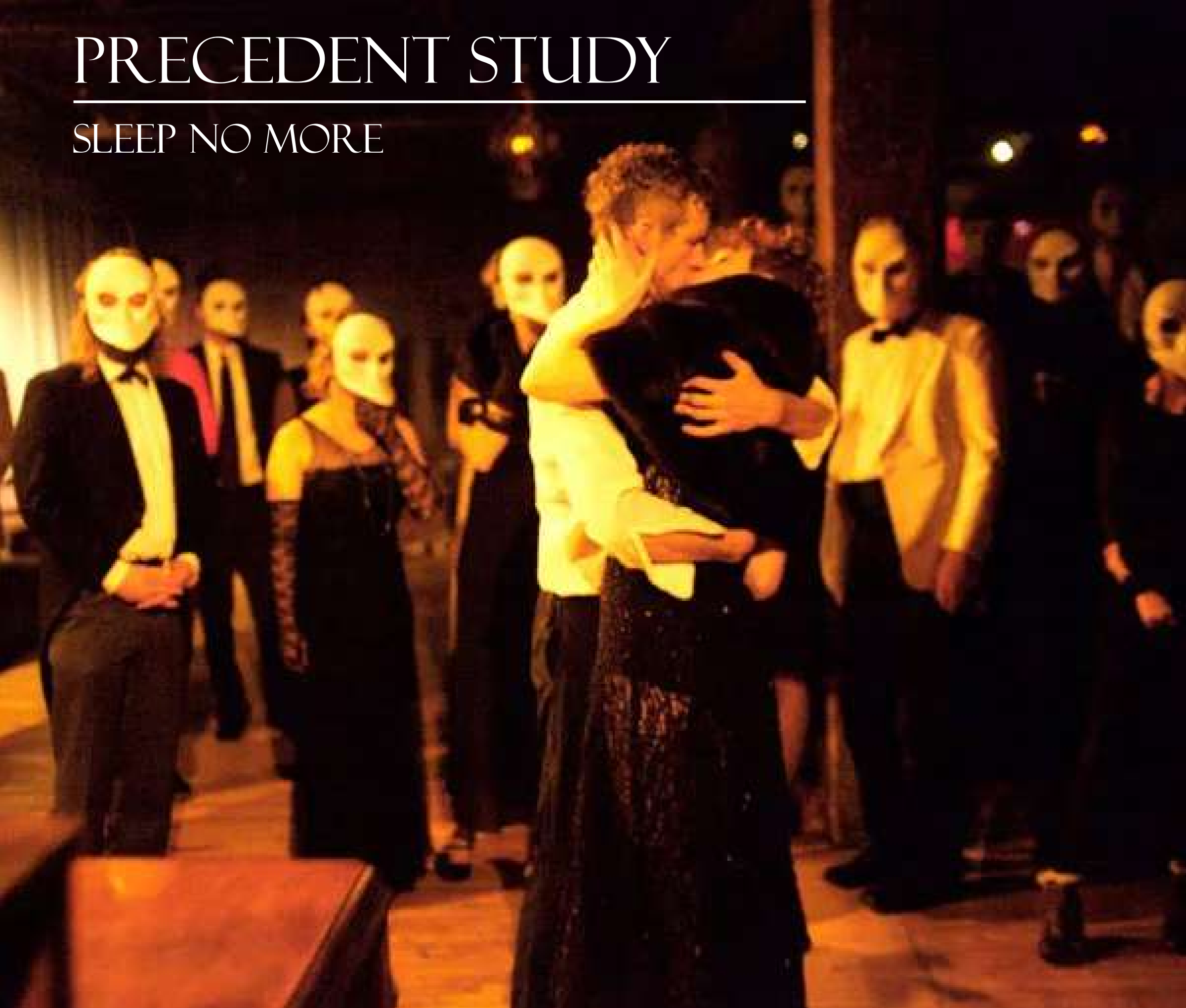
SOUND TESTING:

- WITH THE SPECIALLY DESIGNED ORGAN THAT WAS PLACED IN THE CONCERT HALL, IT COULD NOT BE PLACED INTO THE SPACE TILL AFTER THE OPENING OF THE HALL
- TESTING THE TUNING OF EACH KEY TOOK AT LEAST 30 MINUTES BECAUSE THEY NEEDED TO HEAR ITS EXPERIENTIAL SOUND FROM DIFFERENT SEATS IN THE HALL



PRECEDENT STUDY

SLEEP NO MORE



PRECEDENT STUDY

SLEEP NO MORE

INTERIOR PLAN:

- LOCATED IN NEW YORK CITY, SLEEP NO MORE IS AN IMMERSIVE EXPERIENCE THAT BRINGS INTIMATE SPACE INTO A THEATRICAL EXPERIENCE
- THE SPACE CONSISTS OF A SERIES OF ROOMS THAT ALLOWS FOR THE AUDIENCE TO MOVE AROUND FREELY FROM ROOM TO ROOM, EACH WITH THEIR OWN IDENTITY
- THIS FREE FLOWING DESIGN ENCOURAGES THE PARTICIPANTS TO CHOOSE THEIR OWN PATH AND COME ACROSS A NEW SPACE WITH A NEW THEATRICAL PERFORMANCE
- SLEEP NO MORE IS KNOWN FOR ITS OFF BEAT SHAKESPEARIAN PRESENTATION BUT IT ALSO HAS MUSICIANS THAT PLAY AND CURATE A PERSONAL SHOW FOR YOU IN YOUR VISIT
- IN CONTRAST TO THE WALT DISNEY CONCERT HALL, THESE INTERIORS MORE FOCUS ON THE CONNECTION OF PERSON AND PLACE RATHER THAN ACOUSTICS, BUT WHAT CAN BE ACHIEVED WHEN WE BLEND THESE TWO IDEALS IS WHERE THE INTEREST LIES



PRECEDENT STUDY

MATERIAL INVESTIGATION

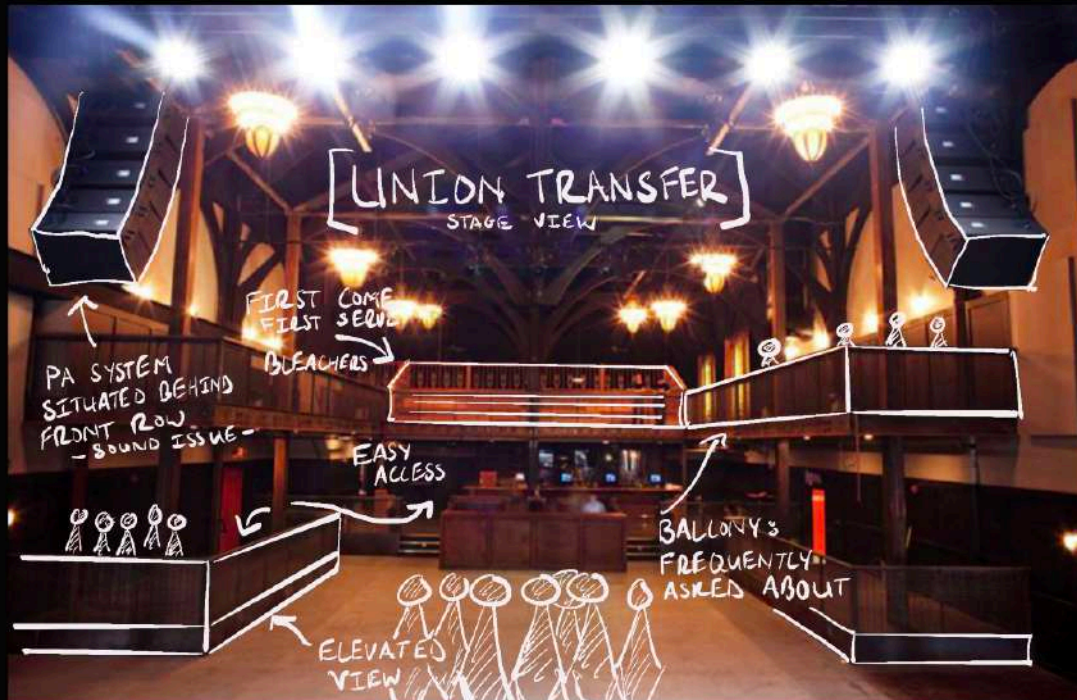




CASE STUDIES

[UNION TRANSFER] CASE STUDY

- The building was repurposed multiple times but it was most notably the UT Baggage Express CO. Storing bags for the railway companies
- Today it is a music venue that has a unique interior as it has kept the original architecture from its previous use
- One notable takeaway from the venue is how the acoustics work in the space; they are not optimal for all guests simultaneously
- Experiences vary depending on orientation to the stage and speaker system



[SLEEP NO MORE]

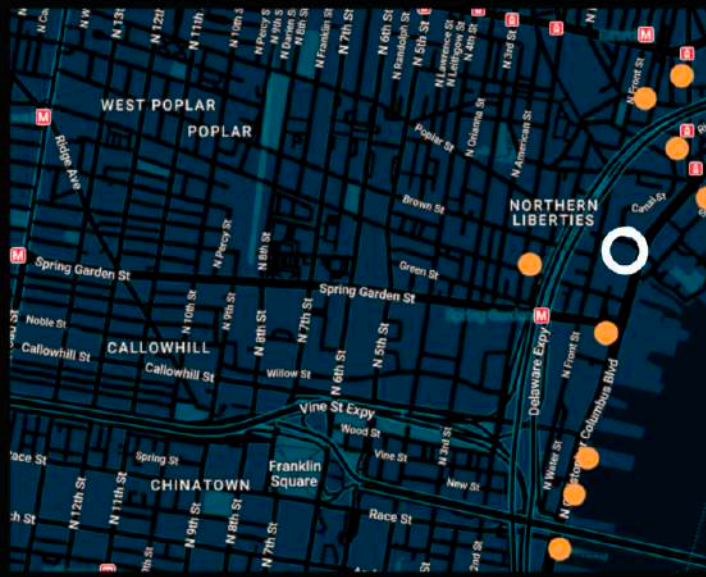
CASE STUDY

- Everyone puts on a mask to keep anonymity (creates an experience and show distinction between performers and “guests”)
- You are encouraged to get lost in the building on your own, even if with other people
- Free roaming is the path: five floors meticulously designed with detail to create an immersive “open” stage
- In each room there are performers that dance and act with each other, never saying any words but their actions speak louder
- It’s impossible to see everything, but that is part of the experience



PROGRAMMING

[SITE - 1 BROWN STREET, PHILADELPHIA PA]



[SITE BENEFITS]

The site is adjacent to Delaware Ave which runs along the Delaware River. It sits near the border between Pennsylvania and New Jersey and next to the Benjamin Franklin Bridge.

