# Tactile and Visual Sound

## A Music Cooperative for the Adams Morgan Community

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Thesis submitted to the Faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements of the degree of Master of Architecture .

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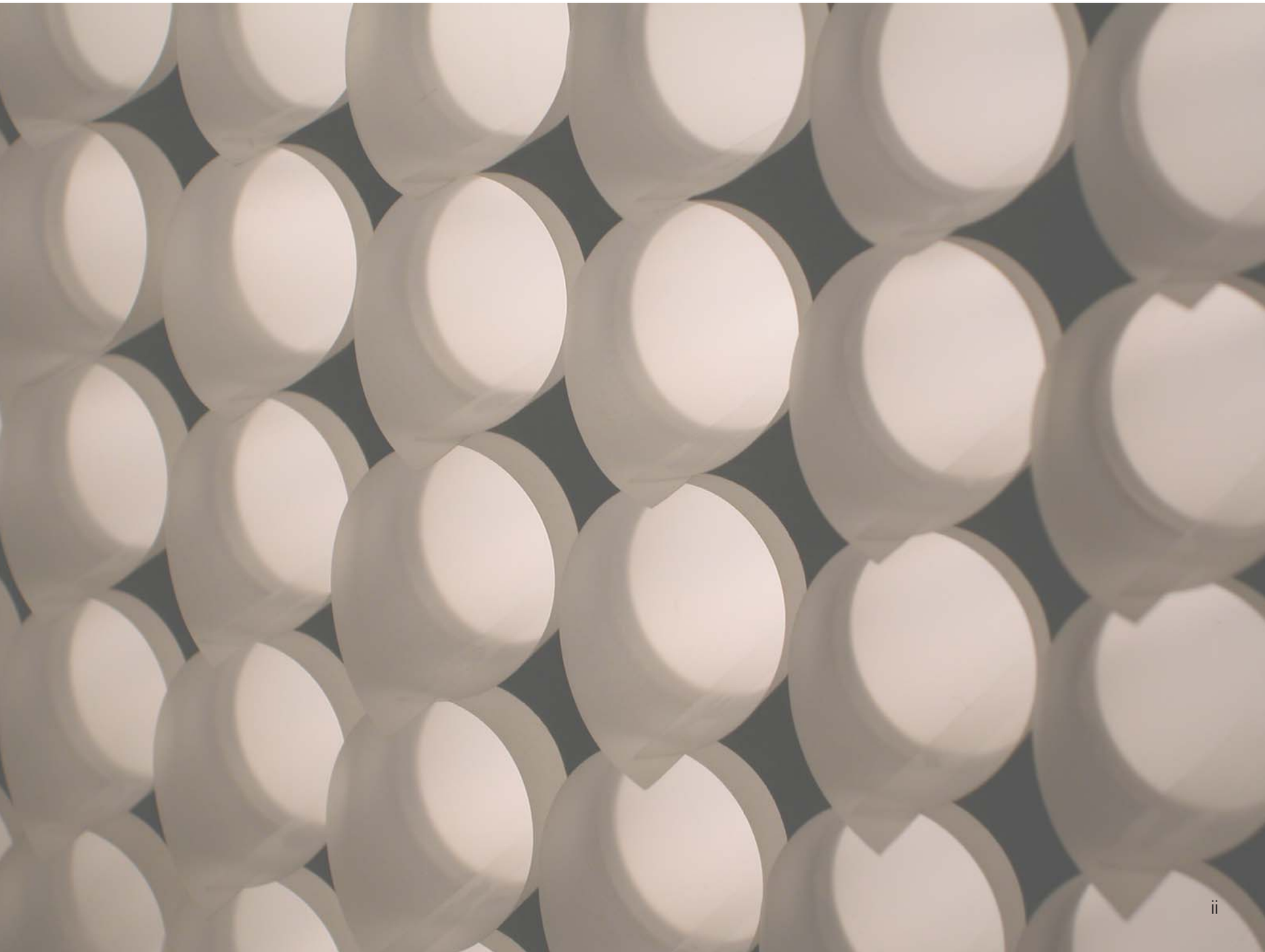
# Abstract

Tactile and Visual Sound...experiencing the aural through the use of material and form to direct, create and control sound.



# Contents



# Adaptive Reuse

Why an existing structure?

As Americans, we are consumers. Our automobiles are constructed from inexpensive plastics that don't (and aren't expected to) last. Our appliances are made sealed in a molded cocoon of plastic so we never see the inner workings. In fact, if we do catch a glimpse of what makes our ipod tick, chances are that we have just voided our warranties. We have become such masters of production that, in many cases, it is actually easier to replace a product than to repair it.

Unfortunately, the developing community thinks so too. Many old buildings are demolished to make room for more floors and tighter floorplans that maximize occupancy and profit.

Of course, every architect dreams of the perfect project on perfect site with a perfect client who has a perfectly unlimited budget. Thankfully, few of us land these "perfect" projects and we are therefore forced to use our creativity to blend our client's needs with these existing structures. In fact, about 70% of an architect's work is made up of reuse projects.

Like this hermit crab, we get to live wonderfully eclectic lives moving from shell to shell. Not every shell will be a mastrepiece, but it's beauty lies within experiencing a new transformation.

# Program

I have chosen a Music Cooperative for my project, as this program holds a lot of meaning for me on many levels.

I myself am a musician who has benefited immensely over the years by being involved with music. This involvement started when I was ten years old by joining the school band.  I never did become a virtuoso at the clarinet, but that didn't deter me from later picking up guitar and drums, something that would never have happened without public school music programs, I think it only fair to mention.

My involvement with music continues throughout my life in the form of rock bands, multi-track recording, jazz combos, and drum circles. Many of my past experiences took place in the city of Ann Arbor, MI. where a close family member taught at the University of Michigan School of Music. This is where I became interested in the idea of a Music Cooperative.

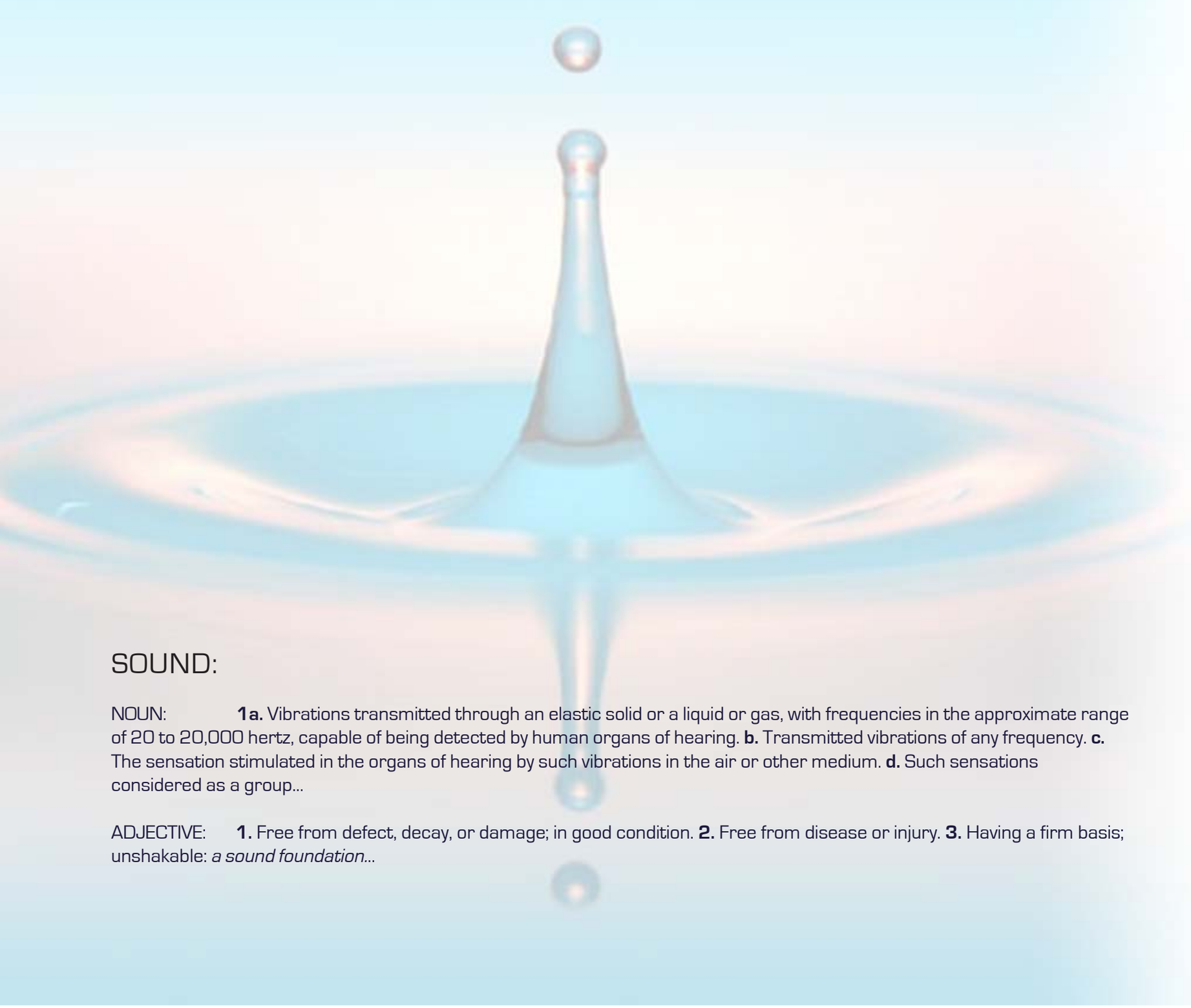
Ann Arbor has a huge base of artists and musicians and it was fascinating to see how they were all symbiotic in each other's development and existence. One property that sticks in my mind and was a basic model for this project was a large warehouse that was divided up into a series of practice rooms and studios for local musicians, dancers and artists. There was a flat rental rate for each space per month, and those who were lucky enough to rent a space could have a "time-share" sort of existence with other friends who could use the space when it was unoccupied. The major difference was that it was owned by an individual, but the people actually running the property were the renters. The Music Cooperative idea is one where the facility is self sufficient by giving the occupants responsibility to run the Coop and build revenue through it's involvement in the community by staging non-profit events such as concerts and community music programs.

One other very important way that music has touched my life and linked my right and left brain is through my training as a violin repair technician. That training has made me aware of the physics of music. That is to say that in it's simplest form, somehow, in some way, a physical piece of material must move to generate the first wave of sound, Building on that principle, the shape, size, density of material and even the material itself, will determine the character of the sound generated. I will draw upon this theme many times in the following pages.

# Functional Requirements

- A large performance area where members have a chance to share their music with the community through recitals and fund raising events. This space can also be used to host guest performers and music clinics.
- Rehearsal areas ranging from 1- 20 performers.
- A recording studio for members to record and share their music with the community and other musicians. This Studio could also be rented out to raise funds for other music programs.
- A Retail / Cafe area to welcome visitors and invite them to take part in the music of the Coop by purchasing CD's and other promotional items.
- Supporting areas including building systems, fire stairs, restrooms, etc.

# The Goal: Sound Sounds



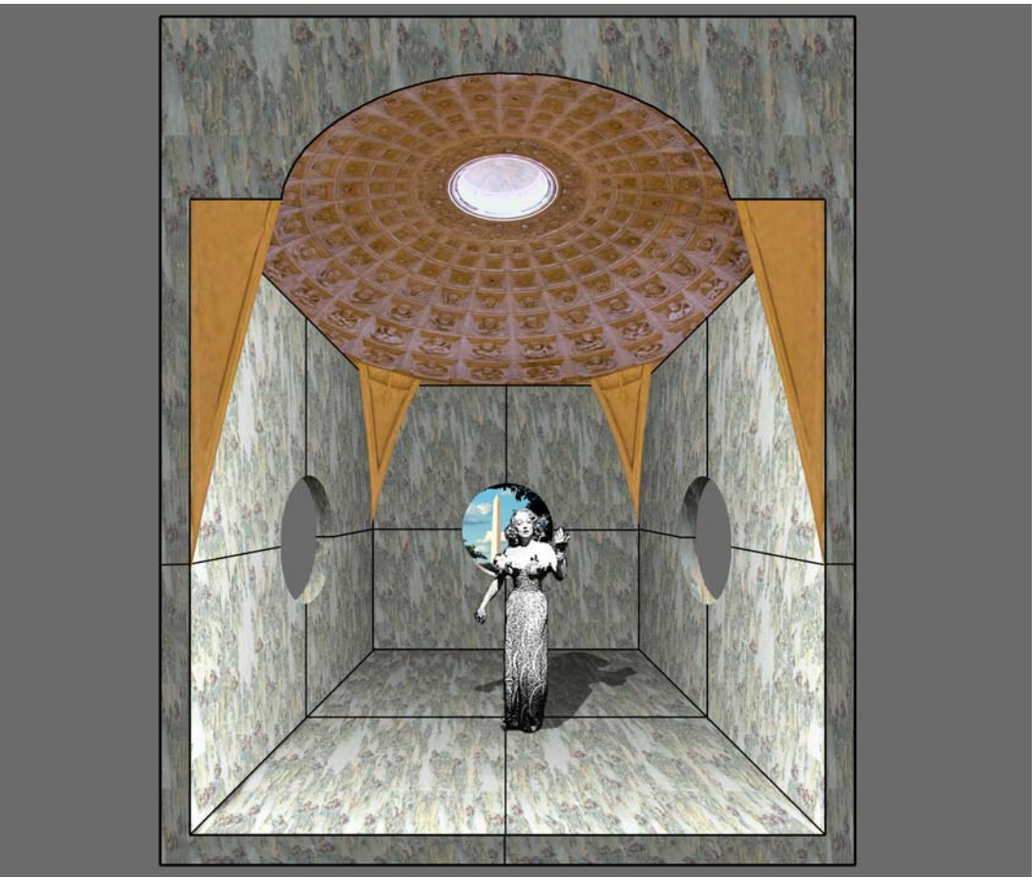
## SOUND:

NOUN: **1a.** Vibrations transmitted through an elastic solid or a liquid or gas, with frequencies in the approximate range of 20 to 20,000 hertz, capable of being detected by human organs of hearing. **b.** Transmitted vibrations of any frequency. **c.** The sensation stimulated in the organs of hearing by such vibrations in the air or other medium. **d.** Such sensations considered as a group...

ADJECTIVE: **1.** Free from defect, decay, or damage; in good condition. **2.** Free from disease or injury. **3.** Having a firm basis; unshakable: *a sound foundation*...

# Soundwave Generators


Musical instruments generate sound in different ways, by using different materials. For example, the piano is the largest percussion instrument. The strings get moving when a hammer falls on them when the keys are pushed. These vibrating strings move the air and you hear the sound. As with all instruments, what makes you recognize the piano as a piano is the combination of the materials that the piano is made of. When you hear a piano, you are hearing the vibrations from its wooden body, steel strings, cast iron harp and the felt covered wooden hammers that strike the strings. All of these materials vibrate in unison to create its discernible sound.

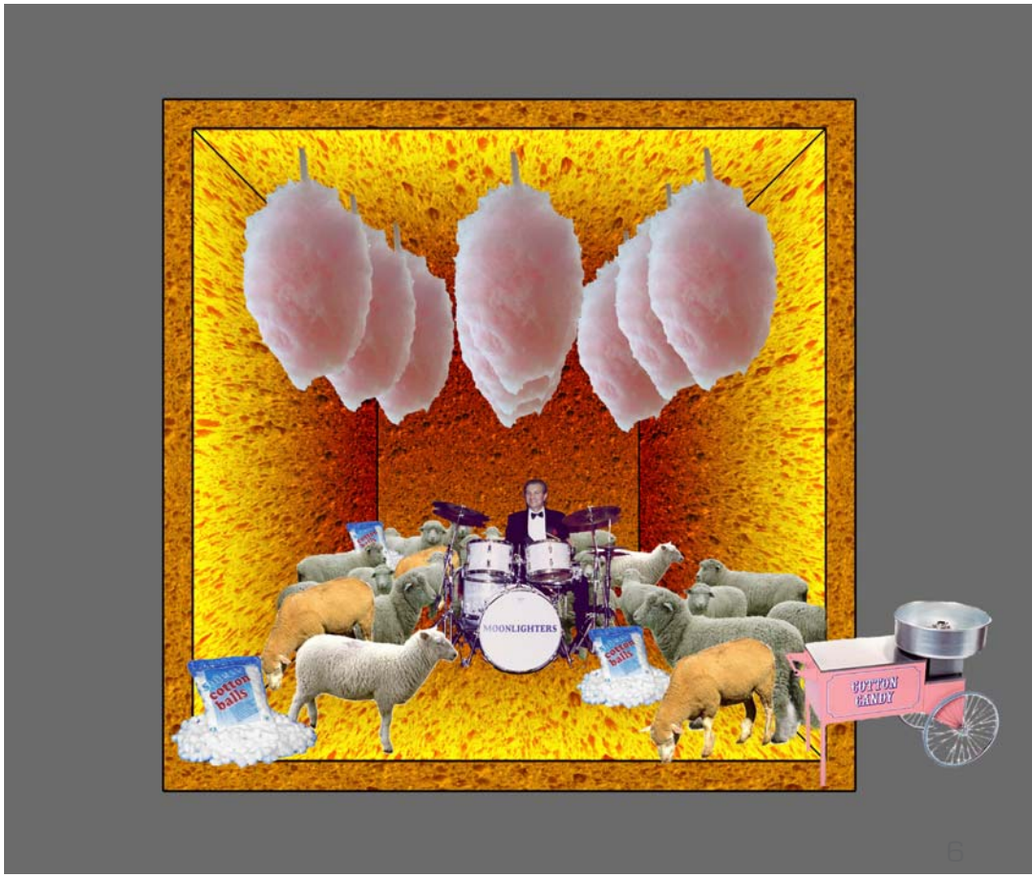


# Materials

Just as the vibrating materials of an instrument or any other sound causing event determine the quality of the sound, the materials that encase the sound also affect it.

