



REINVENTING MUSICAL DESIGN



REINVENTING MUSIC DESIGN

A Design Thesis Submitted to the Department of Architecture and Landscape Architecture of North Dakota State University.

By
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THE PROPOSAL

Tables & Figures	4
Abstract	5
Narrative	6-7
Project Typology	8
Case Studies	9-46
Harpa Concert Hall and Conference Center	10-17
Diocesan School for Girls	18-24
Neuman Hayner Conservatory Design	25-30
Tohogakuen School of Music	31-37
Chetham's School of Music	38-44
Case Study Summary	45-46
Project Elements	47
Client Description	48
The Site	49-50
Project Emphasis	51
Project Goals	52
Plan For Proceeding	53-55
Methodology	53
Project Schedule	54
Implementation	55

THE PROGRAM

Research Results	59-63
Philosophical Framework	59
Theoretical Framework	59
Strategies	60
Tactics	60
Historical, Social & Cultural Context	64-68
Historical Context	64
Social Trends	66
Social Context	66
Historical Narrative	66

THE PROGRAM

Literature Review	69-75
Remixing the Classroom	69
Architecture as a Translation of Music	71
Synesthesia	73
Project Justification	76-77
Site Analysis	78-95
City Information	79
Site Information	80
Zoning	81
Climate Information	83
The River	84
Tree Cover	86
Circulation	88
Context	90
Views	92
Topography	94
Soils	95
Site Character	95
Performance Criteria	96-99
Appendix	122-127

THE DESIGN

Project Solution	102
Design Process	103-104
The Site	105
Floor Plans	106-108
Parking	106
Floor 1	107
Floor 2	108
Renderings	109-110
Sections	111-114
Representation of Music in Architecture	115-121

Figures	Description	Page	Image Credits
Figure 1	Harpa Concert Hall	10	Arch Daily
Figure 2	Quick Facts	11	
Figures 3-7	Structure	13	
Figures 8-12	Massing	14	
Figures 13-18	Circulation	15	
Figure 19	Harpa at Night	17	Arch Daily
Figure 20	Diocesan School	18	Arch Daily
Figure 21	Quick Facts	19	
Figures 22-24	Structure	21	
Figures 25-26	Massing	22	
Figures 27-28	Circulation	23	
Figures 29-31	Spatial Relationships	24	
Figures 32	Neuman Hayner	25	Arch Daily
Figure 33	Quick Facts	26	
Figure 34-36	Circulation	28	
Figure 37-39	Massing	29	
Figures 40-42	Spatial Relationships	30	
Figure 43	Tohogakuen School	31	Arch Daily
Figure 44	Quick Facts	32	
Figures 45-48	Massing	33	
Figures 49-52	Spatial Relationships	34	
Figures 53-56	Circulation	35	
Figures 57-60	Structure	36	
Figures 61	Front Façade	37	Arch Daily
Figure 62	Chetham's School	38	Arch Daily
Figure 63	Quick Facts	39	
Figures 64-69	Structure	40	
Figures 70-75	Massing	41	
Figures 76-81	Circulation	42	
Figures 82-87	Spatial Relationships	43	
Figure 88	Square Footage	47	
Figure 89	Building Capacity	48	
Figure 90	Portland	49	Getty Images

Figures	Description	Page	Image Credits
Figure 91	City Maps	50	
Figure 92	Schedule	54	
Figure 93	Implementation	55	
Figure 94	Musical Elements	59	
Figure 95	Musical Elements	60	
Figure 96	Architectural Representations	61	
Figure 97	Historical Timeline	63	
Figure 98	Portland Demographics	77	
Figure 99	Site Information	78	
Figure 100	Zoning Map	79	
Figure 101	Climate Information	80	
Figure 102	Wind Roses	81	
Figure 103	River Map	82	
Figure 104	River Section	82	
Figure 105	River View Pictures	83	
Figure 106	Tree Map	84	
Figure 107	Tree Species	84	
Figure 108	Tree Pictures	85	
Figure 109	Circulation Map	86	
Figure 110	Circulation Section	86	
Figure 111	Circulation Pictures	87	
Figure 112	Context Map	88	
Figure 113	Context Pictures	89	
Figure 114	Views Map	90	
Figure 115	Building Heigh Section	90	
Figure 116	Site Views	91	
Figure 117	Topography Map	92	
Figure 118	Site Images	93	
Figure 119	Space Allocation Table	95	
Figure 120	Space Interaction Matrix	96	
Figure 121	Space Interaction Net	97	

ABSTRACT

The ability to play an instrument has been proven through numerous studies to improve executive functions and set students up for academic and future workplace success (Nadine Gaab, Ph.D.) however many students find music difficult to understand and drop out of something that benefits them in the long run.

Revamping and purposefully designing a music learning and performance center has the opportunity to improve music education and help students understand music. Through a new and contemporary use of space, light, color, sound and form, music facilities can encourage student learning and foster their growth.

NARRATIVE OF THE THEORETICAL ASPECT OF THE THESIS

Music has the ability to move people in many ways. A song can bring back nostalgic memories, a marching band can energize a crowd at a sporting event, and a bass drum can make you not only hear the music, but feel it too. Anyone can listen to music, hear the soft parts and the loud parts in a song, hear short and long notes, hear a build up to one final note, but for some people those soft and loud parts are played in piano and forte, and those short and long notes are played staccato and legato and that big build up to one final note, that's a crescendo. These people, more often than not, can make music.

There are many ways you can make music but the most basic component is knowing how to play an instrument. Most students are introduced to instruments in intermediate school. They choose an instrument at the beginning of the year and are thrown into a whole different language of notes, key signatures, and rhythms. For many students, this new language is too difficult to understand and they typically drop out of their chosen music program. This lack of interest in music has made music programs in schools one of the first to go. Music classes are often seen as a waste of time because they don't prepare students for future careers like math and science do, however research has shown otherwise. Nadine Gaab, a doctor at Boston Children's hospital stated in an interview with Psychology today that "While many schools are cutting music programs and spending more and more time on test preparation, our findings suggest that musical training may actually help to set up children for a better academic future.". The ability to play an instrument or be a member of a musical group has been shown through numerous studies to help students in other aspects of their life, in particular, playing an instrument increases executive functions. Executive functions are high level cognitive processes that enable people to quickly process and retain information, regulate behaviors, make good choices, solve problems, plan and adjust to changing mental demands. Executive functioning has also been shown to be an even stronger predictor of academic success than IQ (Nadine Gaab, PhD.).

I was introduced to the piano when I was in first grade and was dead set on choosing the saxophone in sixth grade, but ended up picking the violin because the orchestra teacher seemed nice and all my friends chose the violin. After that orchestra teacher is no longer my teacher, and my friends all quit playing after a couple years, I continued to play through middle school, high school and now college.

Being a part of orchestras throughout my schooling has made a difference in my life and even now as I'm interviewing for jobs, my ability to play an instrument has made me stand out among other applicants.

With all these benefits to knowing how to play an instrument, is there a way design can improve music education and make it more exciting and accessible for youth? Acoustics in a music room are a given, designers have been aware of the relationship between acoustical spaces and musical impact, but is there a further step designers can take in music room design that helps students learn scales, pitch, tone, melody, harmony, rhythm, intervals, composition etc., All the components students need to succeed in music. How can designers manipulate space, light, color, form and materials to ultimately improve music education?

"Students can 'flip it and dip it and serve it.' However they want to if that's what speaks to them. There shouldn't be a 'Law' of music, something everyone has to follow, music is a flexible, moving thing and should be taught as such." (Allsup, 2016). In the book *Remixing the Classroom* by Randall Allsup, he argues that music has been taught the same way for years and that there needs to be new innovation and creativity to inspire young students. Design of a music space needs to keep that in mind as well. What was sufficient 30 years ago may not be sufficient now and there is an opportunity to improve student's ability to learn music through design.

Through research I intend to find what specific design elements can improve music education and help students learn something that may not come as naturally to them. I will be learning different, contemporary methods of music education teaching methods, what specific musical elements students need to learn so they can continue building confidence and enjoyment out of their chosen instrument, how music can be represented architecturally and how synesthesia can help students learn in unexpected ways. After I investigate and draw conclusions based on logical findings, I hope to develop a 'kit of parts' that I can implement into a larger design.

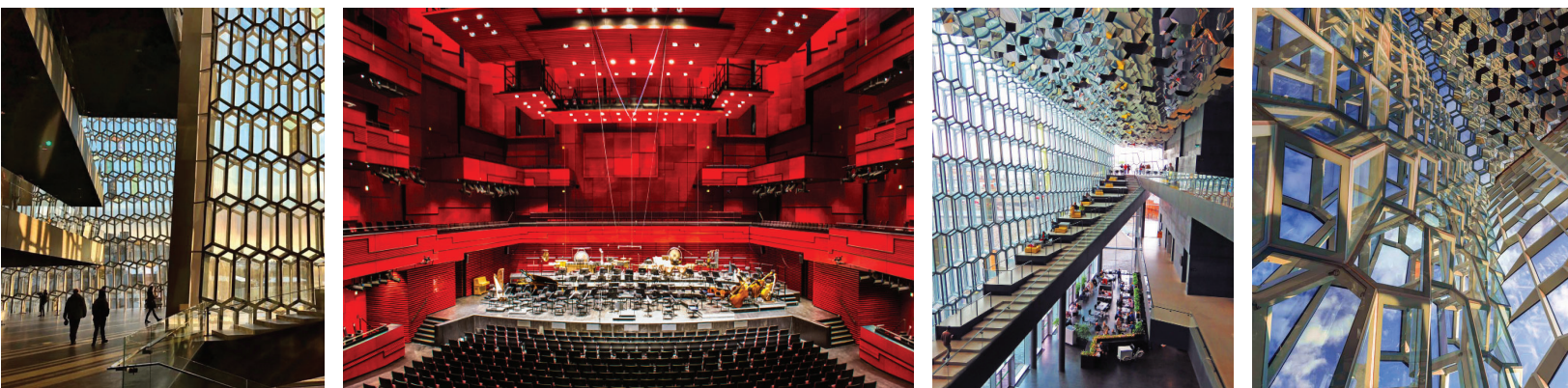
My hope is for this research to be used by other designers in the future to purposefully design music spaces that encourage and excite students within the space to continue their music education.

PROJECT TYPOLOGY

A Music Learning and Performance center combines all forms of music, band, orchestra, choral and all different kinds of performing methods, large concerts, small recitals, individual practicing, ensemble practicing and private lesson spaces into one, cohesive building that allows students to experiment, create, express and learn through music.

Student will have the opportunity to learn through group and individual instruction, they will have the facilities to compose and record and they will have the opportunity to perform. This facility will be innovative and interactive, encouraging students to make their education their own, choose their own routes and provide a level of comfort for students to have the confidence to do so.

- 1 **Harpa Concert Hall and Conference Center**
- 2 **Diocesan School for Girls**
- 3 **Neuman Hayner Conservatory Design**
- 4 **Tohogakuen School of Music**
- 5 **Chetham's School of Music**



1 HARPA CONCERT HALL AND CONFERENCE CENTER

Figure 1

QUICK FACTS

Figure 2

Architect	Project Year	Typology	Square Footage	Location
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Architect

Henning
Larson



Project Year

2011



Typology

Concert
hall and
conference
center



Square Footage

301,000 SF



Location

Reykjavik,
Iceland

Program Elements:

- Arrival
- Foyer
- 4 Music Halls
- Administrative space
- Rehearsal space
- Multifunctional space
- Backstage
- Offices
- Changing Room

This facility has a main performance hall to accommodate a large audience and both theater, orchestral and concert performances. This facility also contains a separate office and administrative space in the back away from the public facilities

This is a statement building, one that was intended to be an image of the city. They used an artist rather than an architect to design the facade, and this building was built to reflect the site more than it was built to reflect the building's visitors. This building also features three large performance halls, more than any other case study, however this building is primarily a performance hall and not a learning facility. This building also contains multiple gift shops, something educational facilities often lack.

Natural Light

Harpa means 'harp' is Icelandic, and is also the name of the first month of spring and a sign of brighter times. The facades of this building are made of a variety of "quasi-brick" that was inspired by Iceland's iconic basalt rocks. These bricks capture and reflect light, so the building looks like it is shining from the exterior, and from the interior there is wonderful bright daylighting with the occasional yellow reflection from one of the colored brick panels. At night the panels light up with built in LEDs and illuminate the area

Environmental Effects:

This building's facade and form respond to its environment. The scale like, reflective panels lining the sides of the structure reflect the surrounding bay and mountains that like the Reykjavik area. The building is situated slightly away from the other buildings in Reykjavik, so you can see a clear division between modern and traditional architecture in the city, which only makes the impact of this building even stronger.

Social Effects:

Socially, this building not only is a place for locals to come see large performances and hold large conferences in a modern facility, it is also a tourist attraction. Reykjavik is the biggest tourist city in Iceland, and this building has become a statement of the city.

Cultural Effects:

The concert hall's front facing facade, the one everyone sees when approaching the building, was designed by a local artist to capture the essence of the site and city. Iceland has a rich history with the port and the surrounding mountains, and this building highlights them quite beautifully from the interior and exterior.

Geometry:

The geometric "quasi-bricks" were designed specifically for this building and site to dynamically change to the color of their surroundings. The bricks capture and reflect the natural light and "initiates a dialogue between the building, city and natural scenery." (Henning Larsen Architects)

Hierarchy:

There is a hierarchy of massing, starting with the tallest mass, containing the main concert hall that is set the farthest inward towards the city. This mass then angles up, towards the bay and into the other 2, smaller masses. These masses contain the smaller performance halls. These 2 smaller masses are longer and extend out towards the bay.

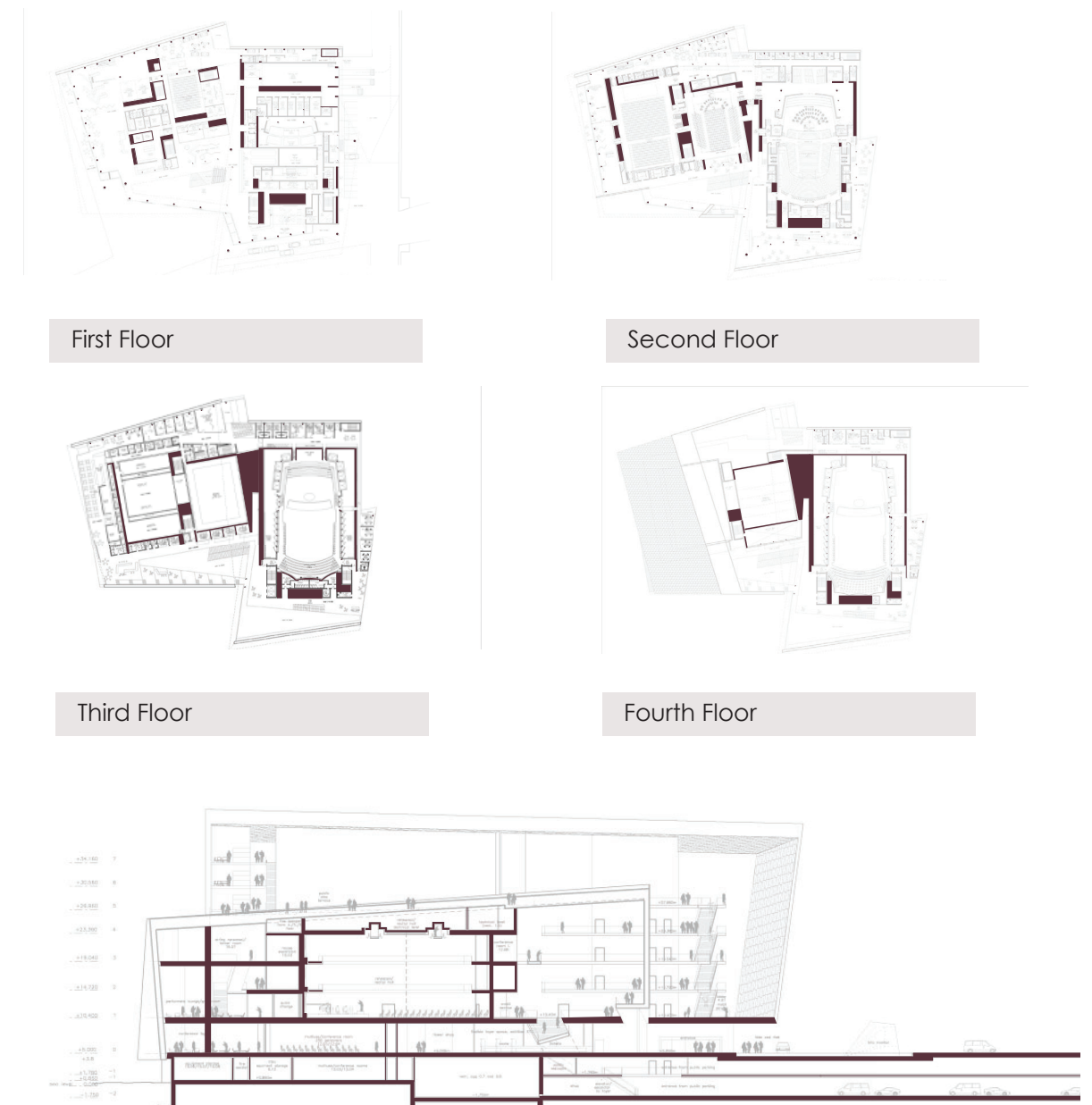
This building was meant to be a statement piece of architecture for the city and an attraction for visitors. Art and visual aesthetic was placed above cost and practicality. It took the history of the site and represented it in a modern way in comparison to the rest of the city.

Structure:

The building is a steel structure with a large concrete core. All 4 of the concert halls are built in concrete and provide solid shear against the Icelandic winds. This solid concrete core also represents

Looking at the diagrams, you can see the solid concrete elements in the center of the building surrounding the large assembly spaces and columns running along the inside of the building facade.

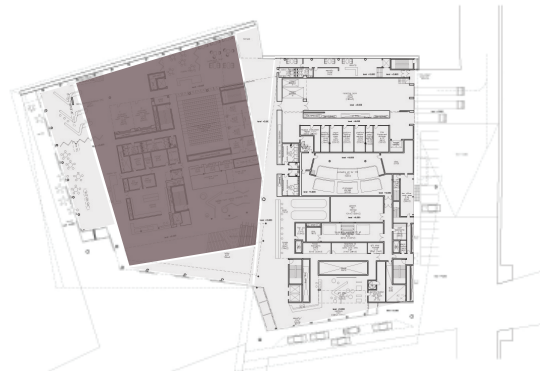
■ Structural Elements



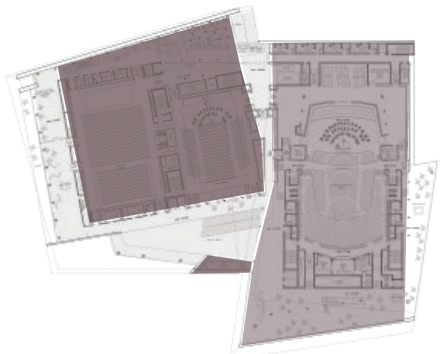
Figures 3-7
15

Massing:

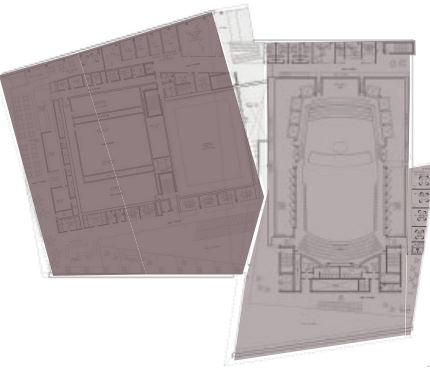
The front façade of this building features 3 masses, the largest and tallest mass positioned closest to the city and the smaller, lower masses stretch out towards the bay. The building is angled and massed as if it is gesturing towards the bay.



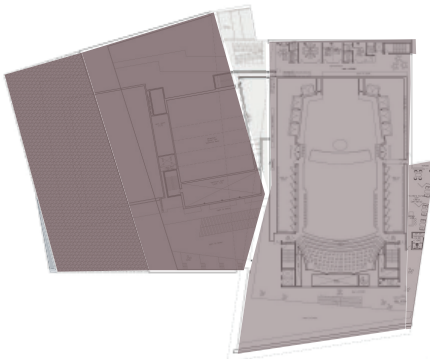
First Floor



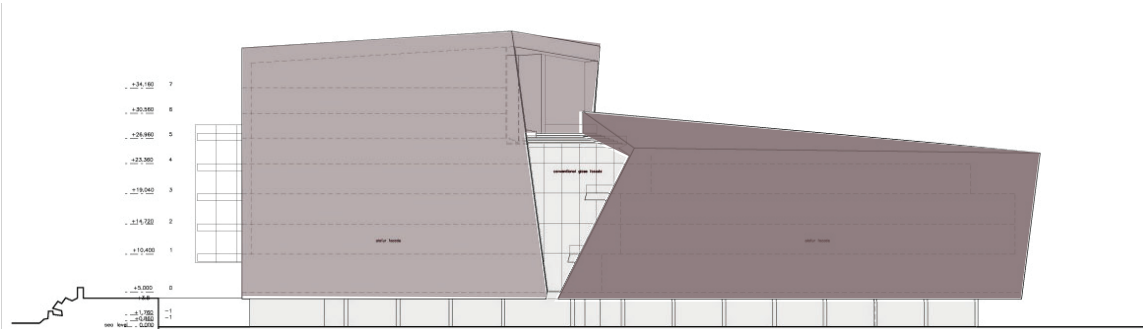
Second Floor



Third Floor



Fourth Floor



Figures 8-12
16

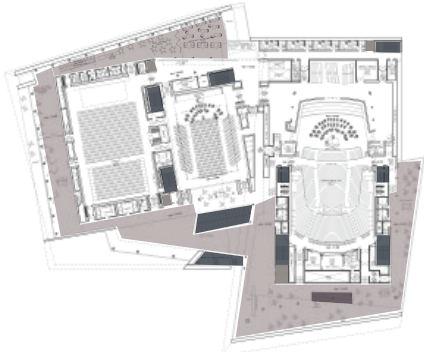
Circulation:

Circulation is placed around the perimeter of the building along the glass façade. Main, statement circulation stairs are located around the perimeter of the building, extending 3 floors for views of the floors below but more importantly, the glass façade.

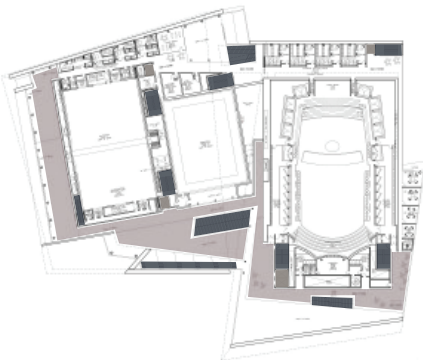
■ Floor Circulation ■ Stairs ■ Elevators



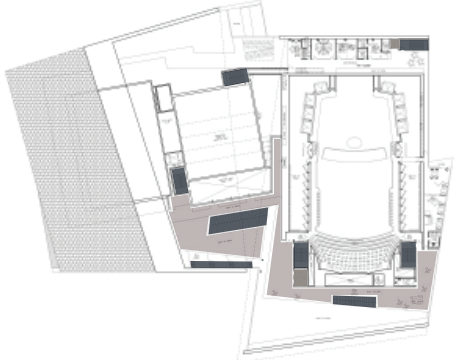
First Floor



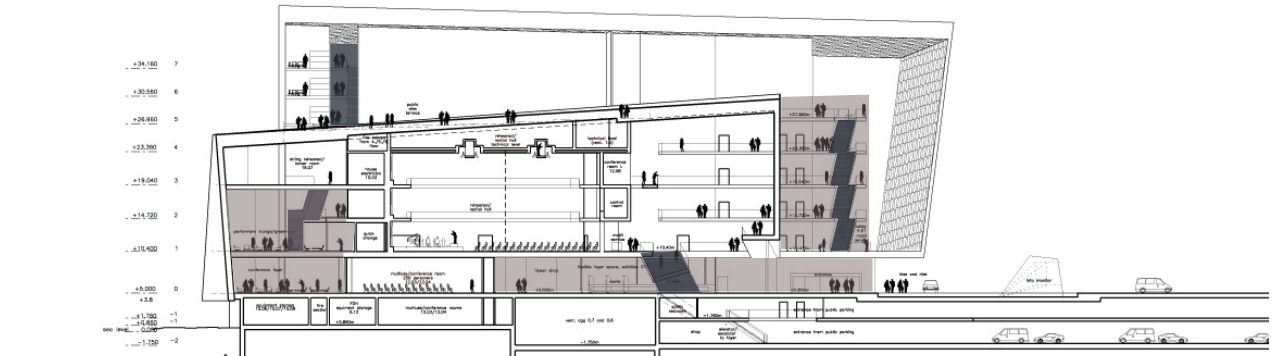
Second Floor



Third Floor



Fourth Floor

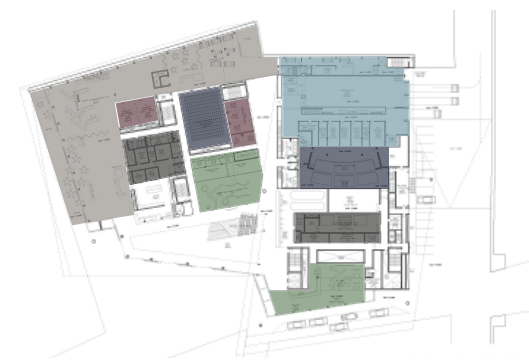


Figures 13-17
17

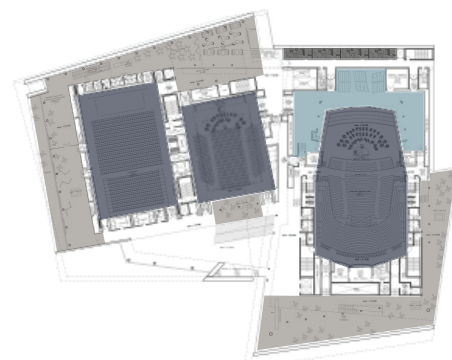
Spatial Relationships:

The main concert hall extends from the second level to the fifth. The main floor has multiple public facilities including gift shops, ticket and information windows, café, large event space and viewing areas. The second floor is the start of the performance halls. The large halls are located in the center of the building will private conference spaces, large conference and event spaces, offices and circulation around the exterior. Overall, performance spaces and offices are located in the center of the building, while circulation and gathering spaces are located around the perimeter.

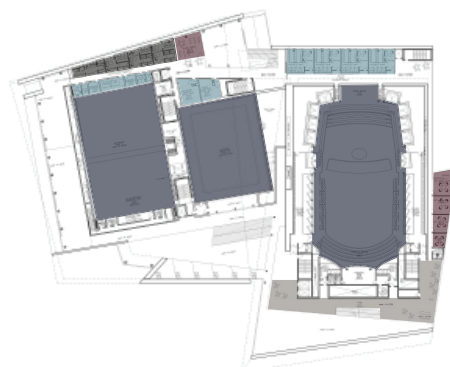
Gathering
 Performance Hall
 Backstage
 Public
 Offices
 Conference



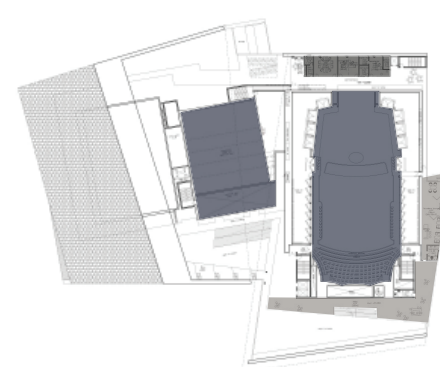
First Floor



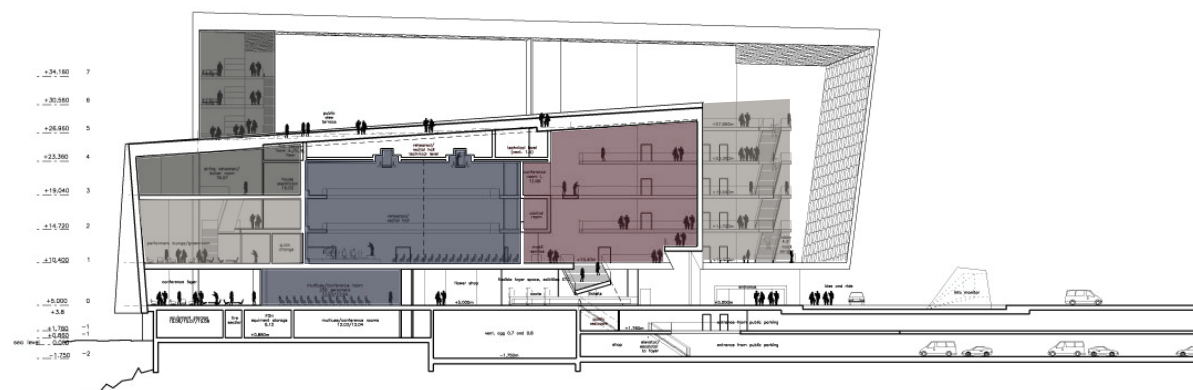
Second Floor



Third Floor



Fourth Floor



Figures 14-18
18

Repetitive to Unique:

This building's façade and angled massing create cohesion and harmony in an asymmetric building. At entry/pedestrian, there is a differentiation in the front façade to add human scale to the street level. The class is transparent and the front is inset from the rest of the façade by 5' or so. The "quasi-brick" façade starts on the second level of the building and extends to the roof.

Conclusion:

This building is an example of how something can be represented through architecture. The highlight of this building was the "quasi-brick" façade, which was intended to represent the site, city, and the landscape and bring all of them together. They achieved this using art and modern techniques to create a new building façade method.

This case study left my Unifying Idea unchanged. I can take the methods this building used to represent something and use it in my own methodology to represent music through architecture.

Figure 19





2 DIOCESAN SCHOOL FOR GIRLS MUSIC & DRAMA CENTRE

Figure 20

QUICK FACTS

Figure 21

Architect	Project Year	Typology	Square Footage	Location
-----------	--------------	----------	----------------	----------

McIlldowie Partners	2012	School for music and drama	Unknown	Auckland, New Zealand
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Program Elements:

- Practice rooms
- Foyer
- Dance Studios
- Recording Studios
- Music Classrooms
- Drama Studio
- Staff Offices
- Breakout Spaces

Similar to the Harpa concert hall, this building uses its skin to represent something, but rather than represent the community and elements on the exterior like the Harpa concert hall, this school's skin represents what's happening on the inside, music, education, drama and dance. They bring creativity and a curiosity to learn into the interior of this building's design, they also acknowledge that arts education is beneficial in child development and are putting a strong foot forward to encourage students to stay in arts education.

Natural Light

The lace work like skin shades the building from harsh western sun and filters the light as though it is coming through a tree canopy. The central atrium of the building features large skylights to illuminate various breakout spaces spread throughout the atrium

Environmental Effects:

The brise soleil skin shading device on the exterior of the building lowers interior cooling costs and provides diffused light for interior spaces.

