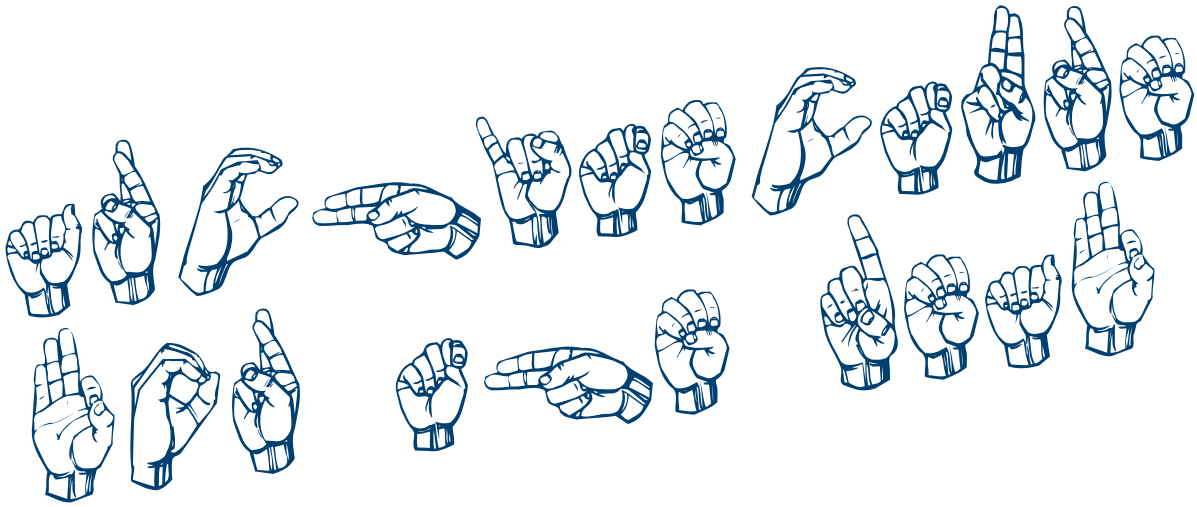
ARCHITECTURE FOR THE DEAF



Deaf Sight: A New Sound in Architecture

TYLER SCOTT SPECHT

Deaf Sight: A New Sound in Architecture

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

By

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In Partial Fulfillment of the Requirements for the Degree of
Master of Architecture

Primary Thesis Advisor

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Thank You Mom & Brad, Dad & Lisa, Grandma & Grandpa

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abstract

The thesis **"Architecture for the Deaf"** examines how design decisions made by architects for the needs of the deaf community can positively influence and improve the quality of the space for all users, regardless of individual abilities. Architects follow ADA guidelines as a minimum for design, however the ADA guidelines do not discuss the needs of the deaf community. It is estimated that between 10 million and 34 million people living in the United States with a hearing impairment. This thesis has developed guidelines that will improve the quality of space in schools of higher education, museums, and theatres to benefit the needs of the deaf and the hearing. All around us, deaf people are becoming mainstream citizens, holding jobs in the public that they never have in the past. Now is the time to understand how to design for their needs also. This thesis will consist of a museum, theatre, and school of drama located in Washington, DC. The deaf community in Washington, DC and the political atmosphere of the city place this project in a prime light. Completion of this thesis will result in guidelines describing how to design for the deaf community now and into the future. Architects and designers can use these guidelines to rethink typical designs of museums, theatres and schools.

key terms

deaf community
museum
theatre
higher education
school
design guidelines
ada
washington dc

problem statement

If we believe that all people, regardless of capabilities, deserve the same architectural experiences, how does this requirement influence the approach to an architectural design solution?

statement of intent

thesis typology

educational performing arts center, theatre, and museum

claim

The Designer creates universal design; the collective design solution that enhances the quality of life, that provides equal and fair access, and that allows for equal architectural experiences to all persons, regardless of individual capabilities.

actor

Designers comprise the intellectual body who have acquired knowledge through professional education, licensing, certification, practice and personal experience.

action

Designer's specialties as related to various aspects of the design problem account for the development of new, better than minimum, creative design solutions.

object

Through close interaction with a designer, persons of all abilities can share knowledge of shared experiences to guide the development of an architectural solution.

manner

By acknowledging greater inclusiveness from persons of all abilities, universal design becomes "a process of innovation targeted at improving buildings' usability for everyone regardless of their" capabilities. (Giuliani, Washington, Paradiso, Holden, Bell 2001)

theoretical premise/unifying idea

Regardless of any one person's capabilities, a place of architecture can be developed and designed to provide for all ranges of abilities. This is so because many design solution that benefit one ability also benefit the larger community as a whole.