A room that is made up of hard materials will let sound linger by reflecting from wall to wall and back again. An extreme form of this reverberation is called an echo. In this "hard" room we find many materials with high incidences of reflectivity. Stone, marble and glass are all relatively smooth dense surfaces that enhance reverberation. This room also contains another feature to encourage this reverberation. The dome above will take these sounds and focus them to the center point of this partial sphere. I imagine that performing in this space with a rock group would produce sound that would be deafening and muddy, but I believe that it might be perfect for the *a cappella* vocalist.

A room that is made up of soft materials will absorb sound like a sponge. In this "soft" room we find many materials with high rates of absorbency. Sponges, cotton candy, sheep's wool and cotton balls, though not practical, are all very absorbent. This room would be a great practice area as it would merely absorb sound without coloring it.




1724 California St. NW
Washington, DC 20009

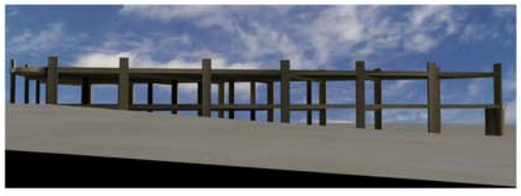
# Site

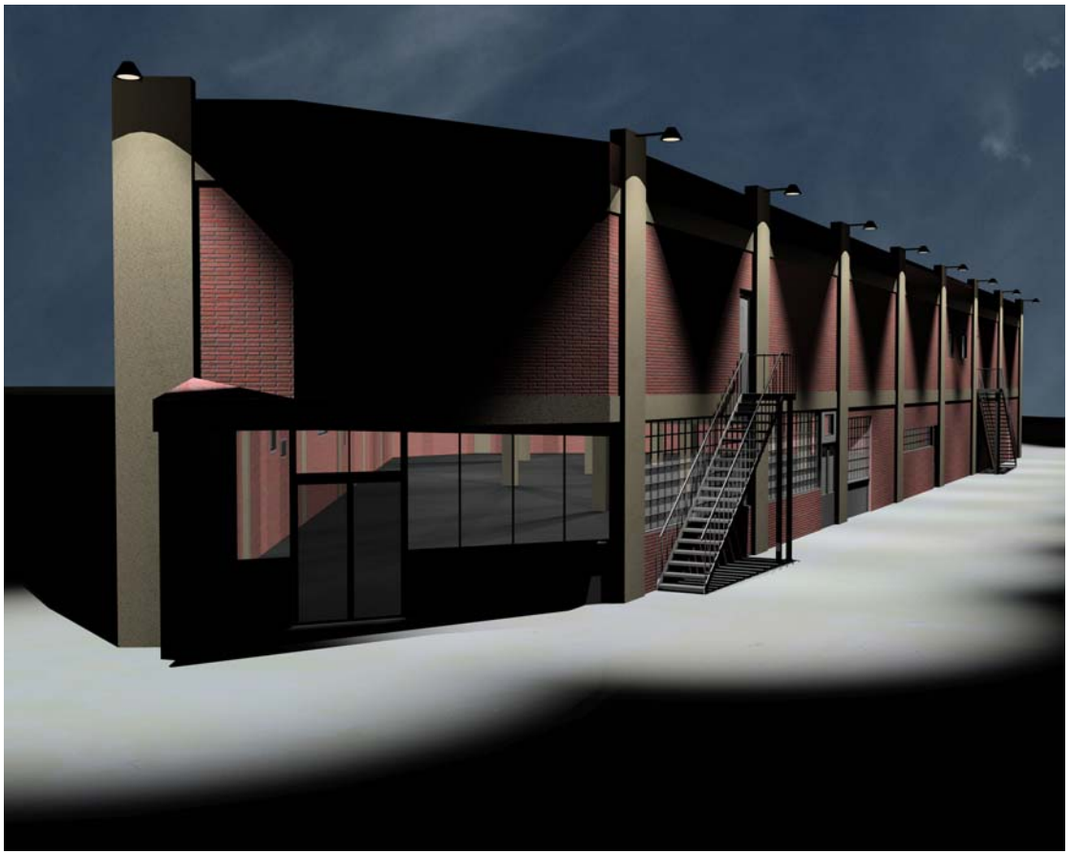
I met this building on 09.07.2003 while attending the Annual Adams Morgan Festival. What I experienced was a community rich in multiculturalism and pride in community and activism. I was treated to many local culinary delights, signed civil rights petitions and rested while watching pieces of a live talent show at a nearby park. As I rummaged around the neighborhood, I ran into 1724 California Street NW, and wondered why the building lay dormant in such a great location right off of the 18th St corridor. Its dilapidated state told me that it hadn't been cared for in quite some time. I was looking for a site for my Music Cooperative at that time and it seemed that Adams Morgan might be the perfect neighborhood for this undertaking. I hadn't really considered using the decaying 1724 until I thought of how it was a real reflection of the Adams Morgan community. This building was constructed in the 1920s and had seen so many changes in occupancy (like the cultural shifts in the community), from dairy warehouse, to car dealership and African dance club. It had lived through riots but still stood there in spite of it all. This building, like its surrounding community, stood tough through the highs and lows and is ready and waiting for its day.



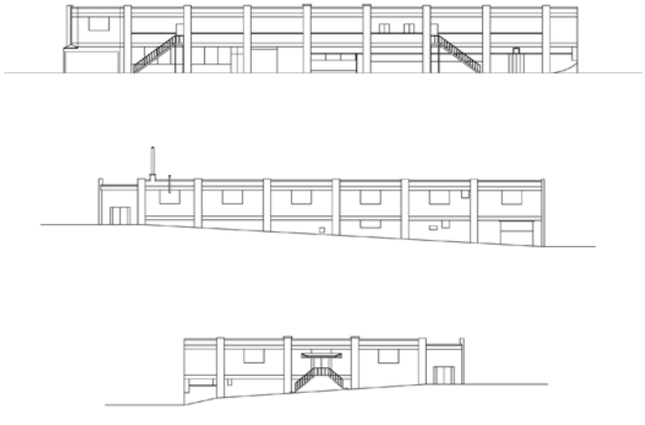








The existing structure is located at 1724 California St. NW, just blocks away from the heart of Adams Morgan, and situated in an odd little triangular lot at almost a perfect 30-60-90 triangle, In the mid-1920s, this building was constructed to fill the whole lot with the appropriate setbacks that maximize space for what was to be a two story dairy warehouse. It is a simple poured-in-place concrete slab, beam and column structure built to withstand trucks driving on the second floor. Not so different from our modern parking garages that are constructed using the same slab, beam and column principles, we now however, use generic precast concrete parts instead. The facade of the building is little more than a brick infill with warehouse-style penetrations for glazing. To sum it up, this structure "...holds little architectural value" as one faculty member put it. It was now my job to bring meaning to the space.



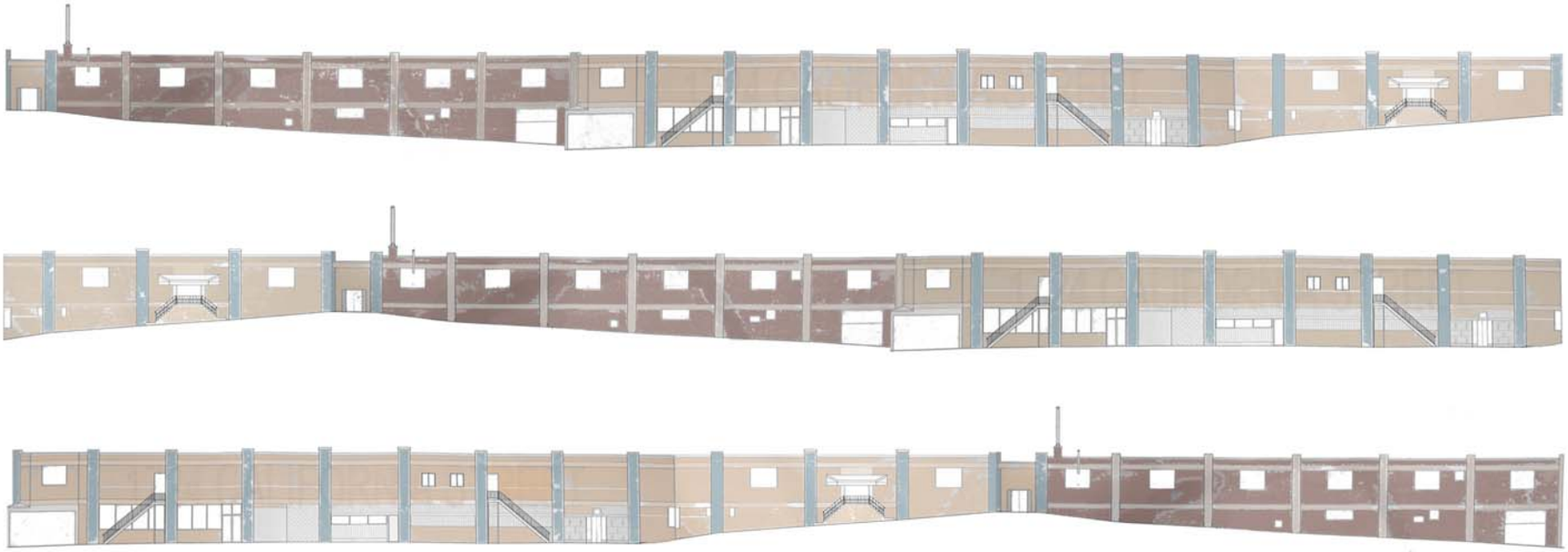


It is in my personality that I am unable to throw things away. If something breaks, I must attempt to repair it, if I can't repair it, I try to find a new use for the object. It is also in my personality to appreciate the way something that has been through many hands feels. The object (in this case, building) seems to actually take something from any hand that touches it. I believe that this is where the soul of this building lies. Even though the occupants of this structure are long gone, their marks remain in a ghostly fashion to tell the building's story. It is through this peeling paint, graffiti, burn marks and bullet holes that you can see this building's will to survive,



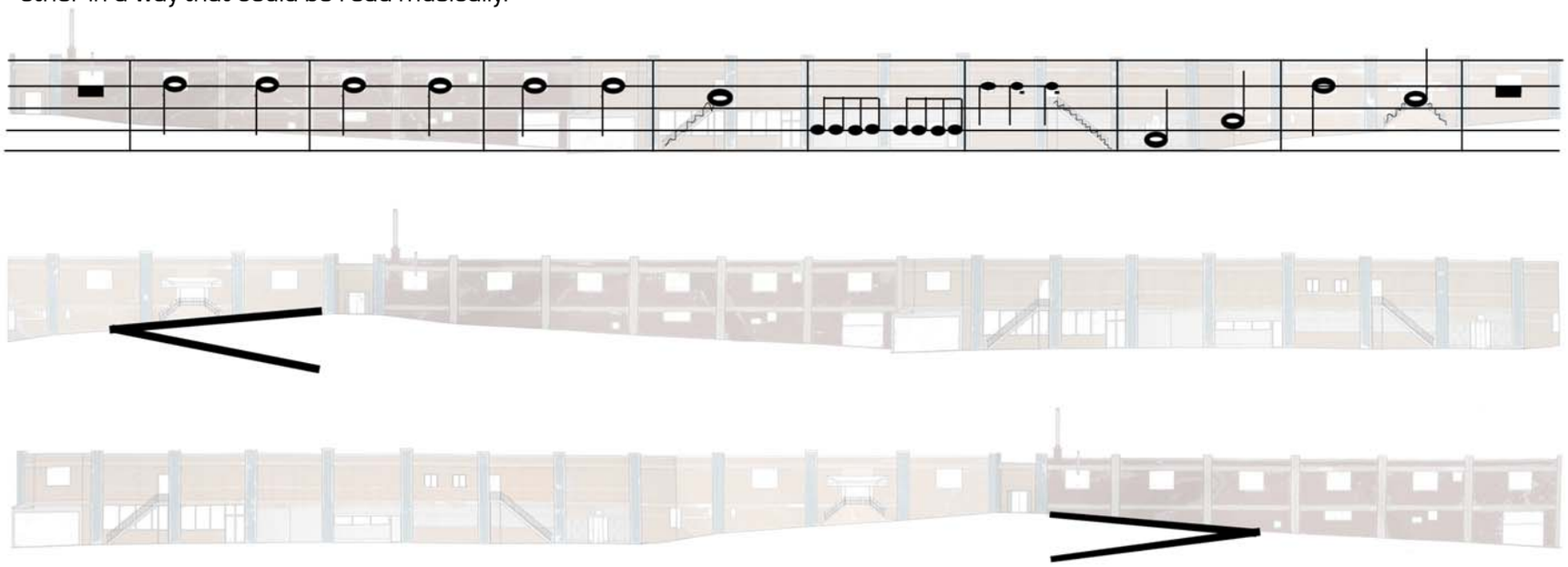
# Existing Conditions

# Initial Reading

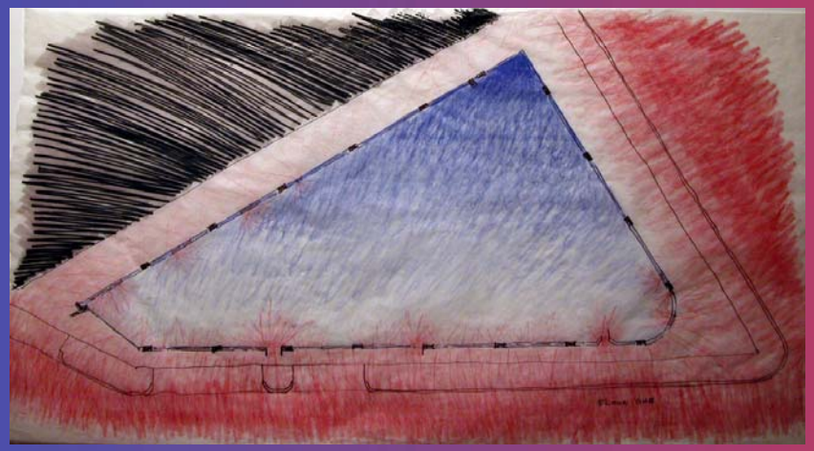


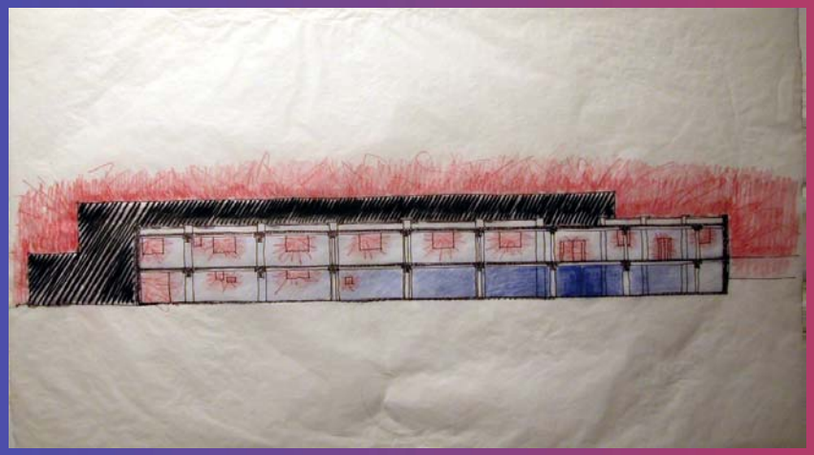
Early explorations of this building were very literal for me. I imagined how the building might "sound" when unwrapped and placed upon the reel of a player piano. Each window opening passing by and triggering a hammer to fall, while columns marked the first beat of each bar.  A later site visit would provide sound samples of the structure and its surroundings which would result in a musical composition using only the sounds collected at the site. I invite you to watch the short video clip and listen to the composition attached to this package.

It was also noteworthy (no pun intended) to mention how these slabs, columns, beams, window openings and site interacted with each other in a way that could be read musically.