Social Effects:

“Music, drama, and dance education is proven to nurture a child’s development. In fact, research has found that learning these creative subjects helps students except in other subjects.” (McIldowie Partners). The architects wanted to make a creative home for students. The school was previously using an adaptively reused building for their school, however they wanted to ensure they were able to teach students at a high level far into the future and a new facility was needed to achieve that. There are multiple internal windows that let students circulating through the building look into rooms to see what is going on so they can aspire to be in a band, orchestra and choir.

Geometry:

The skin’s design is very organic, meant to represent the organic learning of the arts, however the skin’s panels are angled in a geometric formation, similar to an accordion.

Hierarchy:

The materials, colors, stairs and breakout nooks all focus inward towards the building’s central atrium, the center of collaboration and activity in the school.

Repetitive to Unique:

The aluminum skin on this school acts as a repetitive element that acts cohesively with the adjacent historical chapel on the site.

Additive and Subtractive:

A differentiating concrete block façade wraps around the first floor of the building, creating a pedestrian scale for students, and the aluminum skin extends from the second floor to the roof line

Conclusion:

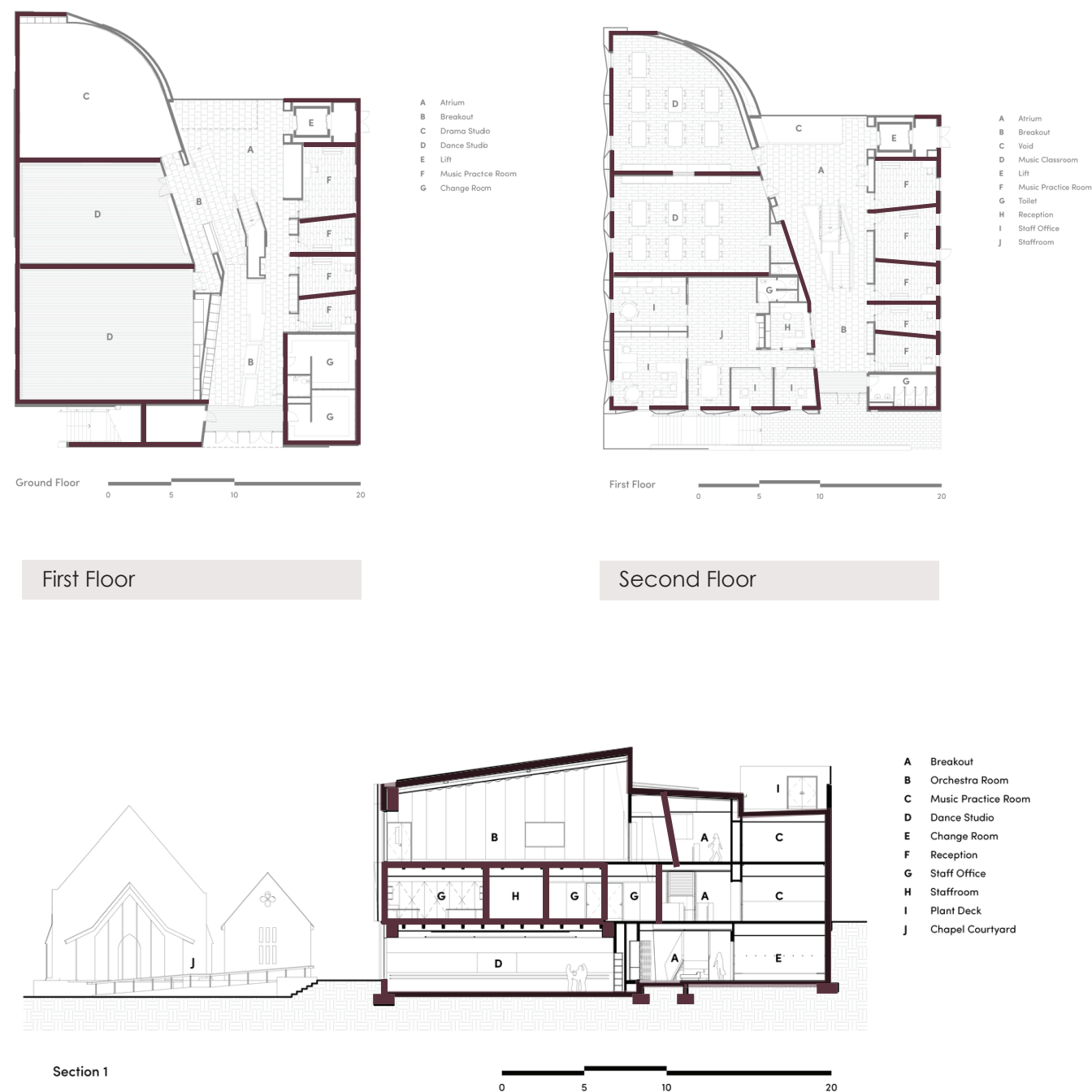
Again, similar to the Harpa Concert Hall, this building is a representation, although rather than representing what is happening on the exterior of the building, this building is representing and responding to what is happening within the building.

The unifying idea is left unchanged, however this is project is a good representation of how learning can be improved through architectural environments and it also emphasizes the importance of music education.

Structure:

This building is wrapped in an aluminum skin that reflects the rhythm and movement of music and drama. The interior is composed of concrete and CMU load bearing walls and columns

■ Structural Elements



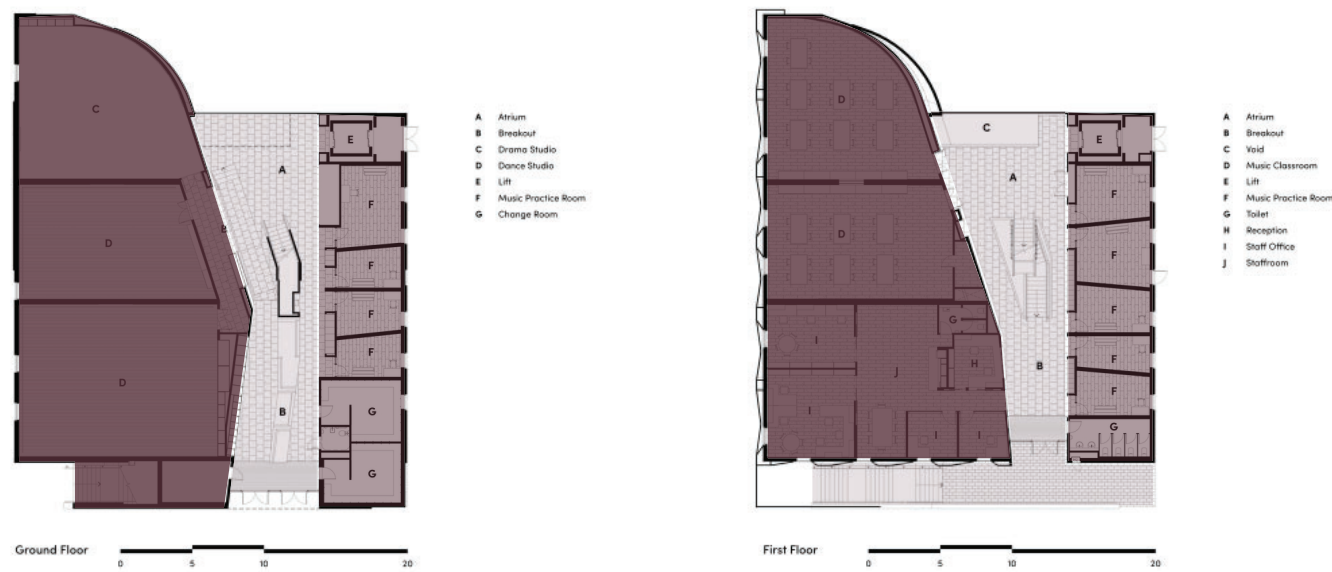
Figures 22- 24
23

Massing:

The building has a simple, rectangular form with a detailed and complex aluminum skin. The designers were building this structure next to a chapel from 1854 and they wanted to be respectful of the heritage-listed chapel but still make a contemporary building.

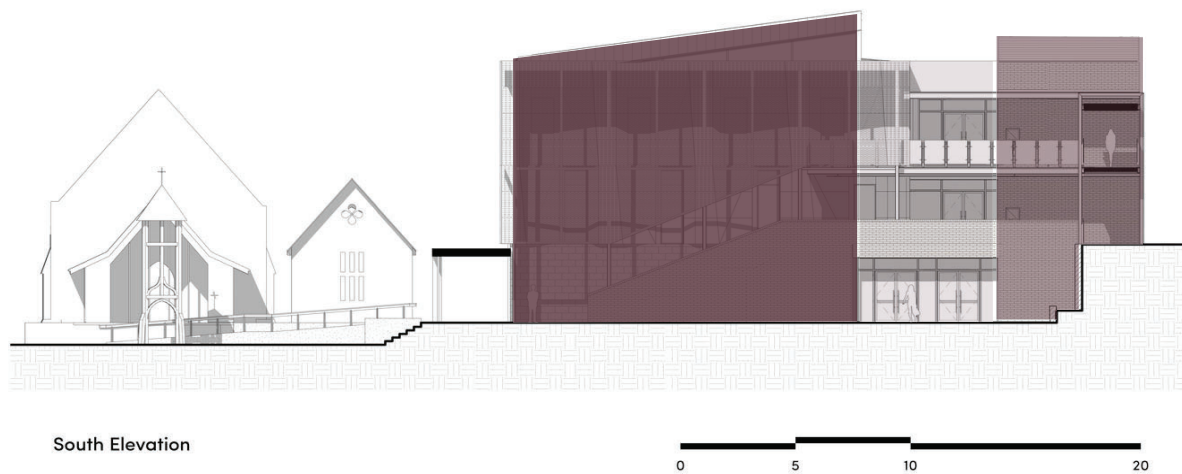
Circulation:

The circulation of this space is centralized in the middle of the school with a large, statement staircase and an atrium with skylights extending from the 3rd story to ground level. Classrooms, studios and offices are all located on the west side of the building while practice rooms and student restrooms are all located on the East side. This creates a division of staff escorted space to student space.



First Floor

Second Floor

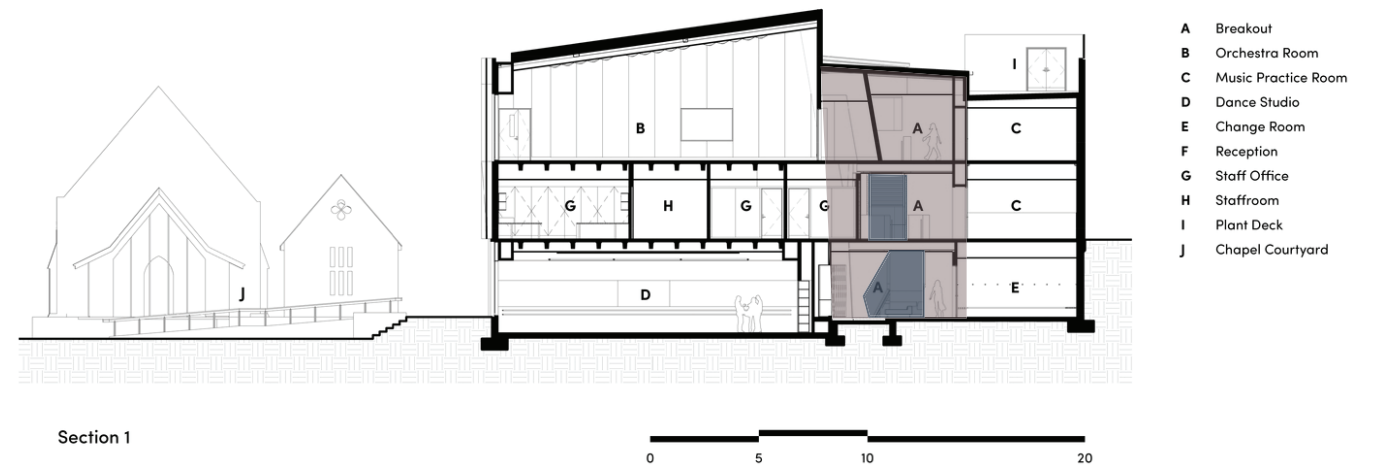


Figures 25-27
24



First Floor

Second Floor

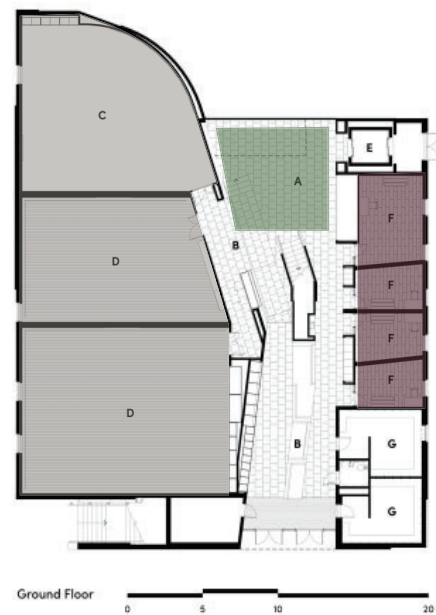


Figures 26-28
25

Spatial Relationships:

Classrooms in this building are all co-located along the west side and the practice rooms are all located along the east side. Within the two large masses to the west and east are lobby space and breakout spaces along with a central staircase.

Classrooms Staff Space Foyer Practice Rooms



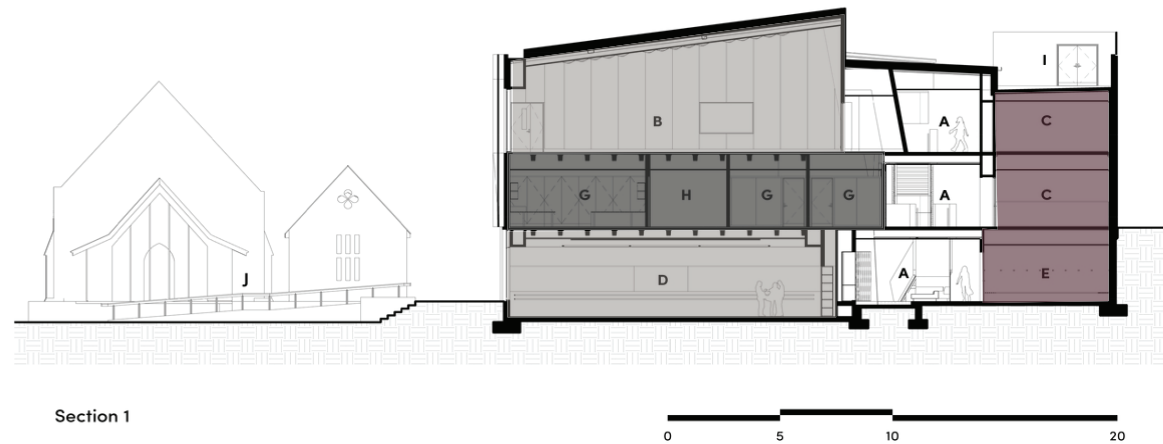
- A Atrium
- B Breakout
- C Drama Studio
- D Dance Studio
- E Lift
- F Music Practice Room
- G Change Room



- A Atrium
- B Breakout
- C Void
- D Music Classroom
- E Lift
- F Music Practice Room
- G Toilet
- H Reception
- I Staff Office
- J Staffroom

First Floor

Second Floor



- A Breakout
- B Orchestra Room
- C Music Practice Room
- D Dance Studio
- E Change Room
- F Reception
- G Staff Office
- H Staffroom
- I Plant Deck
- J Chapel Courtyard

Section 1

Figures 29-31
26



3 NEUMAN HAYNER CONSERVATORY DESIGN

Figure 32

QUICK FACTS

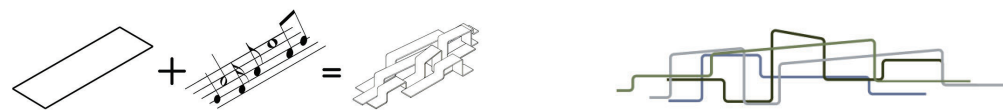
Figure 33

				
Architect	Project Year	Typology	Square Footage	Location
Neuman Hayner	Unbuilt	School for music and dance	Unknown	Mevaseret Zion, Israel

Program Elements:

- Practice rooms
- Auditorium
- Classrooms
- Rehearsal Space
- Interior Gardens
- Staff Space
- Atrium

It is a school for the arts, it is a modern building, program elements are similar, they represent something in their design. This building specifically aimed to represent music lines in their exterior massing, that was their inspiration.



Environmental Effects:

It is stated in the building's design concept that energy efficiency would be taken into consideration through natural ventilation and passive systems.

Natural Light:

This building was designed to be open and airy, letting plenty of natural light through the large glass facades surrounding this building, as well as through the central garden

Geometry:

This building is designed to represent musical staff lines, and the geometry of the building reflects that. There are 5 sections of this building, representing the 5 lines on a staff, and they curve up and down in different patterns, representing the different notes on the staff. There are no sharp edges on the exterior, every line is curved.

Hierarchy:

The different sections in this building curve up at different angle at different heights. The highest most curve is set off to side at 1/3rd the length of the building. The remaining sections create layers in elevation that angle inwards towards the highest section.

Repetitive to Unique:

This building is asymmetric. While the materials and overarching design idea is repeated, the different levels and shapes the 5 different sections in this building are arranged in an asymmetric manner.

Additive and Subtractive:

There is one segment of this building that uses a subtractive element to create an overhang for an outdoor patio.

Structure:

The 5 segments of this building would be constructed out of concrete with curtain wall glass lining the front and back facades.

Conclusion:

This project shows how 2D music elements can be translated and represented by a 3 dimensional architectural mass. While this building is not a literal representation of musical staff lines, it takes certain elements of it and uses that as a guiding idea to form the different shapes this building makes.

This is one architect's rendition of how music can be represented in architecture, and I will be doing my own. But this case study goes to show that music represented physically can be beautiful and interesting.

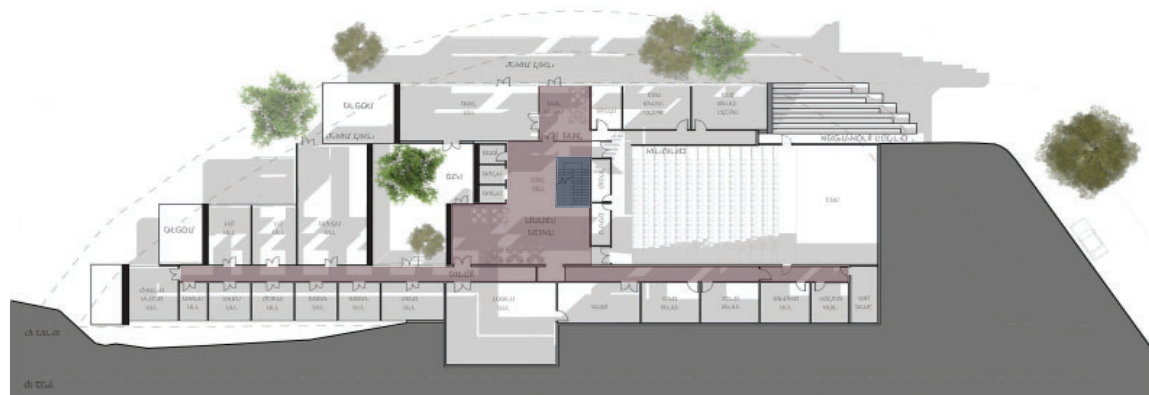
Circulation:

Classrooms and rehearsal spaces are located along the perimeter of the building, while circulation is centralized. The different ceiling heights created by the building mass, creates different interior atmospheres, intimate and open. These different atmospheres help to differentiate between the different types of spaces, public and private.

■ Floor Circulation ■ Stairs



Second Floor



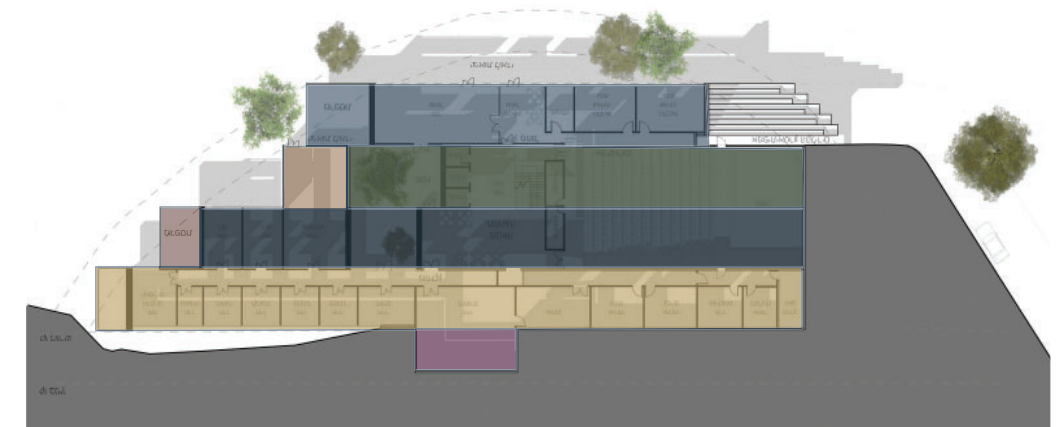
First Floor



Figures 34-36
30

Massing:

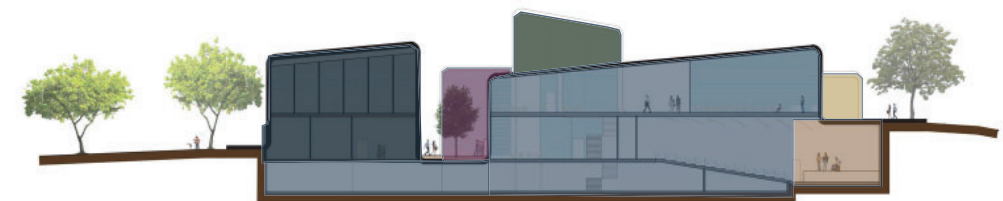
The 5 sections of this building, representing the 5 staff lines in music, creates clearly divided wings. Each wing contains flexible space, that can accommodate the changing needs of the school.



First Floor



Front Facade



Figures 37-39

Spatial Relationships:

Through section, elevation and plan, the 5 sections of this building and the different ceiling heights and spaces are even more visible. Looking specifically on the 2nd floor, the walls of rooms line up with the building sections. Practice rooms are all lined up in rows and large ensemble spaces are spread through the building.

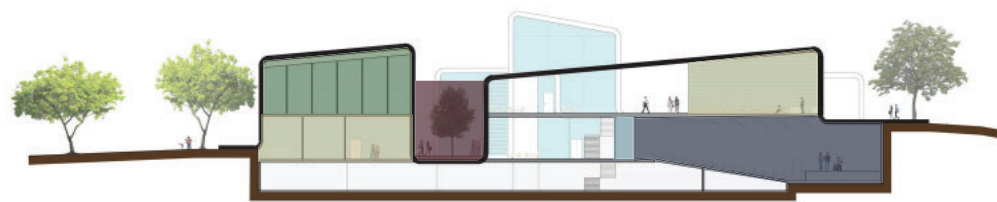
Classrooms Staff Space Green Space Practice Rooms



First Floor



Front Facade



Figures 40-42
32



4 TOHOGAKUEN SCHOOL OF MUSIC

Figure 43

QUICK FACTS

Figure 44

Architect	Project Year	Typology	Square Footage	Location
Nikken Sekkei	2014	School for music and dance	20,914 SF	Chofu, Tokyo, Japan

Program Elements:

- Light Court
- Foyer
- Staff Room
- Lesson Rooms in Various sizes
- Offices
- Meeting Rooms
- Collaboration Spaces

This building is a school of music and has some similar program elements, however this building does not have a performance hall, only lesson rooms. This building is also aesthetically much heavier than the other buildings. While the other building's facades were made primarily of glass, this building is made primarily of concrete. The interior concept on this building is similar to the other ones in the sense that this designer wanted to steer away from compartmentalized lesson rooms and instead layout rooms more in the way a city is arranged.

Social Effect:

The client wanted this building to have more visual connection among musicians and their surroundings rather than isolated practice space. There was also a need for a variety of acoustical spaces, such as narrower rooms, or rooms with higher ceilings. All these design factors were intended to create a more open music college to bring unity between students.

Geometry:

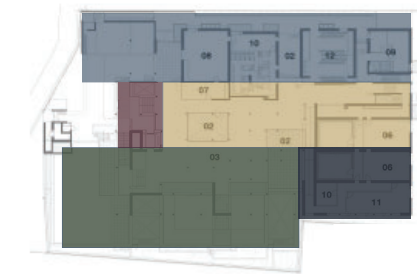
Every element in this building is square or rectangular, and this is made even clearer by the exterior facades. The different shapes interact to create a plan that looks like it is random, however there is a grid like pattern

Massing:

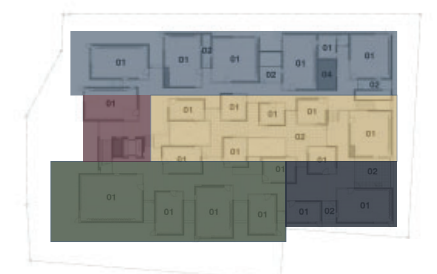
This building is made up of a series of concrete blocks stacked and arranged in a random pattern. The first story of the building is lined with curtain walls and mostly flat, but the second floor of the school is mostly concrete with punched openings placed along the exterior walls. Although the building is made of a very heavy, brutal material, there is a very modern and simple feel to it.



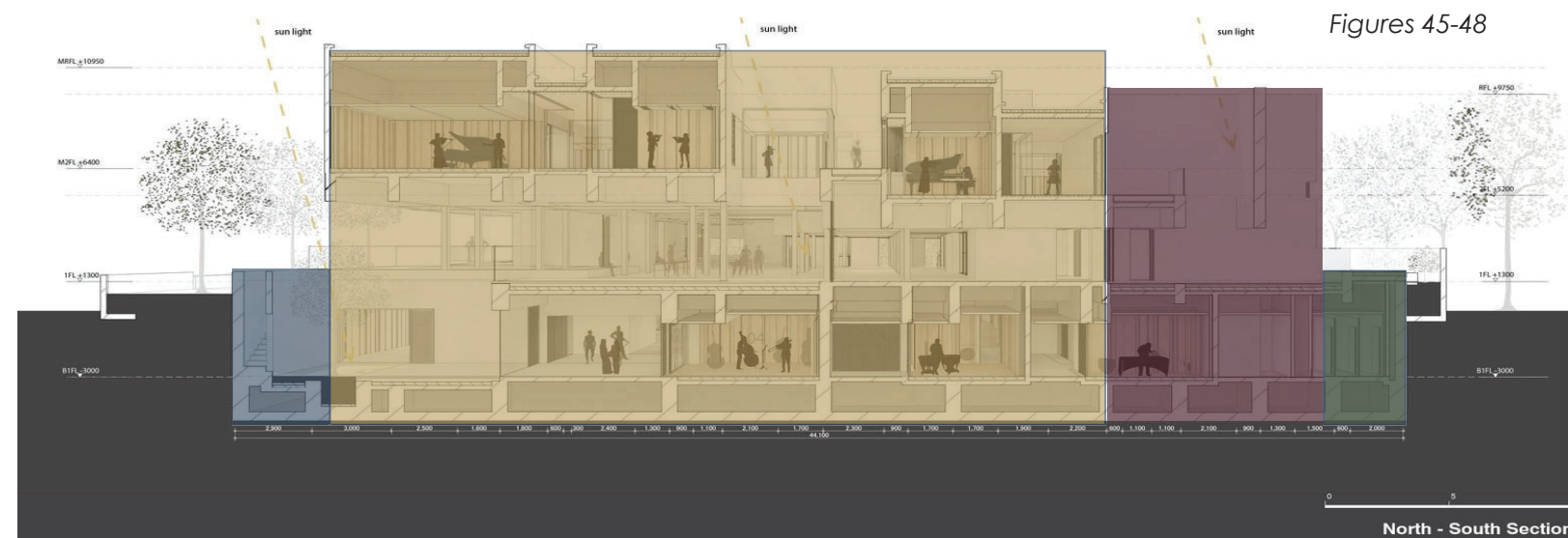
Basement



First Floor



Second Floor



Figures 45-48

Spatial Relationships:

Lesson Rooms are located on the basement and second level. In the basement, the lesson rooms are placed in a more grid like layout however on the second floor lesson rooms are placed in a somewhat random pattern. The first level is intended for the public, containing a large gathering area/atrium that wraps around three light wells. Staff space and meeting rooms are located on the first floor so the basement and second floor are intended only for student learning.

Circulation:

Circulation in this space turns, curves and wraps around the lesson rooms. There are no long corridors lined with rooms, instead the rooms and the circulation space are placed at different, random points. The first floor contains a large public gathering area with large circulation areas while the basement and second floor, intended for staff and students only, contains narrower, winding hallways. Staircases are located around the perimeter of the building, allowing the large light wells to be the focal point of the space.

Lesson Rooms Staff Space Light Wells Mechanical

Elevator Stairs Floor Circulation



Basement

First Floor

Second Floor



Basement

First Floor

Second Floor



Figures 49-52

North - South Section



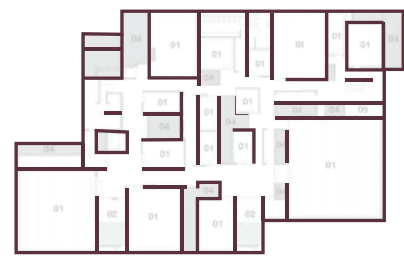
Figures 53-56

North - South Section

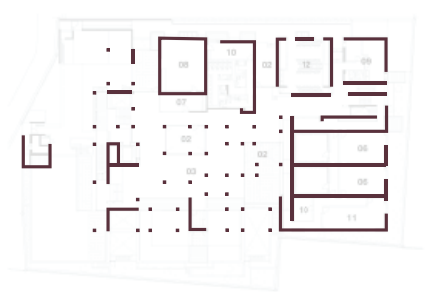
Structure:

This building is made almost entirely of concrete and glass. Load bearing concrete walls line half of almost every practice room allowing for large glass openings within the building. The large first floor atrium is lined with columns to support the heavy concrete on the second floor. The ceilings throughout the building are a simple waffle slab, allowing the weight of the concrete walls to be distributed evenly.

■ Structure



Basement



First Floor



Second Floor

Figures 57-60

Repetitive to Unique:

The cube is repeated throughout this project, however it is manipulated each time it's used. The different cubes create different sized lesson rooms, creating different, unique acoustical environments.

Symmetry to Balance:

This building is asymmetric. The concrete cubes on the exterior, although they protrude at different lengths, balance each other out, so when one is looking at the front of the building, one side to the building doesn't seem heavier than the other.