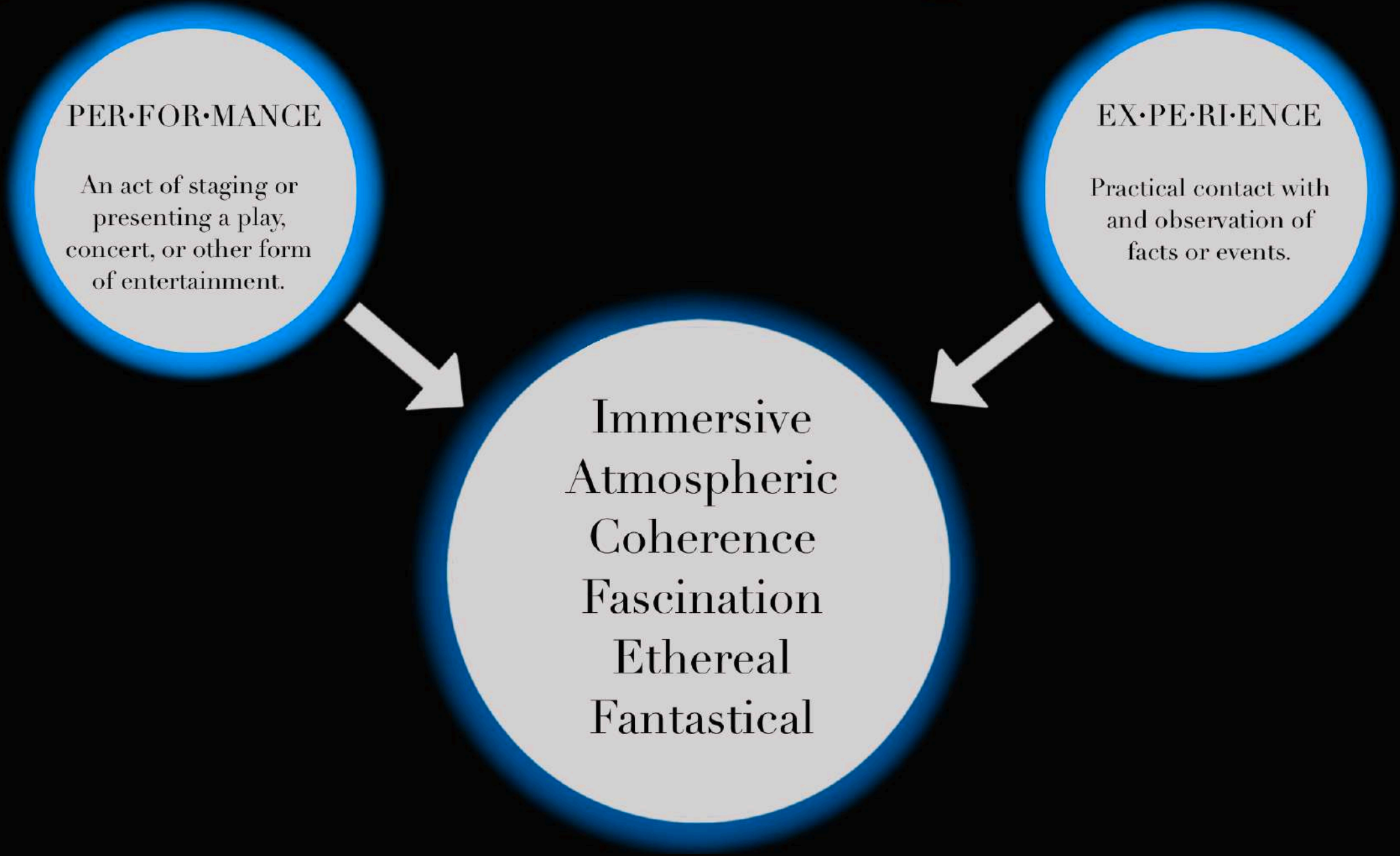
Public transport to the site is available by the Market-Frankford Line which stops at Spring Garden Station and Girard Station, both of which are five Minutes away from the site.

The site sits on the road between North and South Philadelphia, where the sport complexes and other venues reside. Some to mention are:

- The Filmore
- Barcade
- Rivers Casino
- Dave and Buster's
- Cherry Street Pier
- Morgan's Pier
- Penn's Landing



[DEFINING PERFORMANCE & EXPERIENCE]