justifications

Any design solution is the creation of an environment that hosts people. It is through this environment, a medium, that community business, social interaction, and life occur. An architecture that can provide for persons of all capabilities is essential to developing a barrier free world with equal and fair access for the better of the whole.

proposal

narrative

This thesis examines how architecture creates a sense of belonging and place for cultures and communities of people who share similar commonalities as all humans but also require specific design needs based on differing abilities as individuals. The abilities of the Deaf are rarely designed for, instead they are produced and effortlessly prescribed according to minimum legal requirements set by code. Architects' capabilities include the ability to design meaningful architectural solutions that accommodate the needs of the Deaf communities that enhance the quality of space for the general public while not explicitly calling attention to the needs of the Deaf users.

Architecture creates a place that allows for the formation of experiences and chance interactions. Architecture evokes feelings, creates memories, and can encourage or prohibit actions such as communication. Architecture can promote creativity or cause feelings of stress and oppression. Architecture can create lasting memories and feelings in a user. Through thoughtful consideration of different abilities possessed by the users, architects can produce design solutions that benefit micro populations while also enhancing the quality of space for the macro population, all the while educating the greater whole.

In the United States, legislation sets forth rules that dictate code requirements or design minimums for creating design elements such as ramps, slope angles, railing heights and signage size. Reviewed by the United State Access Board these regulations remain legally current but fail to be all inclusive. The American's with Disabilities Act rarely addresses the design needs of Deaf people.

I feel the time to consider design guidelines for persons who are Deaf needs to occur now. The general requirements set forth in the American's with Disabilities Guidelines fail to recognize design needs for this group of people, forcing a portion of the population to accommodate to their surroundings in a way that may not satisfy their needs.

Architects can be advocates in the community for better design solutions that are universally inclusive. We, as architects, can create design standards that enhance the quality of life for the Deaf community through architectural solutions that are conscious of their needs, culture, language, way of communication and way finding requirements.

Universal design as an approach to an architectural solution involves a close relationship between the end user and the designer. What advantages will

the general public experience if regulation holds architects responsible to consider the needs of the Deaf? To accomplish more universally inclusive design are more regulations required? Can architecture be a medium for advocation? Can architecture bring awareness to the public about other's needs without uncomfortably exposing these users and instead celebrate the driving forces behind the design's solution? How can an architecture be a symbol and a model for design to follow? Is the driving forces that help architects design beyond designing to legal minimum requirements to create more universally inclusive architecture is held in the conscience of the architect or in the creation of new legal regulations?

While attempting to be as inclusive as possible and mindful of all individual's abilities, universal design becomes not an end result only beneficial to a single user, but a solution beneficial to the community as a whole. The end user, always effected by the architects design decisions directly or indirectly, always benefits from a more universally designed architecture.

In the current world of globalization where more Deaf people and Blind people earn the opportunity to become mainstream citizens in mainstream careers, our job as architects and designers requires us to expand our understandings of their needs, their culture and their life style. The process of designing to Universal Design standards improves all structures in a way that allows equal and fair access while providing equal and fair architectural experiences to all individuals, regardless of any single persons capabilities. When thoughtfully considered, design solutions will not impose an extra financial burden on the design as a whole. The costs associated with the guidelines in this thesis should not affect the economics of a project in a negative way. I feel that designing to the highest standard of Universal Design will invite business and more use by a

larger group of people.

These ideas will develop to produce a new set of guidelines that will be used to create a design solution for The National Deaf Theatre and Museum.

user client description

The National Association for the Deaf, Gallaudet University, the Deaf Professional Arts Network and the National Theatre of the Deaf have come together to collaborate as a joint body in an effort to design a leading edge theatre to satisfy the performing arts education needs of Gallaudet University and the theatre space requirements of the National Theatre of the Deaf. The core user will be deaf. The aspirations of the group are to create a nationally recognized model for DeafSpace architecture that will house the head-quarters of the National Theatre of the Deaf and an education center for Gallaudet University's Department of Theatre Arts in the Nation's capitol.

The National Association for the Deaf, NAD, was established in 1880 by a group of deaf leaders who desired to represent the rights of the Deaf American community, advocating for the right to use Sign Language and be represented at a national level. (National Association of Deaf, n.d.). Today, NAD represents and supports the American Deaf population by building awareness about the community and advocating for the rights and civil liberties of the community to the general American public and, on an international platform, to the World Federation of the Deaf.