Additive and Subtractive:

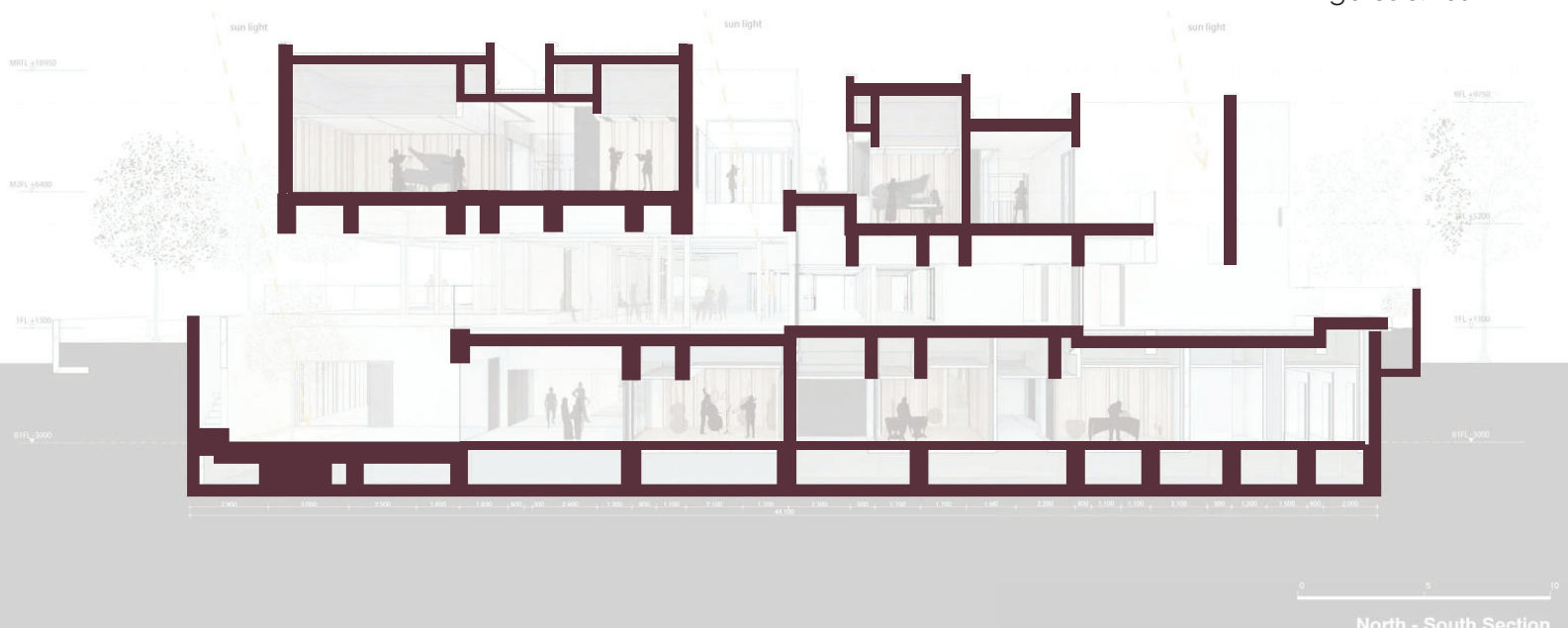
The windows in this building act as a subtractive element from the heavy, concrete exterior. They create punch outs in an otherwise solid form. The cube shapes melded together extend out at different lengths, making them appear as if they were separate elements coming together.

Conclusion:

This building took a very extreme approach to redesigning music education. They created transparent glass practice rooms as a way to connect students and instruments and encourage a more open environment. This building makes a statement with its concrete ceilings, floors and columns and very minimal finishes. It is a blank canvas. Whether this is beneficial to learning could be debated. A blank slate may be a calming place for one to clear their mind and really focus on their musical skills, however it creates a very cold environment.

This building is an example of one way music education has been reinvented. While this environment has some elements that are great for learning, the environment may not be ideal for young learners.

Figure 61



North - South Section





5 CHETHAM'S SCHOOL OF MUSIC

Figure 62

QUICK FACTS

Figure 63

 Architect	 Project Year	 Typology	 Square Footage	 Location
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Stephenson: ISA Studio	2013	School of Music	Unknown	Manchester, UK
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Program Elements:

- 3 story foyer
- Classrooms
- Practice Rooms
- 350 seat concert hall
- 100 seat recital hall

Environmental Effect:

This building was constructed close to a river, so there is a cantilever element in order to avoid the water while also expanding the building's square footage. Being close to the river, this site had elevation challenges. They saw this challenge as an opportunity to implement design reasoning and purpose, dividing program elements by level.

Cultural Effect:

The Manchester city region is looking to preserve their unique features for the long term benefit of its residents, so that was something the architects had to take into consideration. They achieved this through the exterior brick and large massing elements to achieve the signature Manchester industrial look.

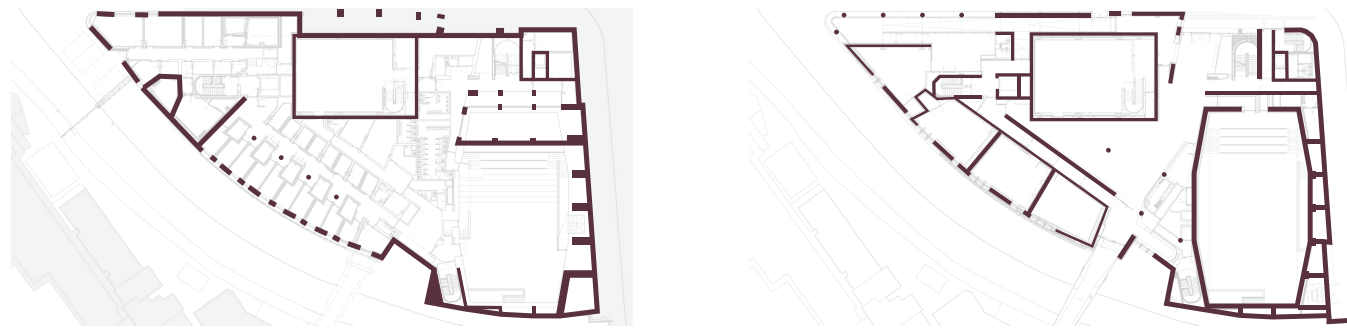
Natural Light:

The large, main foyer in this space has six huge fins that filter natural light into the heart of the building. Neutral colors of black, white and a woody brown are the only colors used in this building. The neutral palate and white walls allow light to bounce off surfaces and spread though out the building. This is especially evident in the main foyer.

Structure:

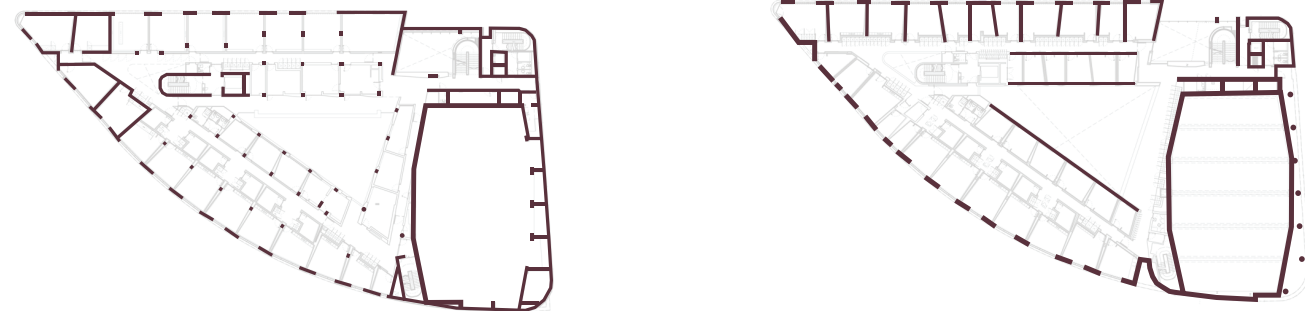
The building's form and structure was highly influenced by the site. This building is located on a river, so a portion of this building is cantilevered and due to the acoustic requirements of the practice spaces, many rooms in this building are independent floating boxes. The Concert Hall is its own independent structure floating on springs.

■ Structure



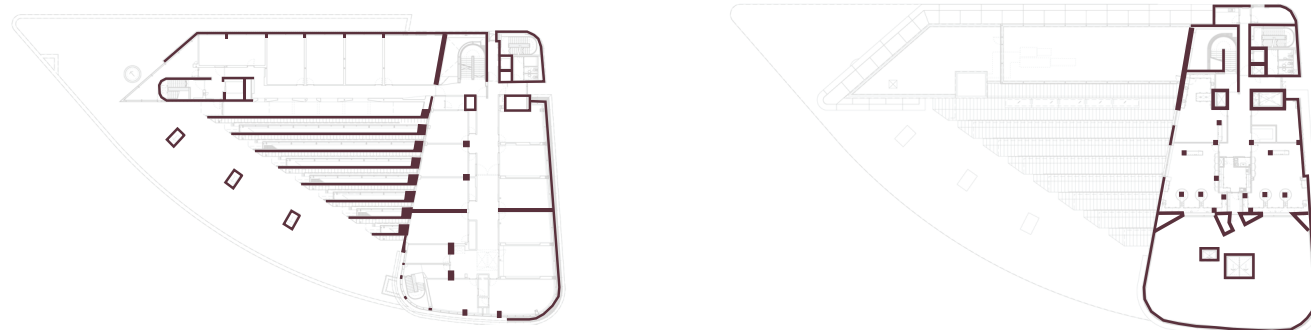
First Floor

Second Floor



Third Floor

Fourth Floor



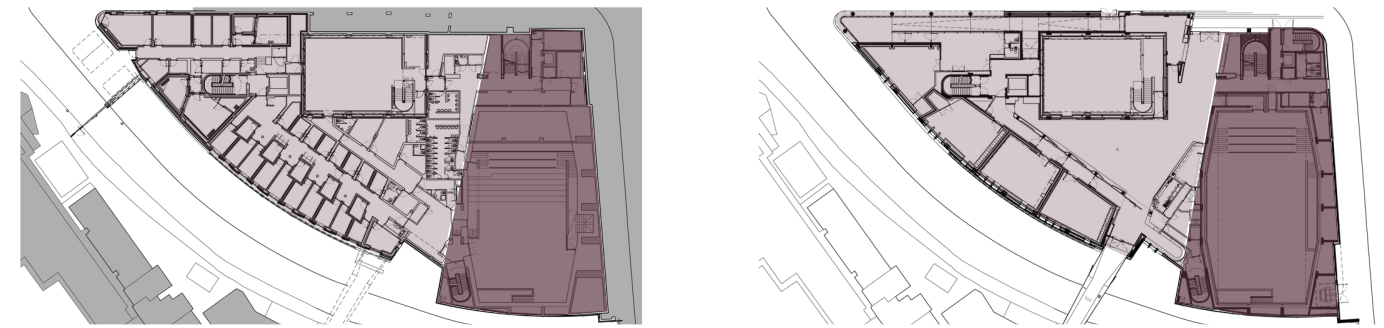
Fifth Floor

Sixth Floor

Figures 64-69
42

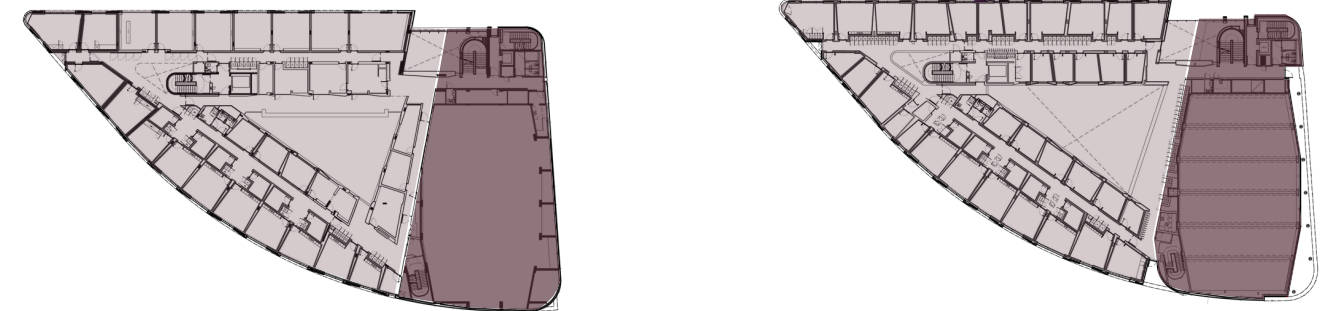
Massing:

The form of this building was meant to represent the fluid forms of musical instruments. The building elevations reflect the image of a musical stave and pianola. Strip windows wrap around the building, creating horizontal elements while the large, white columns create balance with verticality.



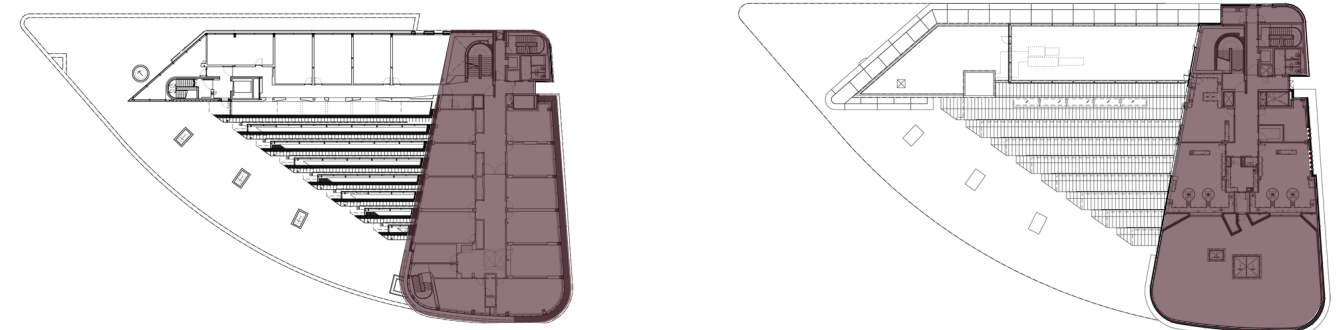
First Floor

Second Floor



Third Floor

Fourth Floor



Fifth Floor

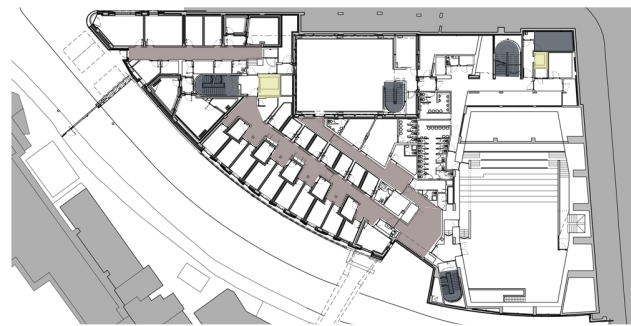
Sixth Floor

Figures 70-75
43

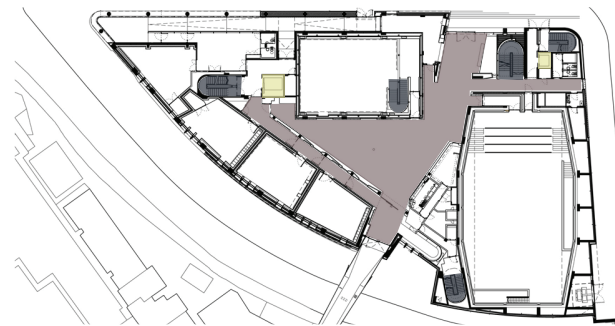
Circulation:

Circulation is located in a triangular shape with practice rooms and classrooms lining its sides. At the center of this circulation zone is the main foyer that extends from the first floor to the roof. The staircases, similar to the building design, are curved and located at each corner of the building for proper egress.

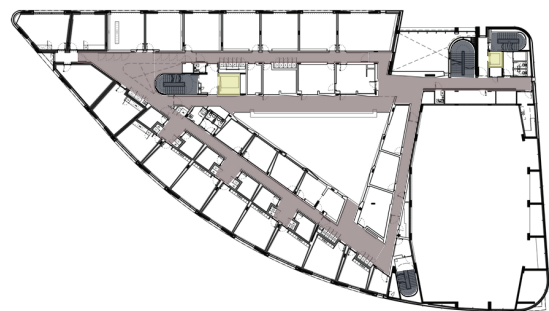
■ Elevator ■ Stairs ■ Floor Circulation



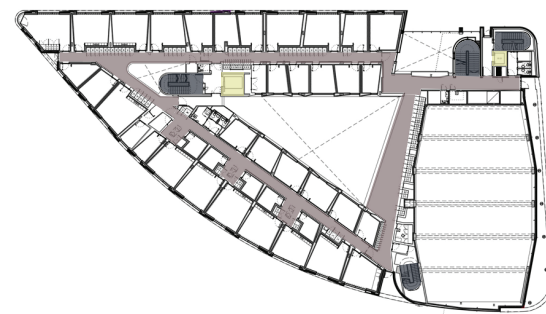
First Floor



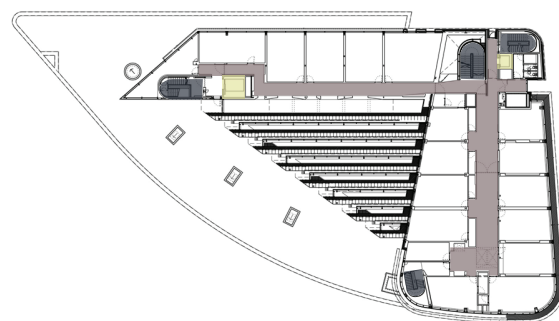
Second Floor



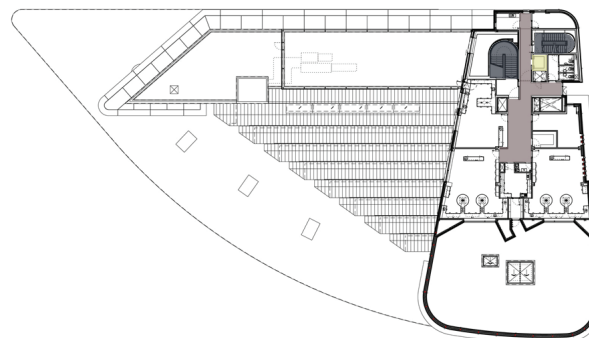
Third Floor



Fourth Floor



Fifth Floor



Sixth Floor

Figures 76-81
44

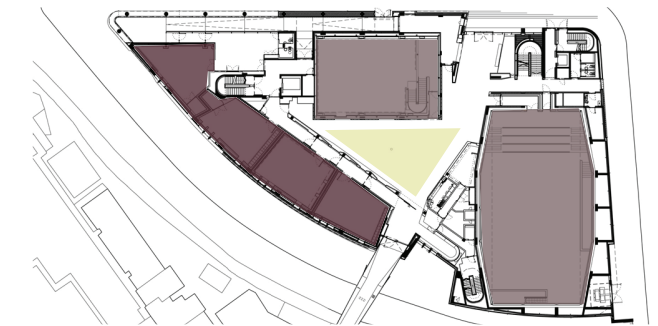
Spatial Relationships:

Because this building was built on a slope, the ground floor is a three tier split level. The main entrance is located on the middle tier, the classrooms are located on the third tier and the performance halls are located on the first tier. Practice rooms on the first floor are separated from the classrooms, however on the upper floors, the practice rooms are located adjacent to the lesson rooms. The main performance hall is located on the right side in the vertical massing element.

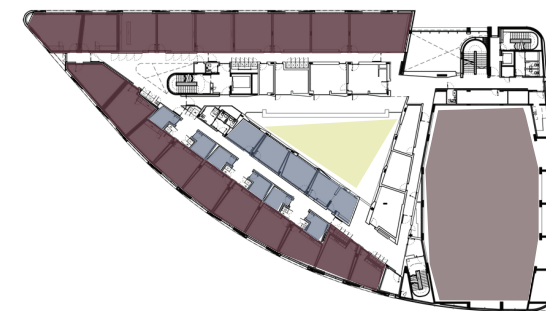
■ Foyer ■ Practice Rooms ■ Classrooms ■ Performance Space



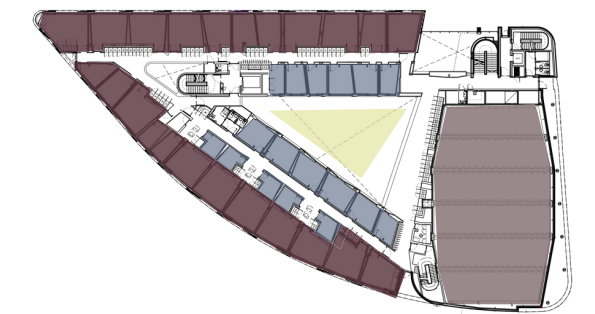
First Floor



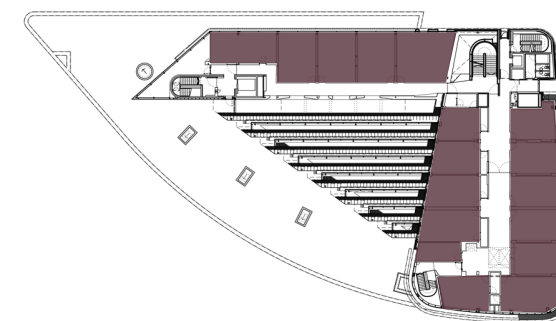
Second Floor



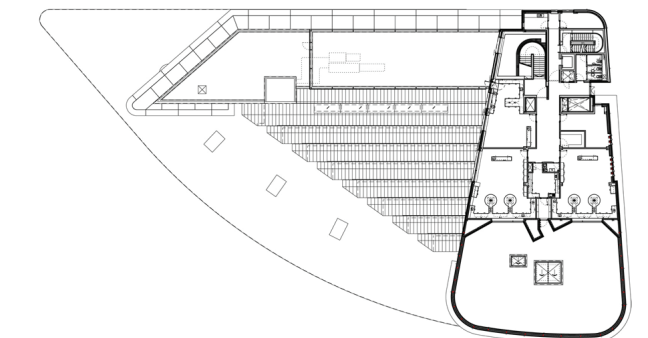
Third Floor



Fourth Floor



Fifth Floor



Sixth Floor

Figures 82-87
45

Repetitive to Unique:

This building is asymmetric. The banded window openings are repeated throughout the horizontal massing element however this repetition is interrupted by the vertical mass with its randomly placed punched openings.

Additive to Subtractive:

The first level with its three different tiers is set back from the front façade, allowing the structural columns to be seen from the exterior or creating a subtractive element.

Conclusion:

This building, similar to the Neuman Hayes project, is a representation of musical elements, in this case, it represents musical instruments through the building's mass and fluidity. While the exterior translated music to architecture, this was not brought into interior spaces. The practice rooms and auditoriums were designed primarily for acoustical perfection. While acoustics is a factor in music room design, this thesis project will push the design of a music classroom farther than merely acoustics. Similarly to the site for this thesis project, this building was built along the river. They dealt with this through split levels, cantilevers and building massing. All of these elements can be taken and investigated further during the design phase of this thesis project.

The premise of the thesis project is made stronger by this typological study. The design of this building scratched the surface of musical representation in architecture. The research and design done for the thesis project will take the architectural representation of music deeper into its design.

Case Study Summary:

The case studies discussed above were all chosen because of their relationship to music performance and music education. Each one featured representative elements or attempted to reinvent music education through the use of design elements. While these case studies did not change the unifying idea, they did support it and they were examples of how it can be achieved.

Each of these building was designed for a different audience. The Harpa concert hall was designed for mainly for adults to hold conferences as well as see concerts and shows. The Diocleians School for girls was designed for young girls to explore music and dance. The Neuman Hayes building was made for young students of all ages to learn the arts and the Tohagakuen School of Music was designed for college students to develop and refine their technique and the Chetham's School of Music combined musical representation with the distinct image of Manchester to create a school for music. These different audiences changed the way each of these building were designed. The Harpa concert hall and the Neuman Hayes building and the Chetham's School of music both used representational elements. Harpa concert hall used it for their façade, and the Neuman Hayes building and the Chetham's school of music used it for its form.

These case studies are examples of how music education can be improved and represented through design and architecture. While there is no right answer when it comes to representations, these are iterations that I can take into consideration.

The location and site of these buildings had different impacts on the final design. The Harpa concert hall was developed along the coast just outside the city center where there is mostly traditional architecture. This building does make a statement in comparison with surrounding context with its geometric shape, glass façade and towering height. The building in Tokyo was built in a fairly natural environment and this building is like a large stone placed right in the middle of it, creating quite the contrast.

The Diocesan School for girls was an addition project, so they had to take into consideration what was existing and a challenge for them was creating a new, modern structure alongside a nationally registered historic chapel. They achieved this by making a fairly simple mass and covering it in an intricate façade that doesn't distract from what is existing on the site. The Chetham's School of Music building had the challenge of building on a site alongside the river. While some may have used the river as a cut off point of the site, the architects extended the floor plate of the building to its limit by creating a cantilevered element over the river.

Culture, politics and social contexts had different effects on these buildings. 4 of these building were built for education purposes and all three took a modern and unique approach to designing for music education. Students going to these schools are going to have a different experience than other student just based on the physical environment they are learning in. Harpa concert hall was built as more of a statement building. It was meant to be something people look to as an image of Reykjavik.

PROJECT ELEMENTS

A Music Learning and Performance Center will need components similar to a school.

- 1 *A large performance hall as well as a recital hall.* Both of these will need to be designed for optimal acoustic balance.
- 2 *Ensemble Practice spaces* for larger orchestra, band, or choir rehearsal. Ensemble practice spaces accommodate all types of instruments and will have to have seating and enough circulation space for all ensemble members.
- 3 *Interactive music space* for early learners. First graders learn music differently than twelfth graders, and they will need a space to explore that learning.
- 4 *Individual practice and lesson rooms* for students to practice on their own and for one on one lessons with private teachers. These practice rooms are often large enough to fit an upright piano as well as seating space for
- 5 *A lab, recording and composition space* where students can use technology to mix or write their own music.
- 6 *Comfortable waiting spaces* for parents while their students are in rehearsal or lessons.
- 7 The final building elements will be standard building program components such as lobby spaces, parking, circulation, exterior spaces, sufficient bathrooms, break rooms, cafeterias and staff spaces.

SQUARE FOOTAGE



Figure 88

USER CLIENT DESCRIPTION

- 1 Students K-12 –
 - Those who are beginners and those who have musical experience
 - There may be some with accessibility and mental health needs, so that will be a design consideration
 - Younger students will not need parking, but high school students will
- 2 Music Teachers –
 - Music teachers with a passion for encouraging young learners, energetic, kind, and patient
 - They will need their own space separate from students to store music parts/scores, instrument parts, etc.
 - Assuming each of them will drive, there will need to be enough parking for them
- 3 Private Teachers –
 - Teachers that can be firm and understanding when needed. They need to be well knowledgeable in their instrument, however they need to accept flexibility and creativity in music performance
 - They will be at the facility by appointment with individual students.
Secure cubbies for music books and lesson tools.
- 4 Parents –
 - There will need to be parking and a drop off loop for parents to bring their kids to the facility
 - Peak times for parent drop off and pick up will be in the morning and mid-afternoon, and parents will park and stay at the facility from 5-8 when after school rehearsals and lessons are held.
- 5 Community members –
 - Concerts will be open to the public, so the performance halls will need to accommodate them.
 - Parking for large events will also need to be considered.

BUILDING CAPACITY



Figure 89

SITE DESCRIPTION

This building will be placed in a location/ city where high school graduation rates are low. The goal of this project is to improve music education and make it easier and more enjoyable for students to participate in music. Studies have shown a correlation between the participation of a student in music programs to academic success, so I would hope this facility would set students in the community up to succeed academically in their schooling and into future workplace success.

Currently, Oregon has one of the lowest high school graduation rates in the country, so areas in Portland, Oregon are being investigated for possible building sites. There are seventeen K-12 schools located within the Portland metro area so this music learning and performance center will be placed within decent range of elementary, middle and high schools as well as public transportation for easy access for parents and students.

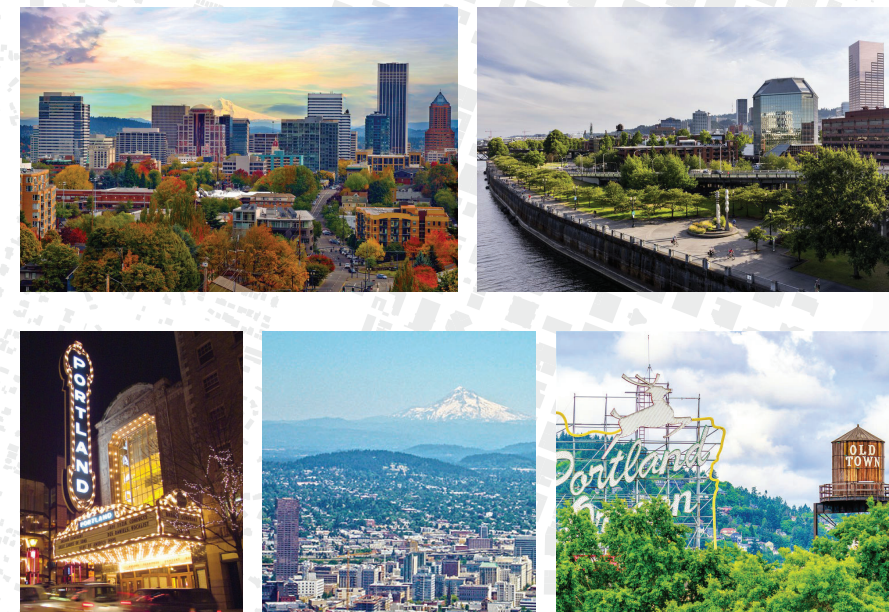
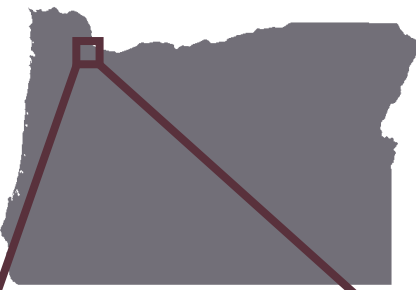
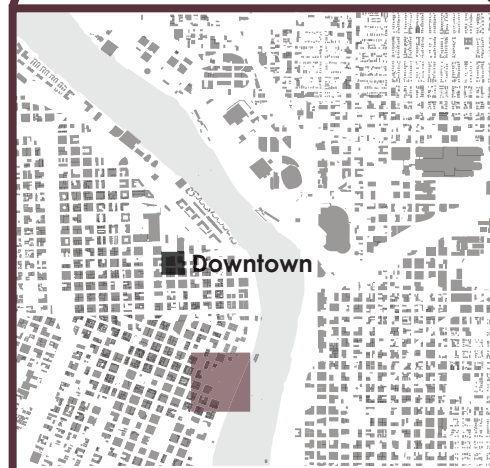


Figure 90

Portland, Oregon



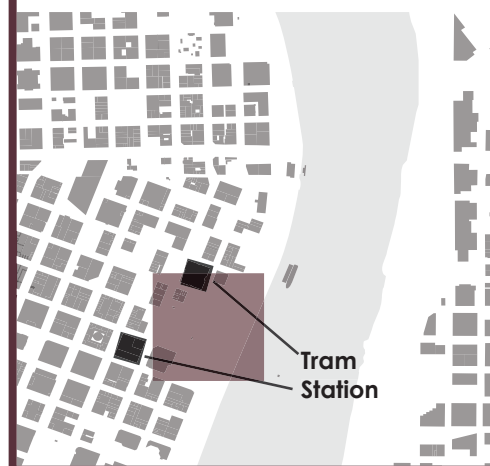
The proposed building site is located on a vacant lot next to the river with great views and a couple miles south of Downtown Portland



The site is located right next to Tilikum crossing, a light rail and pedestrian only bridge that is a staple image of the Portland skyline.