ORIENTATION

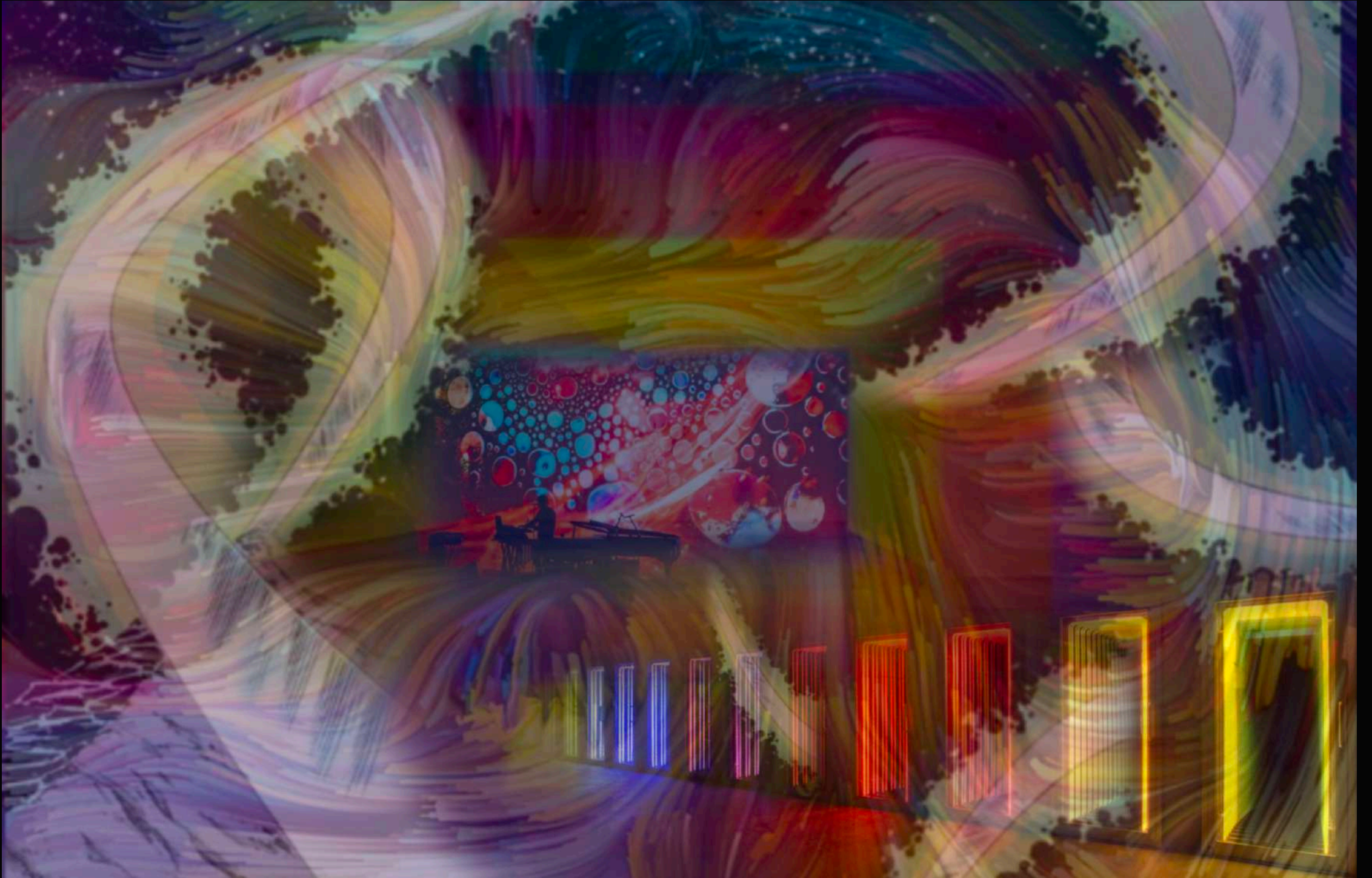
AQUASONICS

ABSORBANCE

METAMATERIAL

ACOUSTICAL
MANIPULATION

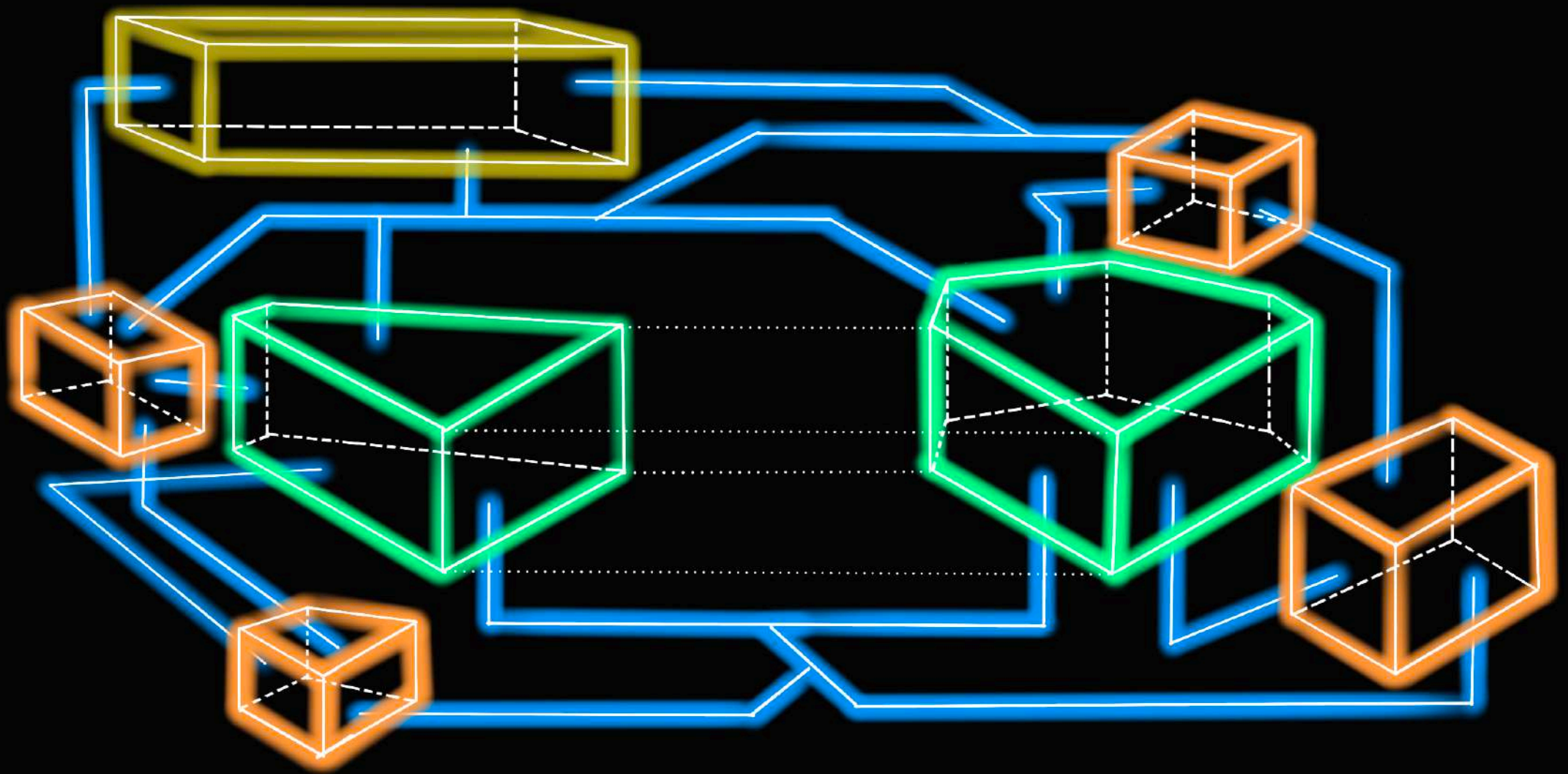
REFLECTANCE



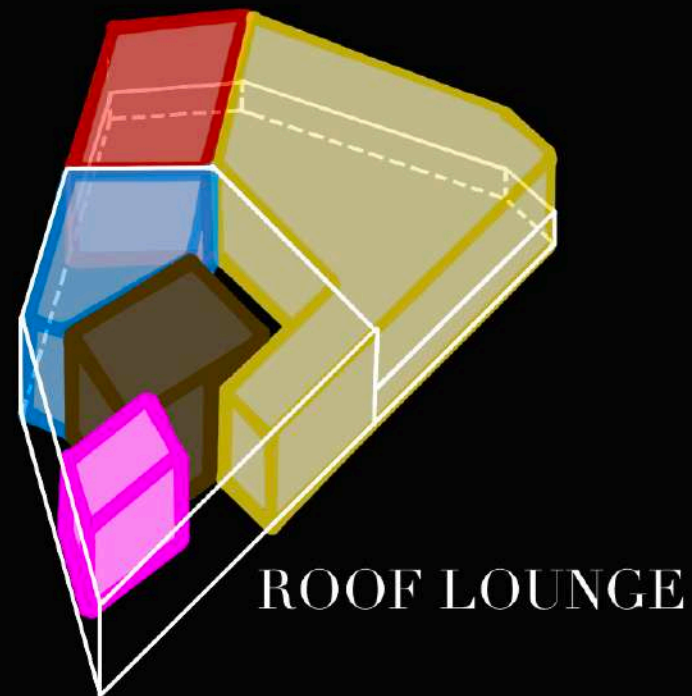
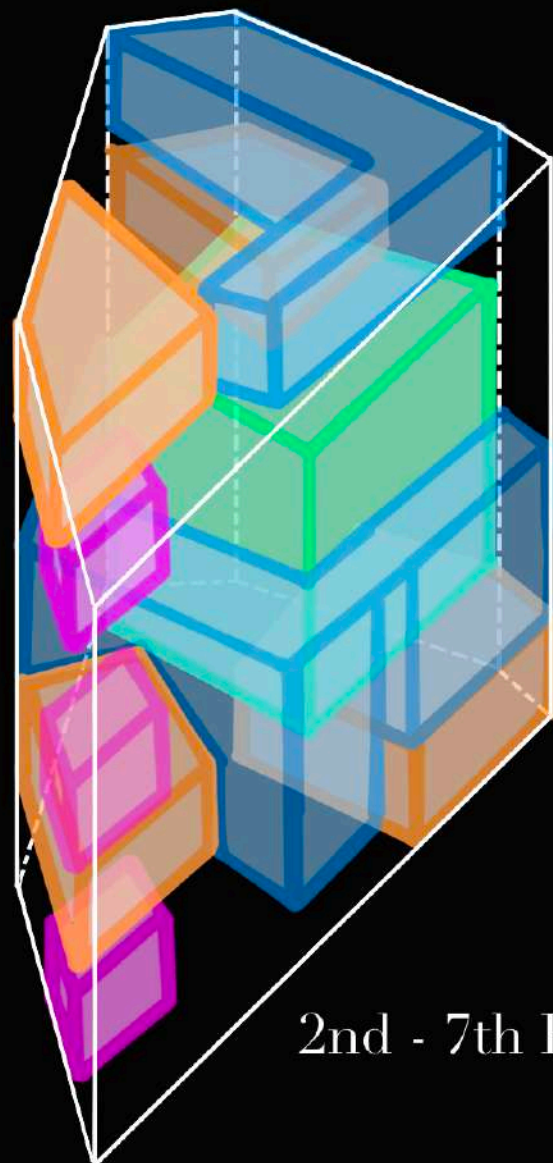
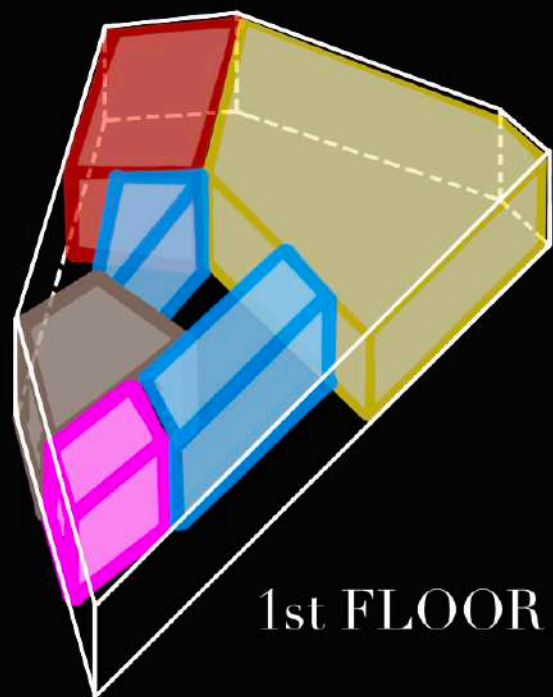
[PASSAGE TO PERFORMANCE]



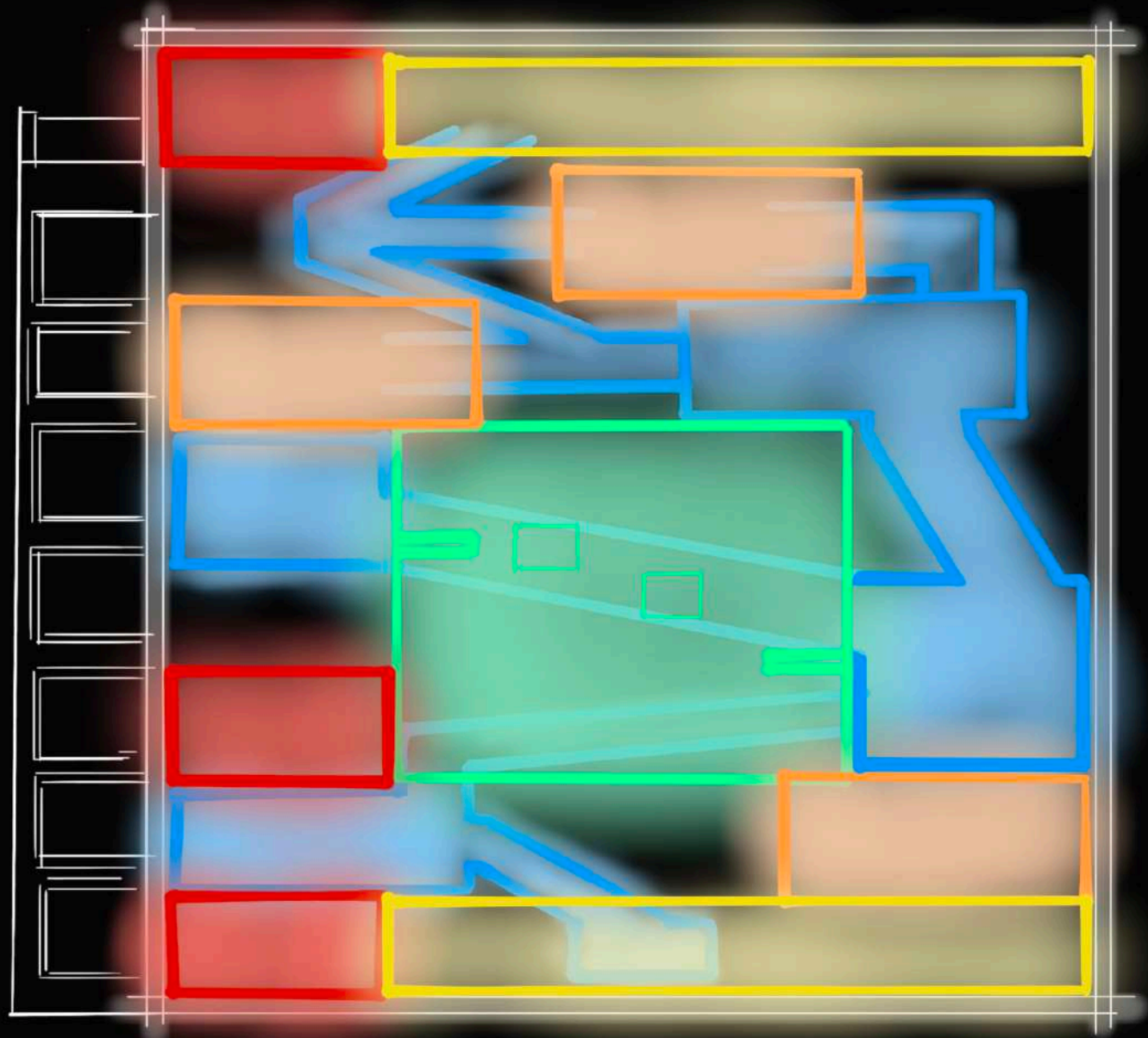
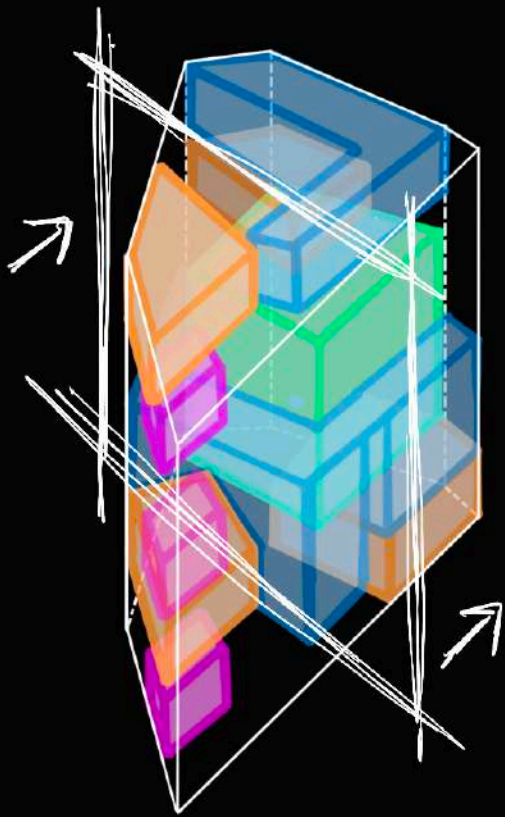
[PROGRAM DIAGRAM]