Quiet
Dead
Dry
Cool
Underground
Private
Flat Line
Static
Dark

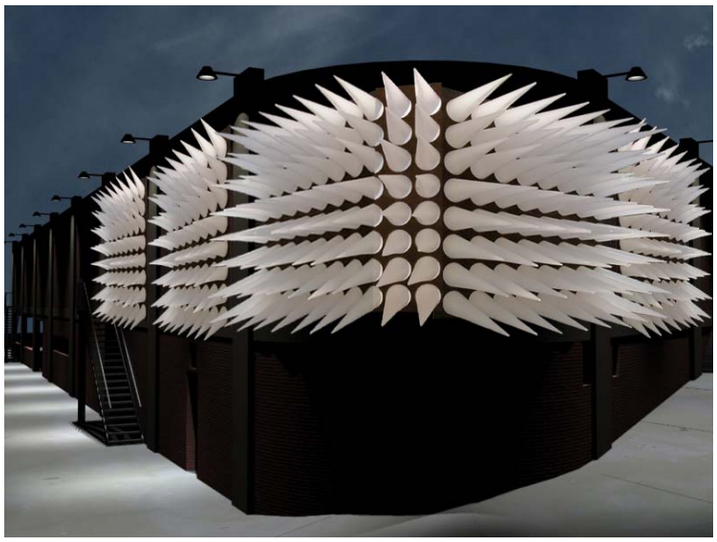




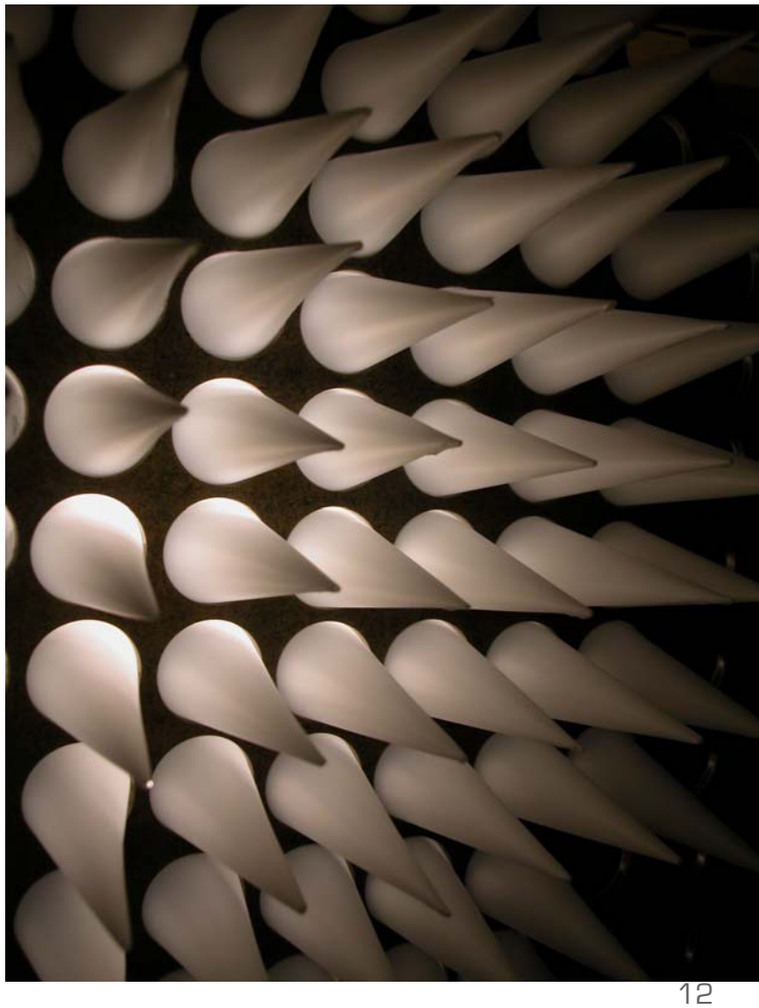
Loud
Live
Wet
Warm
Above Ground
Public
Wave
Dynamic
Light

Inside the building, I studied how external sounds would work their way into the building, and how the mass and density of the building materials and earth would absorb and direct these sounds. This was important to determine the best place for a particular application. For example, the natural choice for placement of a recording studio, where outdoor noise is not welcome, would be in the north west corner of the building where the area is almost completely under ground.

# Cones



My exploration of cones started out simply as a means to dampen sound. These would be open cell foam cones that would maximize surface area for sound absorbing. It turns out that the cone would mean much more to me by the end of my explorations.

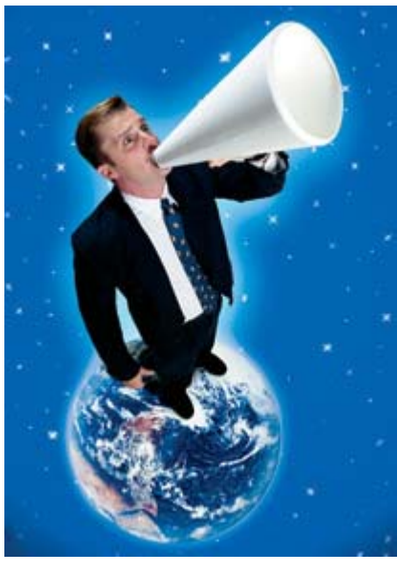


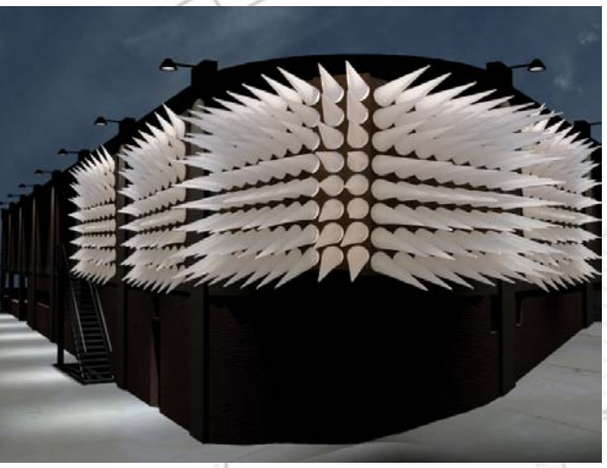
# Collectors of Sound

It turns out that cones have been used for centuries to collect and direct sound. Although not the most fashionable, or functional, (as we have learned from Maxwell Smart's malfunctioning Cone of Silence) it was the most popular means of magnifying sound for the hard of hearing until the incorporation of the transistor in the 1930s.

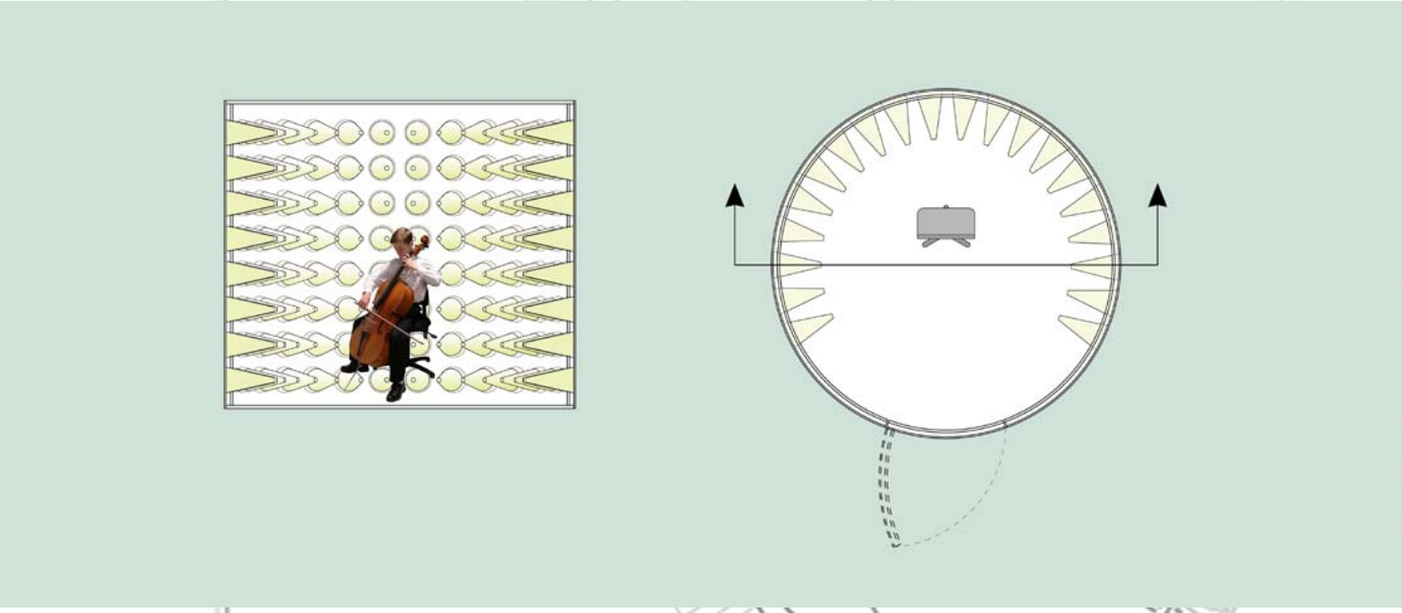
# Directors of Sound

Cones have also been used to direct sound. The simplest example would be the use of one's hands to cup around the mouth to shout a message to another person at a distance. This method does not amplify the sound, it merely directs the sound more effectively to another's ear (incidentally, it is worth mentioning that the outer ear is also a kind of cone, your own little "hearing trumpet"). The use of a cone to amplify is a relatively new process where electronics do the amplification while the trusty cone directs its message toward the intended target.

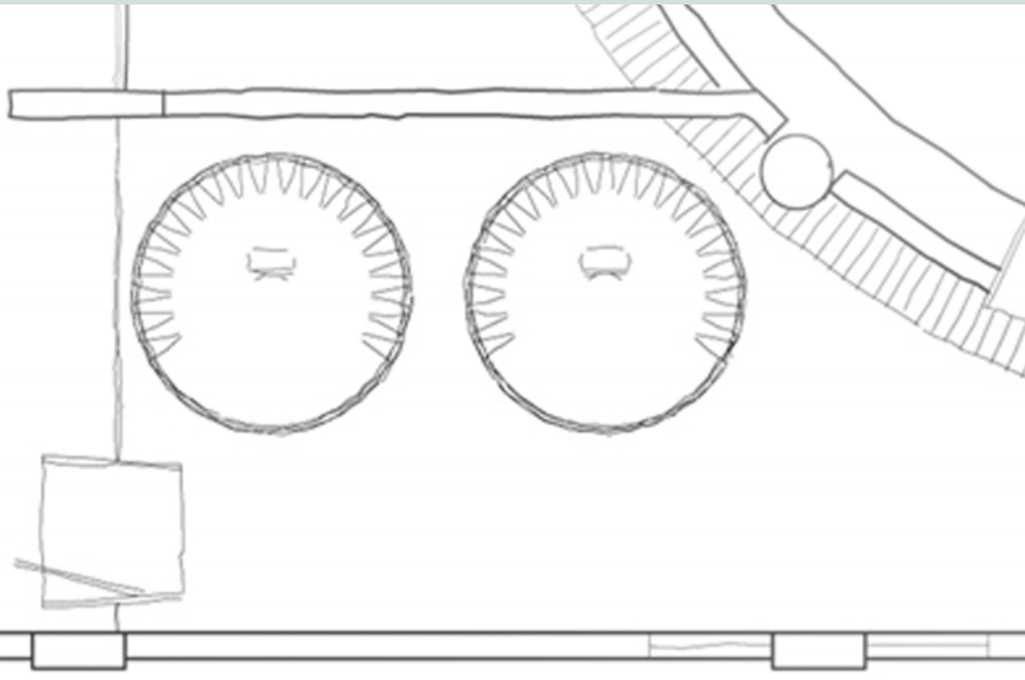




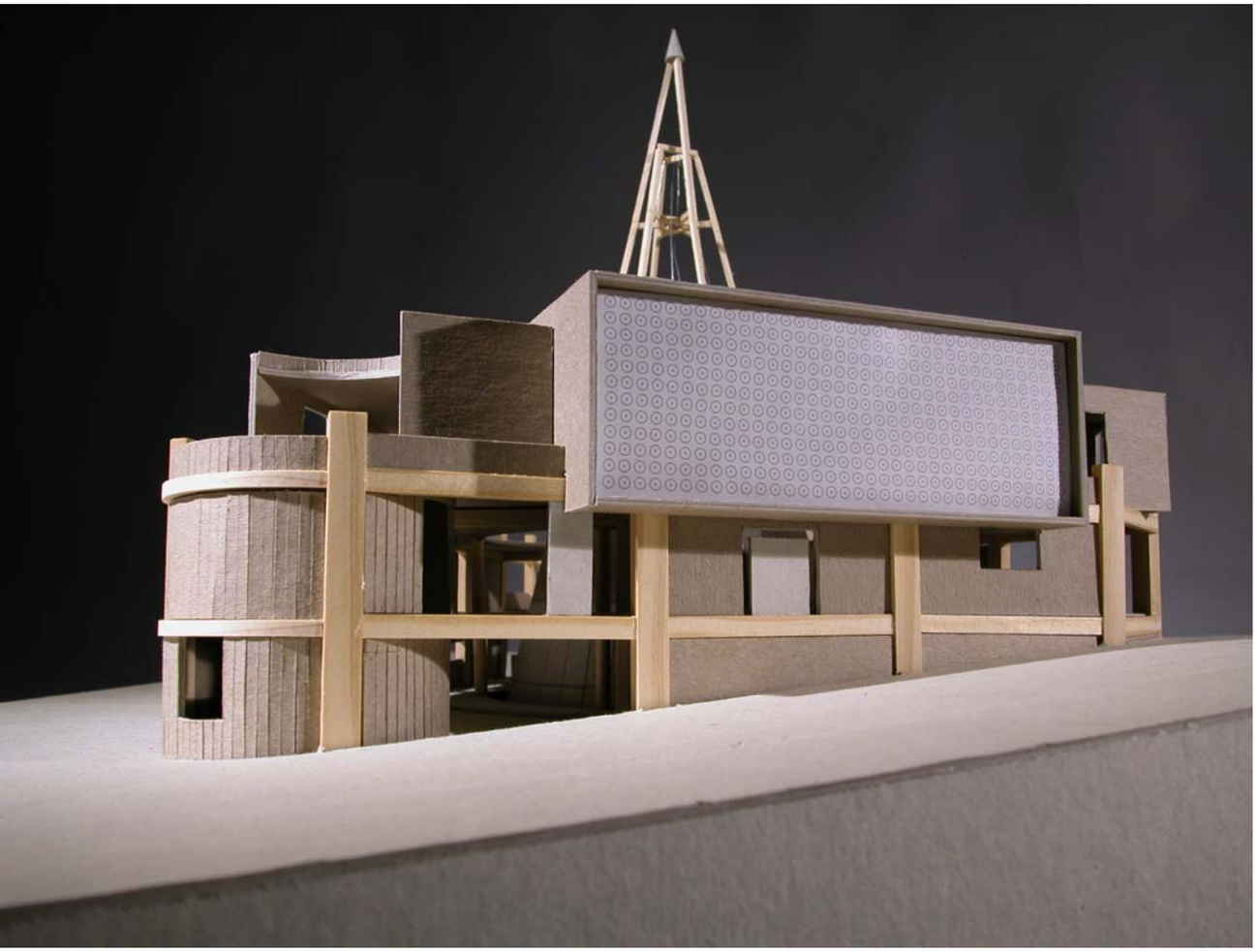
My first attempt to employ the cone in my project produced a rather surreal and unfriendly effect. Although these cones were doing their job acoustically, it seemed that they would drive the community away rather than embrace it.

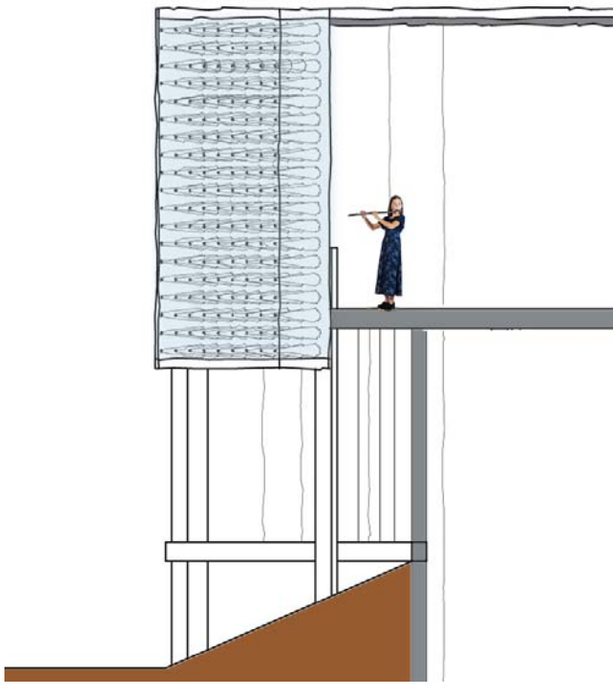


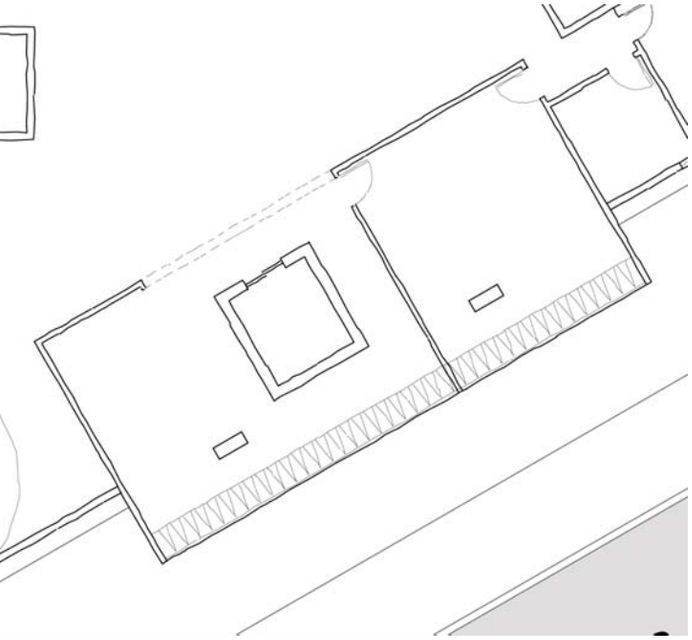
I began to rethink what it meant to be in a Cooperative, and how people and the environment would coexist. This led me to encouraging the occupant to reside with the cones and not be barricaded by them. It is counter intuitive to turn the point in the direction of the occupant, but as the relationship between the clownfish and the anemone shows, it is a relationship that sometimes works.