Just adjacent to this building are two tram stations as well as single family and multi family residences.



PROJECT EMPHASIS

- 1 To make music education more exciting and inviting for students and encourage them to pursue their musical studies so the requirement of students to play and instrument is a joy rather than a task.

As previously discussed, music education can improve the academic and workplace success of students. Through design I hope to make music education more appealing to K-12 students.

- 2 Design a music education space that is inventive and different from traditional classroom spaces.

Music classrooms are typically designed with the same, standard elements. This project will stray away from the traditional and attempt to purposefully design a space that encourages music learning through design.

- 3 Develop a design 'kit of parts' for future designers and teacher to use in music educational spaces.

To develop this I will be researching and developing how to represent music architecturally and then translating those representations into a learning environment.

PROJECT GOALS

Goals of this project include pushing the level of design to create something that is made with reason and purpose. Something that is research driven and has information to back up the design choices made. This building will encompass all research done in the Fall semester and take into consideration the community of the site, and the educational field being designed for.

Through this design, technical drawing and render quality skills will be refined as well as the expansion of graphical display and diagramming skills to portray research completed and design choices made in a clear and user friendly manner. All of which will be helpful in the author's future career as an architect. Being able to illustrate and explain things in an understandable way to a client is important in client-architect relationships. This new research knowledge can also be brought to a future career and open new job opportunities on the research teams of architecture firms. This research and design can be used as an example or at least the first attempt at redeveloping music education design.

Academically, this will be the most thoughtful and research driven project of the author's education at NDSU and this design will surpass all previous projects completed in that manner. This project will portray skill level at this point in the author's educational and architectural career. This project is just the beginning of research driven design in the author's future career and new discoveries and ideas attained through research.

METHODOLOGY

In order to make music education more exciting and to make it more understandable to students, research will be done on how to represent music in architecture and then how that can be translated into classroom design.

To begin researching how to represent music architecturally, the first step will be investigating background information on a few topics relating to this question by reading books, specifically Concerning the Spiritual in Art, Remixing the Classroom and Synesthesia. Each of these texts provide different information and knowledge that can be used in preceding research tasks.

While there is no definitive, correct way to represent music architecturally, it can be done many ways however the research and results found at the end will be an individual interpretation.

Building off of the author's 17 years of music education and background as well as some supplemental research, a handful of key musical elements that are essential to learning and understanding music will be identified. After these elements are defined, the next goal will be to create visual representations of each element using line, point and color in order to gain a further understanding of the elements and how they can be represented.

Once that process is done, a critical look will be taken at the representations and the elements that are found to be beneficial for the next steps of the project will be identified and tweaked as necessary.

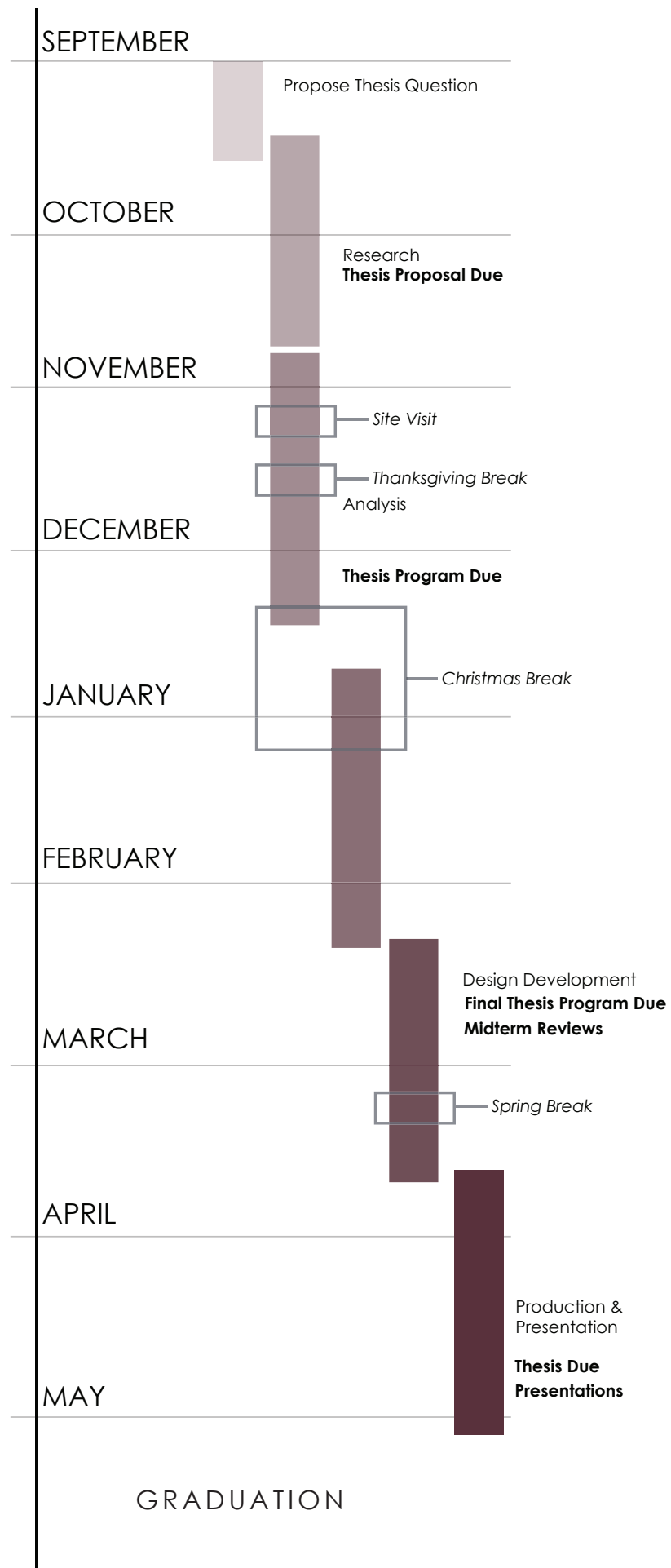


Figure 92

IMPLEMENTATION

The next step will be to start translating these musical representations and terms with architectural elements.

Once I have linked the 2 dimensional music representations with three dimensional architectural representations, I then must create a graphical display of my process and findings in order to better explain my work to my peers, professors and other architects in the field.

To do this, each musical element will have a page containing defining terms so readers that don't know musical terminology have a better understanding of what is being investigated as well as the representational sketches.

Moving into my design work in the Spring, I will take the representational research completed this Fall and implement it into the design of a Music Learning and Performance Center. Each classroom, performance hall, lab and interactive room will have architecturally represented elements of music.

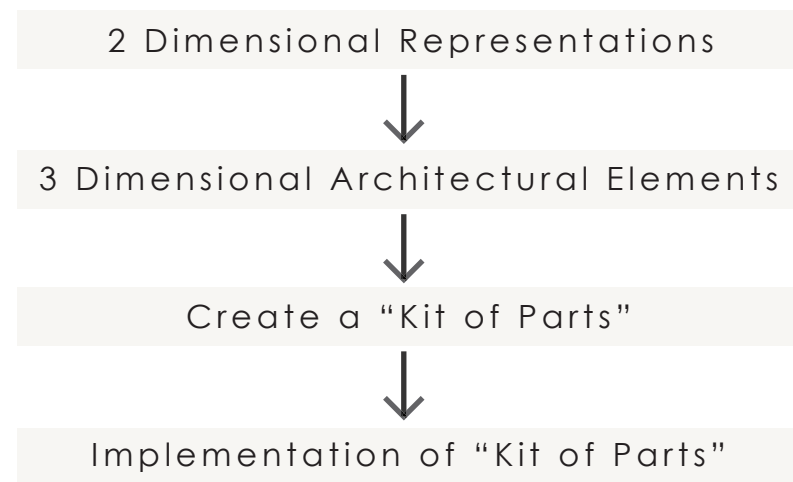


Figure 93

RESULTS FROM THEORETICAL PREMISE/ UNIFYING IDEA RESEARCH

Philosophical Framework

Through the gathering of information using the constructivist approach, and the gathering of qualitative data and drawing conclusions based on correlational research, a process for identifying musical representations has been identified. Using this process, music will be translated into architecture and implemented into a Music Education and Performance Center as well as other music facilities in the future. These findings will make music education spaces more exciting, inviting, and open to all different styles of music and encourage students to interact not only with music and their instruments, but also with each other.

Theoretical Framework

The ability to play an instrument has many benefiting factors. Playing an instrument improves executive functioning, which is a person's ability to make good choices, balance multiple tasks, make plans, regulate behaviors, solve problems, retain information and adjust to changing mental demands. It also improves memory and reading skills due to increased connections between the left and right hemispheres of the brain musicians have in comparison to non-musicians. It increases resilience to stress and depression as well as strengthens one's bond with others due to the amount of collaboration required in musical ensembles (Rampton, 2017). All these elements are life-long skills that not only improve student's academic and social success, but also prepare them for life after school and workplace success. The intent of this project is to be a fresh and new addition to previous attempts at representing music in architecture and introduce new correlational methods and research to this field of practice in hope that designers in the future will reference this work and implement the findings into their own designs. Above the intention of this project to impact the future of the design of music facilities, the research and work done in this project is for the benefit of current and future music students to encourage them to continue in their studies.



THE
PROGRAM

Strategies

To determine how to represent music in architecture, correlational research was implemented. Determining which representations were better than others was based on which representations created had the strongest correlation between each musical element and what each musical element embodies. For example, musical intervals are the relationship of two different notes on the staff lines that when played together create a blend of two different pitches. The basis behind intervals is their proportional relationship between each other. Two of the same notes played at the same time are in unison, equivalent to a 1:1 ratio. Two of the same note but played at different pitches are called octaves and are equivalent to a 2:1 ratio. The other two most common and easy to identify intervals are the perfect 5th and perfect 4th intervals equivalent to a 3:2 and a 4:3 ratio. These proportions can be translated into architecture. Designers use proportions in many elements of their designs including the size of a room, the proportion of ceiling or floor tiles, the amount of natural light in a space, etc. Using this background knowledge of intervals and applying the aspect of ratios to representations, the use of correlational methods will identify which of the created representations are the strongest.

The process of identifying which terms and factors will be used to define each musical element and therefore be used in identifying correlational factors has been done through the research of precedent studies on ArchDaily as well as through case studies analyzed in the text *Architecture as a Translation of Music*.

Furthermore, precedent studies will also be a strategy used in this project as an example of the process previous designers have used to represent music in architecture. They will also be used as an example of program elements, spatial relationships as well as acoustical environments.

Tactics

To begin, seven musical elements were identified as being essential to music: pitch, intervals, scales, melody, harmony, tempo and rhythm. Each of these terms were defined based on dictionary definitions, definitions found from musical references as well as previous experience of the author.

- 1 **Pitch** is defined as “The quality of a sound governed by the rate of vibrations producing it; the degree of highness or lowness of a tone.” (Webster’s, 2018). When playing music, the goal is to play notes in tune and pitch is an important element of that goal.



- 2 **Intervals** are defined as “a space between two things; a gap” (Webster’s, 2018). Intervals are the relationship between two notes and the space between them. Depending on the interval played, the space between those two notes will get larger or smaller, this creates a ratio.



- 3 **Scales** are defined as “A set of musical notes, typically ordered in pitch.” (Webster’s, 2018). Scales move up and down the staff line based on the pitch being produced. They are usually played in a linear fashion that starts on a low pitch on one note, hits the same note but an octave higher, then ends on the same note it started on.



- 4 **Melody** is “a sequence of single notes that is musically satisfying.” (Webster’s, 2018). This sequence of notes follows a musical line that typically evokes an emotional response and attracts the audience to the piece.



5 Harmony is “The combination of simultaneously sounded musical notes to produce chords and chord progressions having a pleasing effect.” (Webster’s, 2018). These chord progressions use intervals and scales to complement the melody and add depth and texture to a musical piece.



6 Rhythm is “a strong, regular, repeated pattern of movement of sound.” (Webster’s, 2018). These repeated elements can be on the beat or off the beat, slow or fast, long or short.



7 Dynamics are “The varying levels of volume of sound in different parts of a musical performance.” (Webster’s, 2018). Dynamics range from very soft or ppp (pianississimo) to very loud or fff (fortissimo).



Tempo is “The speed at which a passage of music is or should be played.” (Webster’s, 2018). Tempo can be slow or fast, it can make a piece energetic or soothing, and it is something that the entire orchestra follows, it keeps everyone together.

Allegro (♩ = 144)

Adagio (♩ = 60)

Once these elements were defined, two dimensional representations were created for each one based on their defining elements. This was the first step taken in the process of representing music in architecture. Each musical element had approximately fifteen different representations, each one a manipulation and further discovery than the last, attempting to embody the musical element using line, point and shape.

Using correlational methods, these representations were narrowed down. Based off the musical elements defining factors, a further study was done to each representation to determine which ones had the strongest correlation to the musical element. This was a careful process that put meaning and reasoning into each representation, thinking of it not only as a line on a page, but music on a page.

After each musical element was paired with a two-dimensional representation identified with correlational methods, the representations needed to be translated into architectural elements in order to implement this study into an educational facility.

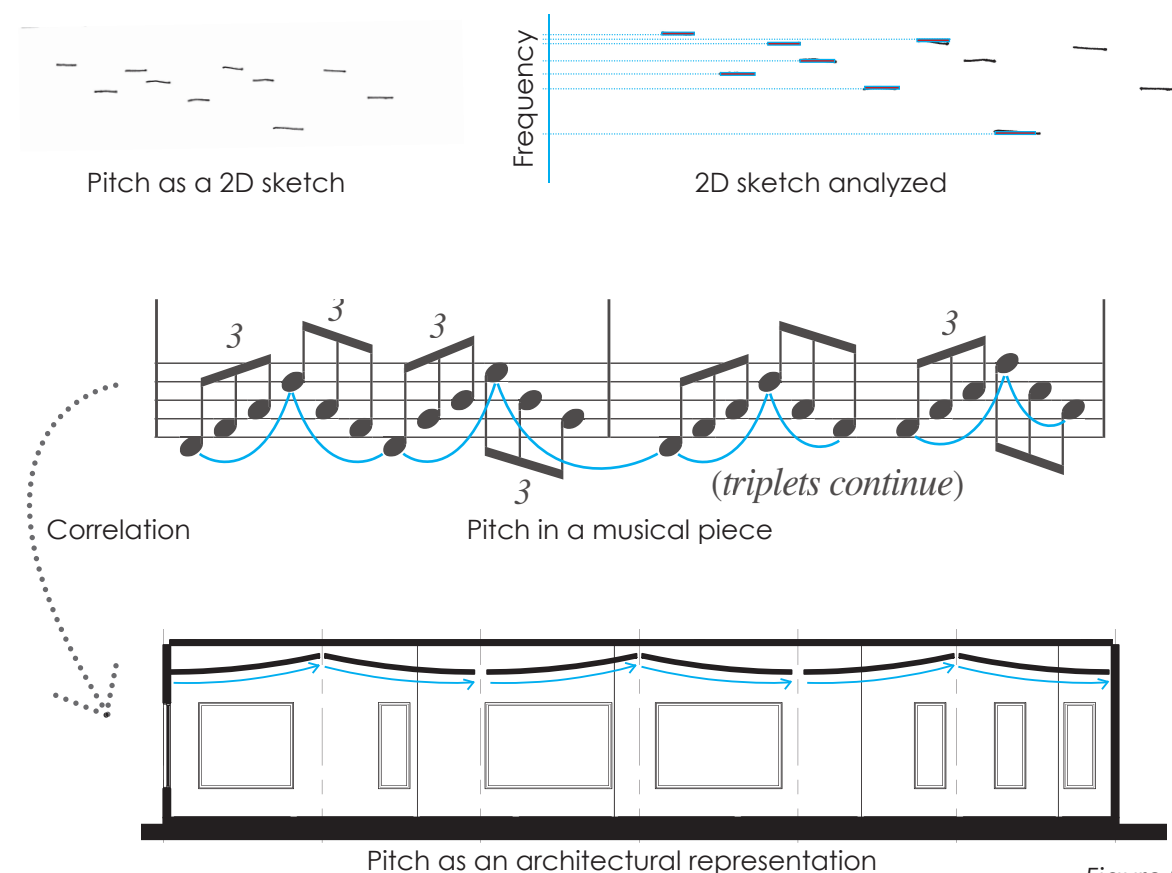


Figure 95

Figure 96

HISTORICAL, SOCIAL & CULTURAL
CONTEXT

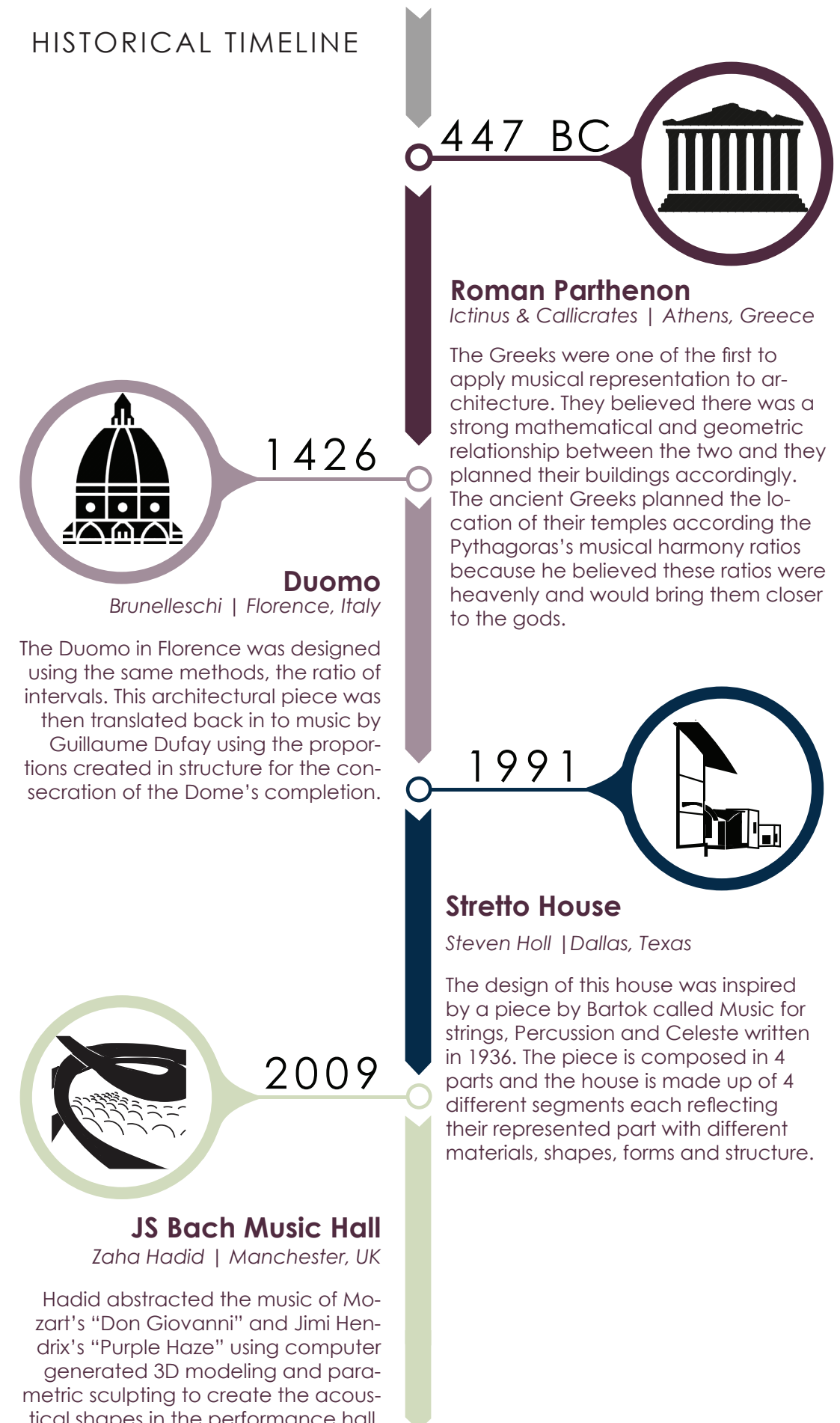
Historical Context

Music and architecture have influenced each other since the time of the Ancient Greeks. The relationship of proportions to musical harmonies was first discovered by Pythagoras. He related his musical and proportional theories to the unity of all things. This translated into the relationship of columns and building size as well as the relationship between their temples. They believed that by placing their temples in accordance with ratios created in musical harmonies, they would be closer to the heavens and therefore, the gods.

Moving in to the Renaissance period, both music and architecture move through similar stages of tangible and intangible development in response to time. Both Baroque music and architecture feature elaborate ornamentation and evoke strong emotions. The Classical era represents both balance, elegance and simplicity in both music and architecture and the Romantic era can be described in both artistic methods as displaying passion and diversity.

Throughout the next major architectural eras in history, the Modernist movement, Art Nouveau, Art Deco, and Post Modernism, the changes in both style of architectural design and musical composition align once again. Architecture taking on a more modern, simple, and futuristic characteristics and music using atonality, dissonance, minimalism as well as unconventional instruments.

HISTORICAL TIMELINE



Social Trends

In many school districts, the arts is one of the first programs to be cut because it is seen as unnecessary and not practical for future careers. However heightened executive function is a cognitive process that enable people to quickly process and retain information, regulate behaviors, make good choices, solve problems, plan and adjust changing mental demands, all of which not only prepare student for academic success, but also workplace success. Even with all the benefits to learning an instrument, students still drop out of music classes after 1 or 2 years because music is difficult to learn.

Social Context

Oregon has the third lowest high school graduation rates in the United States. Only 73% of students finish high school and receive a diploma. While New Mexico and Nevada have lower graduation rates than Oregon, they both have reported a 2.5% in the past year while Oregon has a less than 1% increase. (Hammond 2017) Music education has the ability to increase academic success in students and therefore raising graduation rates and preparing students for a better future. The site for this project is located in Portland, Oregon, a city with 647,805 residents (US Census Bureau 2017).

Historical Narrative

Music has been in existence for over 50,000 and has been an elemental part of every known culture both past and present (Wikipedia 2018). Music began with the playing of basic rhythmic patterns on the drum during religious ceremonies in 4500 BCE. Music and musical instruments continued to be developed and created until the Greeks introduced musical theory in 350 BCE. Pythagoras developed a key element of music theory, the octave scale and Aristotle wrote about music theory scientifically which in turn brought about the first known method of music notation. This method of musical notation was brought to Western Europe in 521 CE allowing musicians to accurately notate their folksongs and hymns. (Hollis 2017)

Most music created after the fall of Rome in 600 CE was commissioned by the church and the first school of music in Europe, the Schola Cantorum, was opened by Pope Gregory. This school was an educational facility for the papal choir whose purpose was to render music in the church. Music at that time was mainly monophonic, or music with only melody, no harmony or counter rhythms, or improvised based on melody, rhythm and poetry. This early form of music greatly influenced the development of music in the Christian Church (Wikipedia 2018).

144 years after the Schola Cantorum was created, numerous other choral schools opened including schools in Paris, Cologne, Fuda and Metz. These schools were break offs from the original Schola Cantorum and continued to develop music in the church including the creation of the church "modes", which would later be morphed into modern major and minor keys. (Hollis 2017)

In 1000 CE the musical theory was improved by Guido D'Arezzo through the addition of time signatures and solfege, which is the vocal note scale do, re, mi, fa, so, la, ti, do. At this time, secular music began developing separate from the church called "folk" music.

In 1465, the Renaissance era began and with it came the invention of the printing press. This new invention allowed composers to print their compositions and disperse them easily while making a profit. This new era brought about some of the most well-known musicians and composers and changed the rules of music significantly. (Hollis 2017)

The Renaissance era brought about three major styles of music: Baroque, Classical and Romantic, each with their own defining factors. Baroque style was written with frills and decorative musical accents, sudden dynamic and tempo changes as well as plenty of emotional turns. Classical style as described by Sir Thomas Bown "...there is music wherever there is harmony, order or proportion." (Hollis 2017) This style of music is a structures and mathematical approach to music compositions, with the goal being the creation of "perfect" music. This concept lead to very restrictive and technical music that was strong, however lacked the emotion created in Baroque style. The Romantic Style, which had no regard for classical rules and was packed with emotion and musical movement.

At this point, music was mainly taught on an apprentice, master basis. A master of an instrument would take on an apprentice and teach them everything they knew about their craft. This method of music education is still used in private lessons however it has been adapted into other teaching methods as well.

In the early 20th century, the teaching and learning of music became refined and widespread throughout all levels of education. The methods of teaching music were divided into four different categories: the Orff Schulwerk Method, the Kodaly Method, The Suzuki Method and the Dalcroze Method. The first of these methods, the Orff Schulwerk Method, teaches young children music by engages their mind and body through a mix of singing, acting, dancing and a mix of percussion instruments. This method is the most free and loose form of teaching, emphasizing the integration of the different arts through stories, movement, play and drama. Music is taught through a natural progression of voice, body percussion and finally an instrument. The Kodaly Method emphasizes the start of music education at an early age, first through voice learning pitch through hand movements and ear training then learning rhythm through syllables and finally into instrumental instruction. The Suzuki Method was introduced in Japan and brought to the United States in the 1960's. This method approaches the learning of music and an instrument similar to learning a language, through listening, repetition, and memorization. Parents are highly utilized in this method through motivation, encouragement and support. The Dalcroze Method was developed by a Swiss educator to teach rhythm, structure and musical expression through movement and learning through multiple senses. This method begins with ear training and improvisation and is always paired with physical movement. (Estrella 2018)

Today, music is often introduced to students in middle school as a class requirement and after the first year it is up to them (and their parents) as to whether or not they want to continue their instrumental studies. Universities also offer bachelor, masters, and doctorate degrees in music education as well as music performance.

“ I call architecture frozen music ”

-Johann Wolfgang von Goethe

LITERATURE REVIEW

Title: Remixing the Classroom

Author: Randall Everett Allsup

Remixing the Classroom by Randall Allsup is a book that argues for the open philosophy of music education. Allsup states that music education is on a downward sloping hill, that there is “Fear of the loss of the arts and humanities in the public school (we’re sorry, but there’s just no time) and now in the university (they aren’t good for getting a job), and to the fear that no one will miss the music classroom when it’s gone?” (Allsup, 2016). In order to improve music education and make it more open and inviting for students and encourage people, schools, and universities to keep music around, it needs to be “remixed” and revitalized. The following literature review will discuss Allsup’s argument for a music education “learning Laboratory” as well as his ideas on the future of music education.

The Future of Music Education

Allsup’s argument through this book is that music education must change, or it will slowly become more and more irrelevant as the generations continue. He states, as music education is currently, that it is up to the “masters” of music to determine what is acceptable in musicianship and what is not. But this concept of “musician” and “musicianship” must be adaptable and able to change, as they are not the same to each person, to each style of music, to each instrument, to each decade, etc. Music master’s shouldn’t be able to deny a student an education because their way of learning or expressing music isn’t what the master deems ‘correct’.

Although Allsup makes a strong argument against the master/ apprentice teaching method, it is a valid one. I believe the master/ apprentice learning style is one that, for some people, works well. All students learn differently and for some, this style of learning is best for them and that is one of the reasons I believe this method has been the dominant teaching and learning method for centuries. But this learning method is very rigid and in order to be more inclusive of different students and their abilities, needs to change. Allsup references Snoop Dog and encourages music educators to break away from the norm and allow students to “flip it and dip it and serve it” however they want to if that’s what speaks to them. There shouldn’t be a ‘Law’ of music, something everyone has to follow, it should be open to different interpretations.

Learning in Laboratories

As Allsup describes, “the Laboratory is a place of patience and action, where knowledge is sent in arterial fashion into the world and back.”. It is a place where learning engages the traditional without worshiping the past and allows the inhabitants of the Laboratory to engage with music in their own unpredictable and creative ways. Allsup argues that there have been innovations and growth in other professions, however music education has stayed stagnant. The Laboratory environment would give students the ability to grow and expand further than they would in a traditional setting. Music is a free moving, playful form of art and should be taught as such. Allsup mentions Architects have long understood that the way we construct spaces affects and shapes the human relationships within. If this is the case, why not use architecture to “remix” the classroom, create Laboratories, and improve music education.

Allsup's 21st century take on music education is refreshing. He uses a variety of analogies and metaphors to keep the text interesting and relatable. I agree with his take on learning Laboratories, that music learning environments shouldn't be a top down hierarchy with master/ apprentice relationships. They should be open to each student's individual interpretation of how music speaks to them. In doing this, students are able to find their own interest in music, not what someone tells them they must like about it. Allsup states “All professions and artistic traditions – if they are to remain open, generously shared, and expanding parts of society – must have the option of growing beyond what another generation has determined good or right”. This concept of learning from the past and growing from it is not a new one, however, this concept has not been applied to music education. This idea of learning Laboratories need not be only applied to newly built facilities. Older institutions can create these learning environments through their teaching methods and classroom layouts, things that appeal to a learner's sense of exploration and freedom. Times have changed, education has changed, however the way students are taught an instrument have not. I believe Allsup's argument is valid on this point, that there needs to be a change, or there will continue to be a drop in student's interest in music education.

LITERATURE REVIEW

Title: *Architecture as a Translation of Music*

Author: Elizabeth Martin

Architecture as a representation of music is, as Elizabeth Martin states, “a work in progress rather than a definitive and exhaustive study.” There is no right answer, no wrong answer, but there are answers that are stronger than others. Throughout this text, Martin goes through the different steps of translating music to architecture, starting with the basics of notating music graphically, translating that to design, and then she reviews a variety of different case studies that have attempted to represent music in their design. Similar to the methodology of this thesis process, Martin uses correlational methods to connect music to design, design to architecture, and people to a space.

Martin begins by describing an exercise students completed. They were each assigned to listen to a musical piece by Claude Clement then translate it into a three dimensional, abstract model. Each student had to develop their own language of musical translation to create the different pieces within the composition. As an architecture student, seeing this exercise is not far from something I could see being given to us as an assignment. It explores form in a more abstract way, taking a step back from literally creating walls and a room, but instead representing and abstracting a concept. Exercises like this one are valuable for designers, not only early in their education, but in their professional career as well.

She then began to explain the “y-condition” of music + architecture. “Although music + architecture have different phenomenal presences, the underlying organization of their respective formal structures and colloquialisms are similar.” Within this chapter of the book, she emphasizes the use of architectural translation of music as a design tool and the translation occurs through a kind of methodology used to connect the two elements. Similar to the methodology this thesis project is utilizing, Martin uses comparison and correlation to bring the architecture and music together. She then identified the major components of minimalist music and their defining factors and began analyzing how these components can be translated into visual forms. A language of musical notation was created to consistently transform musical components to visual elements and then into building elements. The end result of this methodology was a building that was purely designed to represent each musical element holistically, not a conventional building type.