Gallaudet University was federally chartered in 1856 through a land donation by Amos Kendall providing a location to educate Deaf and Blind students in North East Washington D.C.. (Gallaudet University, 2012) By an act of the 34th Congress of the United States, H.R. 806 established and set funding for the charted institution to be known as the Columbia Institution for the Instruction of the Deaf and Dumb and Blind. The son of Thomas Hopkins Gallaudet, Mr. Edward Miner Gallaudet, became the President of the institution in 1864 when President Abraham Lincoln and the 38th Congress of the United States established a bill authorizing the institution to confer college degrees upon its graduates. (Gallaudet Univesity, 2012) By an act of the 83rd Congress of the United States the institution became known as Gallaudet College in recognition of Mr. Edward Miner Gallaudet through H.R. 6655. Today the institution is recognized as Gallaudet University, after an act of congress granted it the status of “University” in 1986. Gallaudet University is currently the only liberal arts university in the world that specializes in the education and career development of the deaf and hard of hearing.

(Gallaudet University, 2012)

The Deaf Professional Arts Network, D-PAN, is a relatively new actor in the Deaf and Hard of Hearing community. D-PAN was established by founder Sean Forbes, a partially deaf musician and performer, in 2007. (Waslsh, 2010) His vision and now goals of D-PAN are to bring professional entertainment to the deaf community and share their language with the hearing world as well. D-PAN and its affiliates use current technology in combination with the beauty of sign language to develop mutually beneficial agreements with musicians and performers. These agreements allow D-PAN to bring music to the deaf community through sign language while also presenting the language and the culture of the deaf community to the hearing community in a very public format accessible through the internet.

The National Theatre of the Deaf is the oldest and longest continually producing touring theatre company in the United states. (National Theatre of the Deaf, 2009) During the 1950s a group of professionals conceived an idea to bring a professional theatre company, consisting of deaf performers, to the public. Dr. Edna Simon Levine, a psychologist in deafness, approached a group of Broadway professionals with her idea. The Broadway professionals included Arthur Penn and Anne Bancroft, (IMDb, 2012) the director and leading actress of the 1962 Broadway drama “The Miracle Worker.” Joining Mr. Penn and Mrs. Bancroft, they brought with them the experienced lighting and set designer David Hays. (National Theatre of the Deaf, 2009) Together they created the National Theatre of the Deaf, NTD. Originally settling on the Wesleyan University Campus in Middletown, Connecticut NTD established a professional training

school in 1965 with a federal grant from the United States Department of Health, Education and Welfare. National tours of the company began in the year following. (National Theatre of the Deaf, 2009) By 1983 NTD relocated to Chester, Connecticut and now resides in its permanent home in Waterford, Connecticut. (National Theatre of the Deaf, 2009) Undoubtedly the company provides an opportunity for deaf artists to perform on a national stage and provides access to the arts to the deaf and hard of hearing community. “Presentations by NTD do more than just make theatre accessible to the Deaf.” (National Theatre of the Deaf, 2009) Their performances bring the skills and theatrical arts to the hearing community as well. Through their performances, audiences of all kinds are exposed to the culture, language, and beauty of sign language; the communication method shared by this minority population. The mission statement of the Tony award winning and acclaimed theatre company expresses their intentions perfectly. They strive to provide high quality theatrical works that link American Sign Language with spoken languages to as many people as possible in an effort to educate the general public about Deaf culture. (National Theatre of the Deaf, 2009)

The National Deaf Theatre and Museum located at 1505 Independence Ave will be the new home for a model architecture that will enlighten the general public about the history, culture and lives of the deaf community. The deaf community is comprised of about five different actors. There are deaf individuals, children of deaf adults, persons who are hard of hearing, DeafBlind individuals, and interpreters.

major project elements

theatre

auditorium

This space will serve as the main assembly for lectures and different forms of performance include drama and music

lobby

This space will serve as a public assembly joining the various elements of the building.

office and administration

This space will serve as the private quarters of the building where working professionals conduct daily business.

back of house

This space will serve as the private quarters of the theatre where professional performers will perform the duties and requirements of developing a performance

museum

gallary

This space will serve as a public area were educational materials, artifacts, art, and documents will be made available for viewing

education

classroom

These spaces will serve as the private areas made available to students of the education center where lectures and classes or various types will occur.

site information: macro to micro scale

The National Deaf Theatre and Museum is to be located along side other National Smithsonian Museums, Monuments, and Memorials on the National Mall. Located at 1505 Independence Ave SW, Washington, D.C. the Theatre will lay to the south of the Washington Monument, west of the Holocaust Museum, north of the Thomas Jefferson Memorial and east of the Lincoln Memorial. This location is the apex between monuments and museums that share historical stories of the deaf.