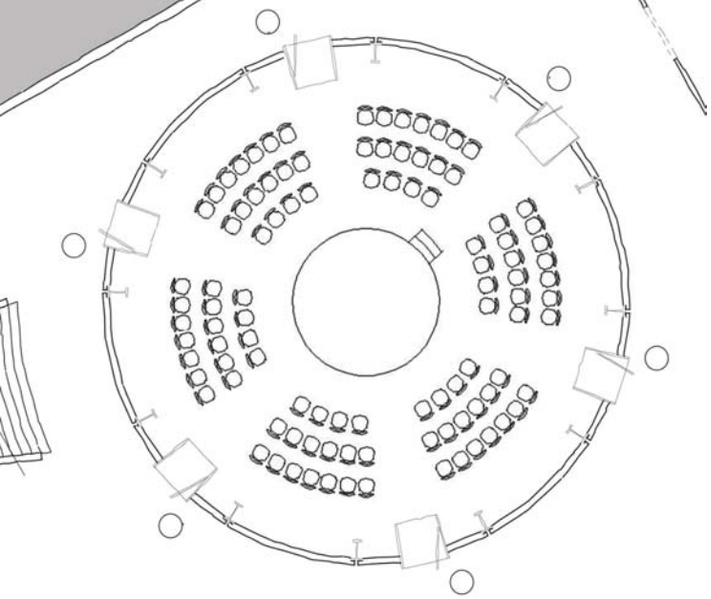
These visually light practice pods are to be used by one player at a time, and can be moved throughout the space to be conveniently located anywhere the player chooses. Their airy translucent foam cones reach out toward the player to absorb excess sound as they warm up for a performance or just practice. The body of the pod is made of a translucent acrylic material to let light out as well as in.





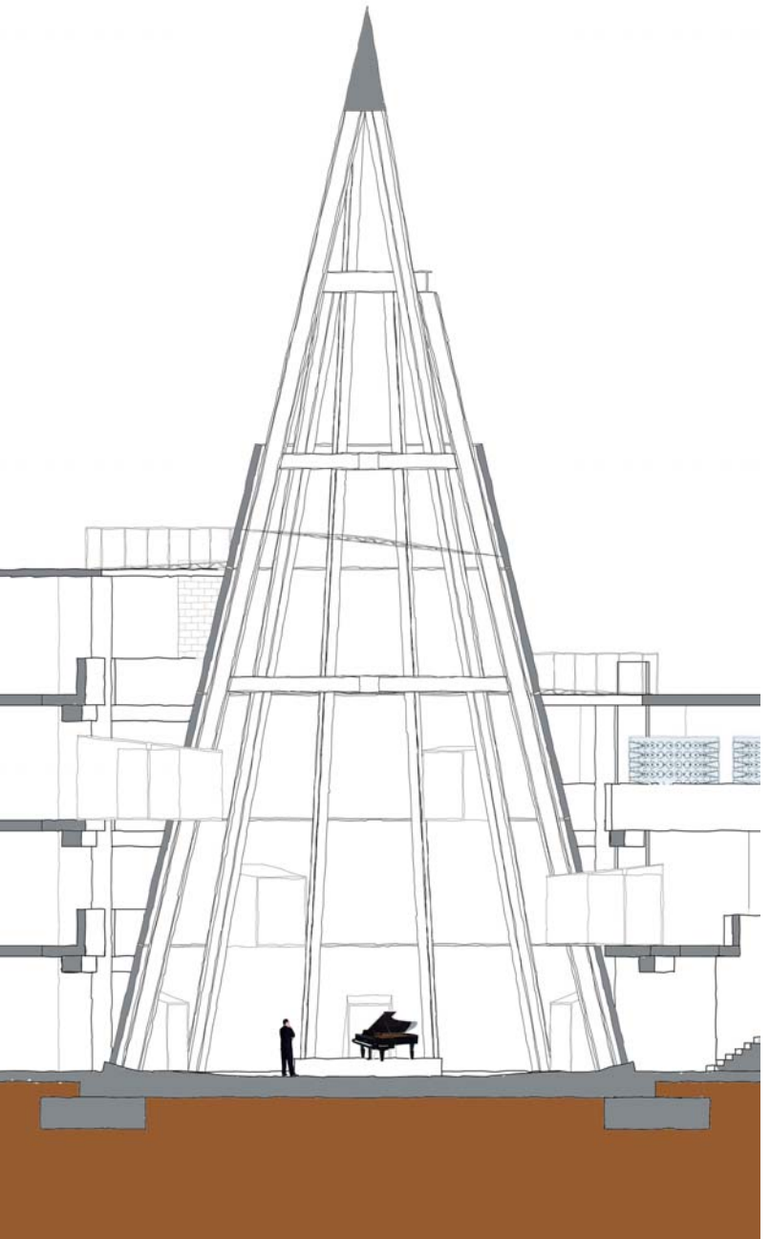


This practice bay on the north side of the building serves as a large practice room for 6-10 players, and it contains a freestyle wall to practice against.  This space is kind and sympathetic to the original structure as it brings these existing columns indoors after all of these years. Players can enjoy playing off of this “rooftop” while still being indoors.



# Main Performance Space

This performance space is the heart of the Coop, where members have a chance to share their music with the community through recitals and fund raising events. This 100+ seat, in the round, flexible space can also be used to host guest performers and music clinics. The main performance area also connects the Coop with the Adams Morgan Community through giving this neighborhood a visible landmark.

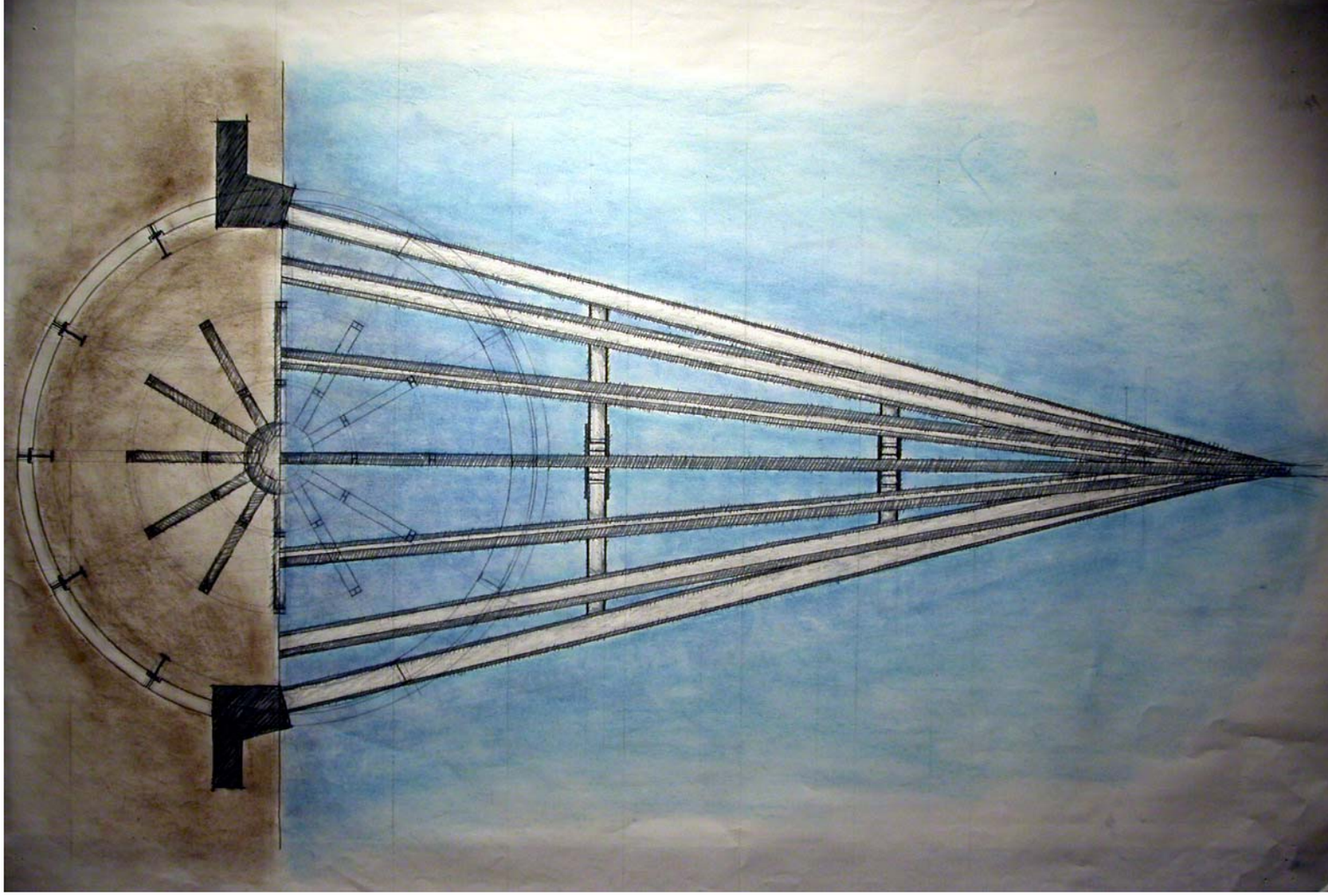


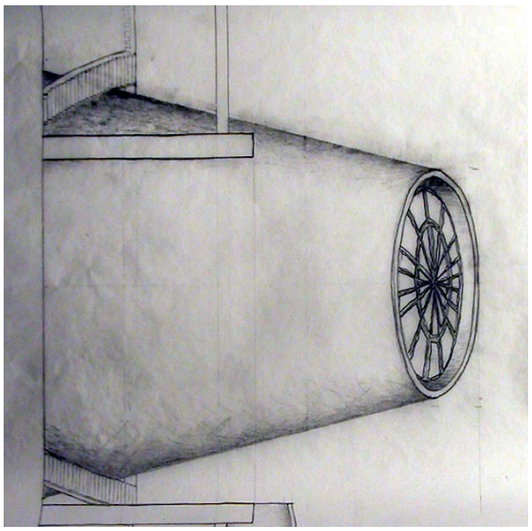
Since this is an existing structure, there will be some necessary surgery required to get the cone into the space. This operation consists of digging down one additional floor and adding a new foundation for the cone. On the upper levels, there will be much sawing through existing concrete and pouring large support rings at the edges of the circular incisions. These rings then tie into 6 new columns that will bear the existing structure and the glass roofing at the 3rd and roof levels. At this point, with a huge hole bored into the original structure, it is now time to add this free standing cone.

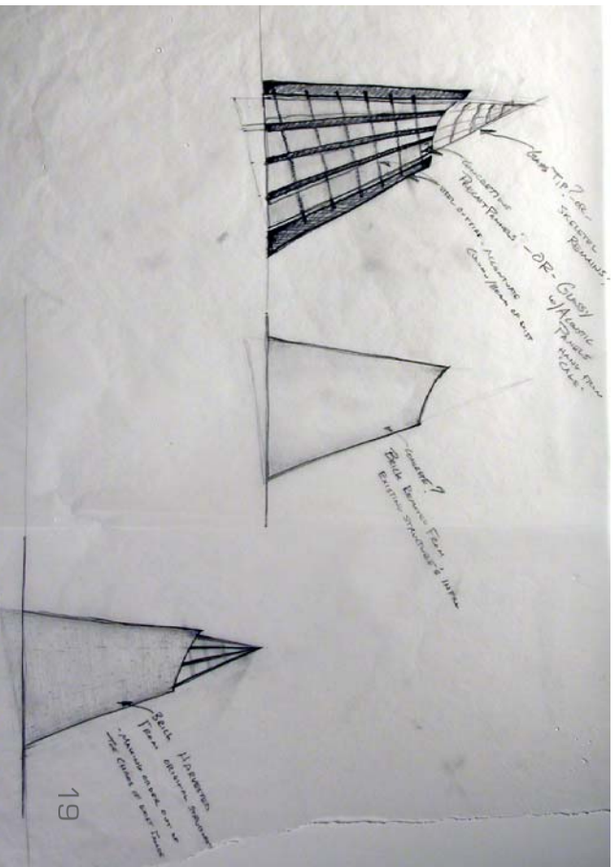
Twelve web flange steel column/beams and 4 "wagon wheel" central supports serve as the scaffolding as well as structure for the main cone. You will notice how the steel column/beams dematerialize as they travel further up toward the tip of the cone. The 1st and 2nd "wagon wheel" pieces join all 12 of the column/beams, the 3rd wheel supports 6 and the 4th joins with 3. The cast tip of the cone also joins the 3 alternating column/beams. Without this dematerialization, all 12 column/beams could never meet at the cones tip.

To add extra support, I also added 6 cables that pull the 2nd wheel toward the 4th to apply tension upwards. One lovely byproduct of having these cables tying into the cone's skeletal structure is that they become musical in themselves when they vibrate with the wind.

Precast concrete panels are now placed on the steel and welded in place. Rubber gasket material fills the gaps between these panels to prevent leakage. The cones top is adorned with a glass roof to let the sun and stars into the space.