This methodology and process of translating music into architecture is similar to that used in this research project. The method turned music into architecture and similar to the exercise done by the students. She abstracted a building, instead of making it a functional one. I believe this is an interesting and explorative element of design that can be helpful when trying to brainstorm new ideas. While this is an extreme and very literal approach to translating the elements, there are elements of this study that can be utilized, however the end result of this thesis project will not be the same as Martin's results.

The final portion of the text dove into case studies. With each one, she identified the key takeaway as well as a detailed description of how musical translation was utilized in the design. One of the more unique case studies done in this section was one of a highway. "Traditionally, music is defined by visual elements expressed through time. Freeway as Instrument explores the idea of music as defined by visual elements expressed through time, specifically, shadows cast as the sun traverses the sky, a visual representation of a temporal experience-the cycle of the day". The different elements on the highway represent different musical elements and instruments. The rows of evergreen trees set the rhythm, similar to a cello in an orchestra. A series of masts attached to the roadside added harmonic overlays, like a viola. The remaining trees and flowering plants are the melody, the first violin. Suspended above the highway is a wavelike structure that represents the second violin, an instrument that follows and supports the first violin. This case study is interesting in the way that the representative elements do not correlate mathematically with any of the musical elements, as Martin does in her representation, but instead represents the idea, feel and description of the musical element. While this method of correlation may not be as scientifically strong and set in stone as mathematical correlations, it is a more poetic and artistic correlation that if explained correctly, could be strong as well. Throughout this text, Martin drew many connections to music and architecture stating "In music as well as in architecture form, rhythm, proportion and mathematics are of elementary importance."

as well as "The conductor of an orchestra music throughout analyze the parts of the score before coming to an understanding of it as a whole – as a synthesis of the individual parts. The same can be said about an architect and design." Throughout history, music and architecture have crossed paths on multiple occasions. Architecture attracts the eye while music attracts the ear, two of our strongest senses. The ability of architecture to represent music is a technical, yet creative and open art form that adds another layer to the design profession.

"Architecture represents the art of design in a space; music, the art of design in time."

-Elizabeth Martin

LITERATURE REVIEW

Title: Synesthesia

Author: Richard E. Cytowic

Synesthesia by Richard E. Cytowic is a book published by the MIT press and is a part in their Essential Knowledge Series. This book aims to define synesthesia as a medical condition and describe how synesthetes experience elements in life different from those who don't have synesthesia. Pre-1970's, synesthesia was said to be a bogus, made up condition and it wasn't till the late 1970's that psychologists and medical professionals started publishing articles and doing studies on synesthesia that is was accepted and identified as a medical condition. The following review will discuss associations among different dimensions and the most frequently occurring correlations between synesthetes.

Associations Among Dimensions

The idea of synesthesia has been an interest to people for centuries. While not everyone has a medically defined case of synesthesia, artists, musicians, movie makers and more have been taken with the possibilities of connections made between different dimensions. Cytowic used examples like Sir Arthur Bliss's Color Symphony and Alexander Scriabin and his tone poem Prometheus which both feature a mute color organ projecting lights above and orchestra to tie music and color together.

While not an “official” synesthetic reaction to a sound, the audience is still making a connection to the sounds being played and the colors being projected, as was the composer’s intent. Georgia O’Keeffe had several paintings titled *Music: Pink and Blue*, in which she intended her paintings to represent music in shades of pink and blue. Walt Disney created the movie *Fantasia* on the idea of sight-to-sound correspondences. Sergei Eisenstein hand-colored film frames to create an overall color wash that would reflect the mood of a particular scene.

Cytowic is very critical of these correlations. He argues that these correspondences are not caused by medical conditions and there is no scientific evidence that verifies these representations are correct. Cytowic takes the approach of a psychologist in this book, unlike the artists and musicians mentioned previously. Cytowic states in his book regarding the artist Wassily Kandinsky and his representative paintings of music that “He failed, because...synesthetic pairings are idiosyncratic rather than universal.” (Cytowic, 2018). While Kandinsky’s representations may not be the same representations other synesthetes see when they hear the same piece of music, it is still Kandinsky’s representations and he can’t fail if there is no right answers when it comes to representing different dimensions, only strong correlations.

Common Correlations

There are 5 major clusters of synesthetic reactions. Language is the most common instigator of synesthetic experiences. For synesthetes, words and the sounds of different letters elicit different shapes, colors, textures, movement and even shimmering. Synesthetes describe, very specifically, what they are experiencing with details that surpass what non synesthetes would use to describe and experience. Other common color sequences are sensations of color in response to ordered sequences especially over learned ones like alphabets, calendar months, numerals, and days of the week. Colored music is an occurrence in twenty percent of synesthetes and occurs when a color sensation is elicited by notes, chords, musical keys, instrumental timbre, rhythm and other musical features.

Affective perceptions is a color experience paired with a felt emotion such as happiness or disgust. Nonvisual couplings are any sense or concept linked to a non-visual response, such as vision to smell or taste. The final synesthetic cluster is special sequencing, or the three-dimensional rendering of any sequence.

Colored music is the focus of investigation in this review. Synesthetes pair the sounds they hear in music with multiple alternate dimensions. Cytowic described two different cases of synesthesia in music, one from a young musician in Italy who experiences musical intervals as distinctive tastes. Another subject saw different shapes and colors whenever he listened to music, specifically electronic music. After reviewing several different people, Cytowic was able to identify a common trend throughout most synesthetes. “High tones are always lighter than low ones...” and “Color intensity relates to emotional intensity.” (Cytowic, 2018). The musical elements synesthetes respond to are sounding pitch, pitch class, musical key, timbre, chords, melody, and volume. Cytowic is very descriptive in this section of the book. “Melodic intervals obey the law of regular correspondences, too, by mapping to bright-dark values: lighter stimuli are judged to go with ascending melodic intervals, and darker stimuli with descending ones. The wider the melodic interval, the more gradations of light and dark there are.” (Cytowic, 2018). Cytowic goes on to explain different people and the different experiences they have with their case of synesthesia. The way synesthetes experience music is at a different level than non-synesthetes. They experience music in ways other than by just sound, which is why it’s no surprise that many musicians are synesthetes. While not everyone may, for example, hear the note C and think of the color green, there is a certain range of sound to visual pairing that non synesthetes to experience. The bouba/kiki effect was a study done in the mid 1900’s that gave participants two shapes, one curvy and one with sharp edges and played two different kinds of music, one that was softer, more legato, or smooth, and one that was louder and more staccato, or short. Nearly everyone in the study linked the curvy shape with the smoother song and the sharp-edged shape with the short, loud song. This section of the book is filled mostly with facts, studies, and people’s personal experiences. It is very informative and contains interesting information.

PROJECT JUSTIFICATION

Music education has the ability to impact students' mental capacity to learn, make decisions, express themselves and foster qualities that will prepare them for future careers. Through the gathering of qualitative data, I will find a connection between music and design and discover how music can be represented architecturally. I will be investigating, the constructivist approach, alternative music teaching methods, synesthesia, as well as the connection between art, music, color and form. Using these sources and the information gathered, I will draw conclusions based on logic and precedent studies. Using inductive processes for creating knowledge, it can be argued that music rooms need to be revitalized and taken another look at; how that should be done and what specific design elements are needed to complete this task is still unknown, but the end result will ideally be the improvement of music education and therefore, students' academic success.

Through scientific studies, a correlation has been shown between a student being able to play an instrument and heightened executive functions (Nadine Gaab, PhD). Executive functions are high level cognitive processes that enable people to quickly process and retain information, regulate behaviors, make good choices, solve problems, plan and adjust to changing mental demands. Furthermore, executive functions have been shown to be a better predictor of academic success than IQ. Not only are executive functions heightened, but memory and reading skills are strengthened, stress and depression is decreased and playing an instrument strengthens bonds with others due to the collaboration utilized in ensembles (Rampton 2017).

My research project this semester will identify how architecture and design can represent music and how that will ultimately improve the way students learn music. This research will leave me with a 'kit of parts' that I can take and apply to my thesis project next semester and answer the question 'how can design improve music education?'

The hope for this research is for it to be of used by clients and firms designing educational music spaces, in whatever typology that includes them. This research will be compiled in a research booklet as well as in a journal article and my classmates as well as my primary thesis advisor will be reviewing it. I will be using information from Kandinsky's *Concerning the Spiritual in Art*, *Remixing the Classroom* by Randal Allsup, *Synesthesia* by Richard Cytowic as well as various other books, and articles. This research, when applied, will encourage and excite students within the space to continue their music education. The research I am doing involving the architectural representation of music will be explained using psychological and qualitative principles.

I was introduced to the piano when I was in first grade and was dead set on choosing the saxophone in sixth grade, but ended up picking the violin because the orchestra teacher seemed nice and all my friends chose the violin. After that orchestra teacher is no longer my teacher, and my friends all quit playing after a couple years, I continued to play through middle school, high school and now college. Being a part of orchestras throughout my schooling has made a difference in my life and even now as I'm interviewing for jobs, my ability to play an instrument has made me stand out among other applicants.

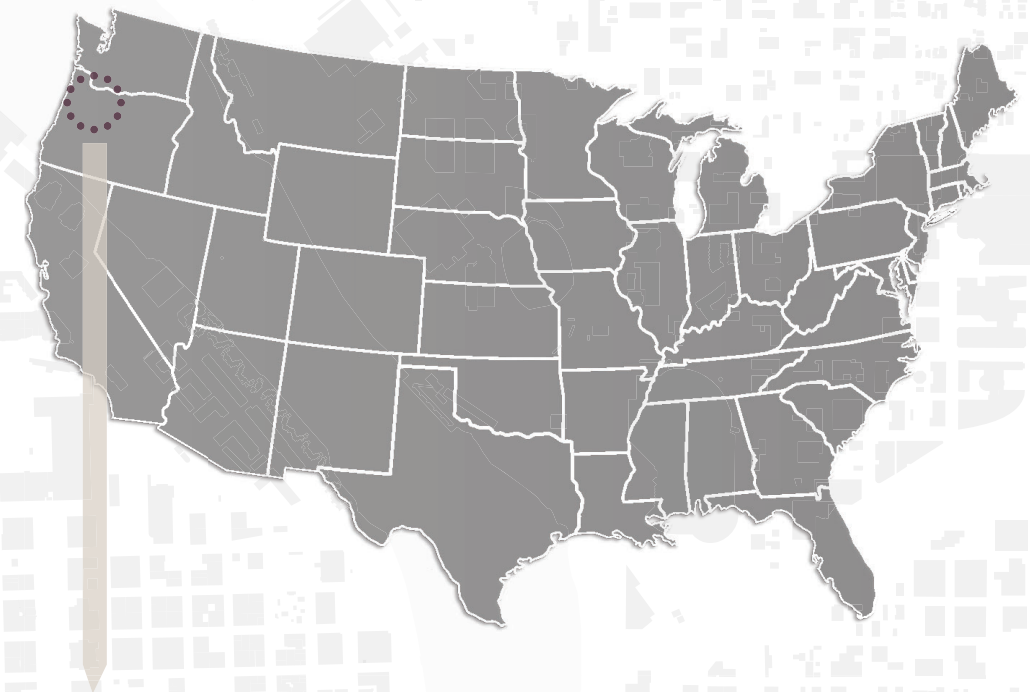
At this stage in my education and professional development, this is an opportunity to create my own project and research something I am interested in. I can apply all the tactics I have learned through my semesters in studios to the final design of my project and learn new research tactics and methodologies to apply to my research project as well as future careers. Thesis is more of an open book, allowing us to choose a topic of interest and create a project that we are passionate about. This open book also comes with more responsibility, however, and as graduate students it is expected that we are able to create our own project goals, program elements, performance criteria, etc.

SITE ANALYSIS



Portland, Oregon

CITY INFORMATION



Portland, Oregon Demographics and Land Information

Land Area: 134.2 square miles
Elevation: 50 feet

Figure 98

Female 50.5 %

Male 49.5%

Population: 639, 635



- Average Resident Age
36.7 years
- Population Density Per
Square Mile:
4,762
- Most Common Profes-
sional Industry:
Professional, scientific &
tech services



- Average Household
Income: \$62,127
- Average Per Capita
Income:
\$27,513
- Average House Value:
\$395,100

SITE INFORMATION

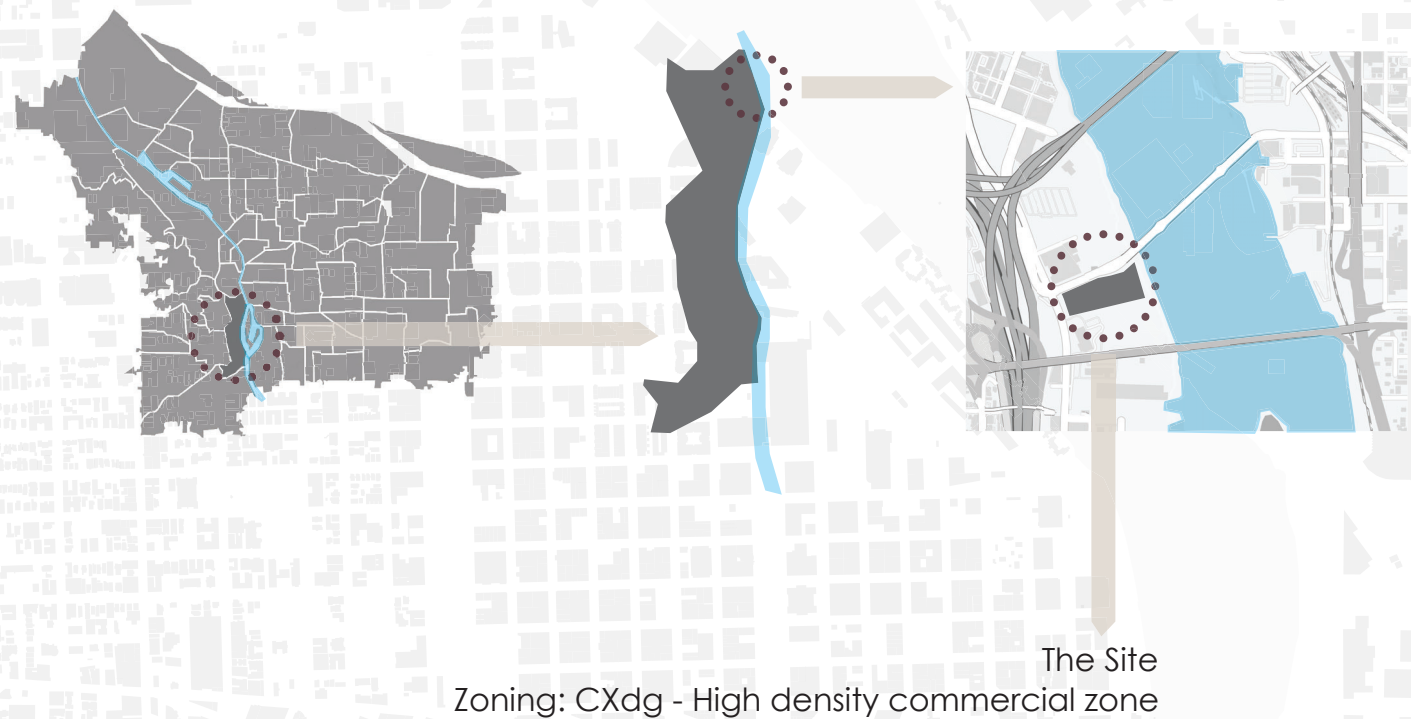


Figure 99

- 75% of the ground floor must be at least 15 feet between the floor and the structure above.
- Max FAR: 4 to 1
- Base Height: 75 feet
- Step Down Height: 45 feet
- Minimum Building Setback: 10 feet

- Maximum building setback: 10 feet
- Maximum Building Coverage: 100% of the area
- Landscaped Buffer Zone: 10 feet
- Ground Floor Window Standards: 40% of ground floor must be transparent

ZONING

CXdg or high density commercial zone is intended for development within Portland's most urban and intense areas. The CX zone is programmed for intense development with high building coverage and large buildings placed close together. Development is intended to be pedestrian oriented with a strong emphasis on safe and attractive streetscapes as well as promote economic prosperity, healthy lifestyles, environmental health and support the local neighborhood areas (Portland Zoning, 2018).

The addition of a school to this site would not only support the nearby areas, but it would promote the health and well being of the community by educating the young generations. With proper planning and landscaping as well as building placement, this school has the opportunity to create an inviting and accessible streetscape and outdoor public space.

The CX zone allows the tallest buildings in the Portland zoning code in order to promote high density construction, however step down heights are also encouraged in some situations to create a buffer between downtown and nearby neighborhoods.

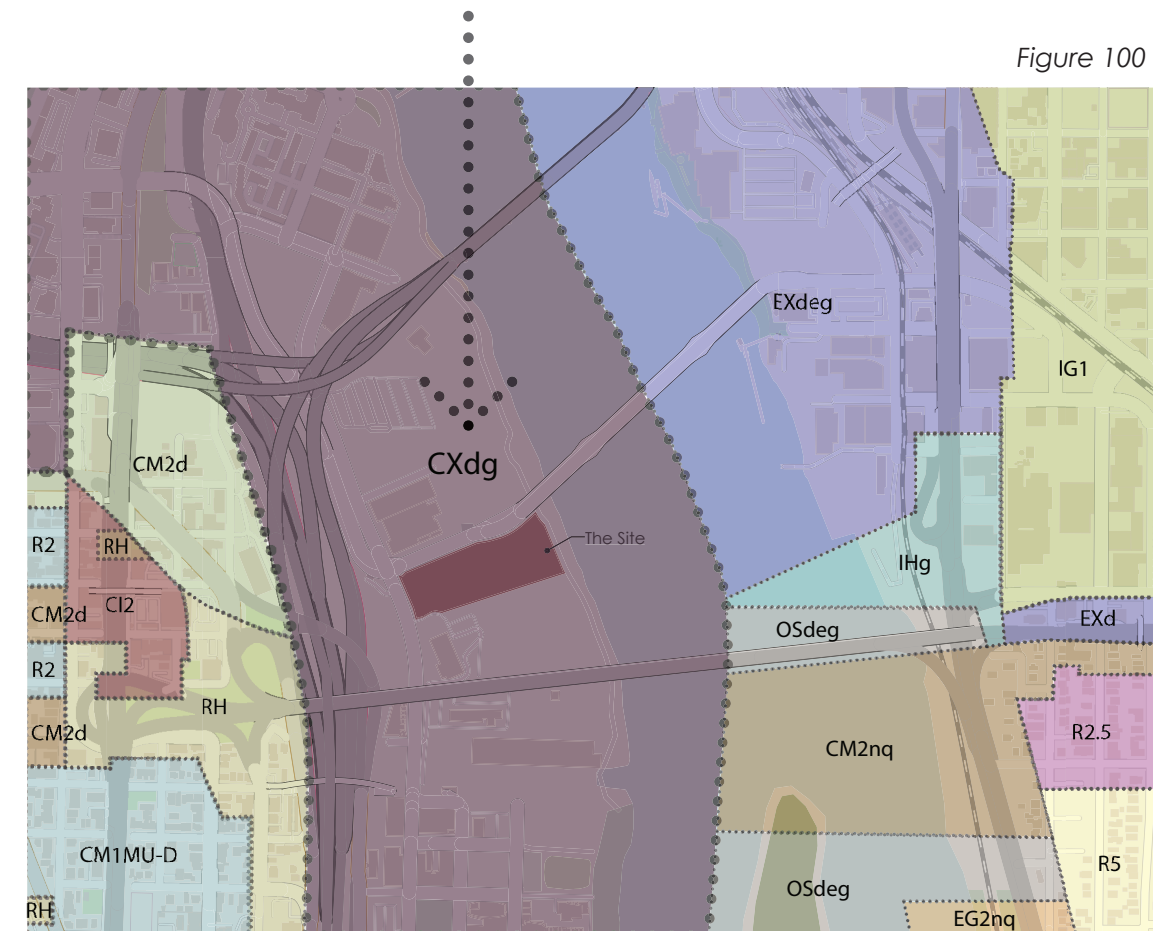


Figure 100

CLIMATE INFORMATION

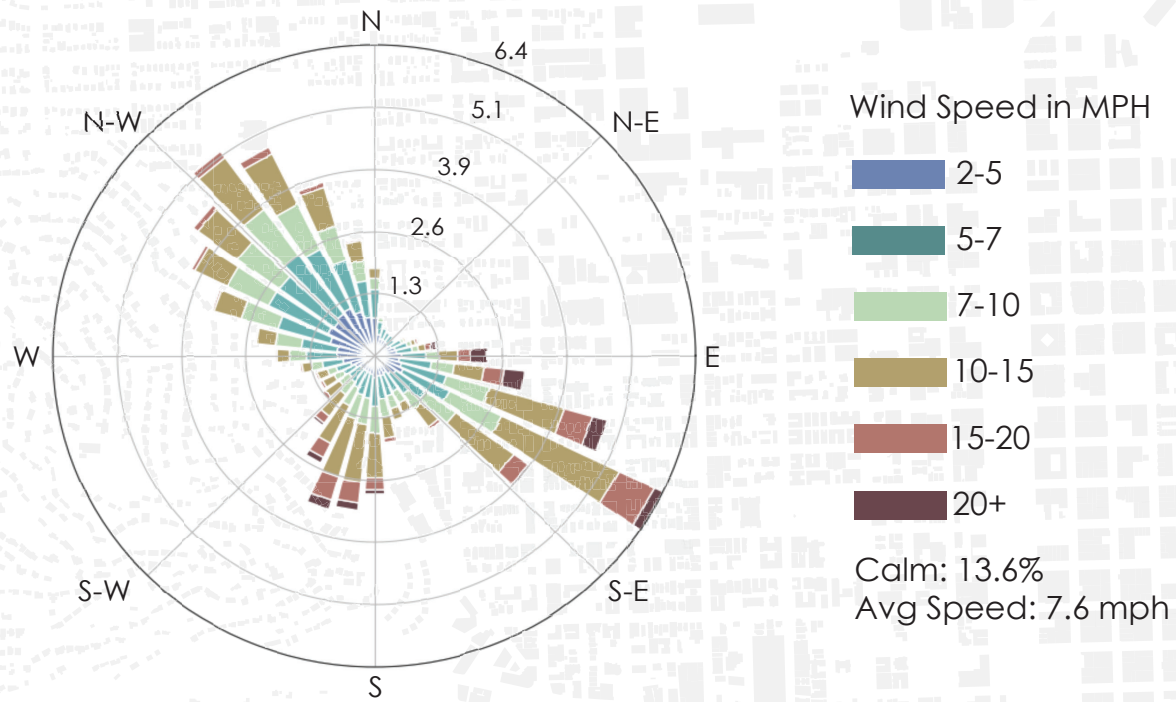


Figure 101

Portland has warm, short, dry and mostly clear summers and long, cold, wet and overcast winters. Temperatures average from 36 degrees to 84 degrees throughout the year and rarely dip below 26 degrees and rarely rise above 95 degrees. Most people visit Portland between early July and late August due to the dry, warm weather that time of the year usually has. The warm season lasts for about 2.9 months with an average temperature usually reaching about 76 degrees while the cool season lasts about 3.2 months and the average temperature typically around 45 degrees. Clouds cover Portland for 8.1 months of the year with a wet season lasting 6.2 months, making Portland live up to their “always raining” stereotype. Wind in Portland is on average, fairly mild, with windier days in the winter months reaching 6.3 miles per hour.

Although Portland has a more rainy and cloudy days than other parts of the country, it does not have severe heat and cold weather changes. The low wind speeds and mild temperatures mean achieving a sustainable building with passive heating and cooling is a more practical goal.



Average temperature: 54.5 degrees



Average annual days of sunshine: 144 days



Annual low temperature: 45.7 degrees



Average annual rainfall: 35.98 inches



Annual high temperature: 63.3 degrees



Average annual snowfall: 4 inches

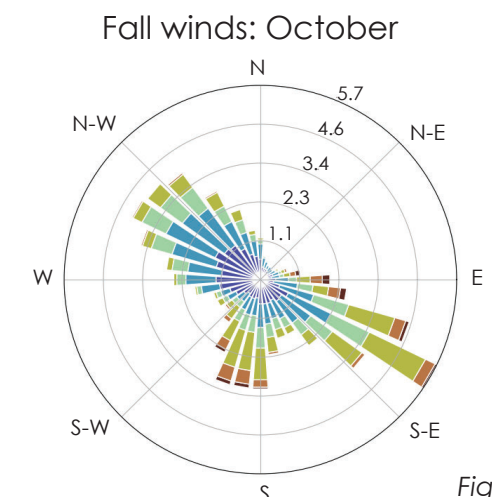
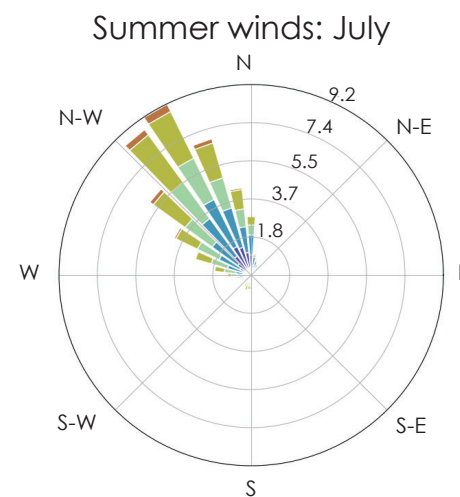
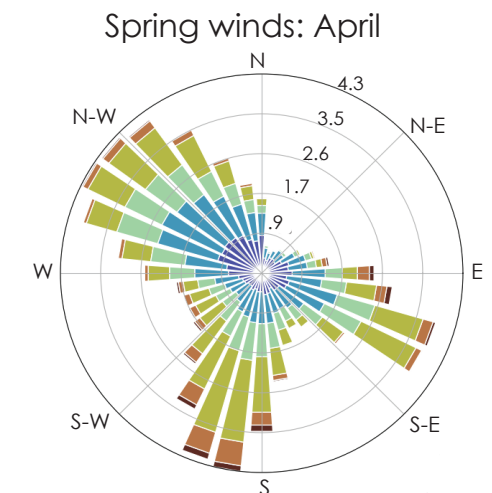
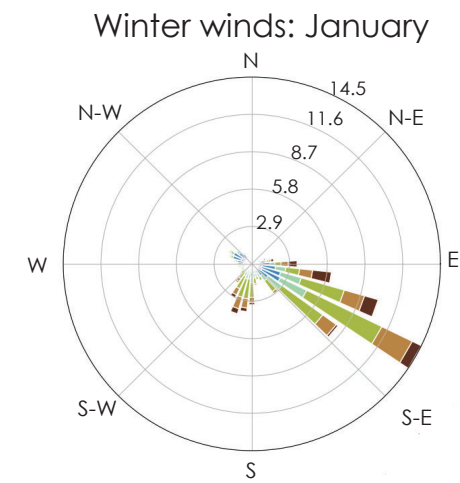


Figure 102

THE RIVER

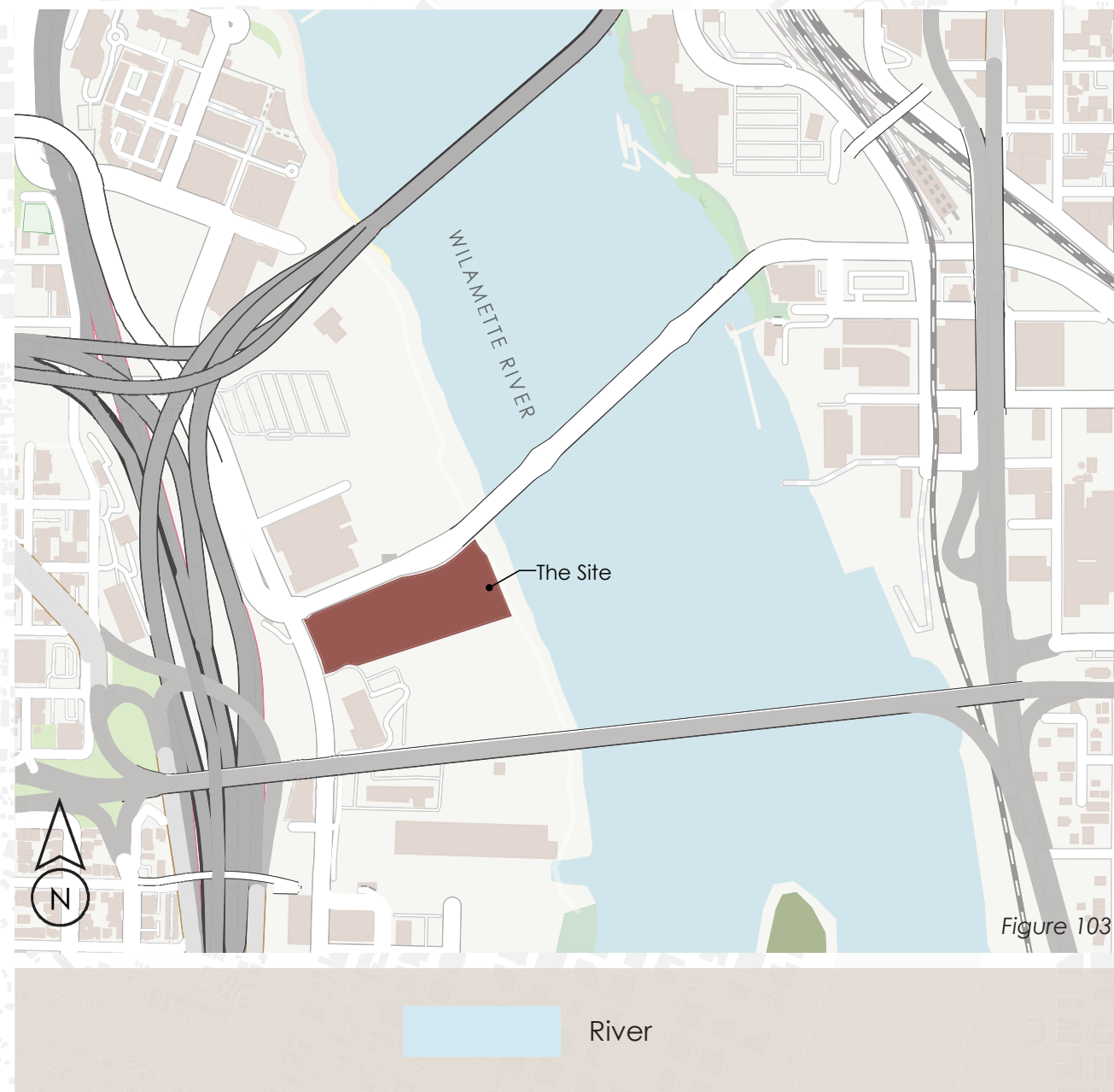


Figure 104

This site is adjacent to the river with approximately 200 feet of river front. Due to the proximity to the water, however, the distance to ground water is only 10' and the site is raised 20' from the river level. Although Portland is built along the river, according to the City of Portland, nearly all of their drinking water comes from a watershed 30 miles east of Portland

The Willamette River is a tributary of the Columbia river that stretches for 187 miles and creates the Willamette Valley, which contains two-thirds of Oregon's population. On Oregon's Department of Environmental Quality water quality scale, the water quality in the Portland area scores fair at an 85 on a scale of 60 - 100. A significant effort was made by governor Tom McCall to reduce the pollutants in the river, however even with increased efforts, there are still remnants of the industrial waste left from the early 1900s.