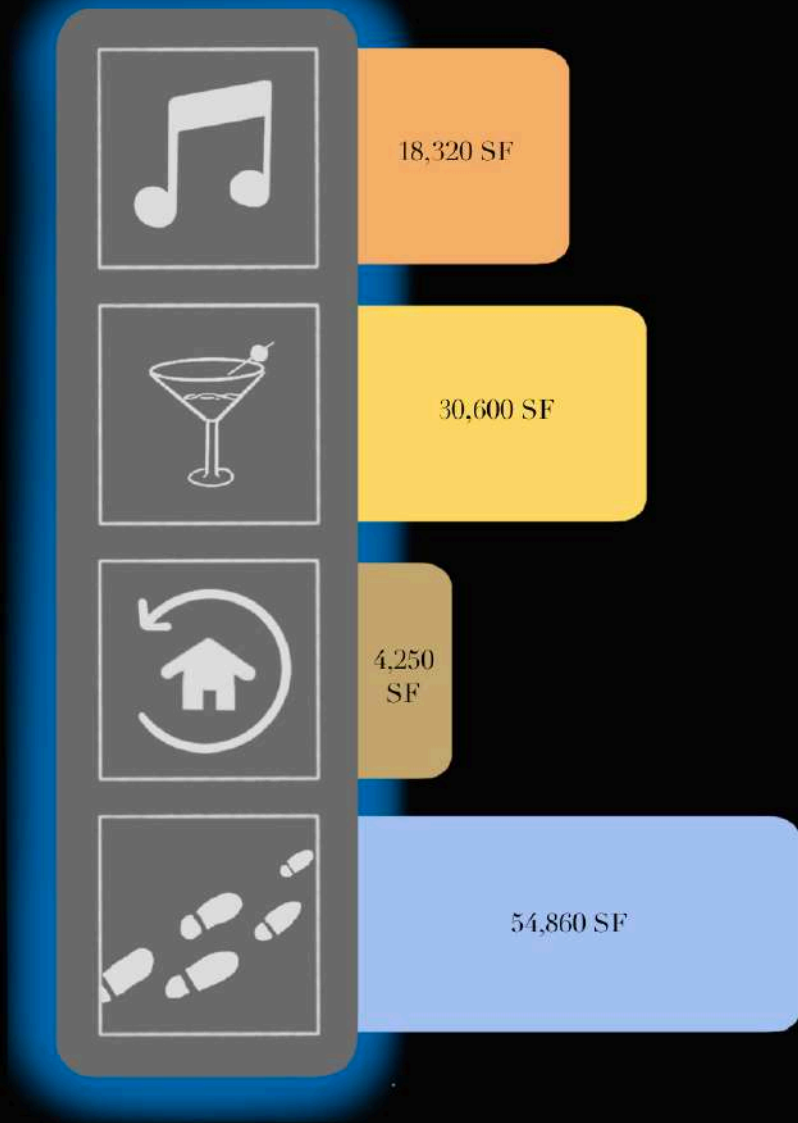
[ISOMETRIC BUILDING MASSING]



[SECTION SKETCH]



[PROGRAM]

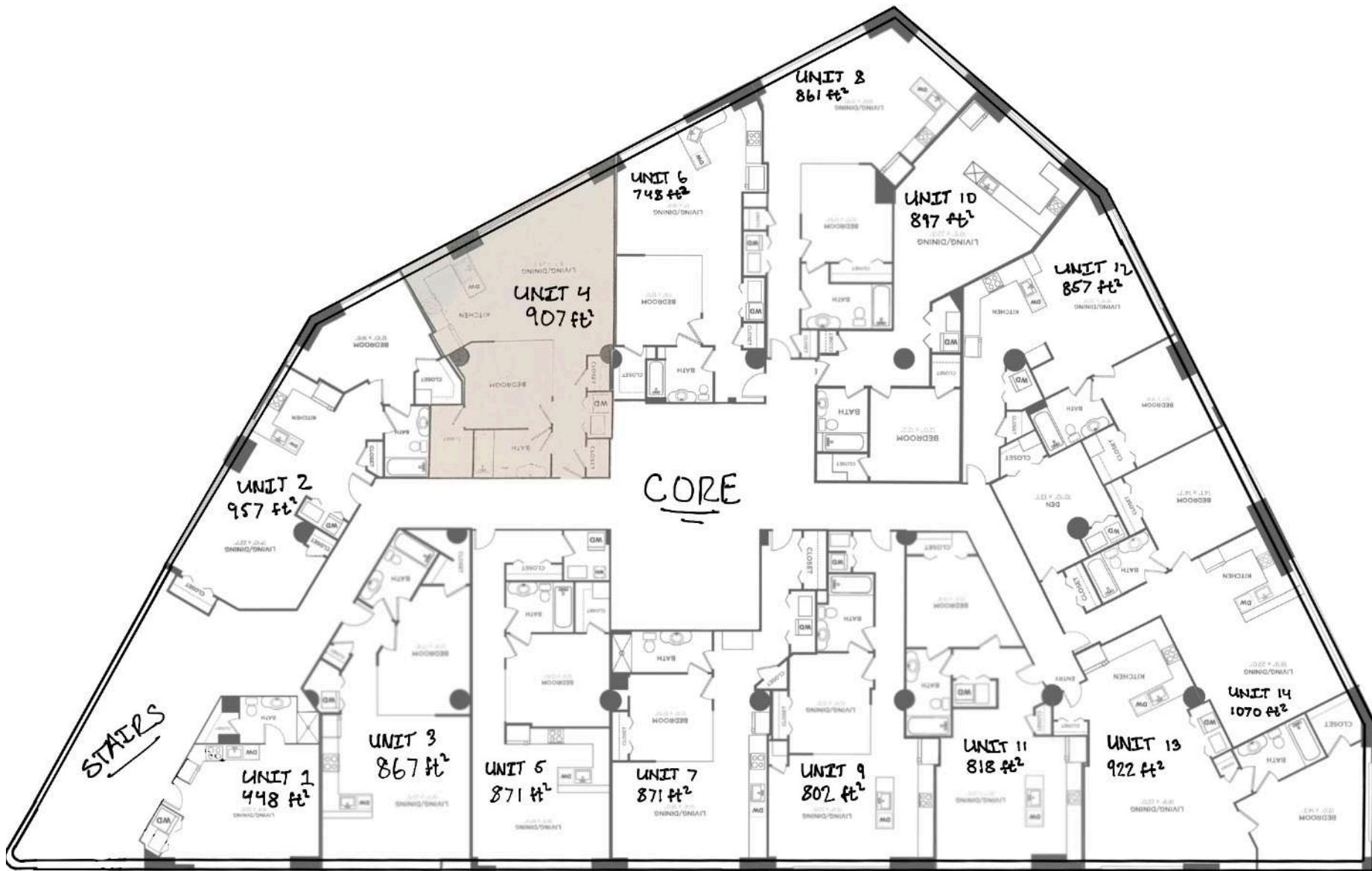


Performance Spaces	
Main Performance Stage	800
Main P.S. Audience Space	1,600
First Performance Stage	500
First P.S. Audience Space	1,000
Second Performance Stage	250
Second P.S. Audience Space	500
Third Performance Stage	600
Third P.S. Audience Space	1,200
Fourth Performance Stage	400
Fourth P.S. Audience Space	800
Mezzanine	400
Green Rooms	4,000
Side Stages	1,550
Back Stages	1,100
Dressing Rooms	720
Fly Loft	400
IT Rooms	500
Electrical Rooms	500
Mechanical Rooms	1,000
Sound Engineer Booth	500