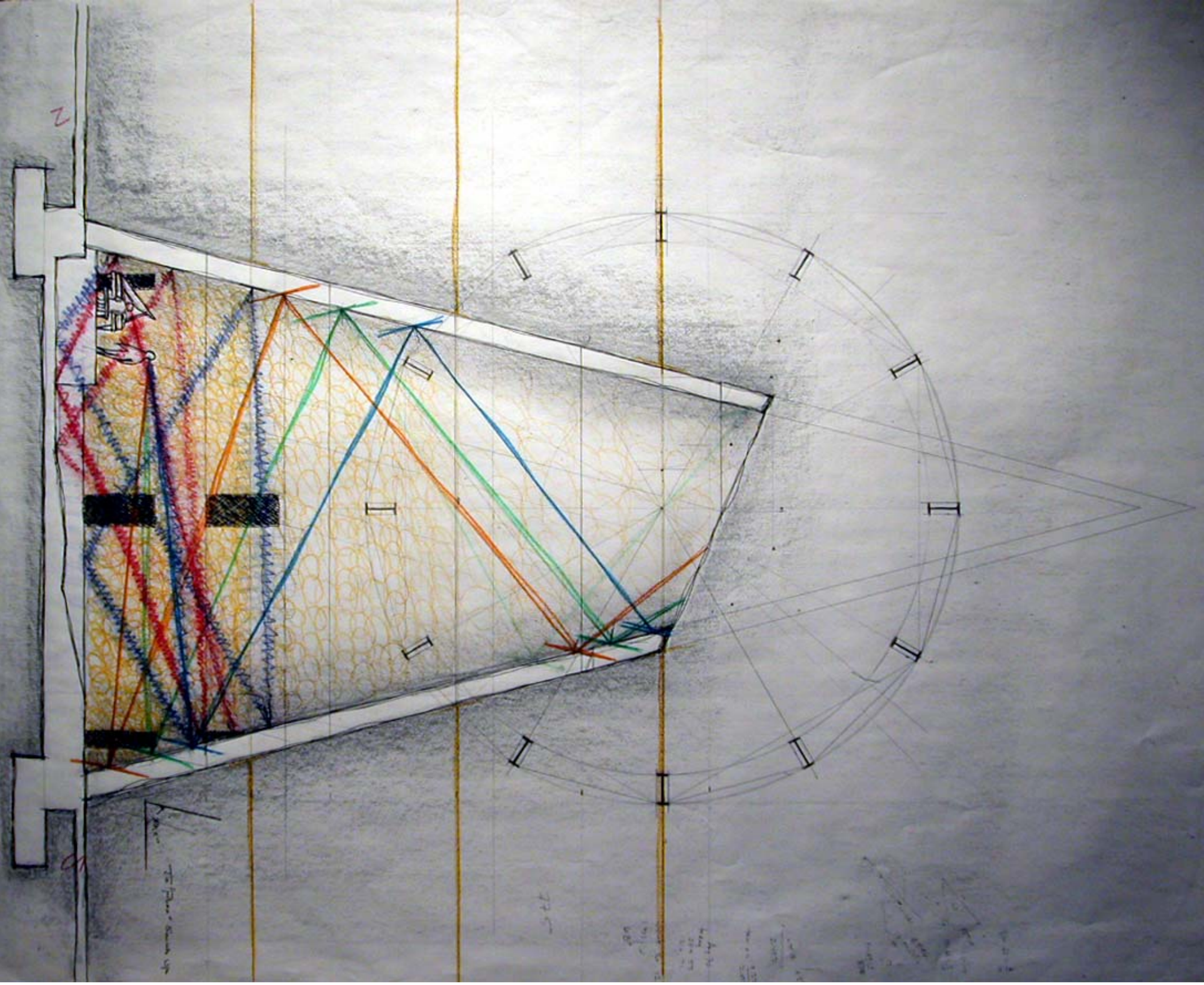






Skeletal and Precast Studies

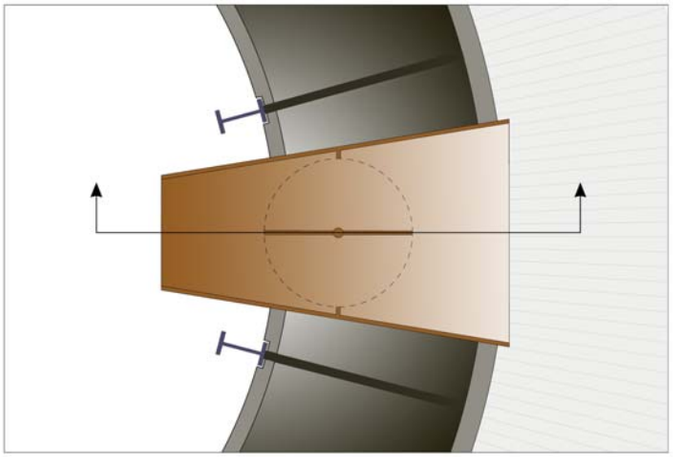
# Cone Studies



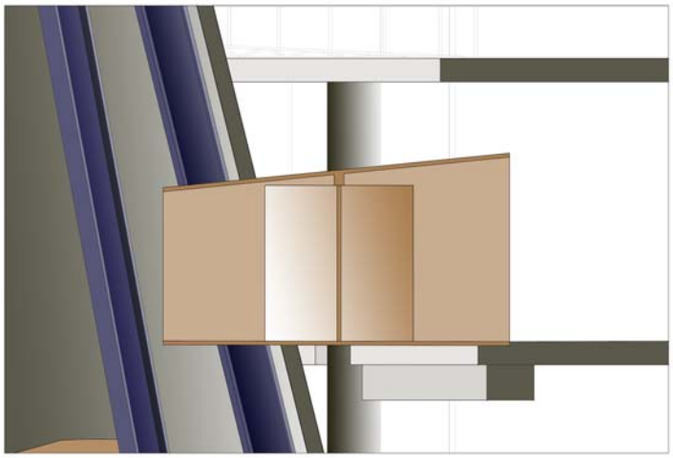
An Early Acoustical Study

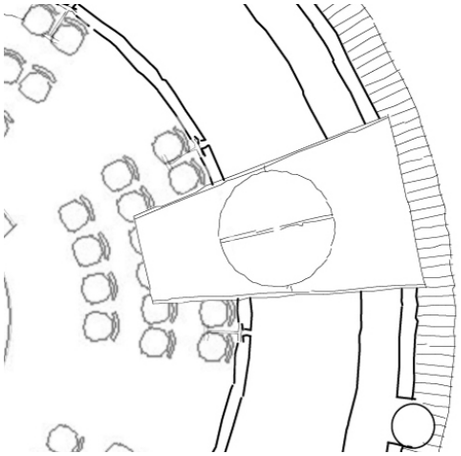
# Cone Studies

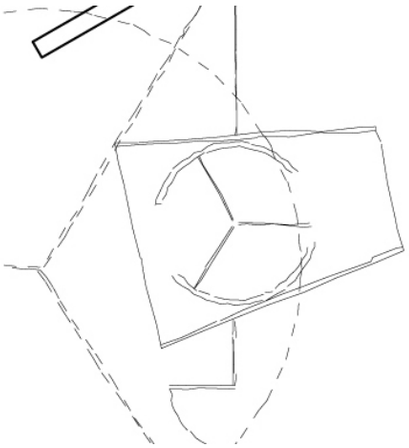
# Portals

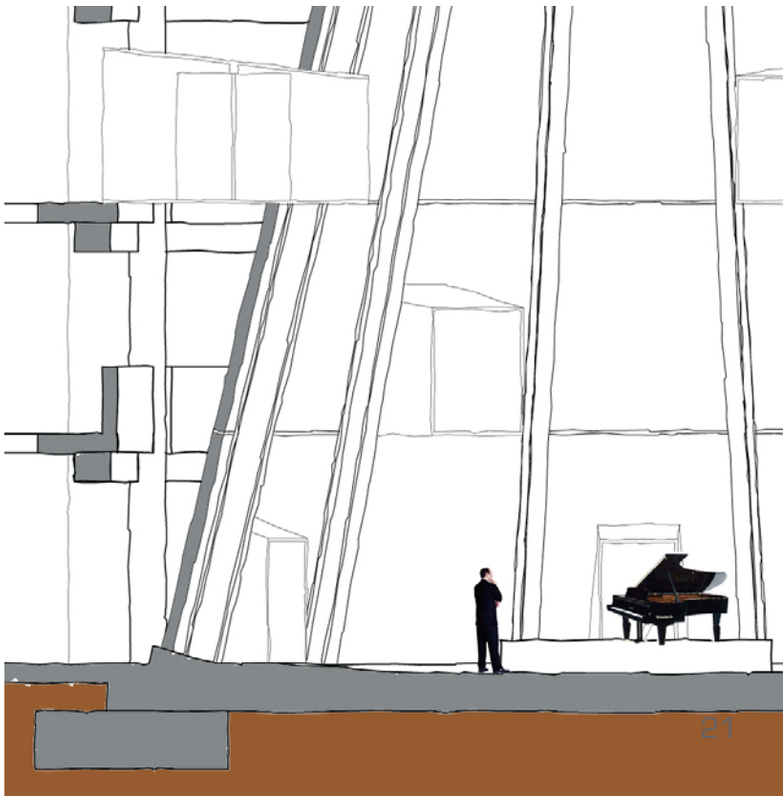


Tapered portals throughout the space are made of steel and bronze and have a revolving door, (A door that I like to imagine would cause a sirenlike whistle in a high wind.) Portals into the concert area penetrate the cone and provide a unique vantage point for concert goers and passersby.

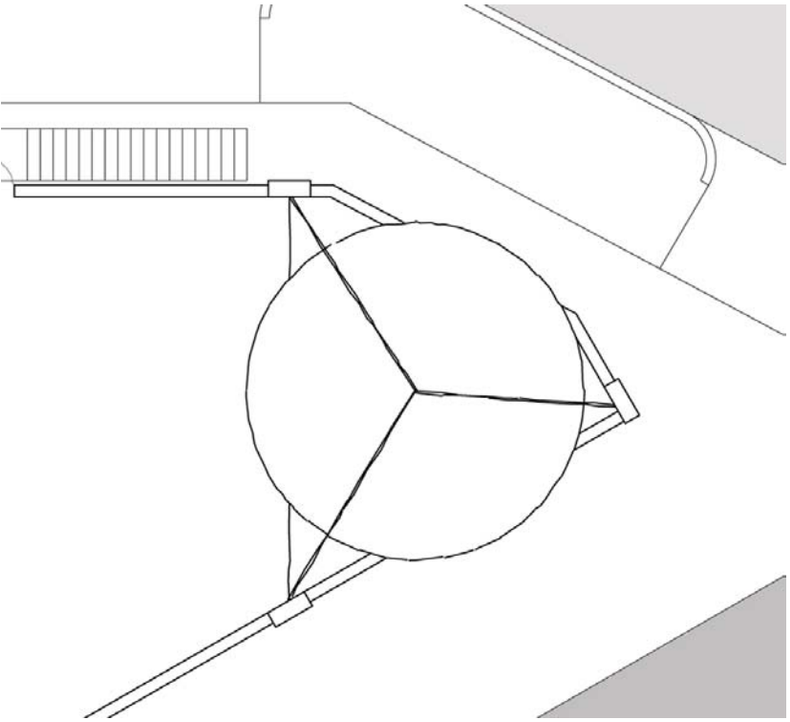


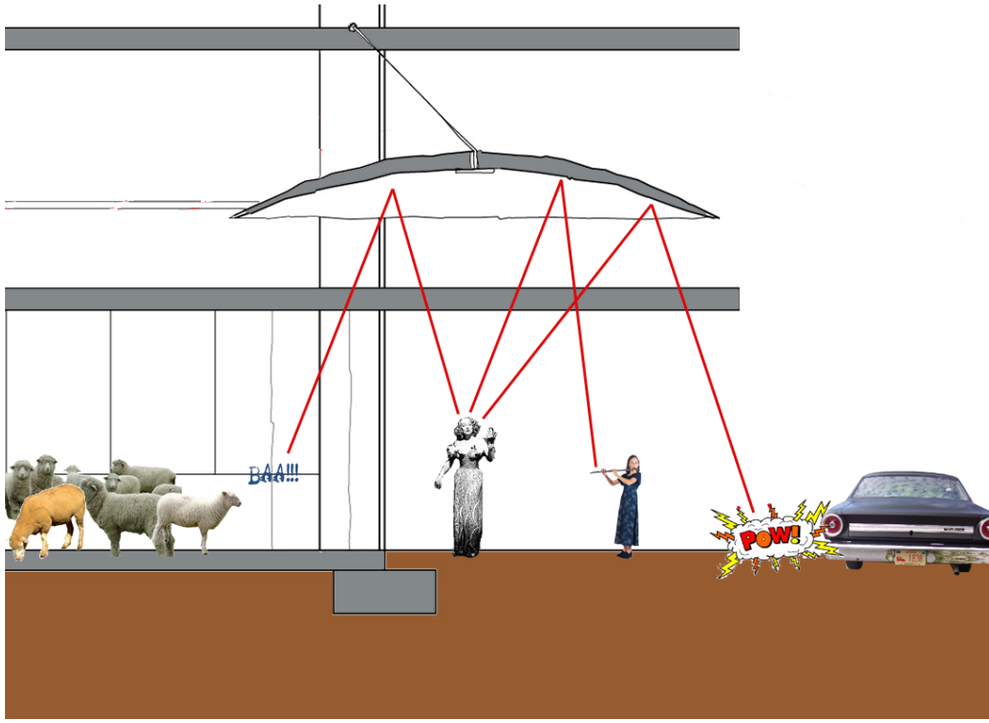




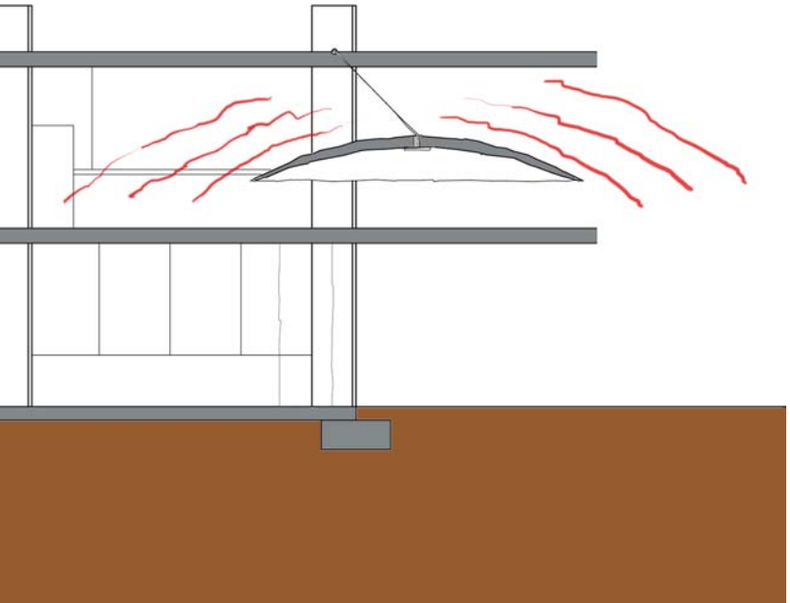


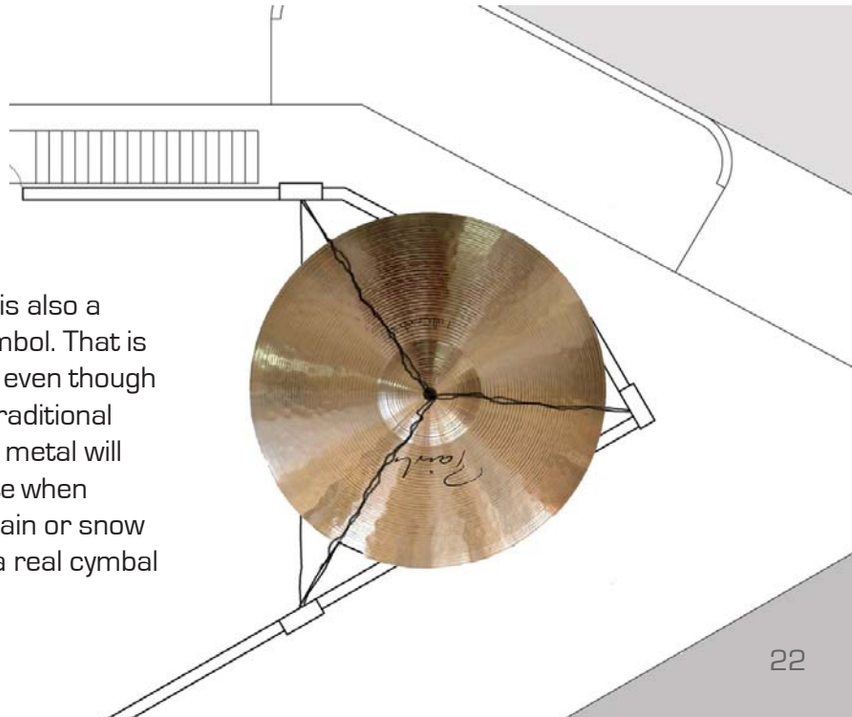
# Dome



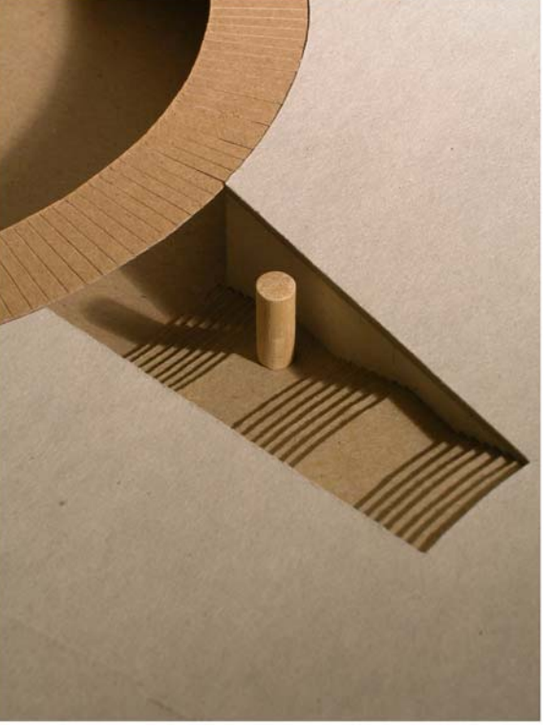



The main entry for the Coop is at the southern tip where it can easily be seen from 18th Street. This simple metal disc hovering over the entryway is designed to heighten the awareness of sound upon entry into the Coop. It does this by reflecting sound off of its smooth surface directly to the focal point of this partial sphere which is purposely set at 5'-2", the approximate height where an adult human ear would be. That means that any sound made under and near the dome will be focused on the ear of someone directly under the dome.



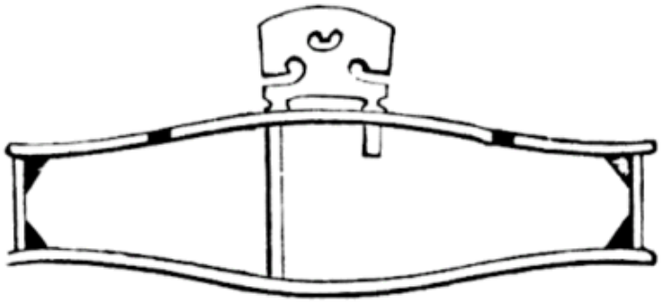


The dome is also a cymbal symbol. That is to say that even though it is not a traditional cymbal, its metal will reverberate when struck by rain or snow much like a real cymbal would.

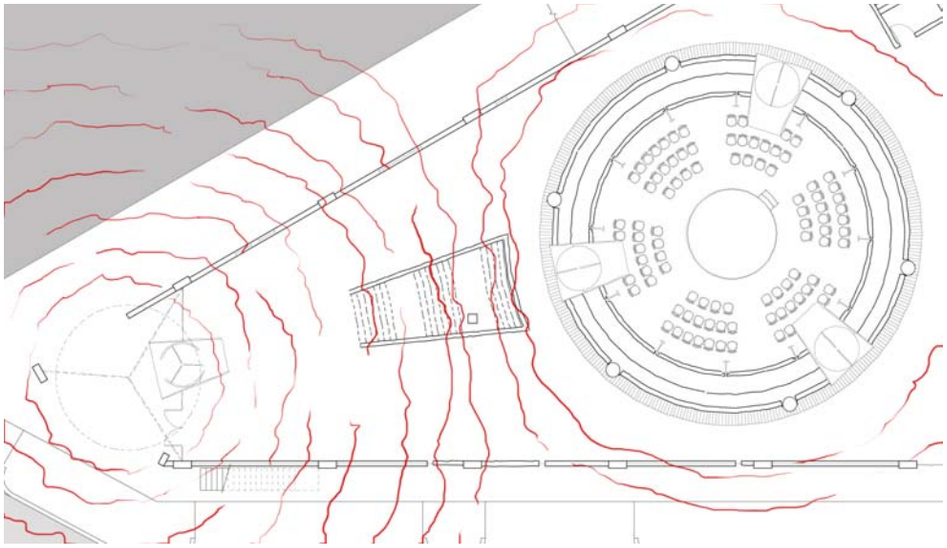


# Soundpost

The soundpost is a crucial part of a violin or other instrument in the violin family. It is through this post where sound that is generated at the top of the instrument is transferred to the bottom of the instrument causing every part in between to resonate. Its placement takes hours, and sometimes days to find the sweet spot that will make the instrument sing.