Due to the volume of seasonal precipitation this area receives, flooding has been an issue. After a major flood in 1948, the river was highly engineered with dams and watersheds to reduce the chance of future flooding. Although there have been instances of flooding after the construction, flooding in the Portland area has reduced significantly, leaving the site with a very low chance of future flooding.



View on Tilikum Crossing to the N of the site



View across the river to the E of the site



View of the site from the river

TREE COVER



Common Trees in Portland



Figure 107

To the south of the site, across the street, there is a heavy tree line that creates a barrier between this area and the highway. These are large, mature trees that add to the attractiveness of the nearby streetscape and not only provide a visual barrier from the highway, but a noise barrier as well.

Currently, the site is barren, a blank slate. There are no trees, hardly even grass. Site zoning requires greenery and landscaping to make the streetscape more inviting, so that will be an important element of the design. Trees are an important, and abundant image of the city of Portland. Forest Park, located just 5 miles north of the site, is one of the country's largest urban forest reserves covering over 5,100 acres.

Across the Willamette River on the eastern river bank, there are quite a bit of trees dotted around the industrial area that frames a view of Mount Hood in the distance. Greenery provides shade, breaks up the built environment, and is beneficial to the environment and would be a welcome addition to the site.



Trees to the W of the site



View of the site



View of the river bank to the E

Figure 108

CIRCULATION



Figure 109

This area of Portland is an up and coming area just south of downtown. One of the large focuses written in the zoning code here is to make streets attractive and accessible to pedestrians. Along the street just to the west of the site on the Tilikum crossing, there are designated bike and pedestrian lanes running along the side of the road and light rail lines.

The differentiation between the bike, pedestrian, vehicle and light rail lanes make the circulation space more welcoming and accessible for all people. The circulation is organized with faster circulation to the left, starting with vehicles, and slower circulation to the right, ending with pedestrians.

This separation encourages all different types of activity by providing a safe environment. Portland is nicknamed "Bike Town", so providing adequate bike paths is important, but providing quality light rail systems and accessible pedestrian lanes encourages their usage. The differentiations between circulation lanes as well as the surrounding infrastructure adds to the attractiveness of the streetscape. The zoning in this area also encourages quality and innovative design that has been applied to the new construction in this area.



View to the North of the site.



View of Tilikum Bridge



View of the intersection to the NW of the site

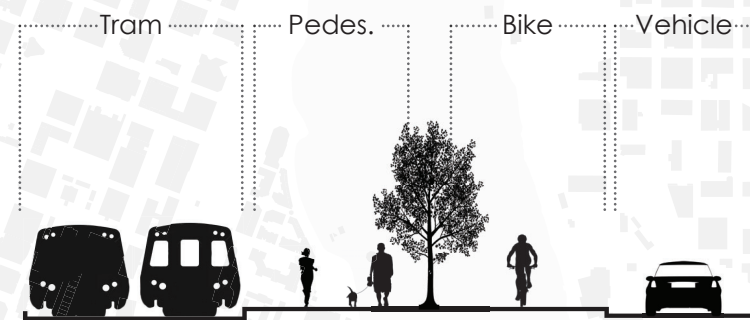


Figure 110

CONTEXT



Figure 112

The close proximity of this site to large, family neighborhood supports the need for a music education and performance facility. The close distance would make it a more appealing to parent drivers and the nearby public transit as well and safe bike/ walk lanes make it easy for older students to walk to the facility.

Just to the south of the site is the Oregon Health and Science University campus, located both on the river and on the top of the hill accessible by sky tram. From this view, the development along the river further south of the site can be seen. This new development is very modern, with mostly metal and curtain wall glass used as materials.

The site's close proximity to the river not only provides great views, but also allows the building to be seen from Portland's eastern river banks and the over 12 bridges that cross the Willamette within the city limits.



Neighborhoods to the SW of the site



Tram and development to the S of the site



View to the SE of the site looking off Tilikum Crossing

VIEWS



Views

The views from the different angles on this site provide quite the variety of scenery. To the West, the newly developed high rise educational, residential and commercial buildings are visible. To the South East, The Ross Island Bridge and Ross Island can be seen. To the East, the industrial factories as well as a gorgeous view of Mount Hood can be seen from the shore. To the North, the Tilikum Bridge crossing and then Oregon Health Science Building are visible.

This area of Portland has large variances in topography. The residential area and highway to the West are significantly higher than the high rise development along the river to the East. This difference in elevation allows large, tall buildings to be constructed without the risk of blocking sunlight to the shorter homes. This also helps to create a physical separation between the busy commercial and quiet residential areas of the city.

The location of this site allows for maximum Eastern sun exposure, and because the building directly to the South of the site is only two stories, the new facility will be exposed to Southern sun as well.



A: View to the West



B: View to the South East



C: View to the East



D: View to the North

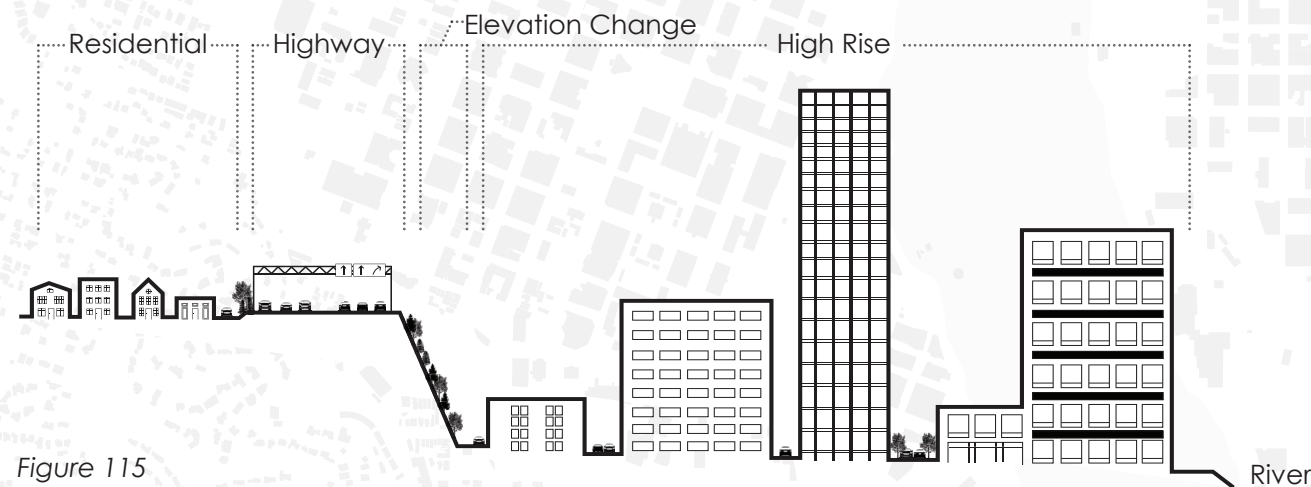


Figure 115

Figure 116

TOPOGRAPHY

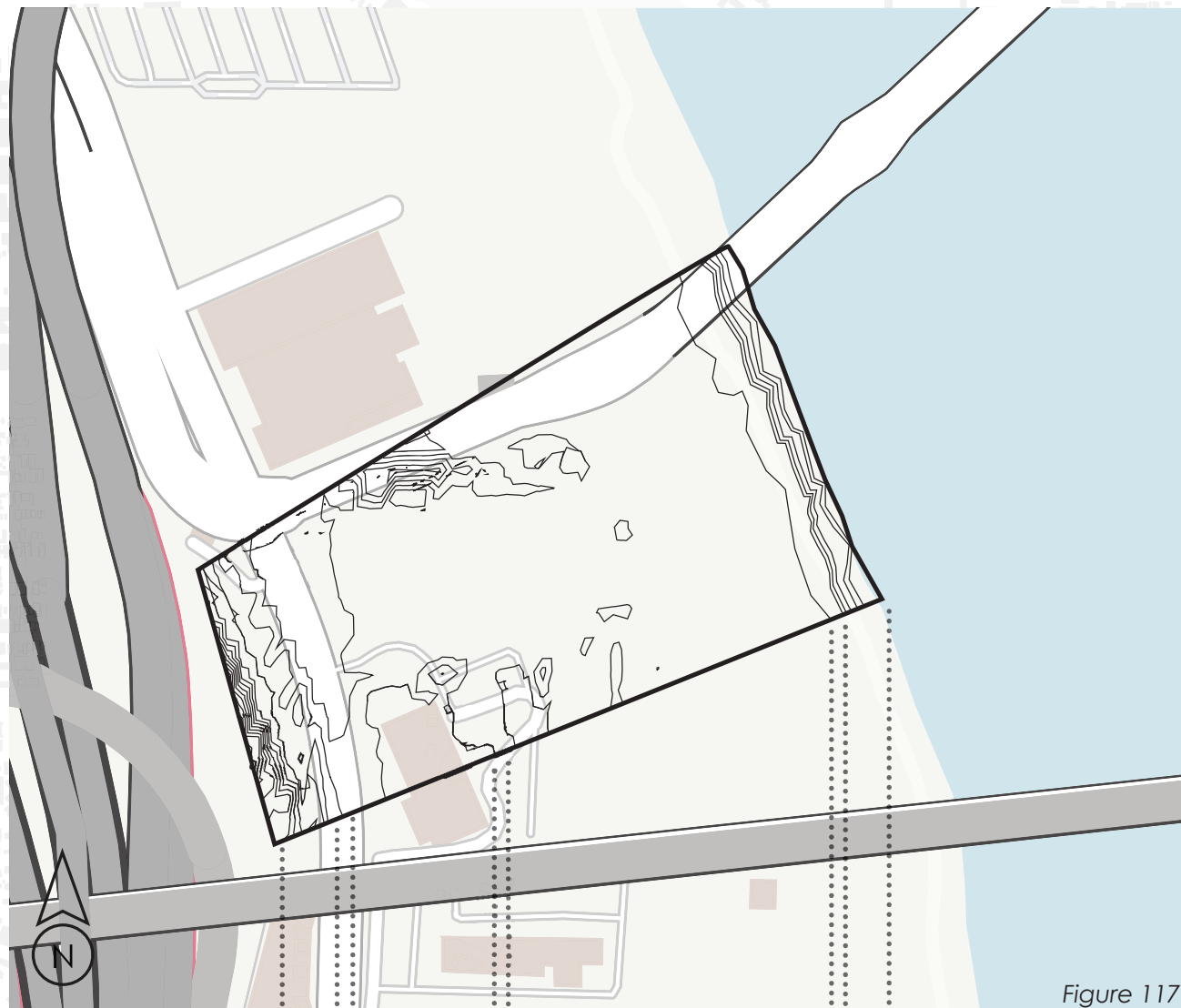


Figure 117



The buildable area of this site is nearly completely flat with a 3-4% slope according to Auto Desk's Infracore program, with a slight slope up to the western borders and a light downward slope towards the river on the eastern side. The flat, even site is ideal for building, and although there is significant sloping towards the west, the sloping begins past the site boundary. The flat leveling creates minimal climate variations. This steep sloping to the west elevates the highway and creates a noise and physical barrier between the pedestrian area below. This flat slope was most likely created by developers in the past century as they started developing this area of Portland.

SOILS

Powellsilt loam	37%
Salem gravelly fine sandy loam	32%
Willamette loam	24.5%
Cascade silt loam	6.5%
Engineering Classification	GM

The soils in this area of the country have all developed under an abundant supply of moisture and fairly high temperatures. Because of the temperatures in this area, the soils rarely freeze. The surface soils are relatively light in color and texture compared to the soils below. The site has recently been infilled and leveled in preparation for future development. The engineering classification of silty gravel means the site is well graded retains slightly more moisture than other soils. This will need to be taken into account during design work.

SITE CHARACTER

The site itself is a completely blank slate and lacks character. The area surrounding the site is full of character however. Being one of the newly developed areas in Portland, it is full of innovative architecture, large, trees, welcoming pedestrian and cyclist paths and easily accessible public transit. New infrastructure built on this site should use the same vernacular of modern materials used on other building in this area and the landscaping on the site should interact with the public and the sidewalk.



Dirt pile currently located on the south side of the site

Figure 118



PERFORMANCE CRITERIA

A large portion of this project is representing music in architecture. To determine if these representations were done correctly, correlational methods will be utilized. Each musical element was identified along with its defining factors. After this was completed, hand sketched visual representations were created and the strongest translations were chosen and developed further based on the correlational strength between the two-dimensional drawing and the musical element. A similar process was used in the translation of the two-dimensional representations and the architectural elements. The strongest of the hand sketched representations were then linked to architectural elements, again based on the musical elements defining factors and the visuals created in the sketches. The final step in this investigation was creating three dimensional architectural spaces using Revit using the representation of music. Each of these spaces will have different combinations of musical elements represented. After this process is completed and the representations still have strong correlating factors with the musical elements and their defining factors, this investigation is successful.

Because this building is intended for musical performance and creation, acoustical soundness is important. While the shape and architectural elements in a space will be largely influenced by the representation of music, acoustics will need to play a part in the design of a room as well, particularly in large ensemble rehearsal space, practice rooms, recording spaces, recital and performance halls. Acoustical quality will be measured using computer programming that allows the user to listen to the acoustics in their own digital building model. Changes can be made according to the sound quality heard in this recording, making sure there is a balance between the strings, brass, percussion, wind and bass sound. Once these elements have been balanced acoustically in the space and the computer program has verified it, the acoustical spaces can be implemented in the final design.

The final criteria being measured in this project is the space's ability to improve the way students learn music. This is difficult to measure, not all students learn the same way, and people experience spaces in a slightly different way, however, previous research and studies have shown that the space students learn in does affect the way they learn.

By creating spaces that are open, interactive, inviting and exciting for students, this design aims to inspire students to engage with music and provide them will all the resources to do so. The architectural representation of music in a space will assist students in their learning, understanding, and retention of musical elements by providing a constant, and literally built in, reminder. While this learning aid will be blended into the building, it is similar to posters teachers post in their classrooms reminding students math students of their mathematical functions, or English students proper grammar. The biggest factor in this performance criteria that will determine the success of students learning if this space is the successful representation of music. As previously discussed, the process of representing music in architecture is measurable using correlational methods, so although the ability of the created spaces to improve music education can't be directly measured in this research, the roots of the learning process can be.

The majority of the programmed area in this facility will be dedicated to educational spaces, with second priority going to performance spaces. Staff and waiting spaces as well as break rooms, cafeterias and mechanical spaces take a lower priority. This space is primarily for the students to allow them to explore music on their own terms. The above chart shows each space in the program and approximately how many square feet that space will take up in the building. The 70,000 SF building size was determined based off precedent studies of K-12 education facilities and music performance centers.

SPACE ALLOCATION TABLE

Space	Square Feet (SF)	Percentage (%)
Ensemble practice spaces	8,400	12%
Practice / lesson rooms	4,200	6%
Classroom	4,200	6%
Performance hall	5,600	8%
Recital hall	3,500	5%
Interactive music space	3,500	5%
Labs	3,500	5%
Waiting spaces	2,800	4%
Lobby	3,500	5%
Circulation	10,500	15%
Bathrooms	5,600	8%
Break rooms	2,100	3%
Cafeteria	3,500	5%
Staff spaces	2,100	2%
Mechanical	7,000 SF	10%
Total	70,000 SF	100%

Figure 119

SPACE INTERACTION MATRIX

The remaining two diagrams lay out room adjacencies for future design consideration. The interaction matrix and net was created based off precedent study research as well as architectural planning concepts and building code guidelines, such as mechanical room and bathroom placements.

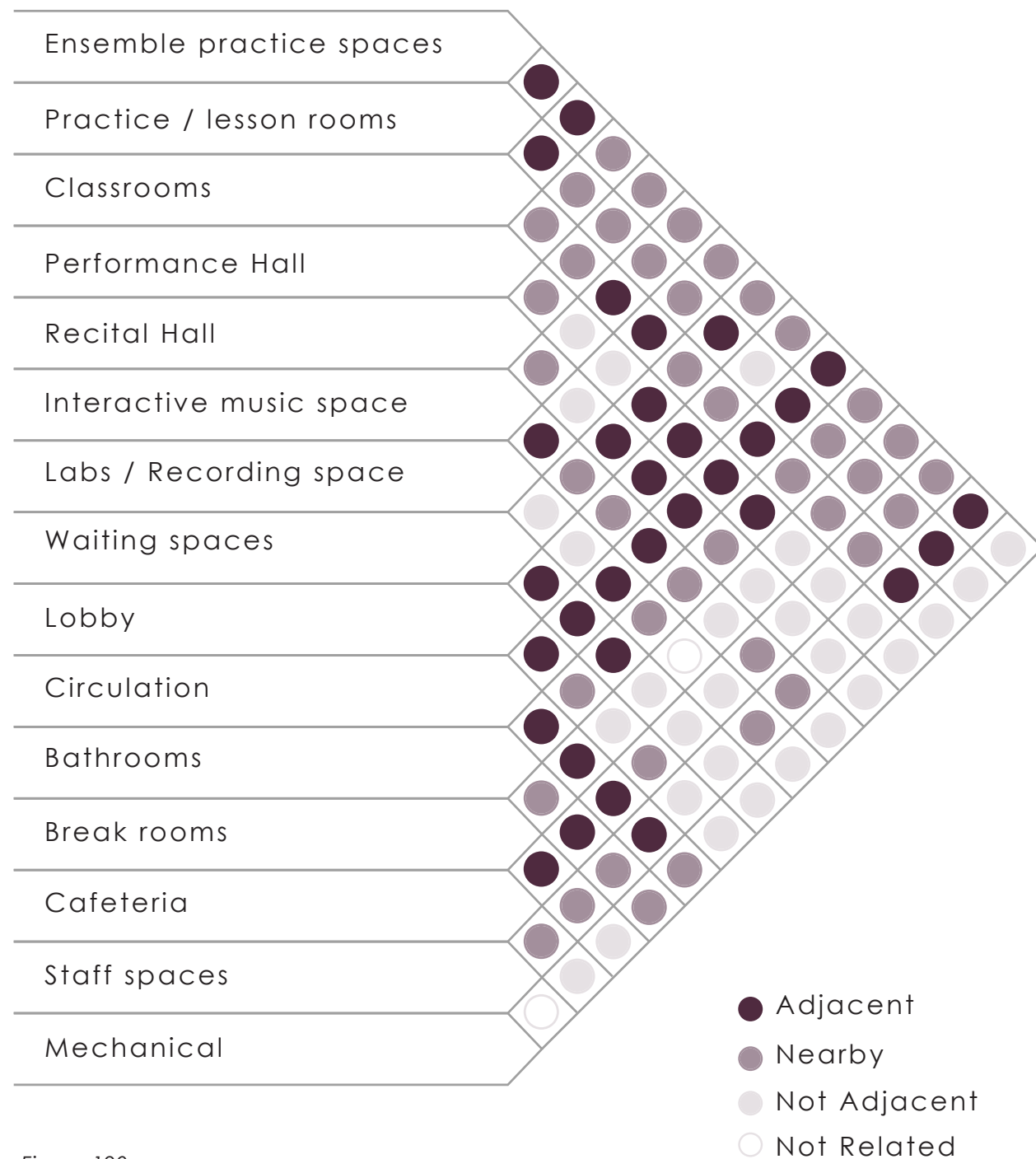


Figure 120

SPACE INTERACTION NET

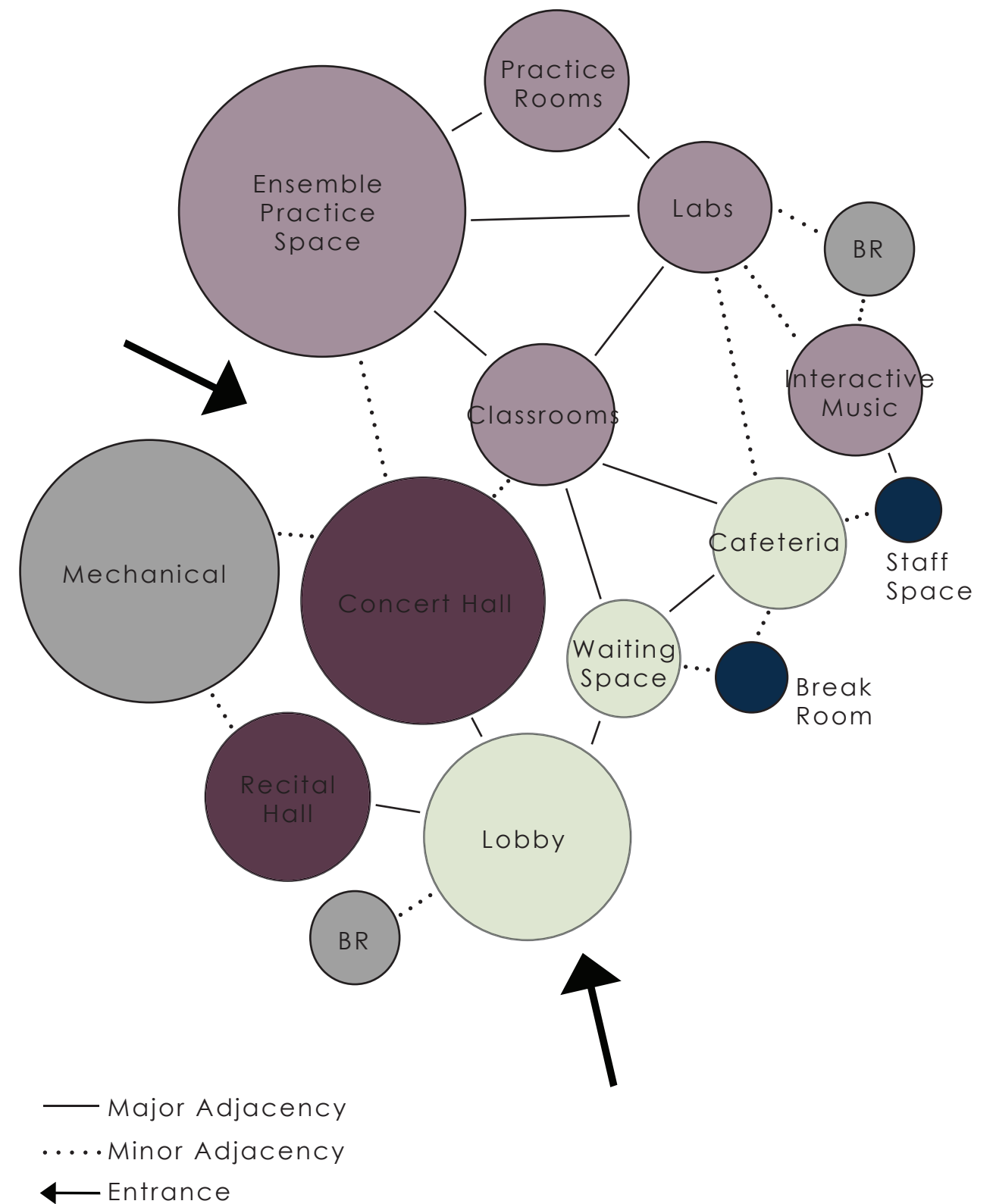


Figure 121



THE DESIGN



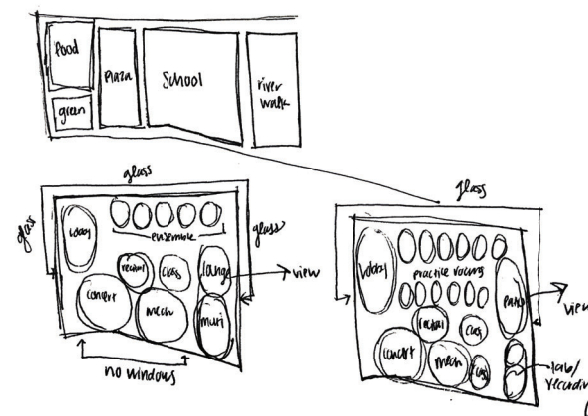
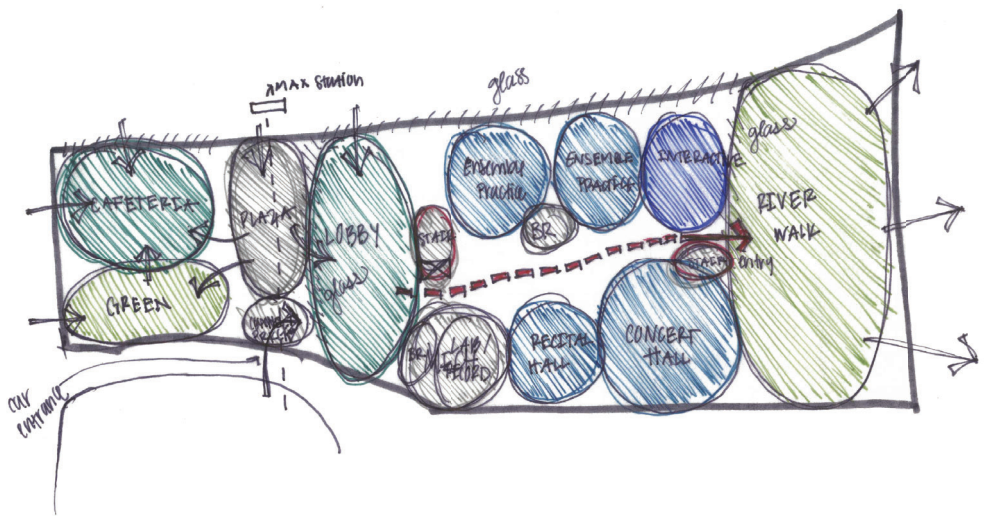
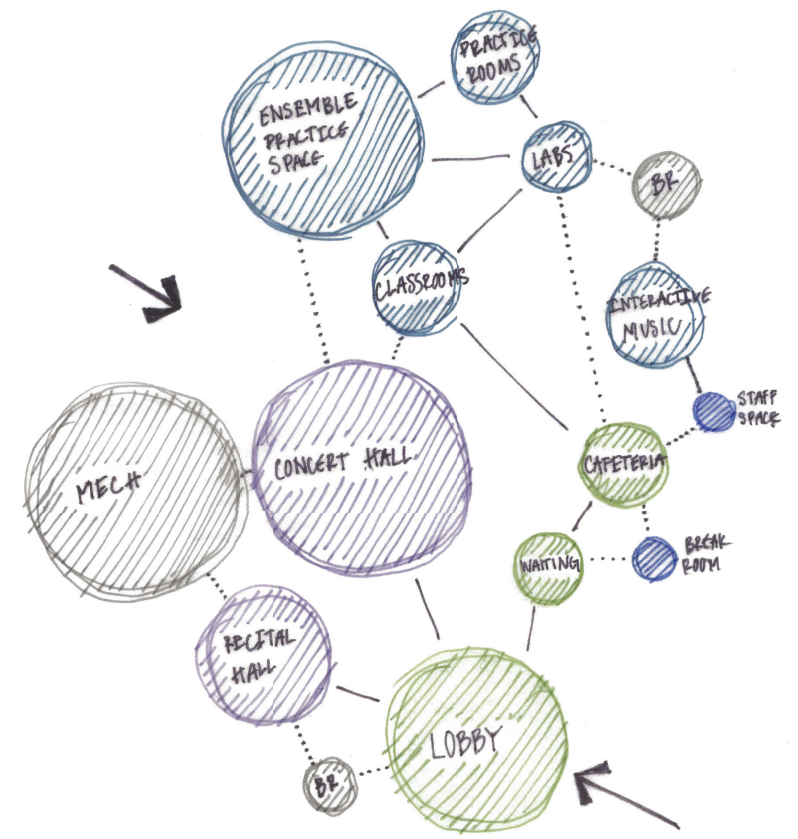
The ability to play an instrument has been proven through numerous studies to improve executive functions and set students up for academic and future workplace success, however many students find music difficult to understand and drop out of something that benefits them in the long run.

Revamping and purposefully designing a music education and performance center has the opportunity to improve music education and help students understand music. This facility provides students with the resources to learn through group and individual instruction, while having the space to practice, compose, record and perform. By turning basic musical elements into architectural elements, the spaces within this facility enhance the interest, excitement, synesthetic experience and interaction with fellow students while helping them learn.

Through the representation of music in architecture using space, light, color, sound, structure, elevation and form, this music performance and education center encourages student learning and fosters their growth.

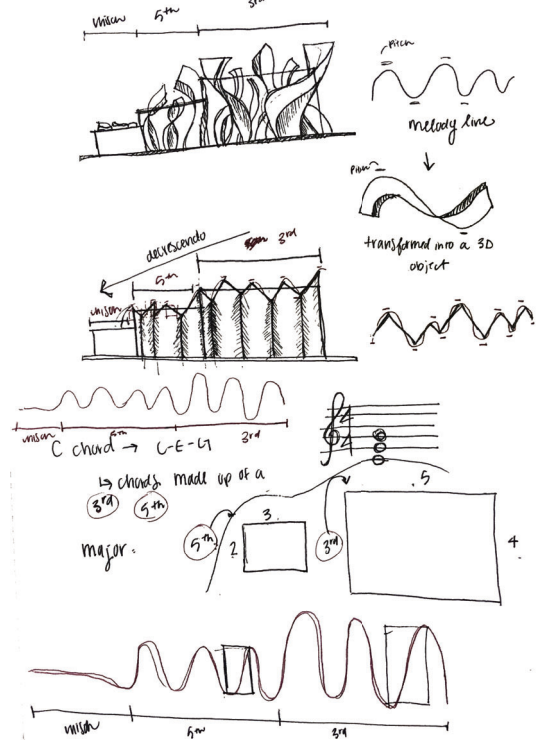
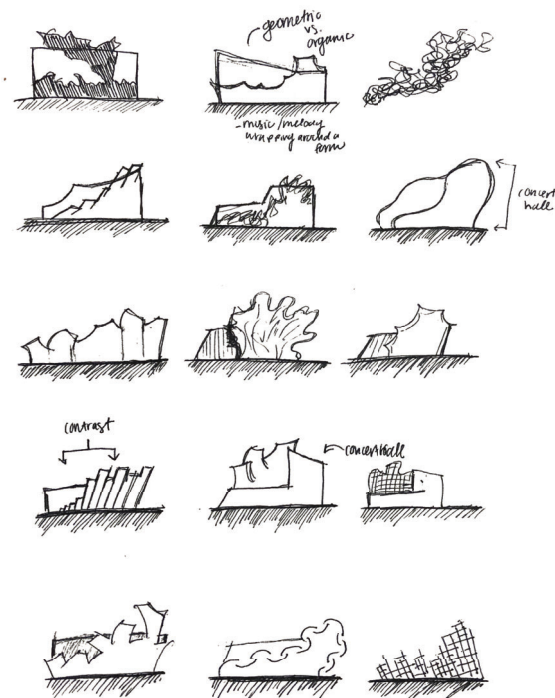
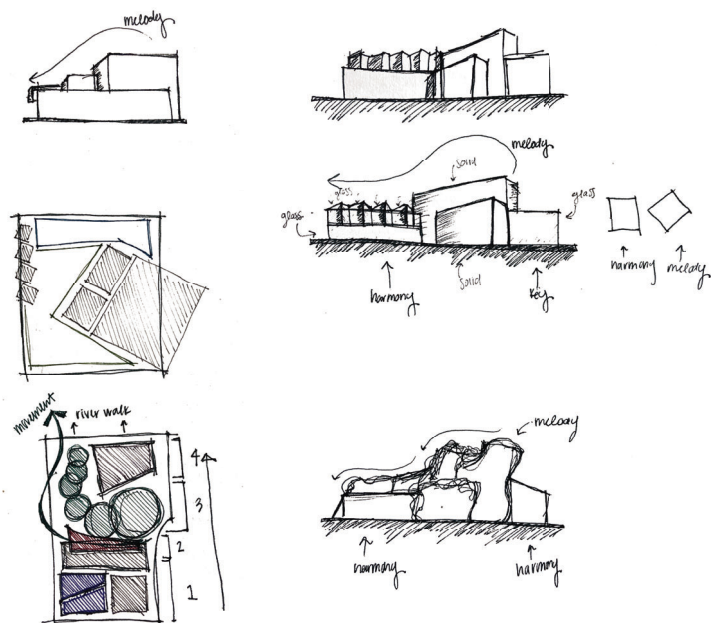
DESIGN PROCESS

The design of the site started with both site development and spatial planning. Based off research completed previously, room adjacencies were already determined and this could be applied to a floor bubble diagram. From that point, the diagram could be applied to the site and further explored with the surrounding streetscape.