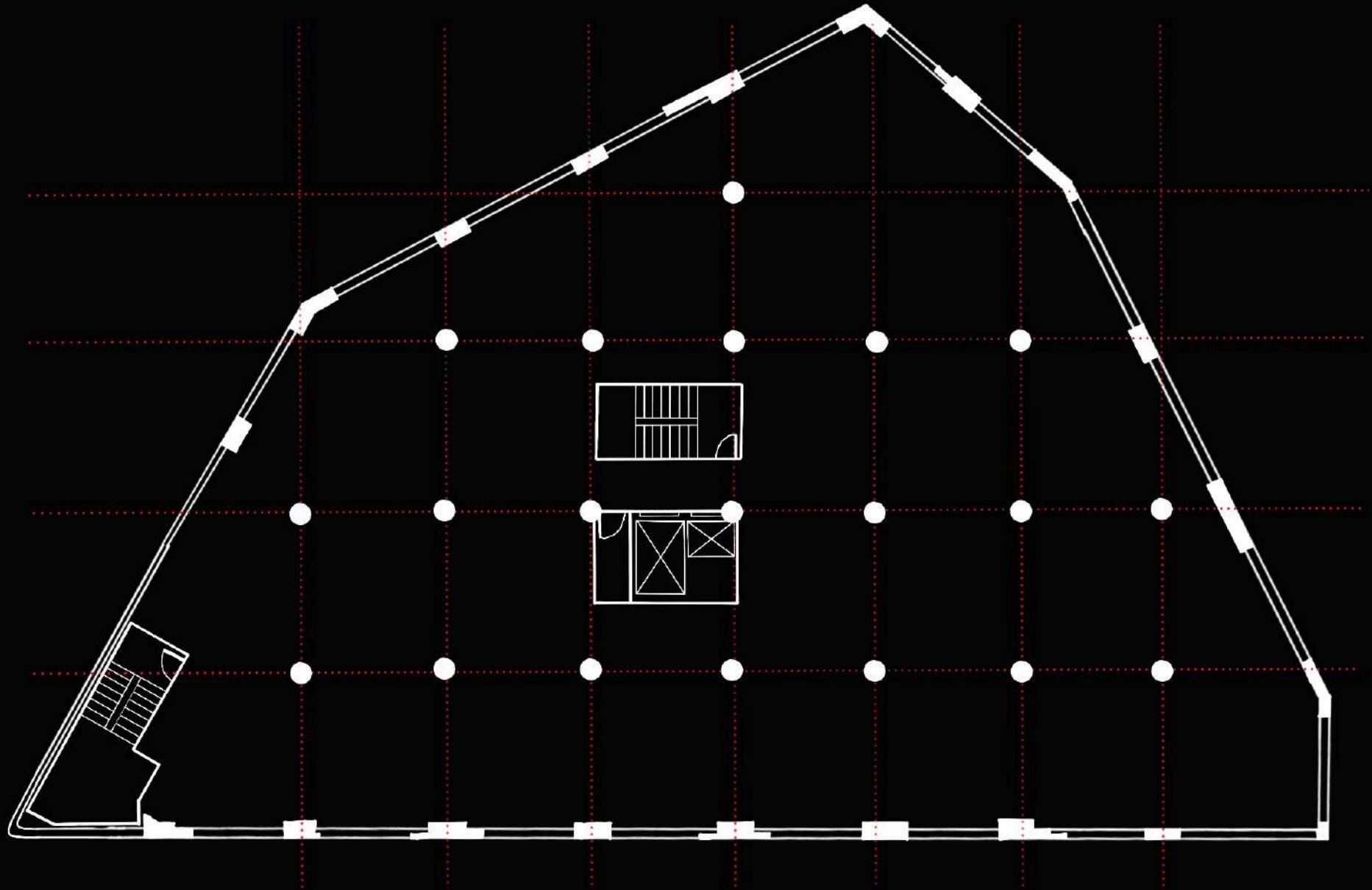
Amenities	
Entrance Lounge	5,000
Bars	3,500
W.C.	3,500
Kitchen	1,600
Lounges	8,000
Merchandise Selling	1,000
Rooftop Lounge	8,000

Back of House	
Employee Lounge	600
Employee Lockers	600
Offices	600
Storage	1,000
Maintenance Spaces	1,000
Loading Dock	450

Circulation	
Circulation Pathway	54,860



[STRUCTURAL PLAN]



FINAL DESIGN

WHEN DESIGNING THE BUILDING I WAS TRYING TO CREATE AN EXPERIENCE THAT WAS UNIQUE AND INTRIGUING TO EVERY VISITOR NO MATTER WHERE THEY WERE IN THE SPACE. THE FIRST PROMINENT FEATURE OF THE BUILDING IS THE EXTERNAL SHELL. IT IS MEANT TO ACT AS A BEACON TO START THE JOURNEY AND PULL PEOPLE INTO THE SPACE.

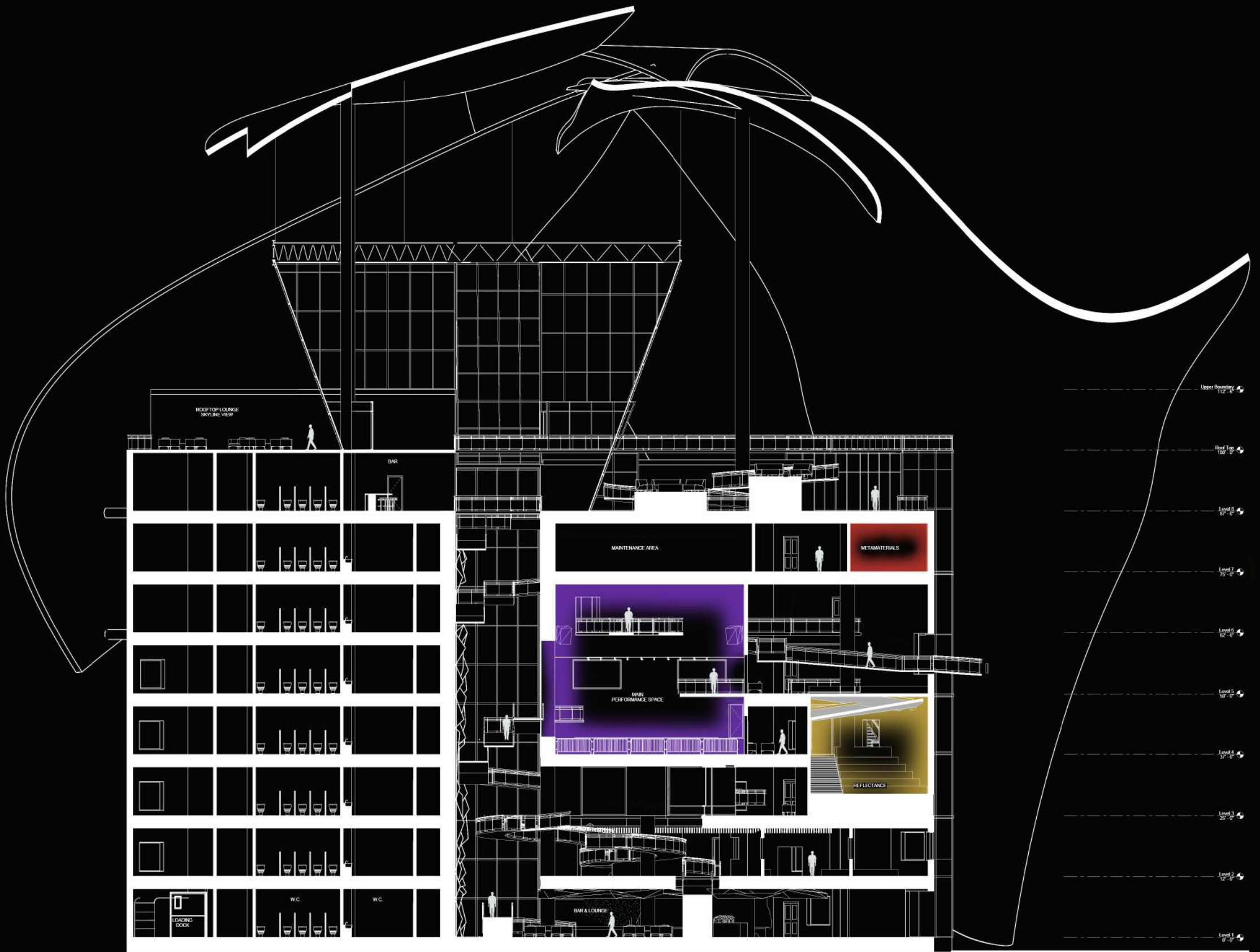
THERE ARE FIVE DIFFERENT PERFORMANCE SPACES INSIDE THE BUILDING EACH CATERING TO A DIFFERENT TYPE OF ACOUSTICAL MANIPULATION. WHEN PEOPLE ENTER THE SPACE THEY ARE GREETED WITH AN OPEN FLOOR THAT GUIDES THEM INTO A LOUNGE, FROM HERE THE JOURNEY BEGINS. THERE IS A RAMP SYSTEM THAT IS USED FOR CIRCULATION THROUGHOUT THE BUILDING (ALL OF WHICH IS TO ADA CODE). THE PURPOSE OF THIS IS TO HAVE THE VISITORS BECOME A PART OF THE PERFORMANCE SINCE THE BUILDING IS DESIGNED TO PERFORM FOR THE VISITORS AS WELL. AS THEY TRAVEL VERTICALLY THROUGH THE SPACE IT IS NOTICED THAT THE CENTRAL ATRIUM THAT CUTS THE BUILDING IN HALF ACTS AS A WAYFINDING TECHNIQUE. VISITORS WILL START TO APPRECIATE THE LITTLE WINDOWS OF VIEWING THEY GET INTO THE UPCOMING PERFORMANCE SPACES AS THEY TRAVEL. THE PURPOSE OF ALL OF THIS IS TO CREATE CONSTANT INTRIGUE AND THEREFORE PUSHING CIRCULATION THROUGH THE ENTIRE BUILDING. THIS COUPLED WITH DIFFERENT PERFORMANCE SPACES PLAYING IN SCATTERED TIME SLOTS ALSO ENTICES MOVEMENT.

ONCE FINALLY GETTING TO THE TOP OF THE BUILDING THE VISITOR IS REWARDED WITH THE VISTAS ON THE ROOFTOP OF THE BENJAMIN FRANKLIN BRIDGE AND THE SKYLINE OF PHILADELPHIA.