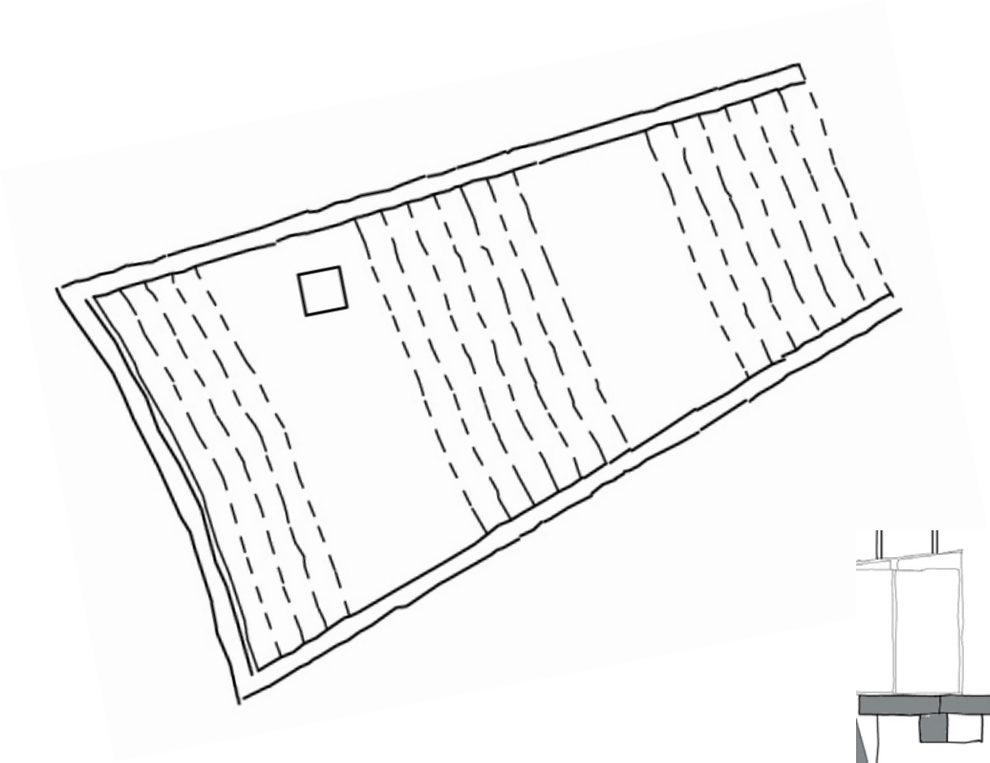


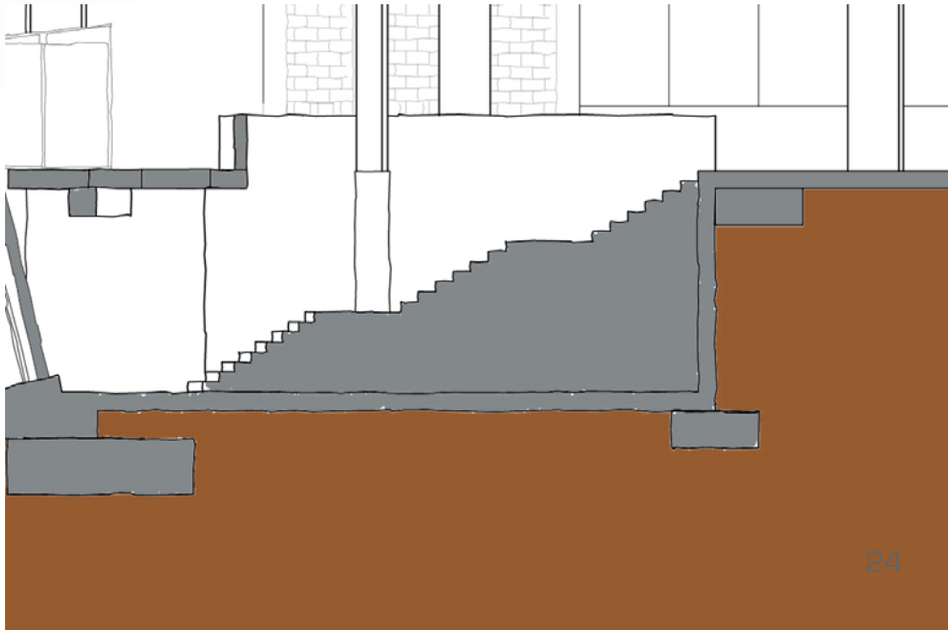
I have named this column, the only existing column that extends into the earth joining old and new, the soundpost of this building. I image it is here where the major cone transfers its vibrations through the rest of the structure. People filter around it and even touch it as they pass by to enter the concert space.



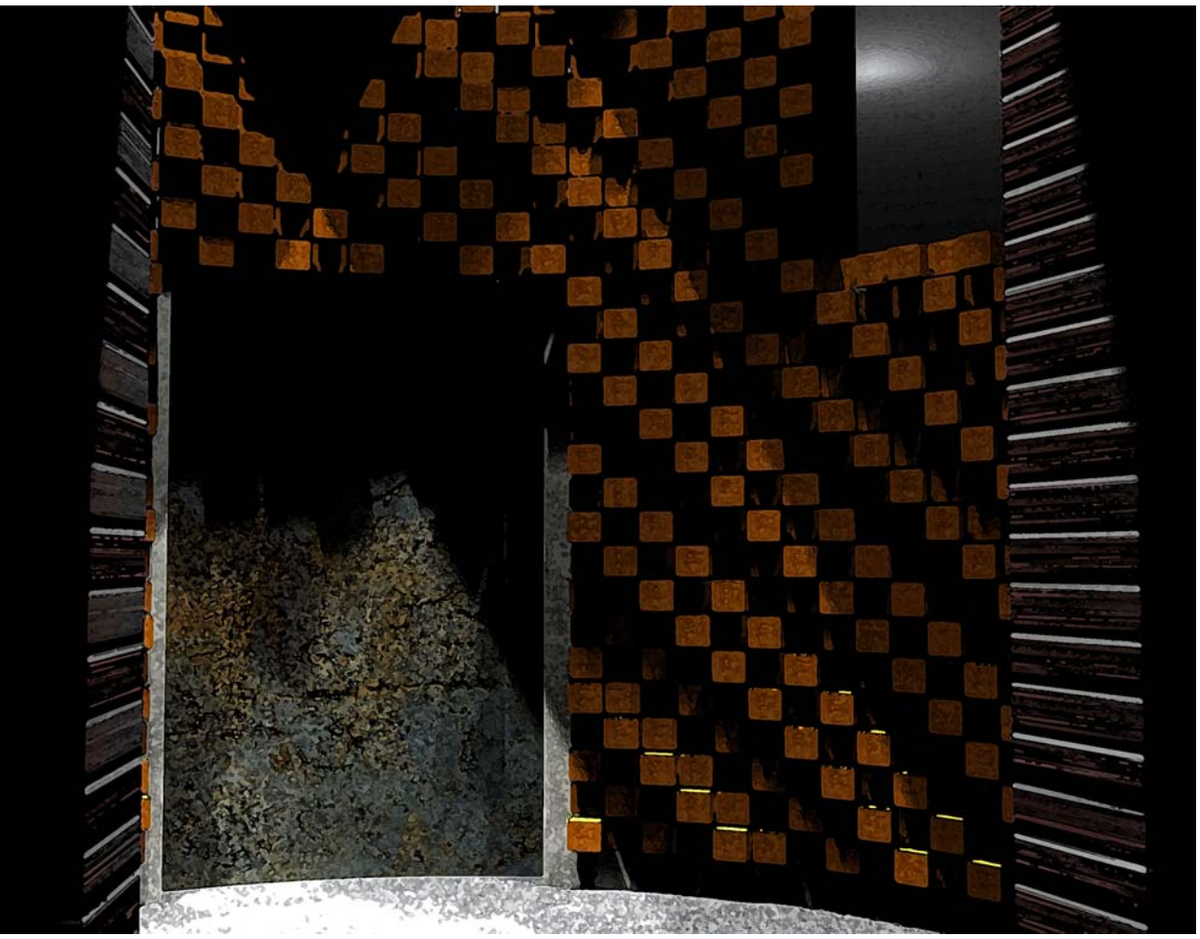
# Where Waves Collide

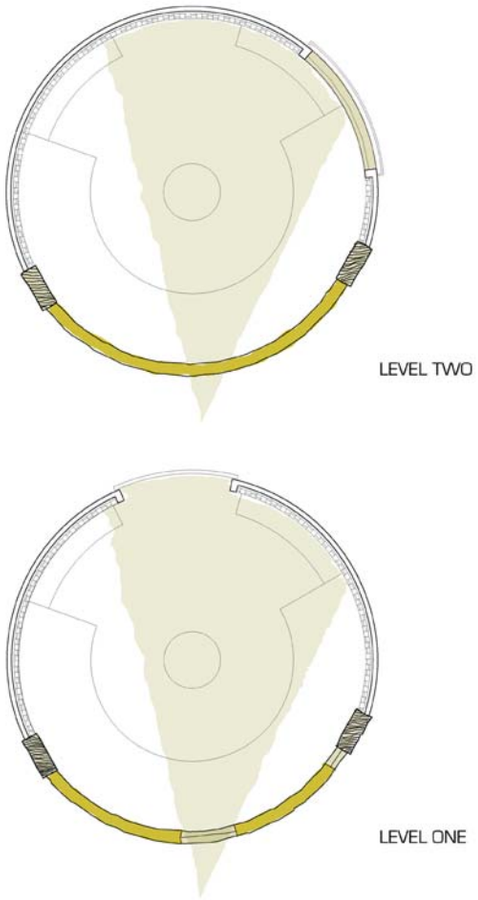
The stairs leading to the major cone are formed in a tapered slot in the original slab on axis with the center of the major cone and the center of the dome. You will notice that the steps are curved, which is analogous to two sets of soundwaves - one set originating from the dome and one from the major cone. I have chosen the collision point to be at the "soundpost", which will add another dimension to this already resonating column. The stair treads emitting from the dome are made of bronze, while the landings (calm areas) are constructed of neutral concrete. The last set of stairs that belong to the major cone are made of steel to resonate with the steel of the cone. Each step will have a pitch and timbre all its own when walked on as they change width and material.





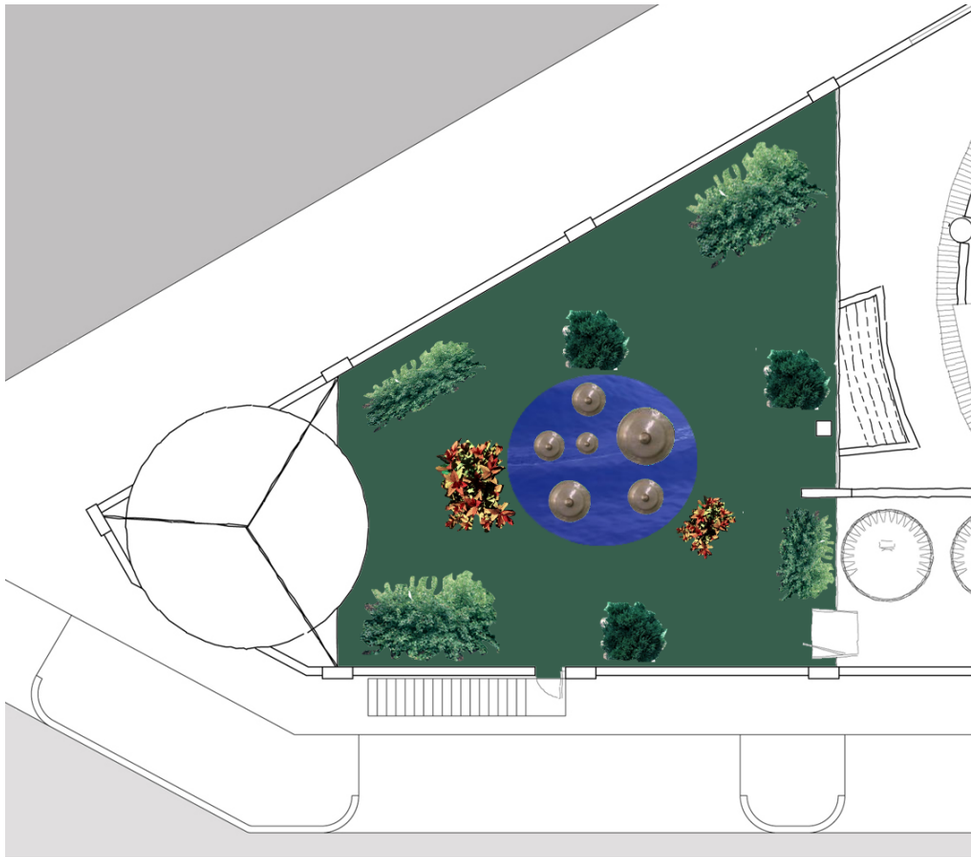
# Classroom

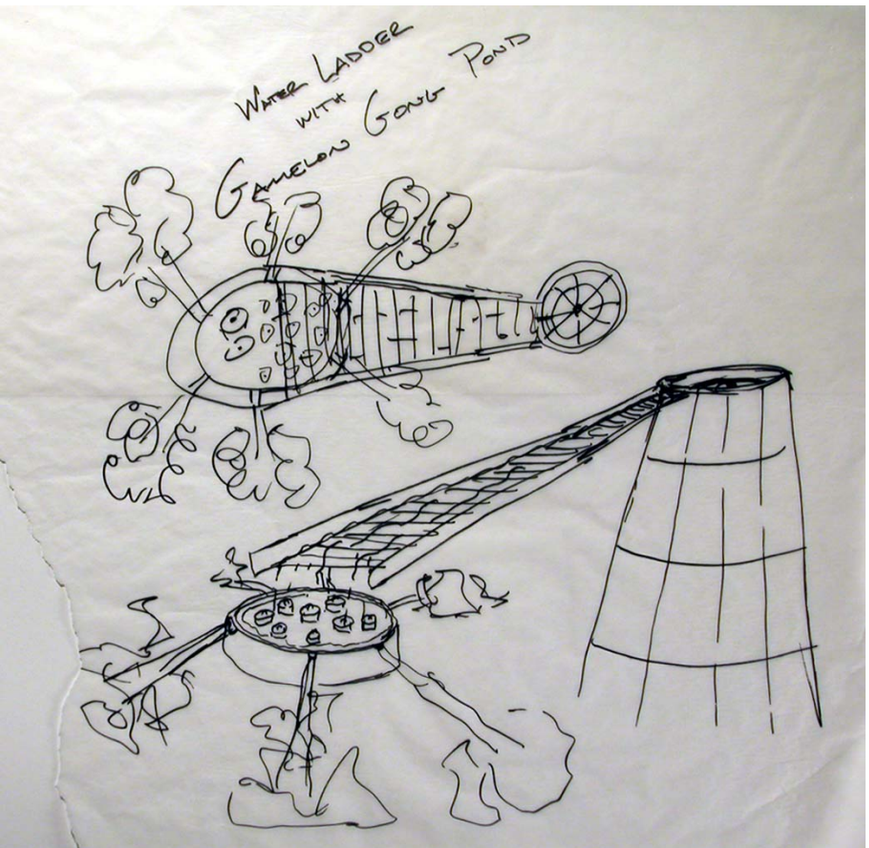





The classroom occupies the northeast corner of the building and can accommodate 20-25 students. It is constructed by leaving the exterior portion of the brick in place and completing the circle with brick harvested from other places in the building. The second story slab is removed to gain a double height space for sound control. The interior is also clad in an undulating acoustical CMU to control sound. On the second floor is a window where classes can be observed and this hallway also doubles as a waiting area for parents. Another feature of this room is its steel patchwork door, made from existing doors in the building that have been removed. It slides on a barn door type track and opens up into the corridor to be a potential small performance area.