DESIGN PROCESS

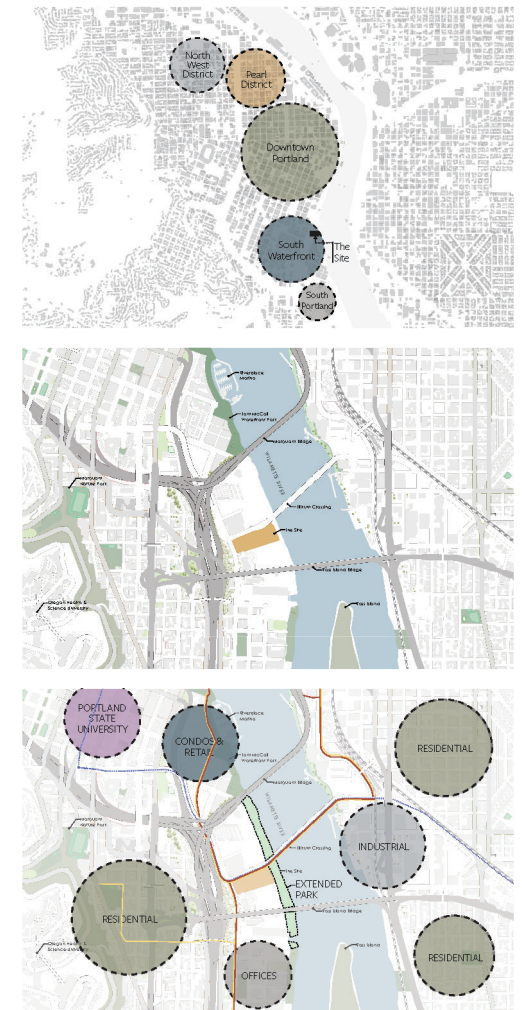
Once a preliminary floor plan was developed, a form was needed. At this point, the representation of each musical element started to become relevant, especially with the visibility of melody in the form of the building that was visible not only in plan, but from the exterior of the building. Different ways of representation were explored until the design of the curvy roof was settled on.



THE SITE

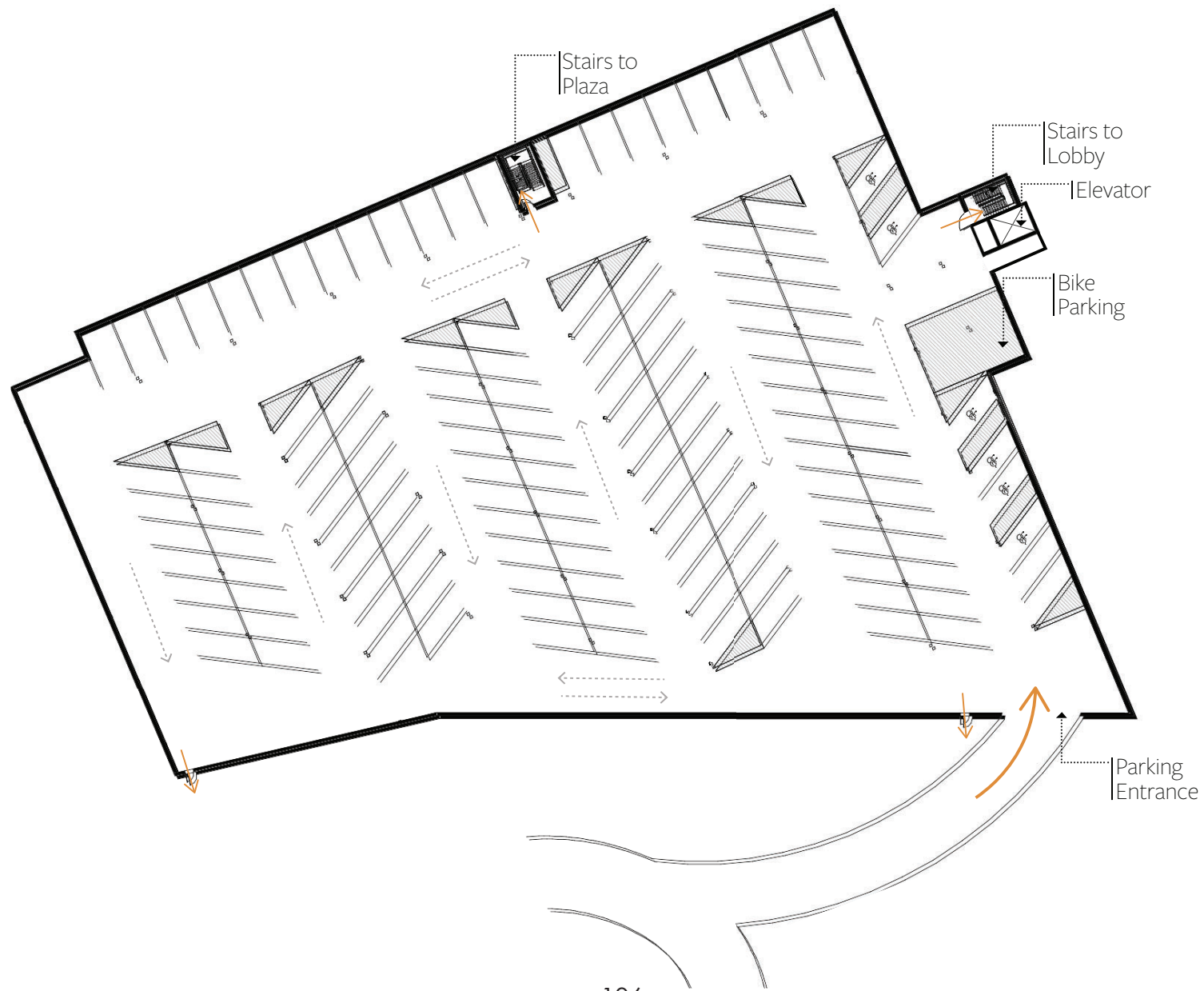
When it came to designing the site, it was quickly discovered that the area required for the program of the building was much lower than the area of the entire site, so the site was split into different sections. In the North West corner of the site along the street, a food hall was created for the use of not only people using the music education and performance center, but also pedestrians on the street and people in the surrounding office buildings. The building is located in the middle of the site, with the entrance to the right of the tram stop along Tillikum Crossing.

The riverside park is a popular attraction to both residents and visitors of Portland, and because this area is a new development, it can be assumed that there is a future plan to extend the park to this site. This assumption is taken into account with an extension of the park shown on the East side along the river. The remainder of the site contains a public plaza with interactive landscape elements and movable seating.



FLOOR PLANS

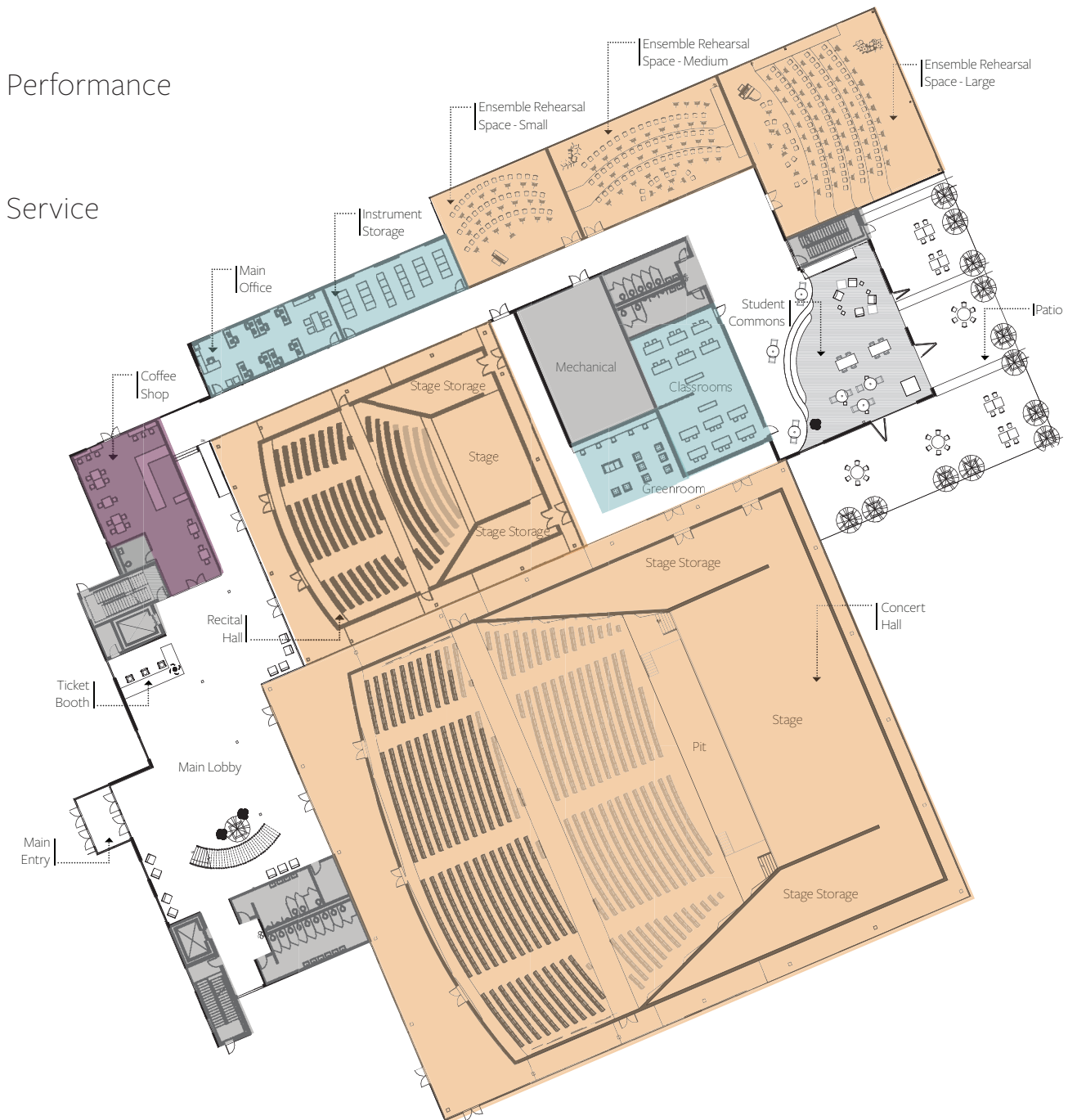
Ground Level - Parking



FLOOR PLANS

Level 1

- Education
- Commercial
- Performance
- Service



FLOOR PLANS

Level 2

- Green Roof
- Education
- Performance
- Service



Front Entry



Lobby



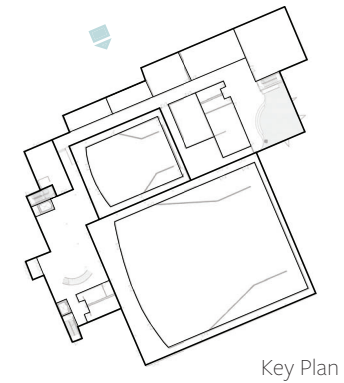
Student Commons



Remix Room

ELEVATIONS

North Elevation



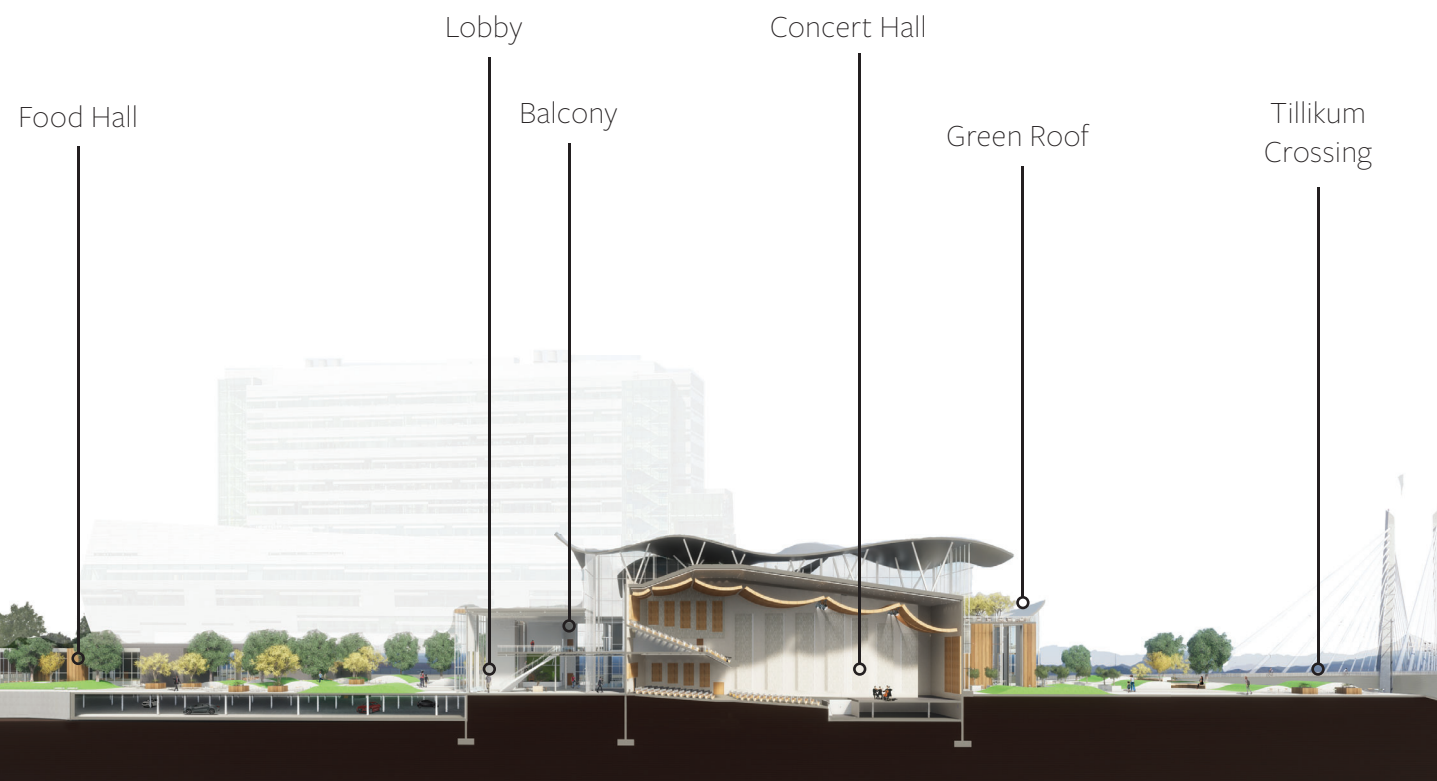
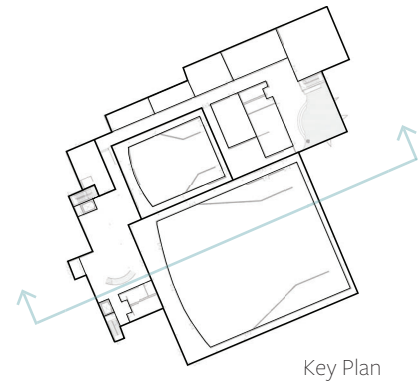
Key Plan



North Elevation

SECTION

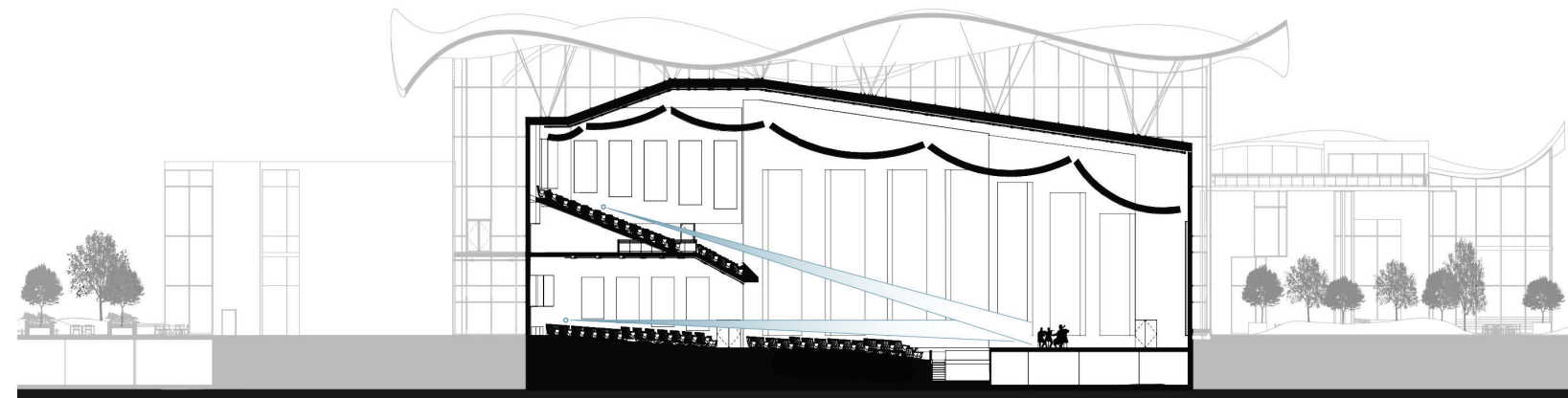
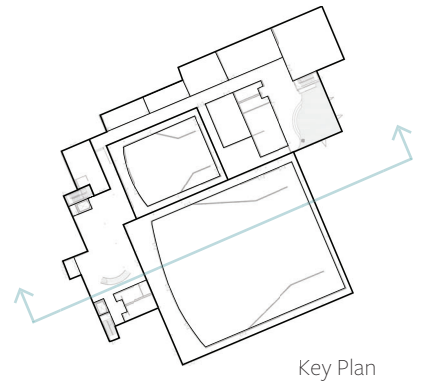
Concert Hall



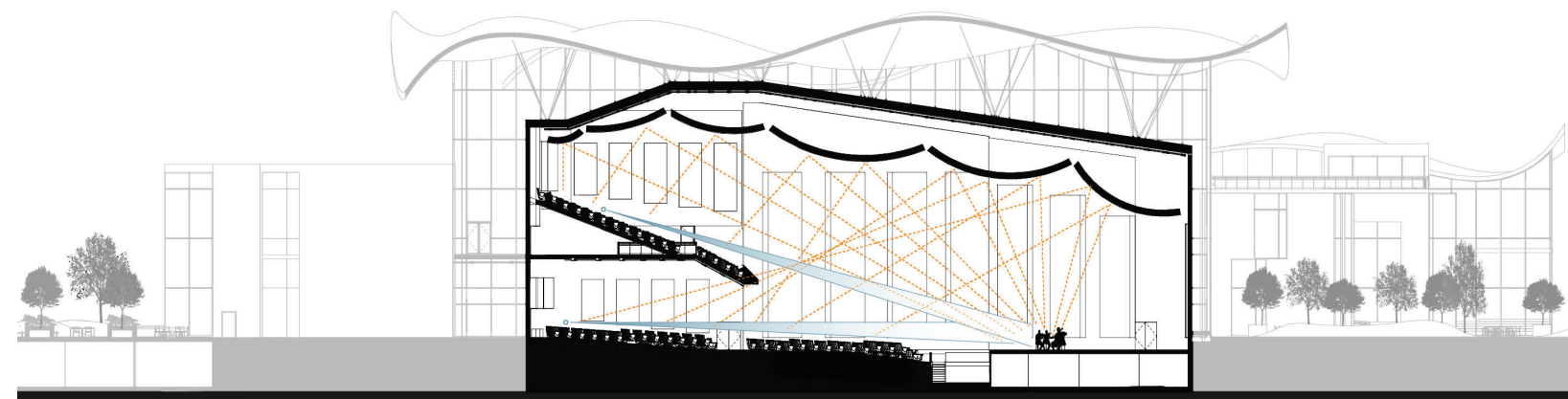
Concert Hall Section

SECTION

Concert Hall Acoustics & Viewpoints



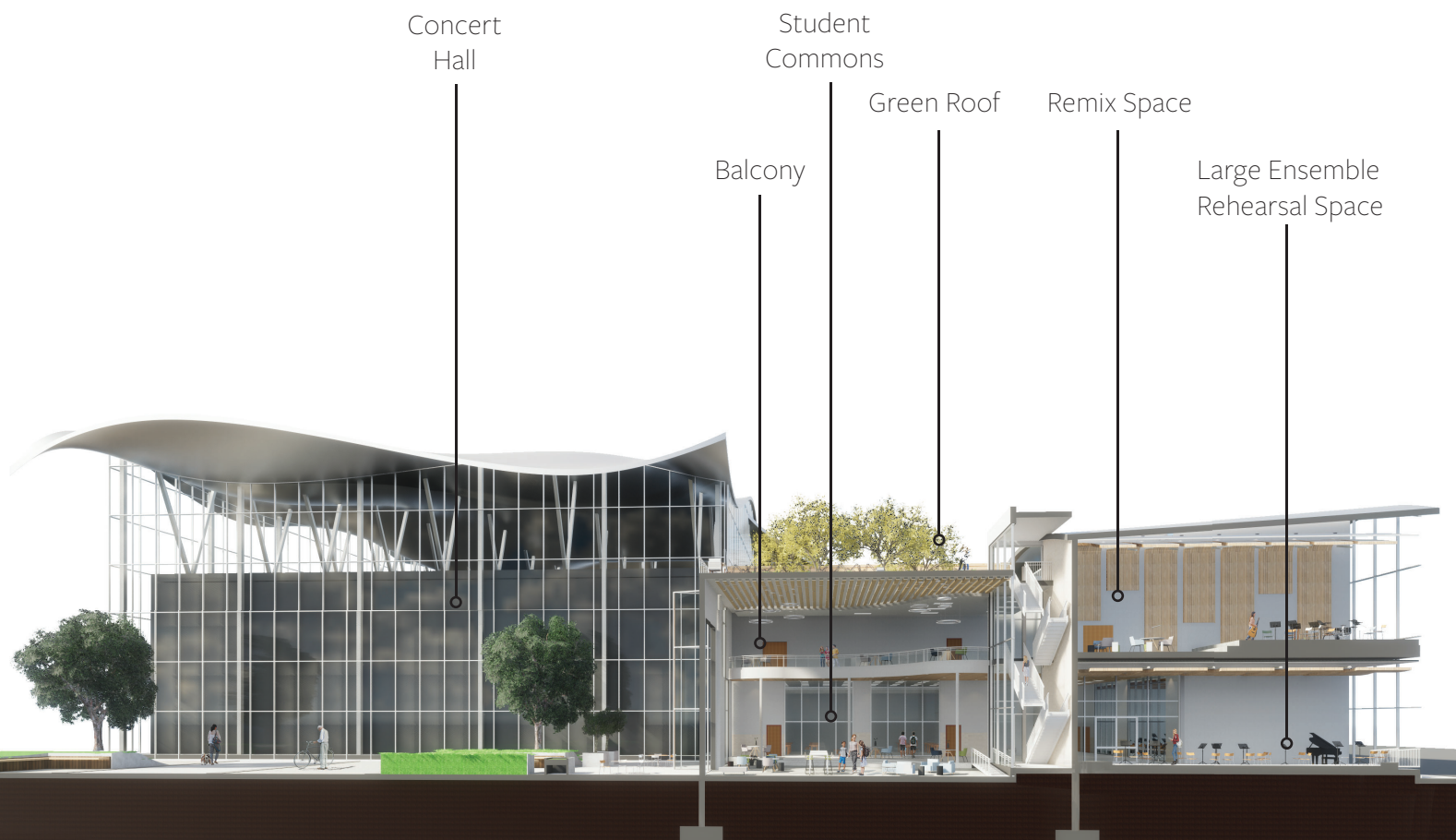
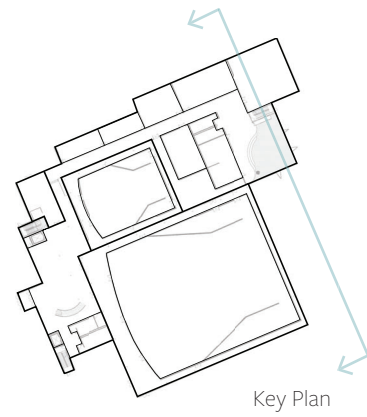
Viewpoints



Soundwaves

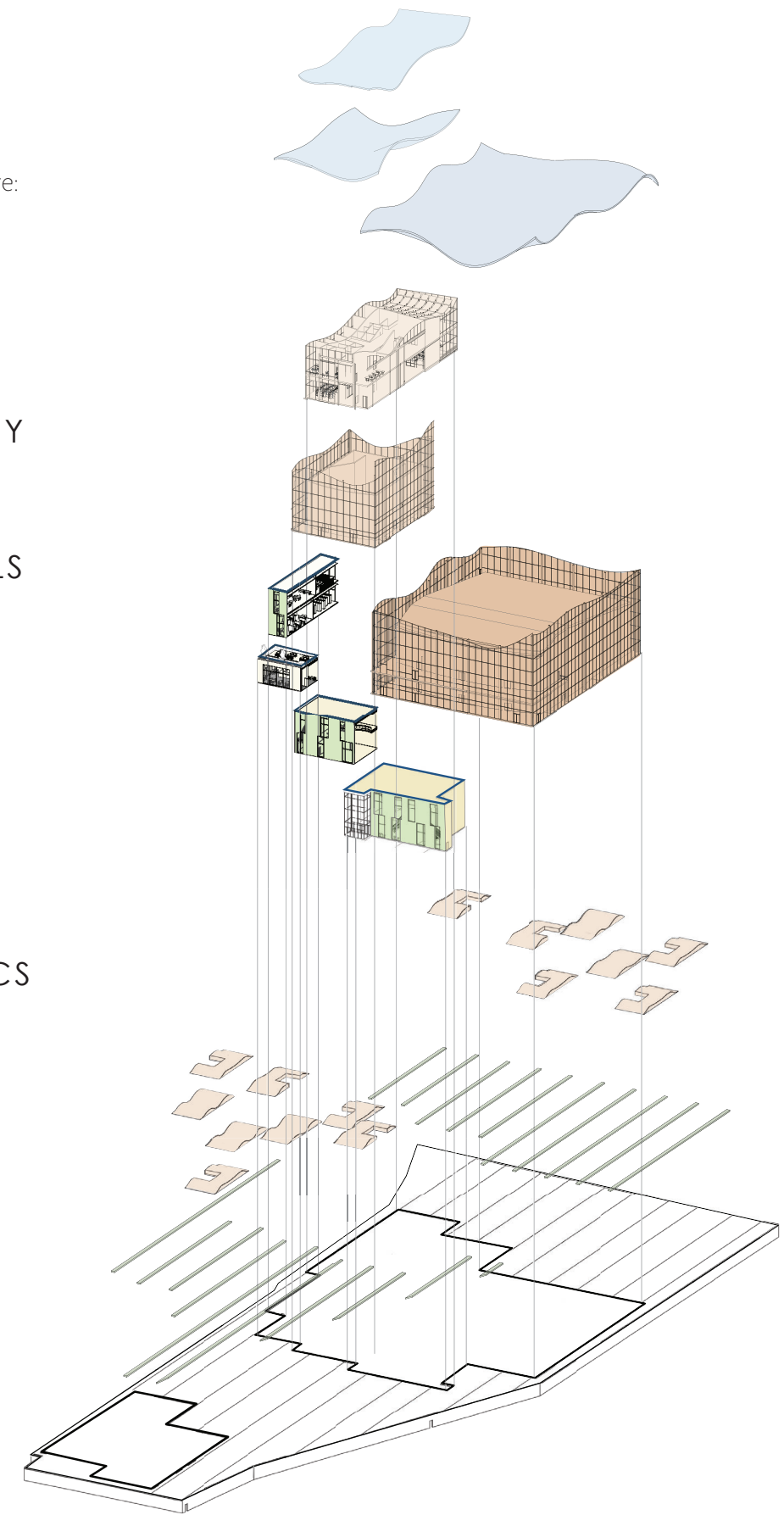
SECTION

Student Commons



Representing musical elements in architecture:

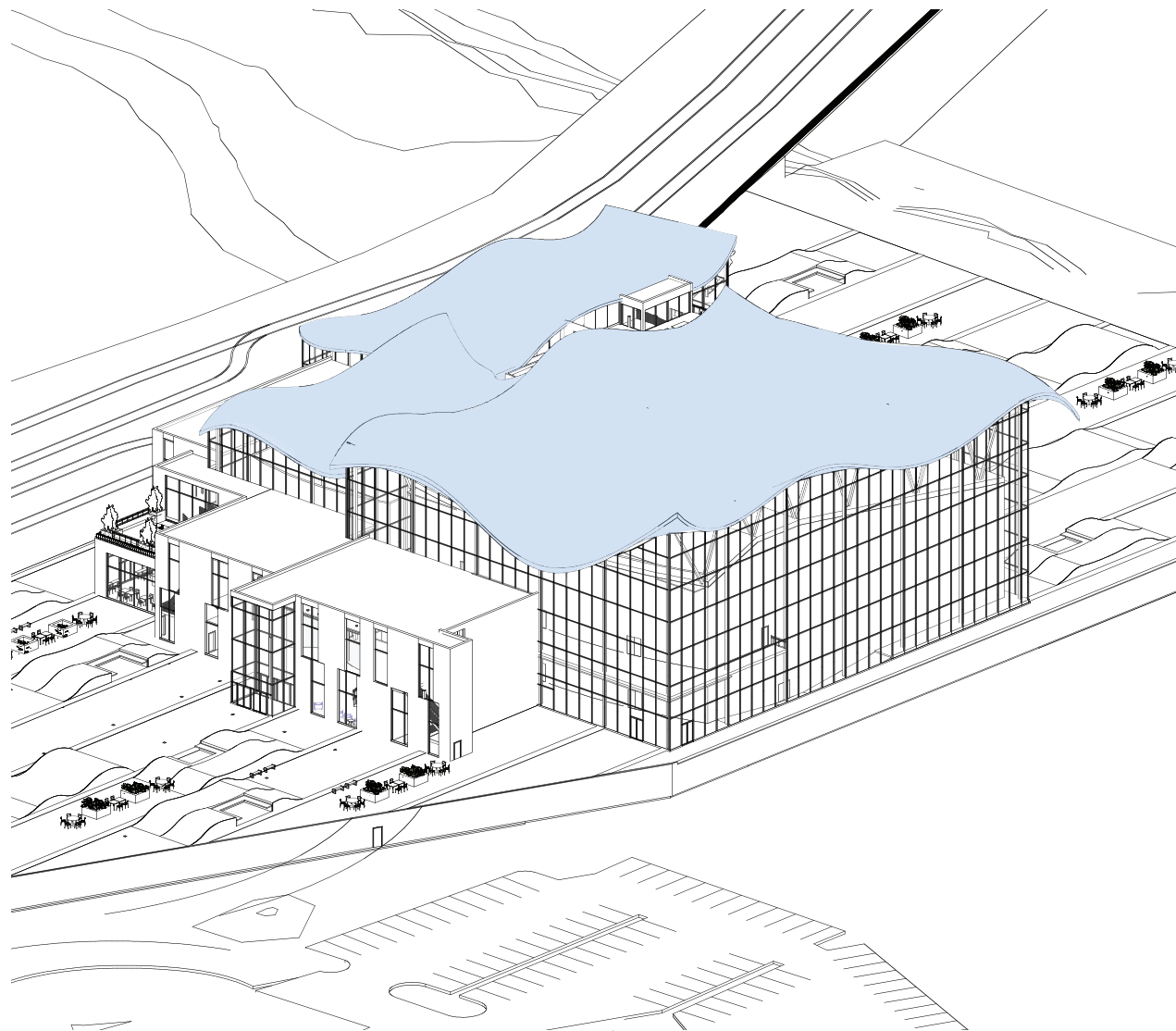
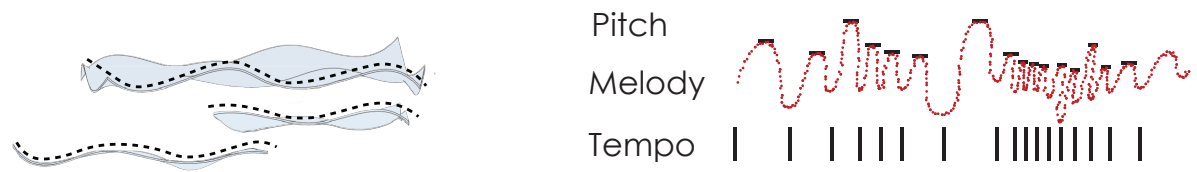
- 1 MELODY
- 2 HARMONY
- 3 INTERVALS
- 4 RHYTHM
- 5 TEMPO
- 6 DYNAMICS
- 7 PITCH



MELODY

Melodic Line :

- Organic, wavy roof covering musical performance spaces (Concert hall, Recital hall, Rehearsal spaces)



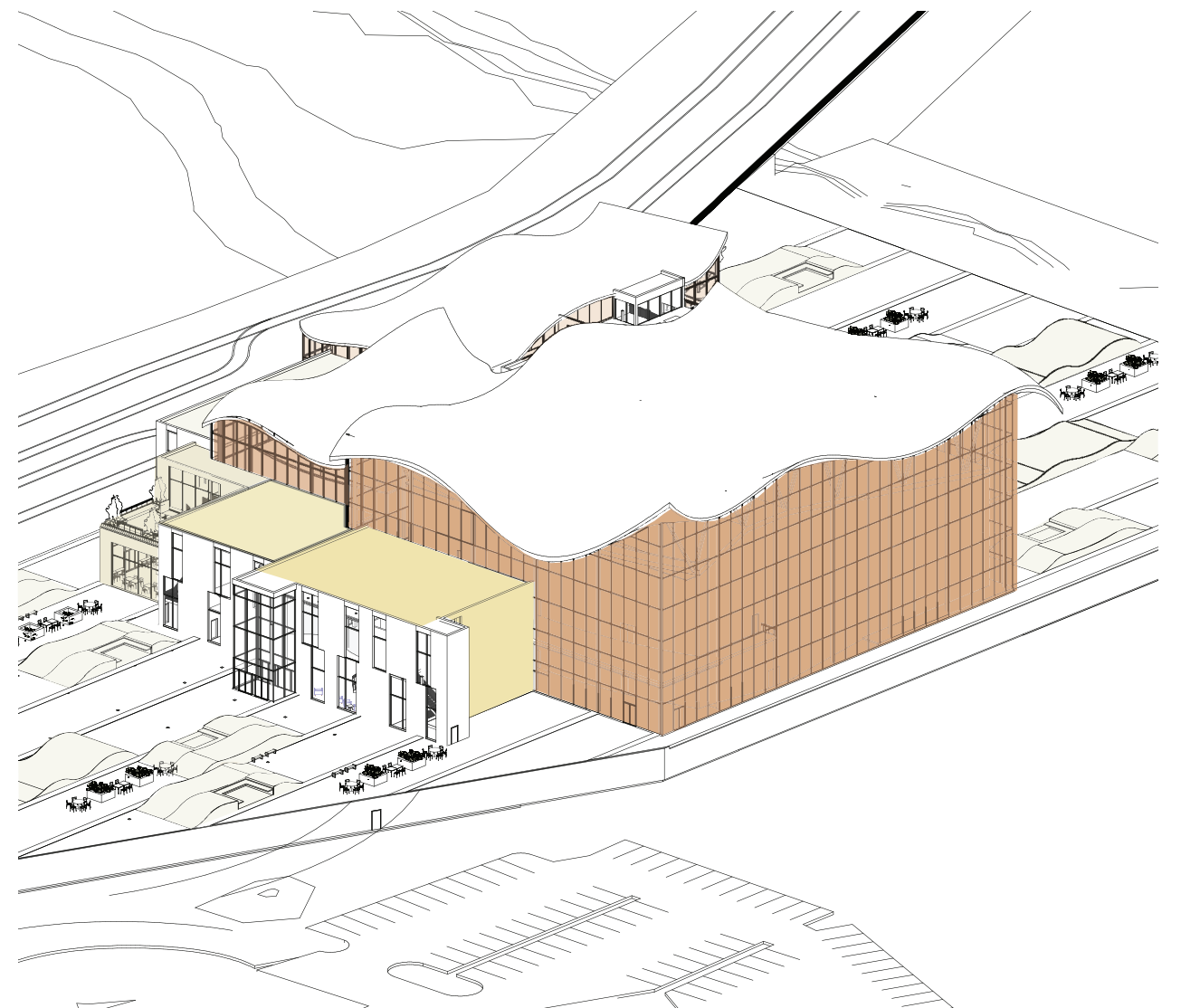
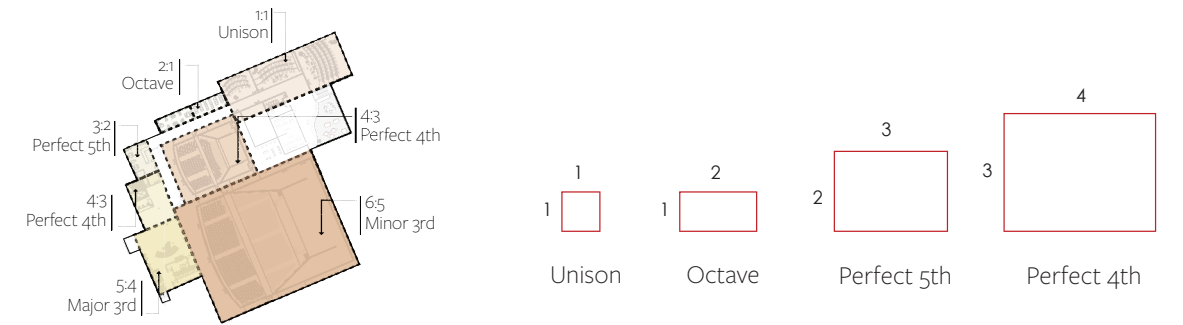
INTERVALS

Melodic Intervals (1 = 30') :

- 6:5 | Minor 3rd
- 4:3 | Perfect 4th
- 2:1 | Octave

Harmonic Intervals (1 = 15') :

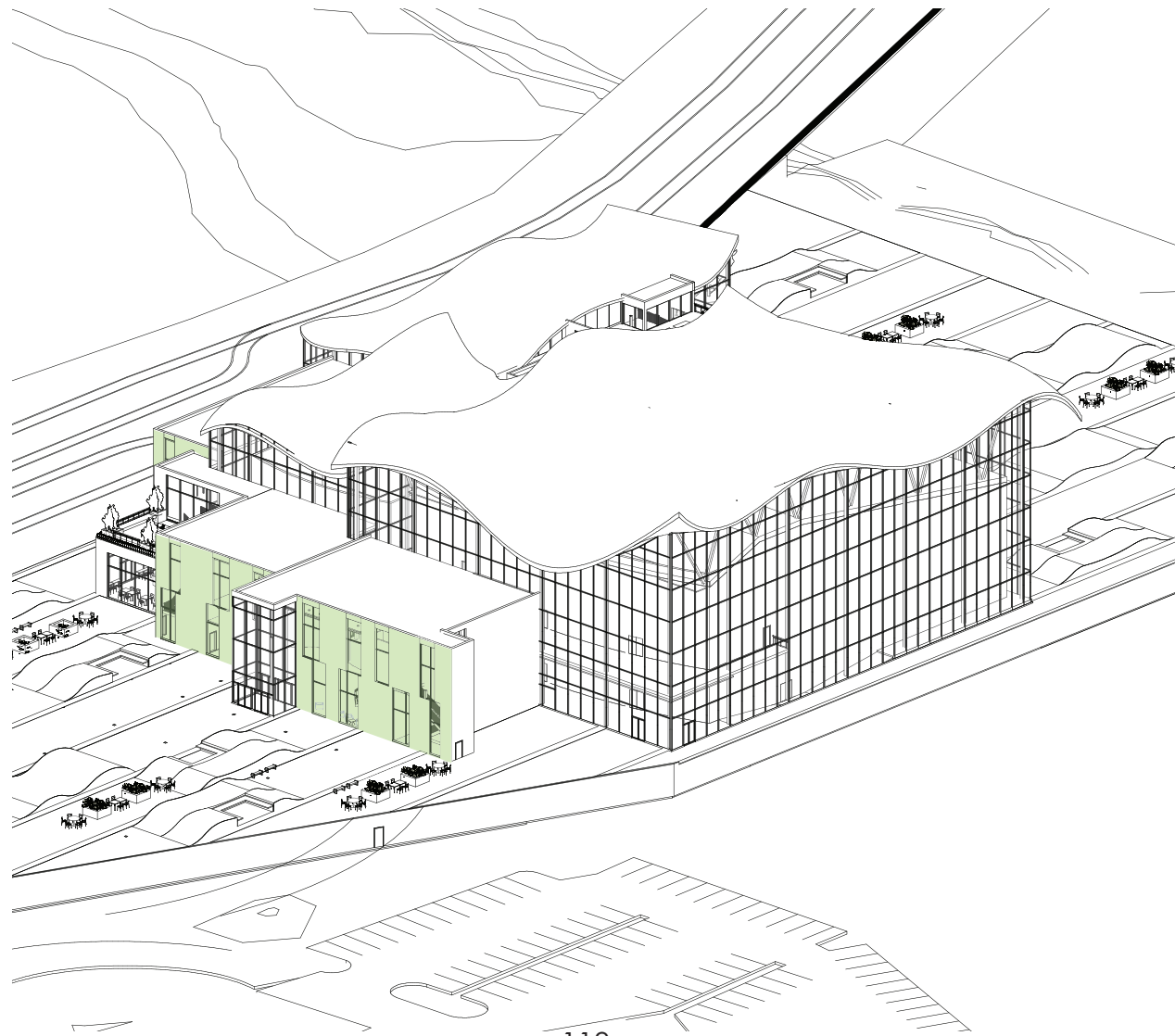
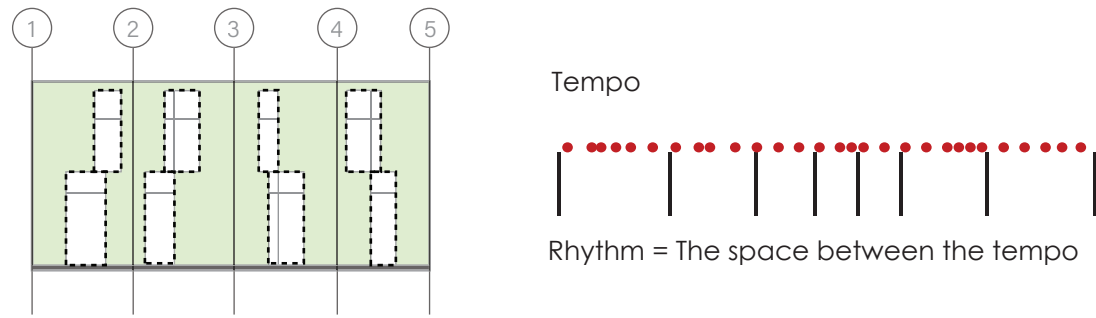
- 5:4 | Major 3rd
- 4:3 | Perfect 4th
- 3:2 | Perfect 5th
- 2:1 | Octave



RHYTHM

Rhythm

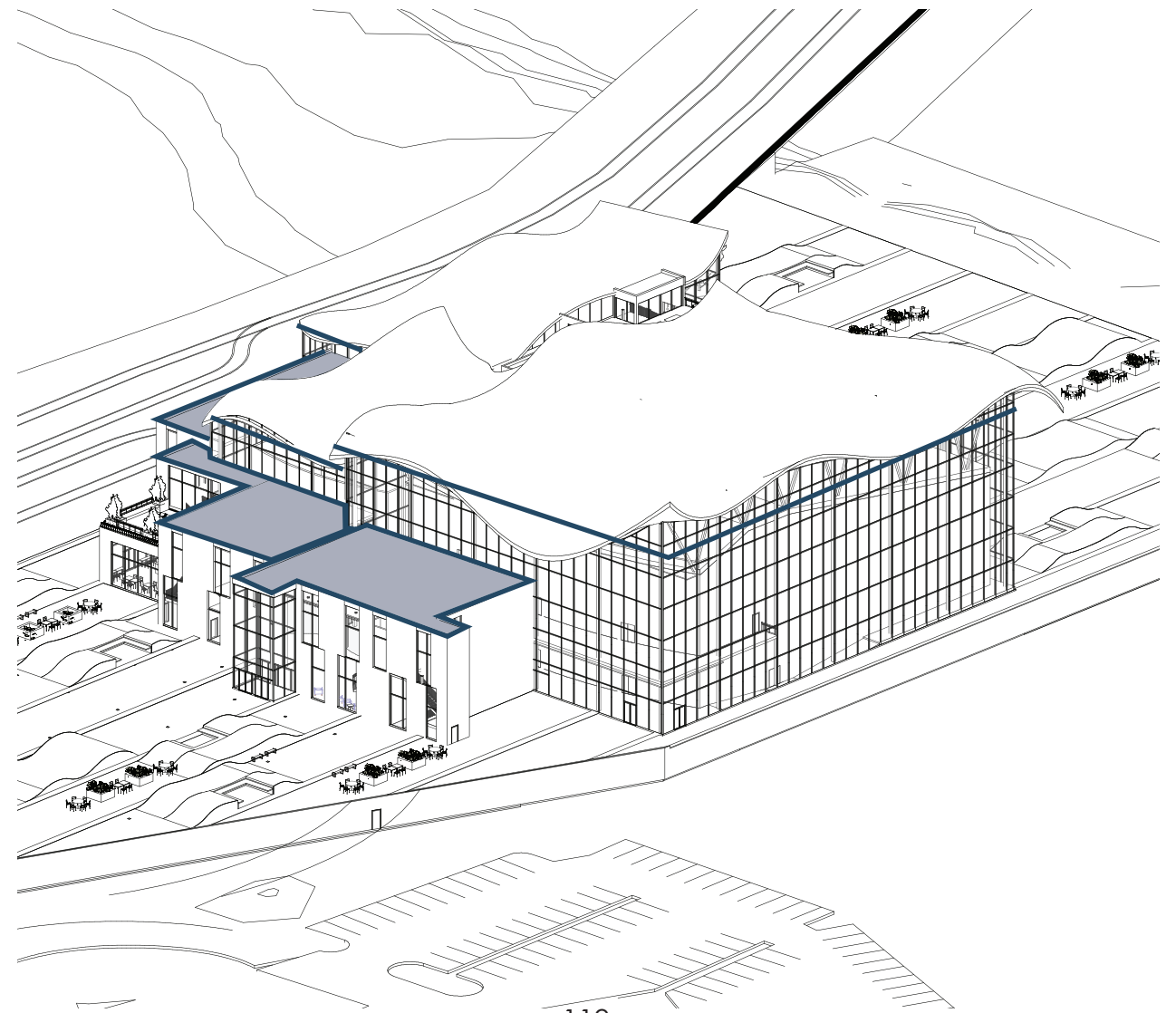
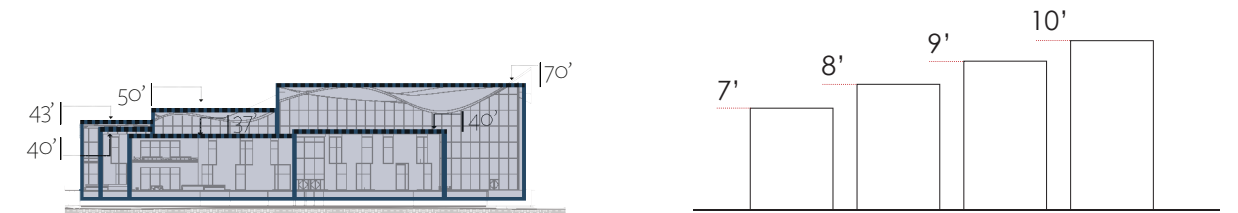
Represented by the punched openings in the front massing facades



PITCH

Pitch

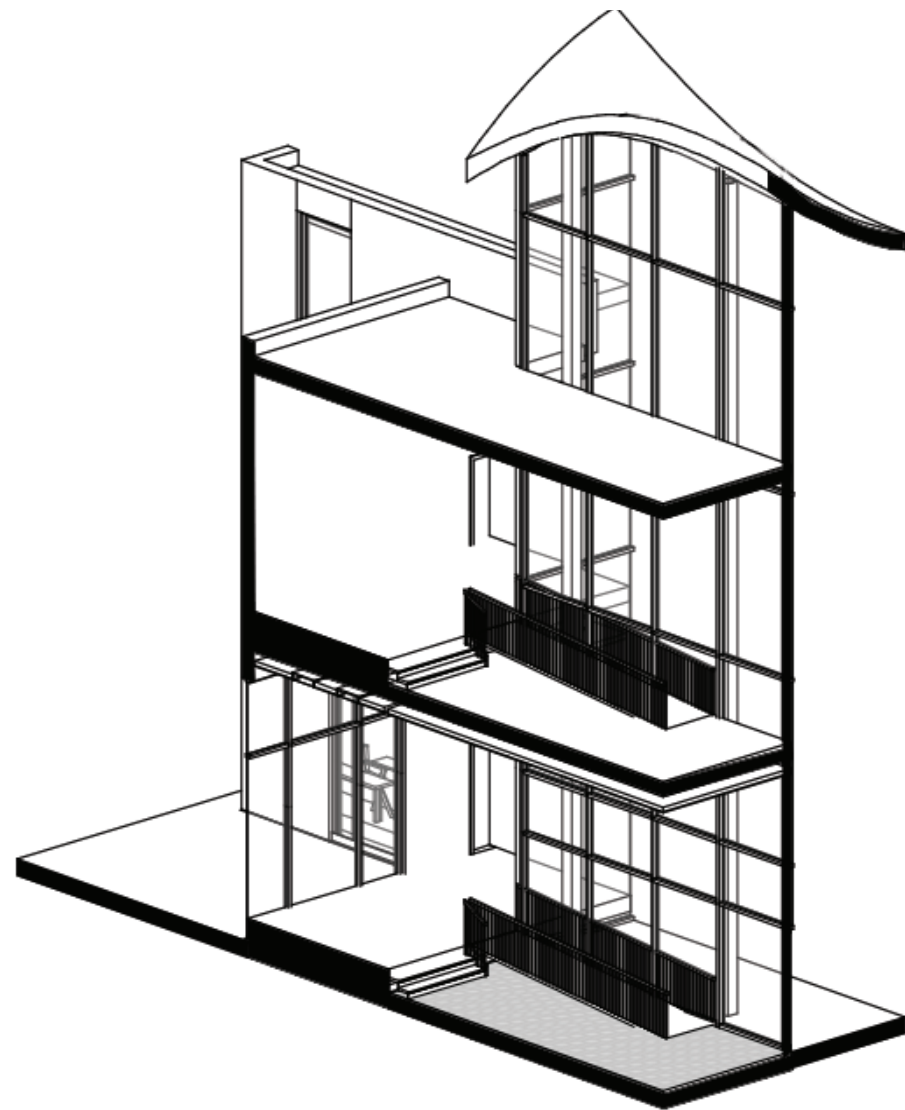
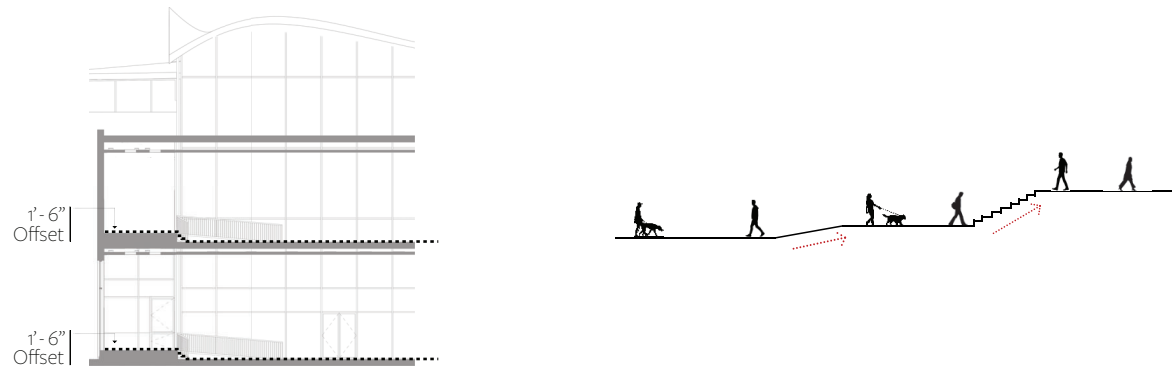
Represented by the varying roof heights in both the front masses as well as the performance spaces



DYNAMICS

Dynamics

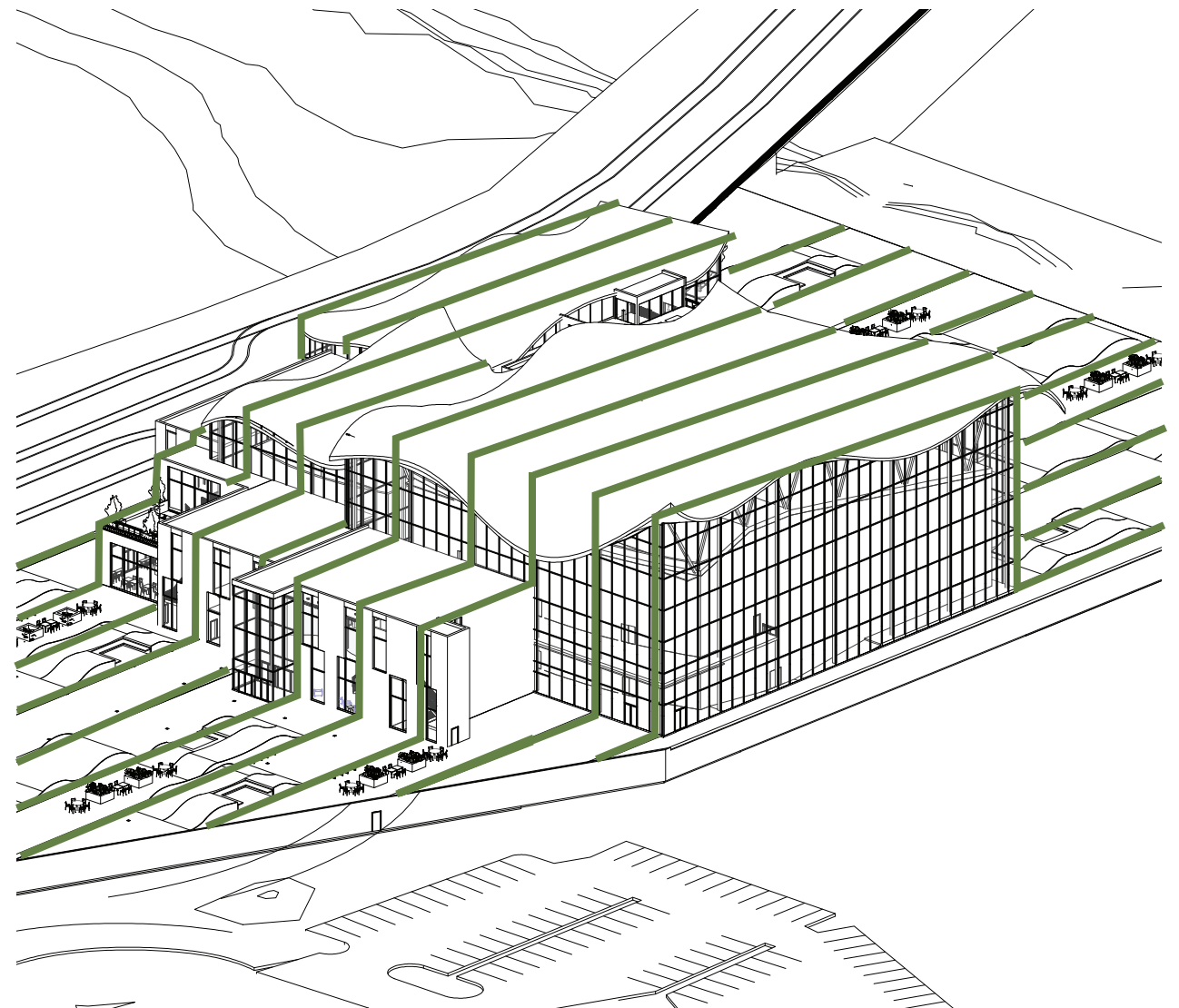
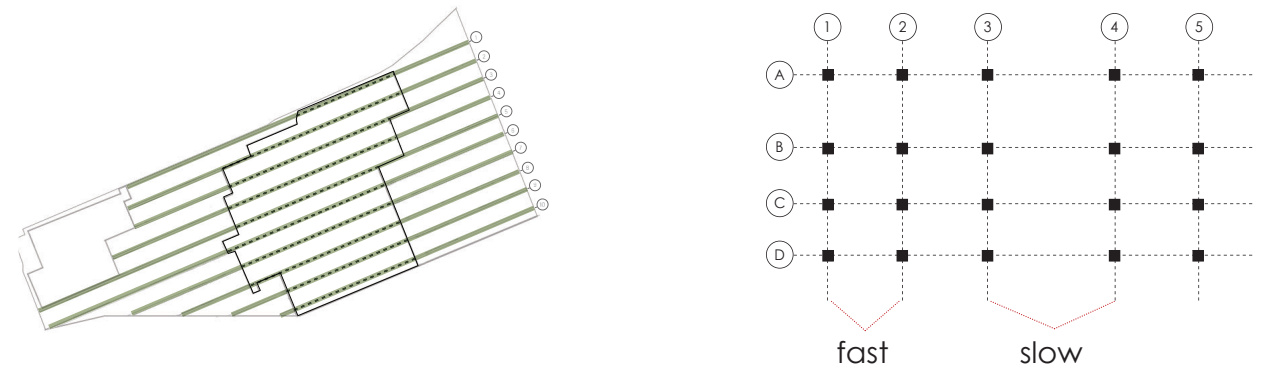
Represented by the change in elevation between the public and student space on both the first and second floors



TEMPO

Tempo

- Starts in the Plaza
- Extends into the structural grid



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PREVIOUS DESIGN STUDIO EXPERIENCE

1st Year

Fall 2014

Environmental Design | Heather Fischer

Metaphor & Movement

Visual representation of playing a violin

2nd Year

Fall 2015

Studio | Joan Vorderbruggen

Tea House | Moorhead, MN

Designing for a site with purposeful design

Spring 2016

Studio | Ron Ramsey

Montessori School | Fargo, ND

Design of an alternative early education facility

Passive Dwelling | Cripple Creek, CO

500 SF dwelling utilizing passive principles

3rd Year

Fall 2016

Studio | Paul Gleye

Wellness & Empowerment Center | Fargo, ND

Community center for local refugees

North Dakota Culinary Institute | Fargo, ND

Renovation and addition of a future culinary school

Spring 2017

Studio | Regin Schwaen

Science Museum | Fargo, ND

Design of a museum along the Fargo dike

Home for the 21st Century | Fargo, ND

A modern, concrete home in a historic neighborhood

4th Year

Fall 2017

Studio | Bakr Aly Ahmed

High Rise | San Francisco, CA

*30 story comprehensive design of a hotel and
Apartment building in downtown San Francisco*

Spring 2018

Urban Design Studio Abroad | Paul Gleye

City Block Redevelopment | Brussels, Belgium

*The redesign and planning of an underutilized block
in a low income neighborhood in Brussels*

5th Year

Fall 2018

Studio | Ganapathy Mahalingam

Research Design Studio

Research of a design question related to the thesis proposal

Spring 2019

Studio | Ganapathy Mahalingam

Thesis Design Studio

Final application of thesis research to a design

ABOUT THE AUTHOR

Makayla Lakeman

Makayla has had a passion for music since she started playing the piano in first grade. In 6th grade she picked up the violin and it has played a major role in her life for the past twelve years. She is currently a member of the NDSU Symphony Orchestra and was Concert Master Fall of 2017.

This project will be a combination of the two biggest elements in Makayla's life, music and architecture.

"Design has the ability to do so many things, but one of the things I love the most about it is the way it can make people happy. Through my education at NDSU I have been able to explore and create a variety of spaces. Throughout my designs, I strive to create buildings that engage and excite users and I look forward to continuing this into my future career."

- Makayla Lakeman



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