THE RONDURE

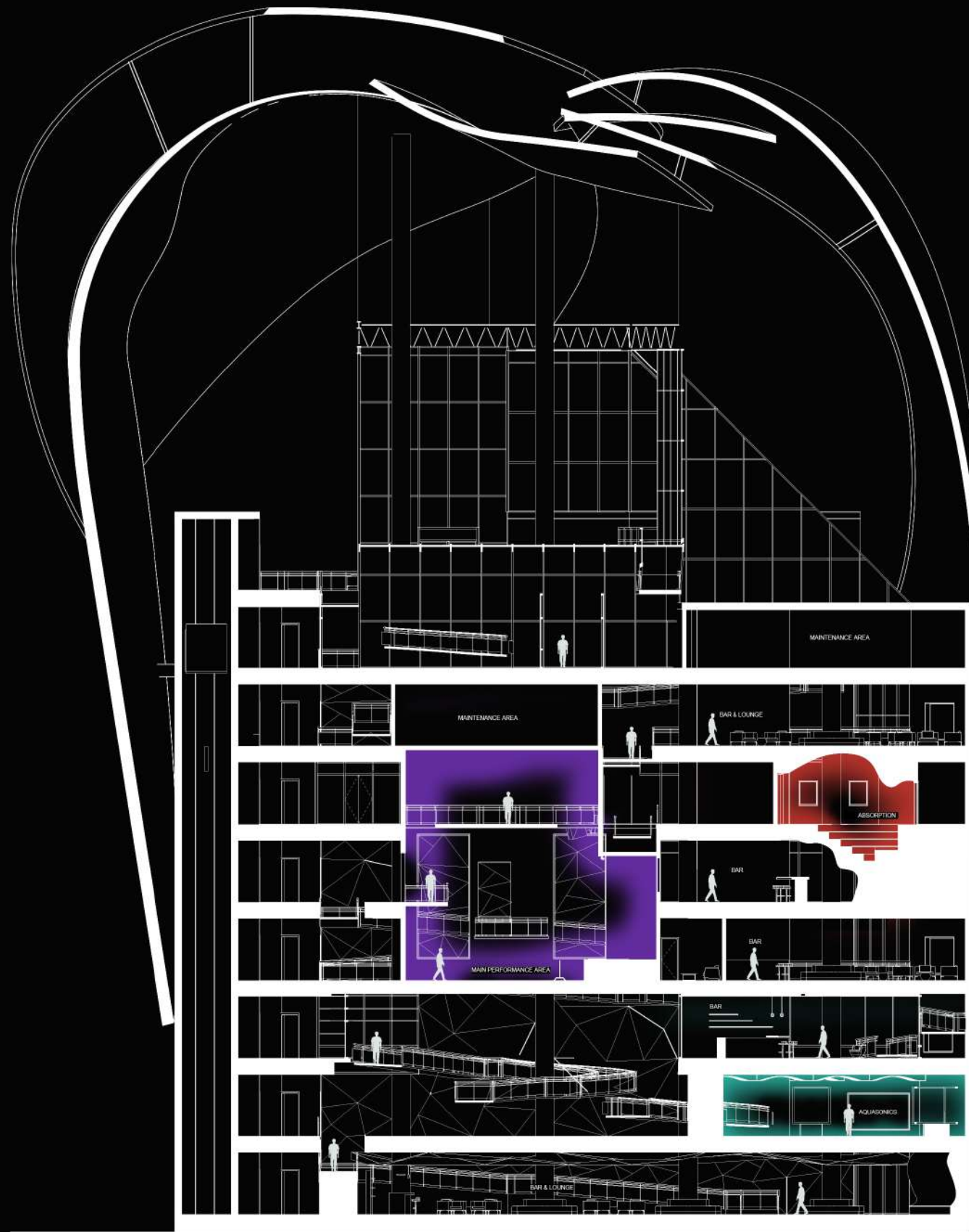






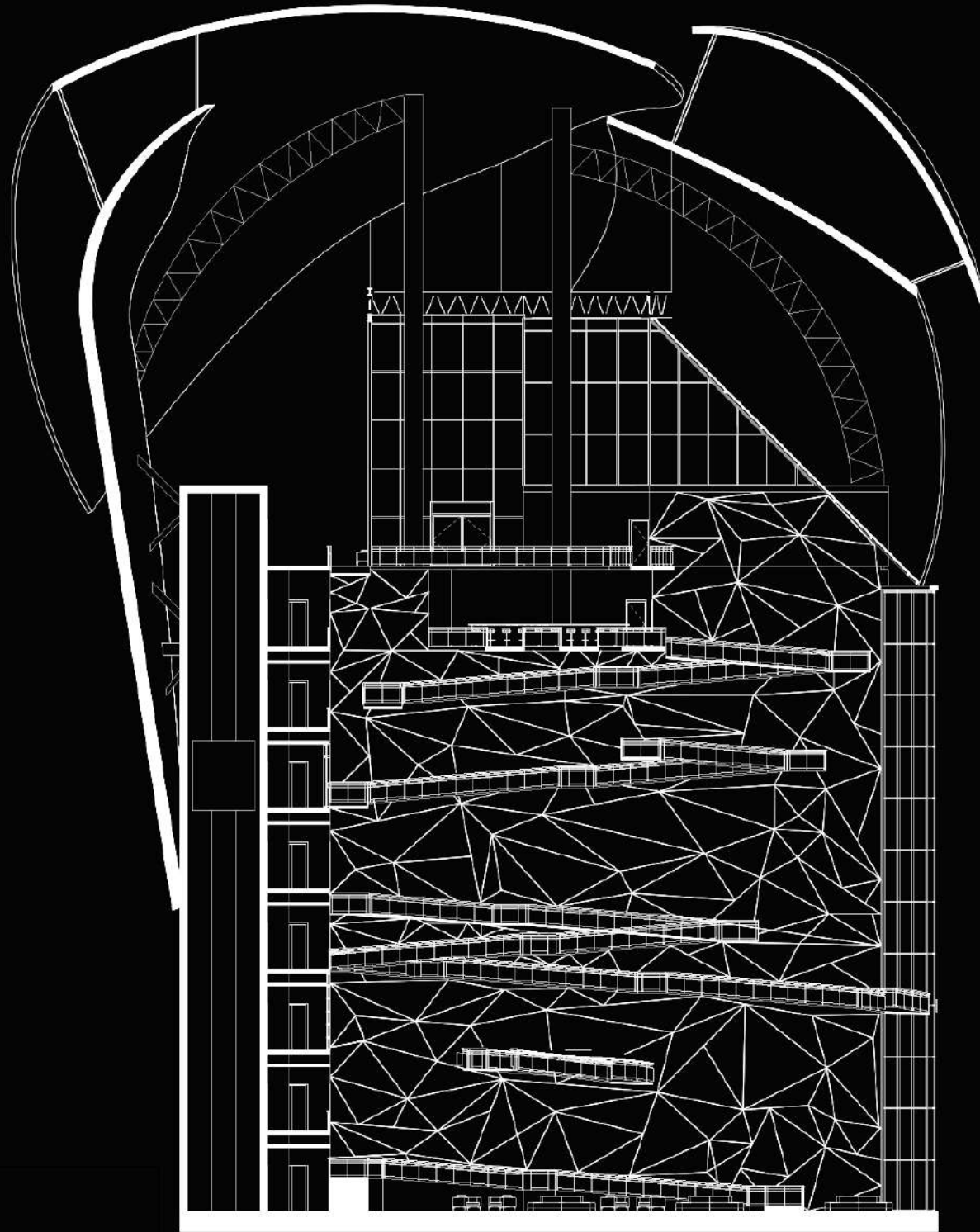
NORTH SECTION

SIDEWALK

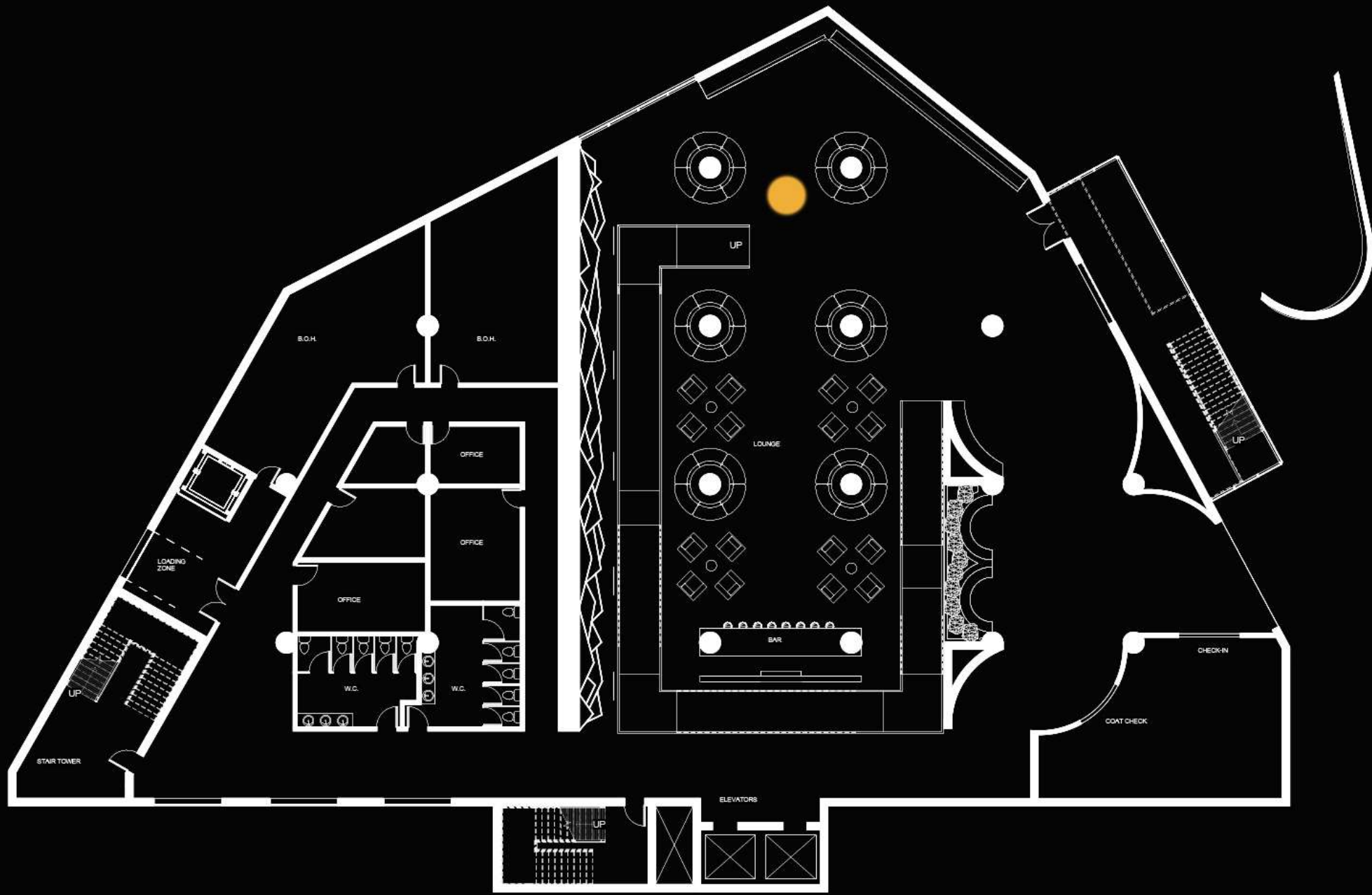


SIDEWALK

WEST SECTION



ATRIUM SECTION