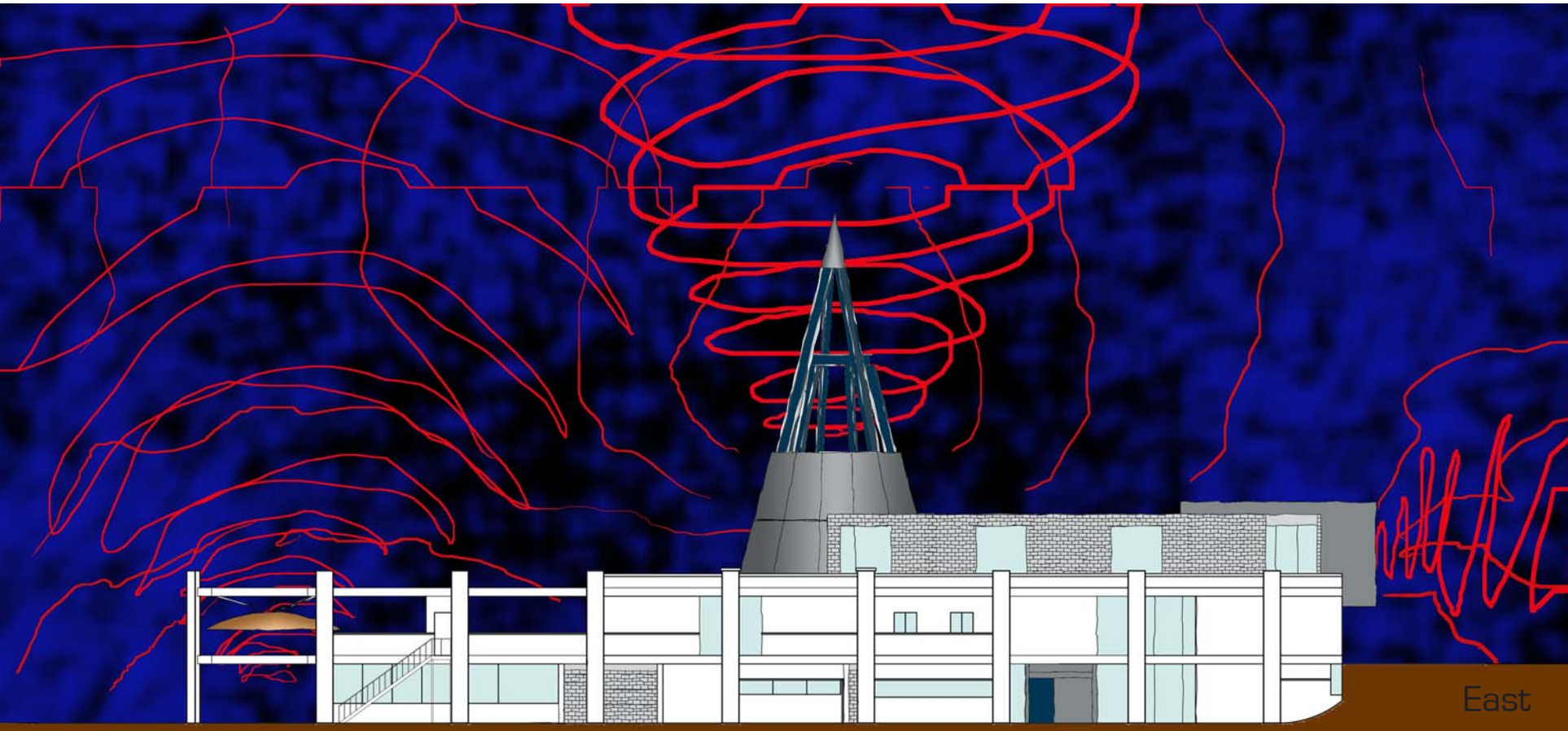
# Roof Garden

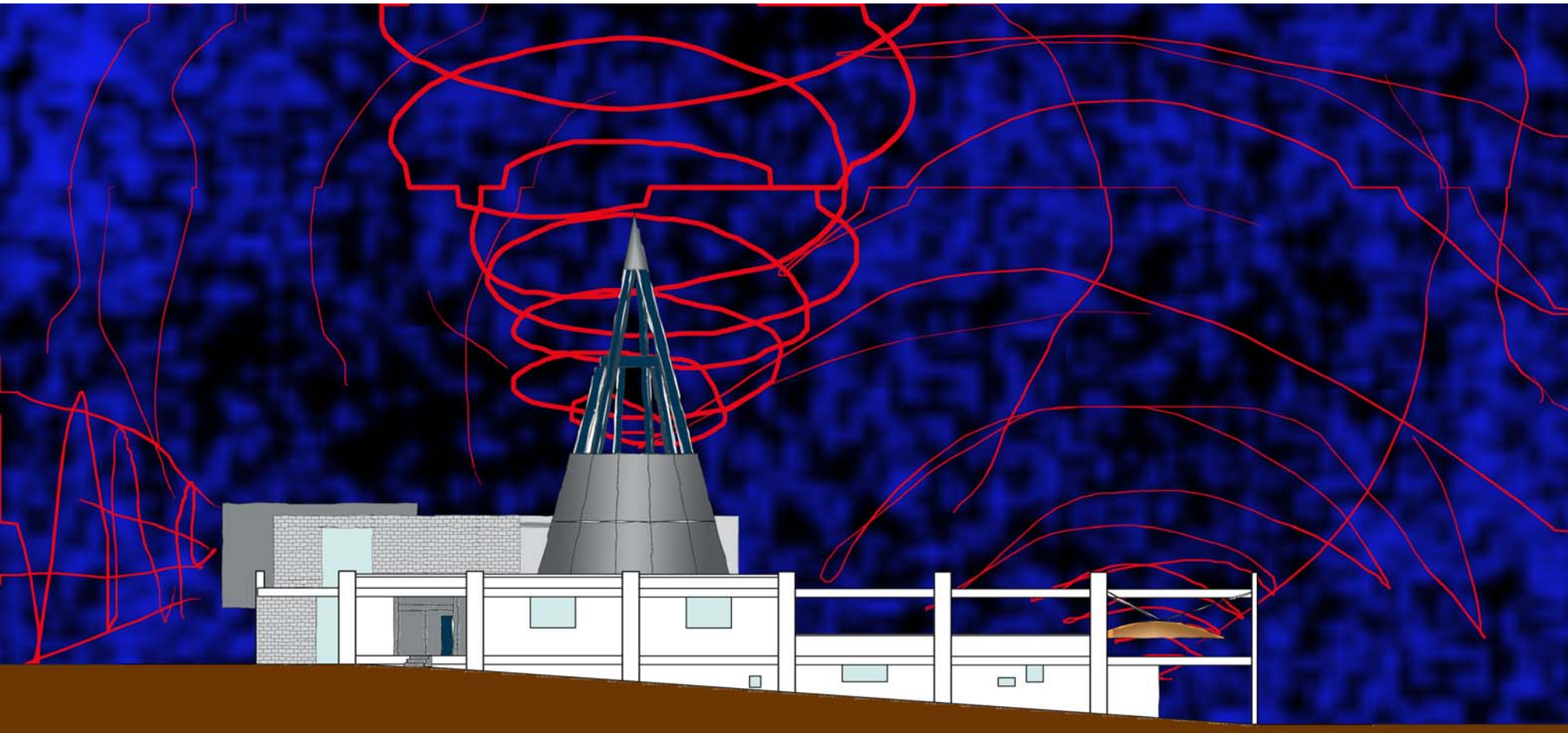





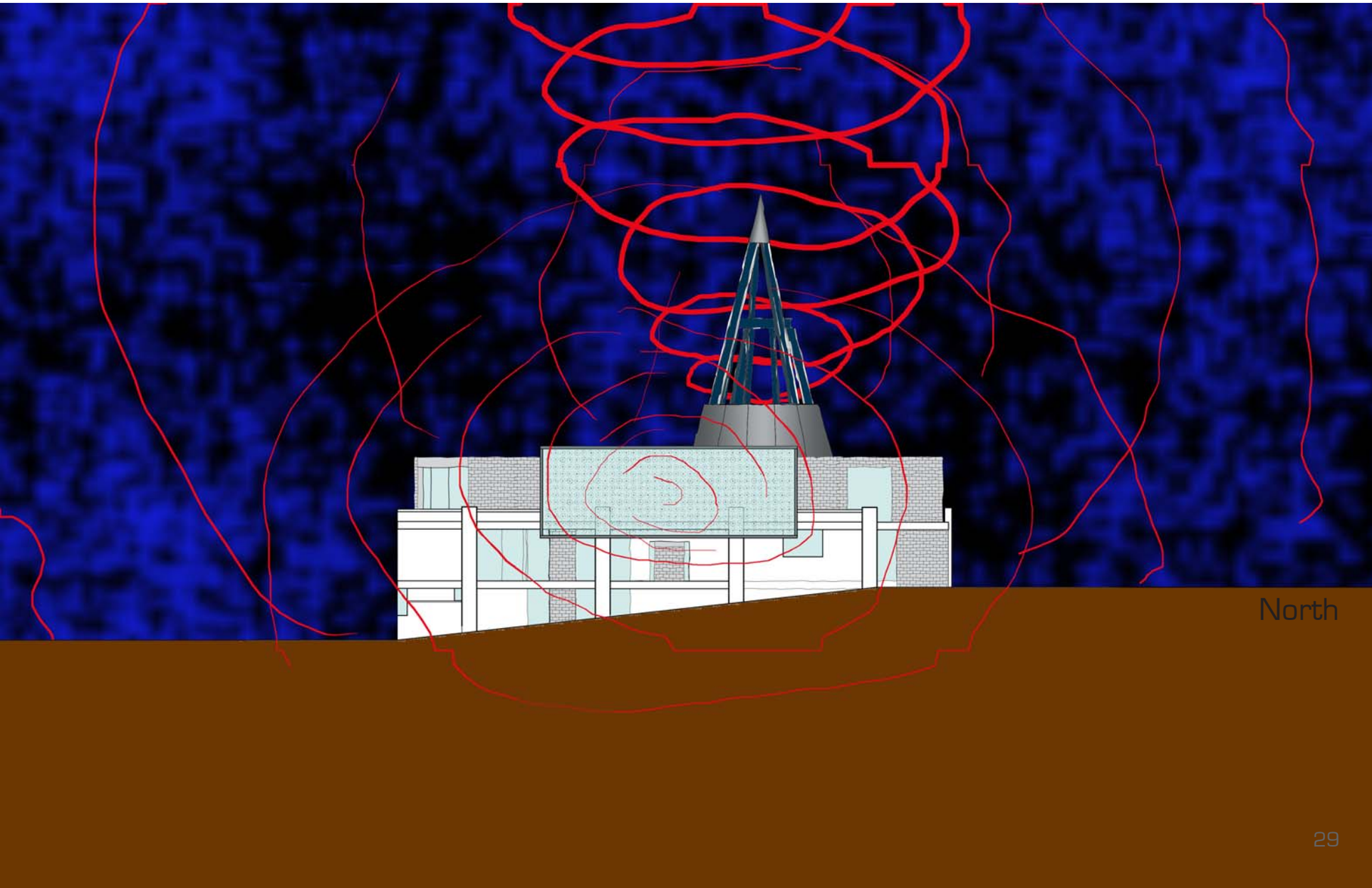

When I first visited the site, it seemed that the earth was trying to take the building back. There were pieces of rubble falling from here and there, and there was an overgrowth of vines that looked as if they were trying to drag the structure underground. With the building's renovation I see the roof garden as a refinement of what I witnessed upon initial viewing of the site. Now, the building pulls the greenery up out of the ground for all to enjoy. This outdoor oasis is a place to practice in the sun, or to just sit and read. I have used the runoff water from the major cone to water plants and play music as it falls into the gamelan gong pond.