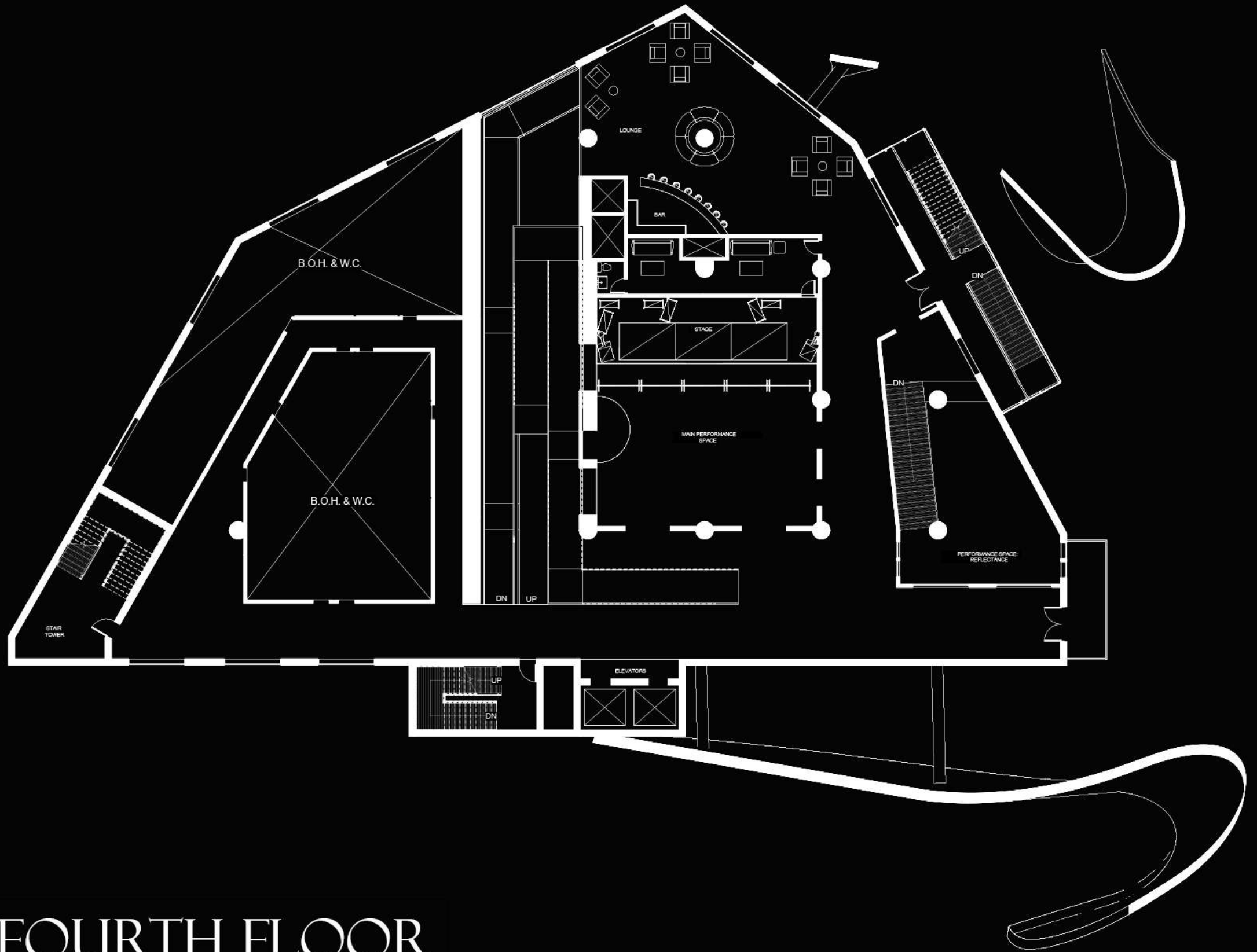
FIRST FLOOR



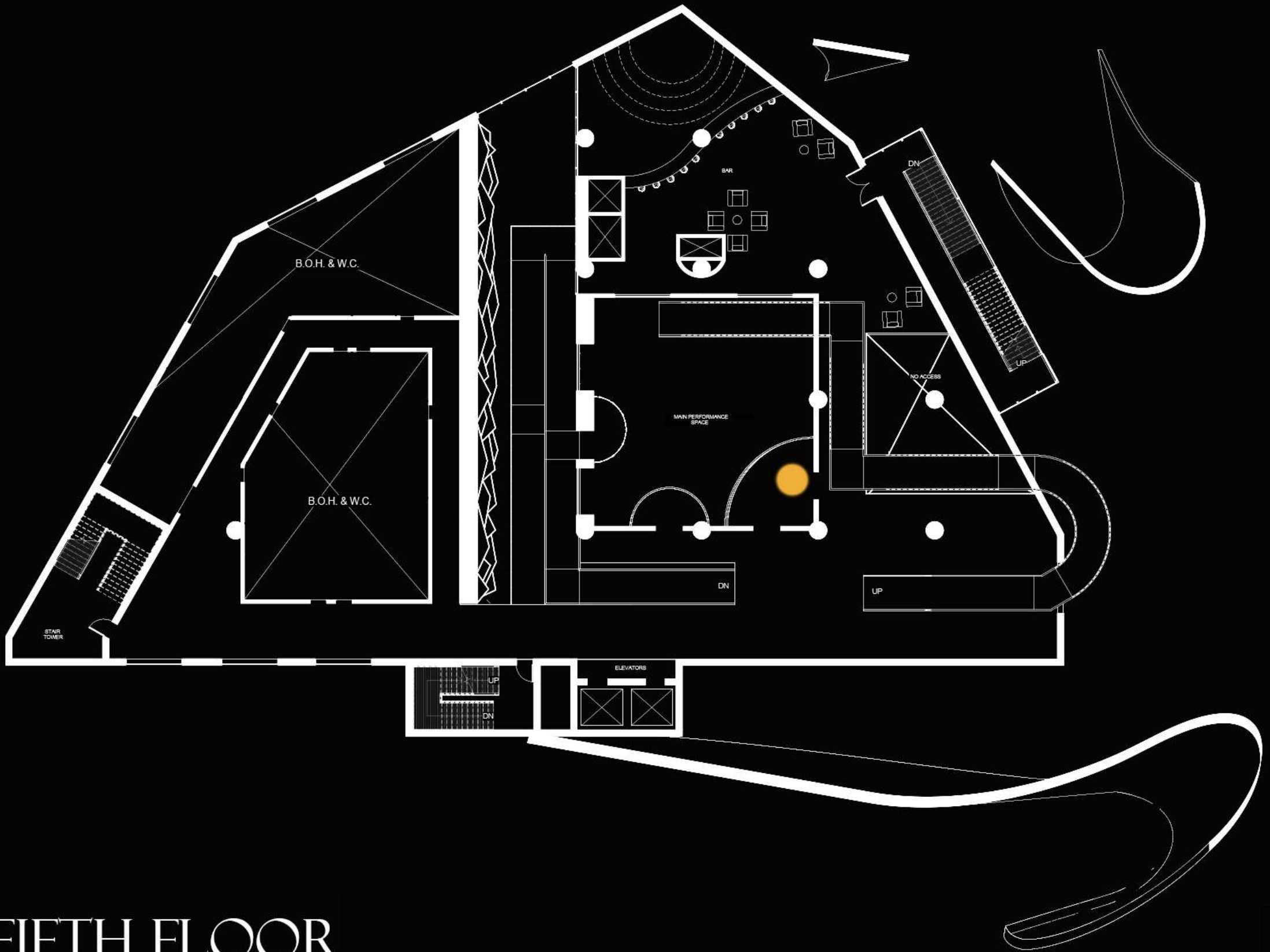
SECOND FLOOR



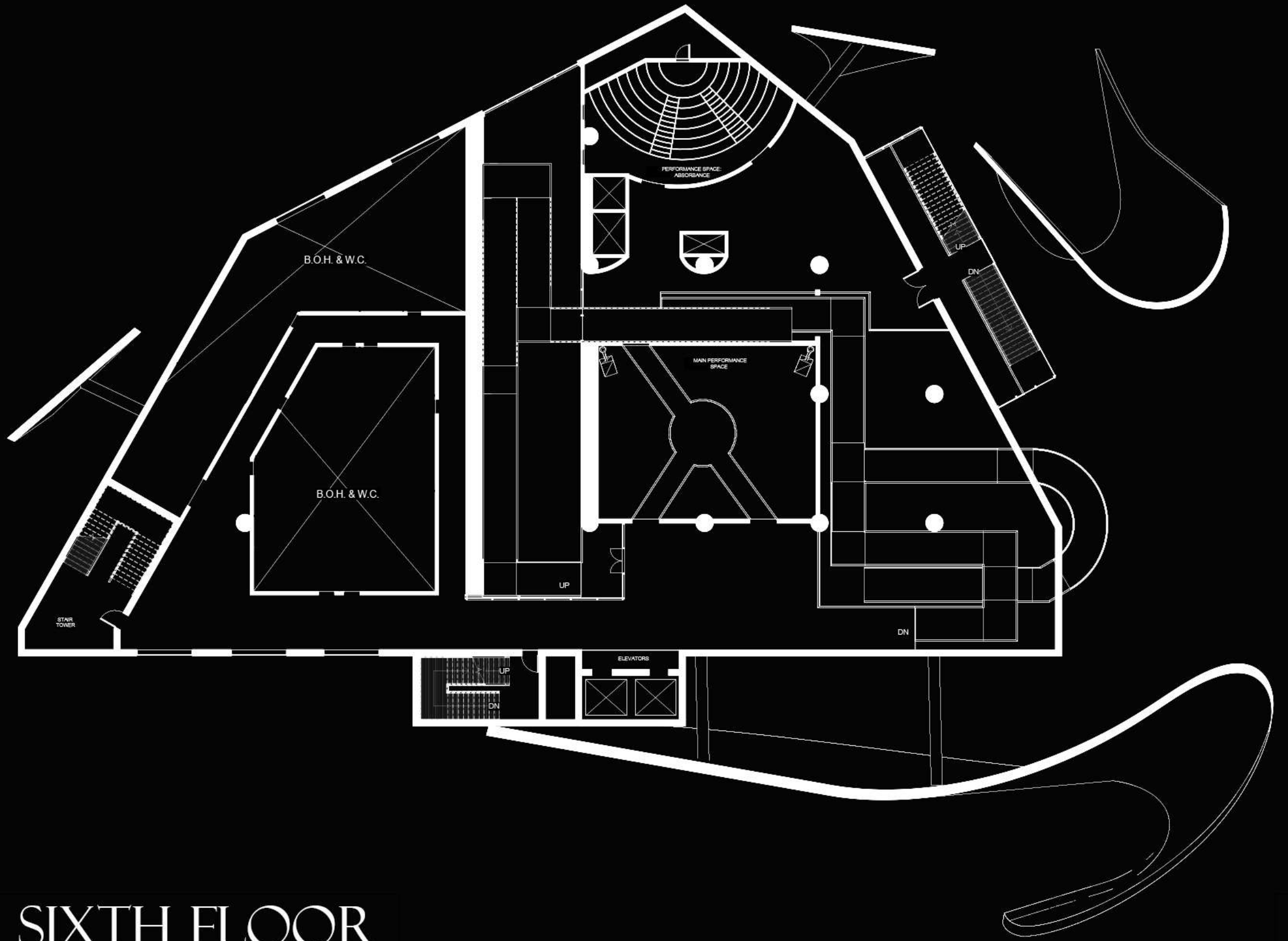
THIRD FLOOR



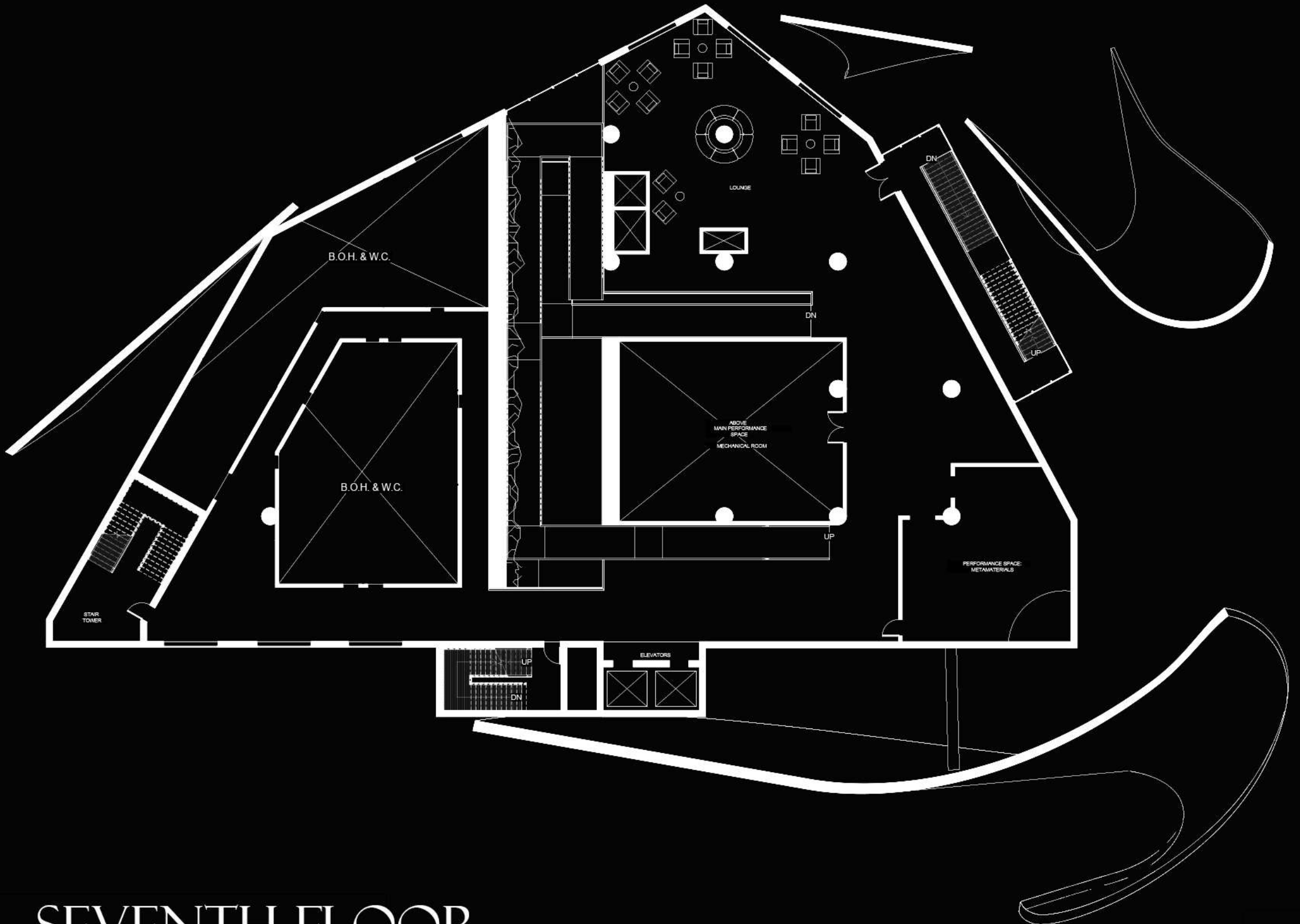
FOURTH FLOOR



FIFTH FLOOR