# Elevations

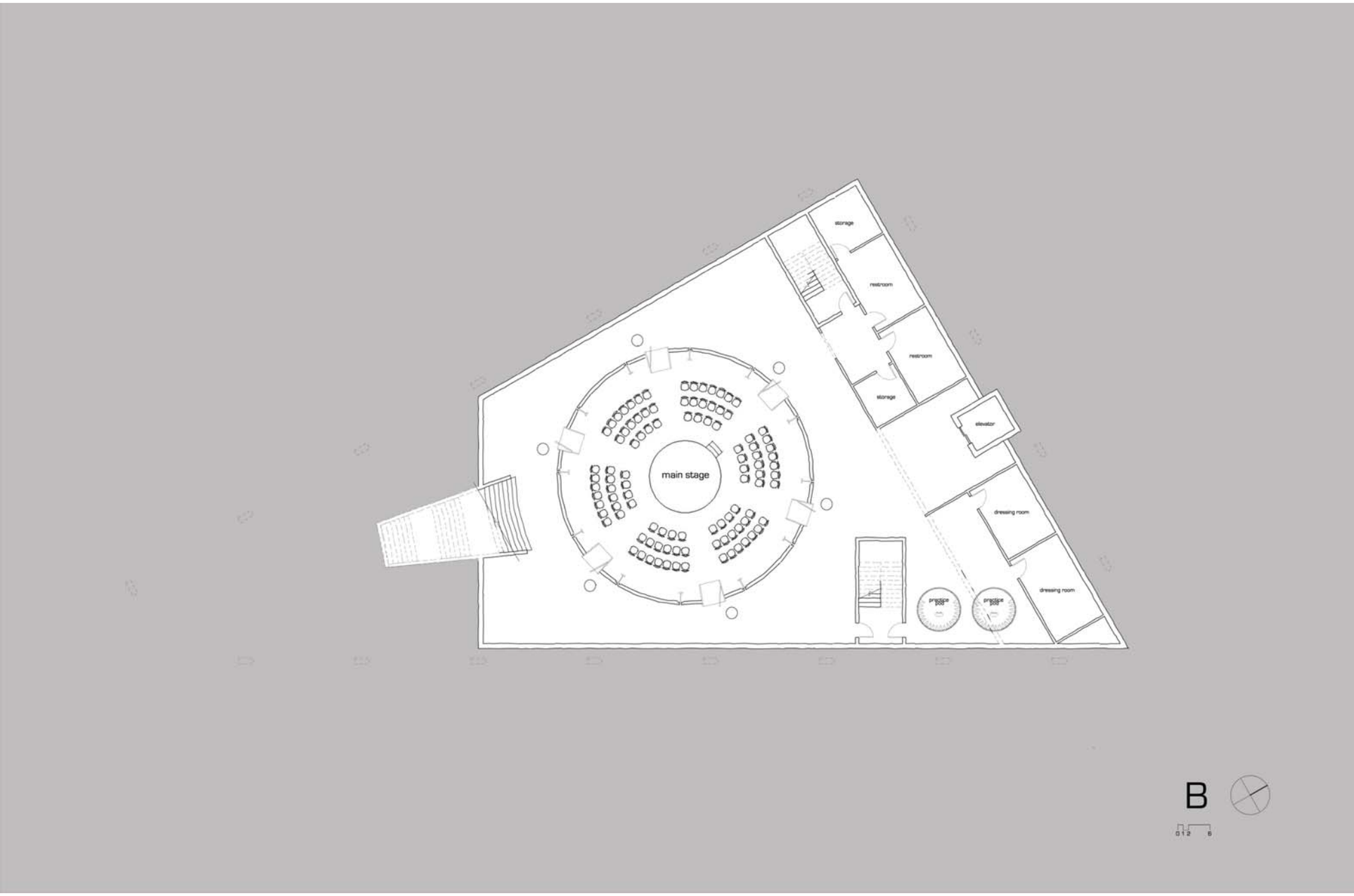


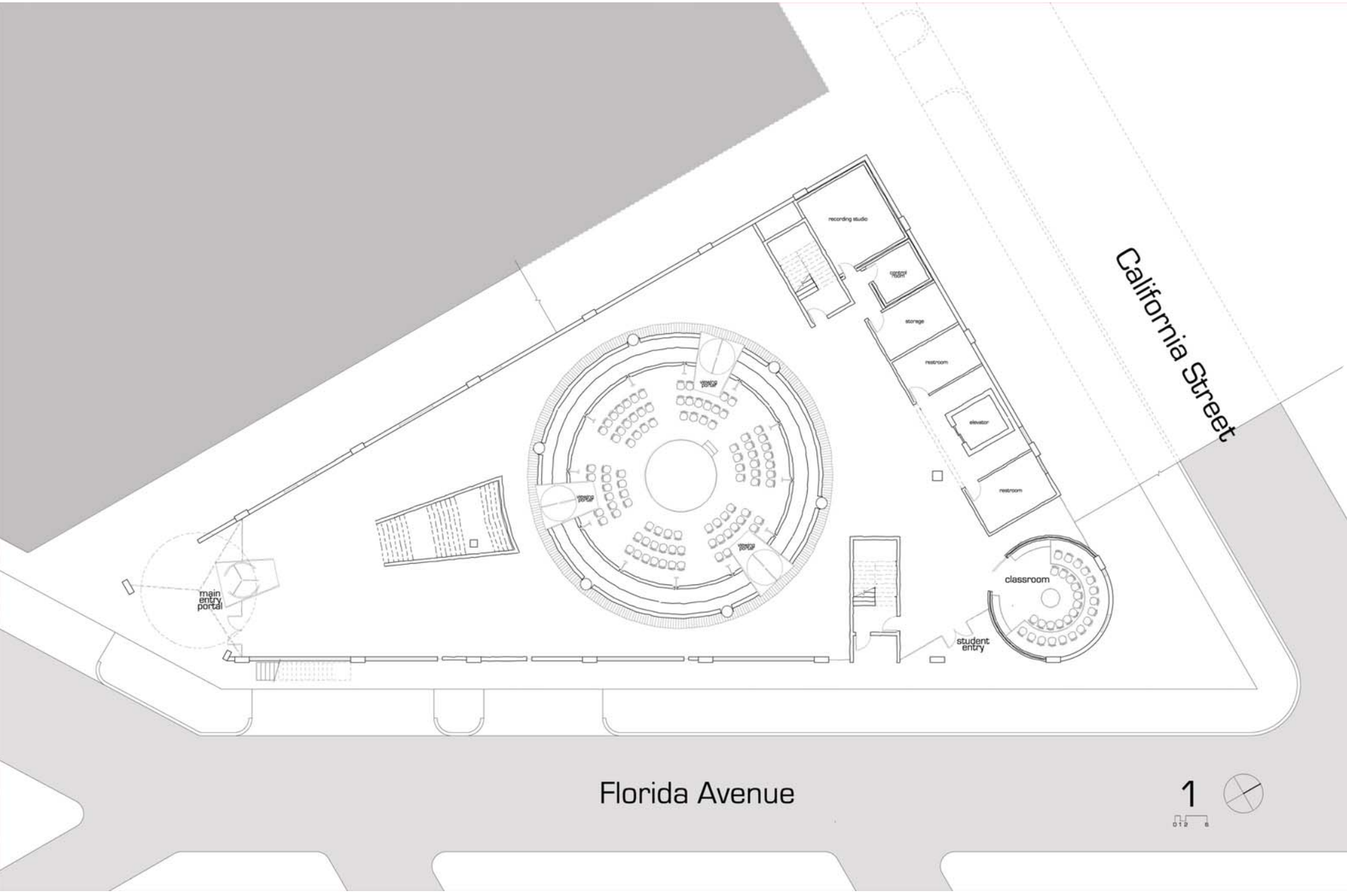


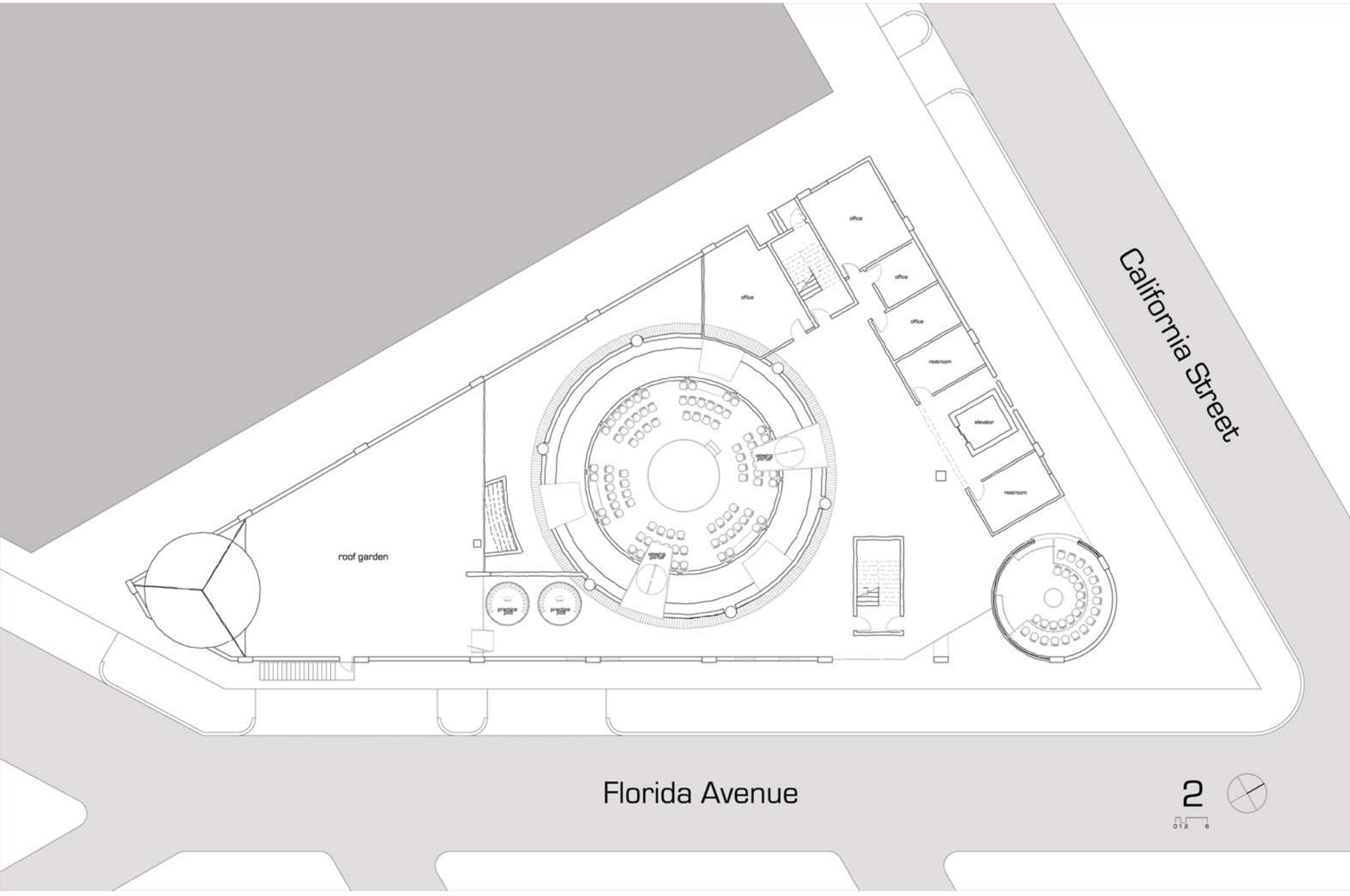
West

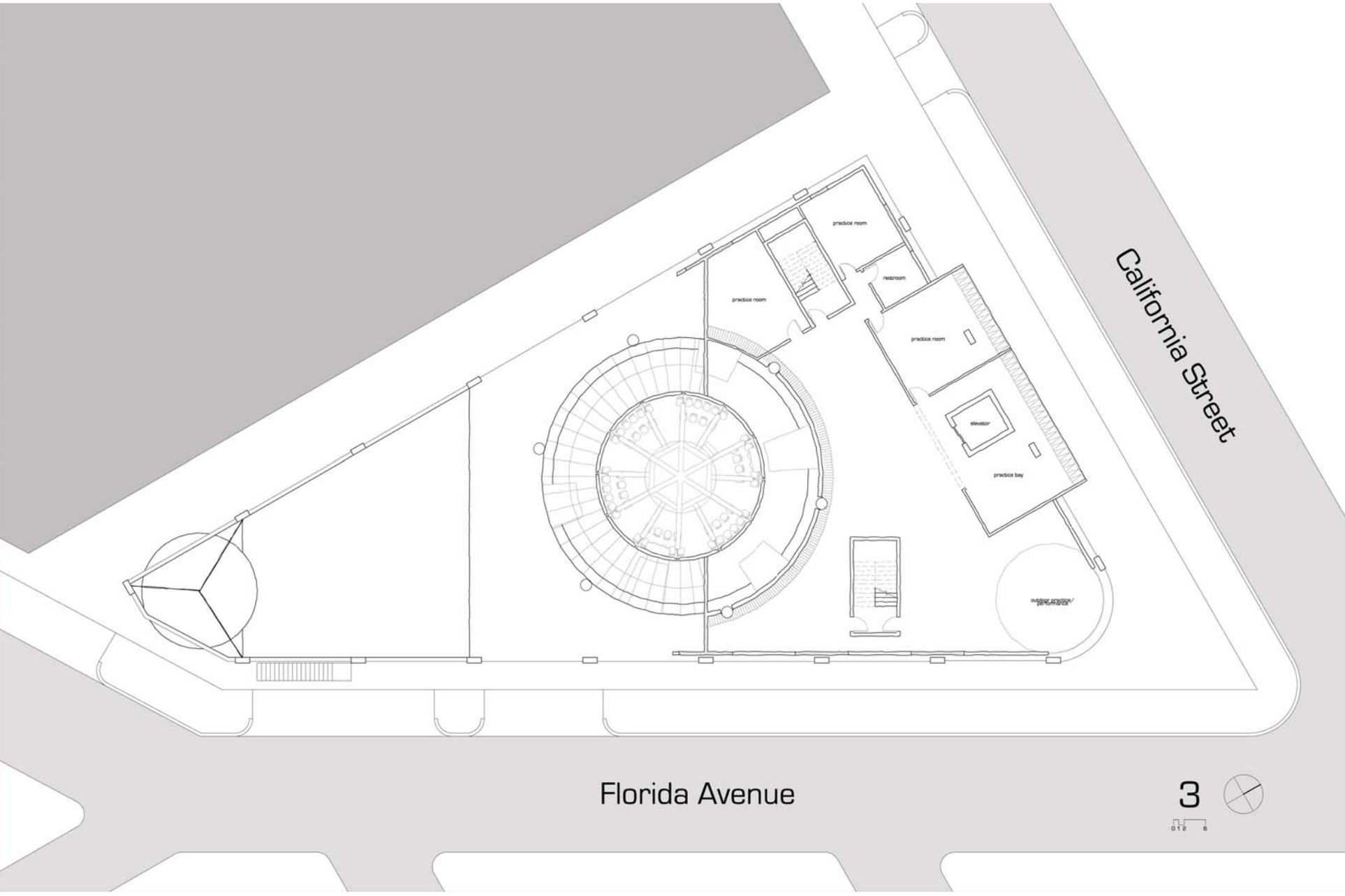

North

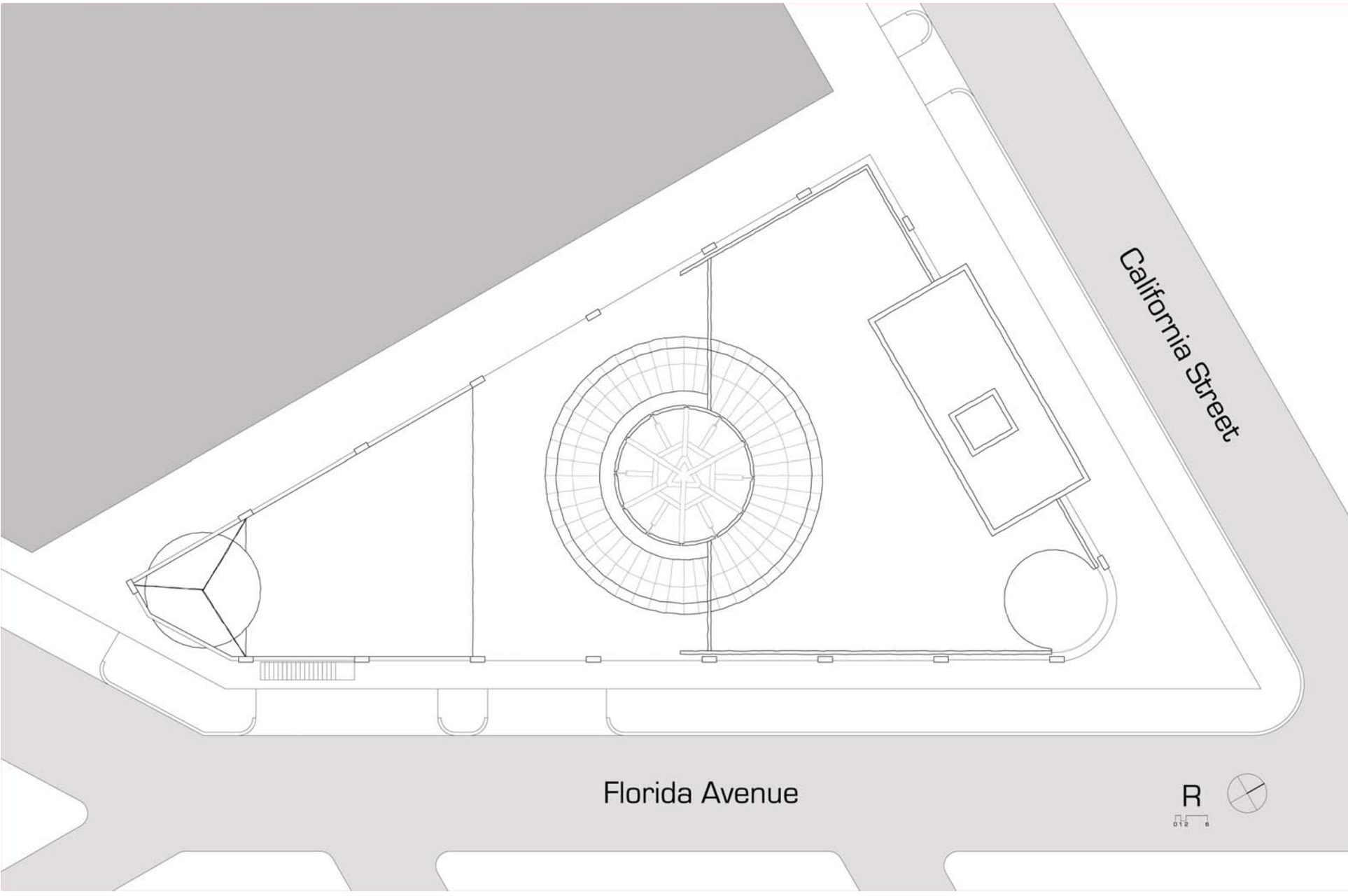
# Plans


storage
restroom
restroom
storage
elevator
main stage
dressing room
dressing room
practice
practice
B

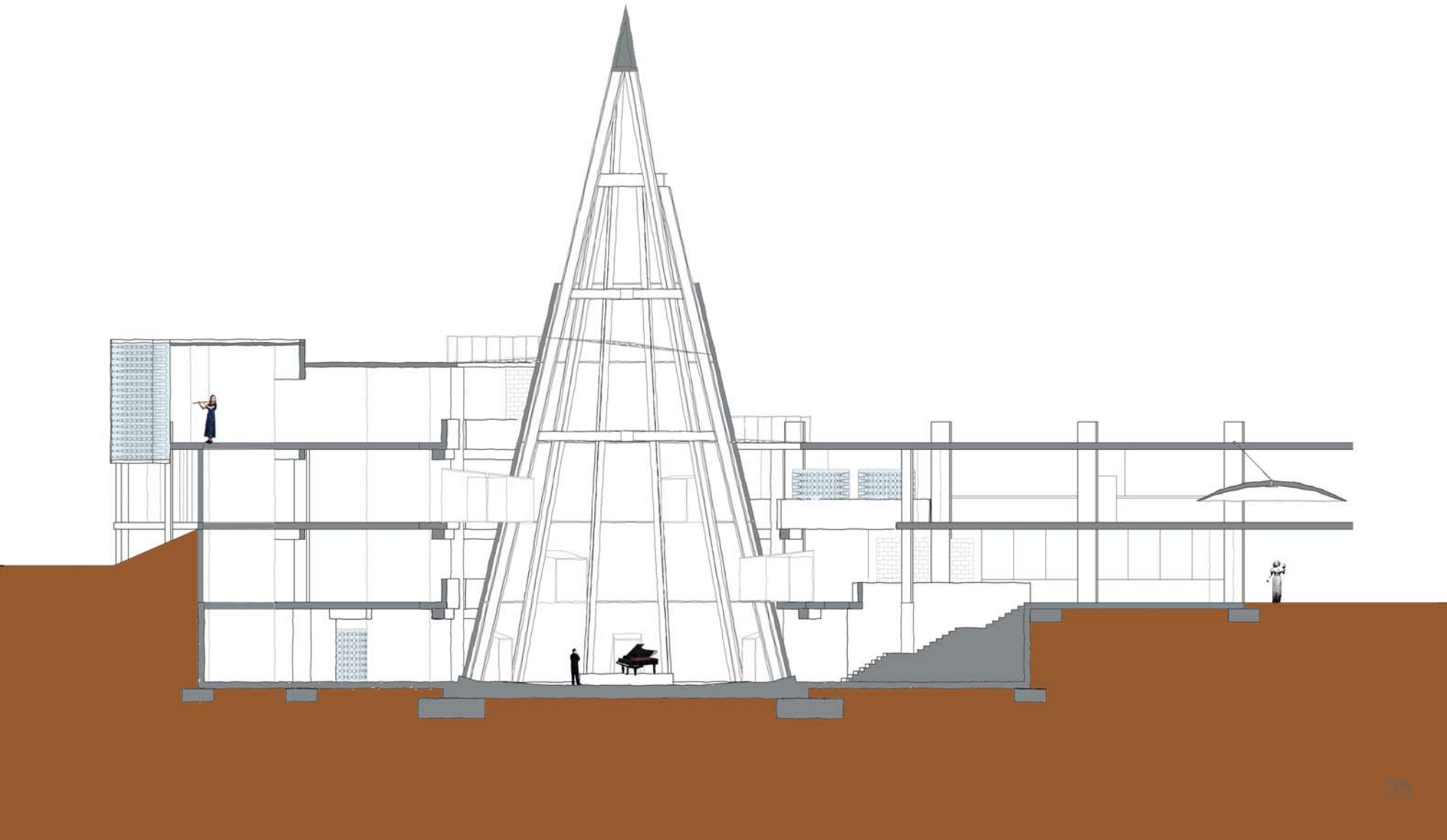

California Street
Florida Avenue
recording studio
storage
restroom
elevator
restroom
classroom
student entry
main entry portal
1


California Street
Florida Avenue
roof garden
office
office
office
office
restroom
elevator
restroom
2


practice room
restroom
practice room
practice room
elevator
practice bay
California Street
Florida Avenue
3


California Street
Florida Avenue
R

# Section



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All sound samples were recorded on site by the author.
Original composition is by the author.

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