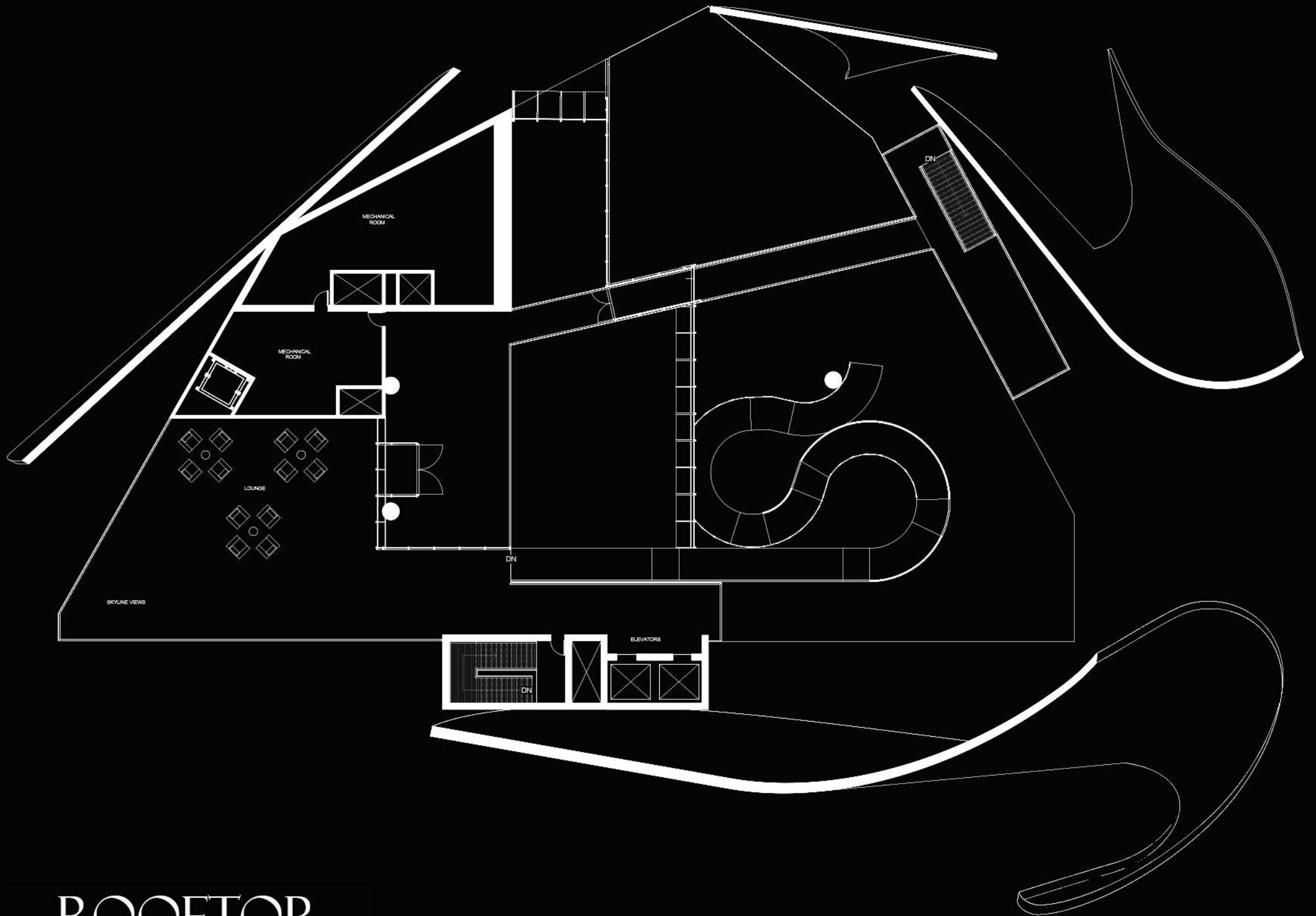
SIXTH FLOOR



SEVENTH FLOOR



EIGHTH FLOOR



ROOFTOP





ENTRANCE LOBBY



AQUIASONICS



THIRD FLOOR BAR



REFLECTANCE



MAIN PERFORMANCE SPACE



BRIDGE VIEW



ROOFTOP