To the east, the Holocaust Museum, contains the documentation of mass murders of Deaf people during the Holocaust because of the inability to hear. To the north, the Washington Monument, standing tall and strong represents George Washington, the First President of the United States and his vision for the country. To the south stands Thomas Jefferson, the writer of the Declaration of Independence who believed all persons are created equal and should be treated equal. Finally to the west, some say, sitting with his hands in the shape of an American Sign Language "A" and "L" is Abraham Lincoln; who as President signed the charter to establish the now Gallaudet University.

On this one site, a new architecture that celebrates the needs of the Deaf community, will become a model to the Nation, educating both the general public and politicians about the lives and culture of the Deaf. No other location will place DeafSpace Architecture in such a prime light.

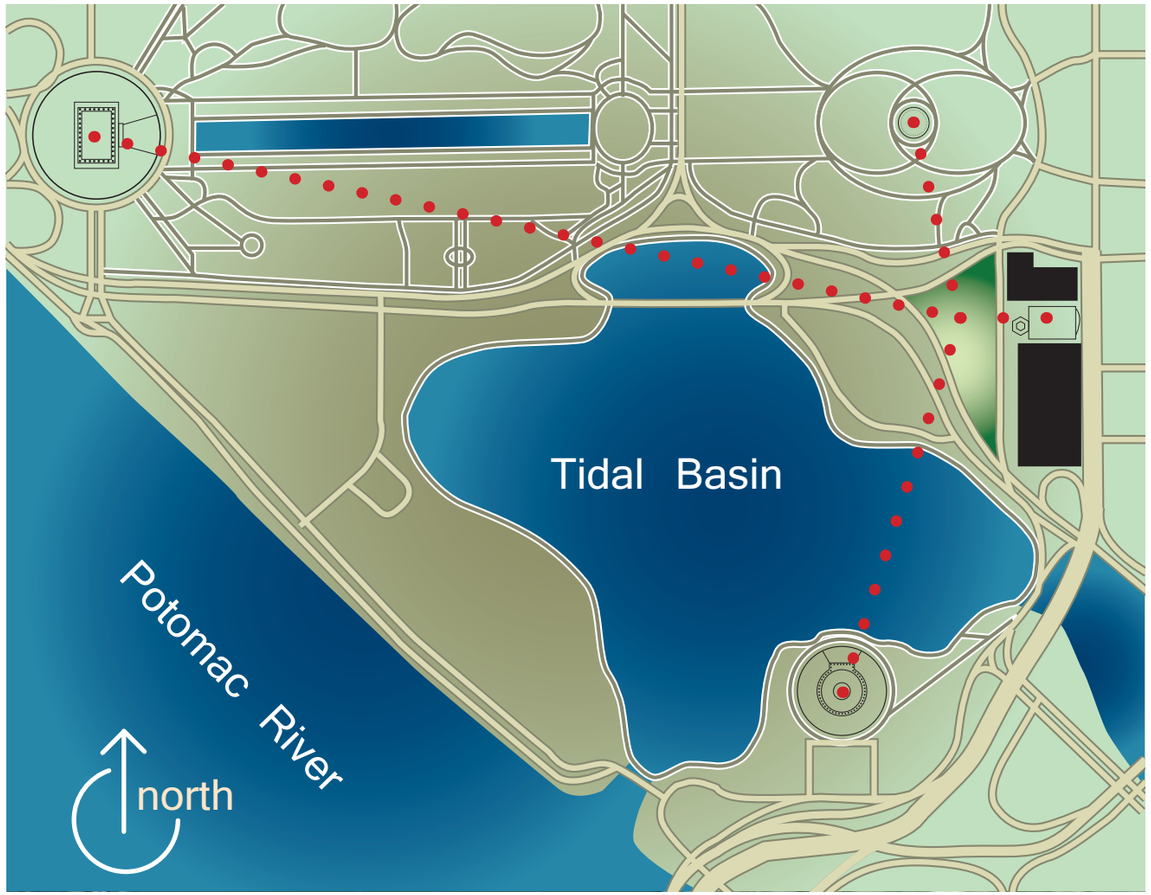

figure 1: site map

specht, t. 2012 date from: date retreived from Google Earth

regional map

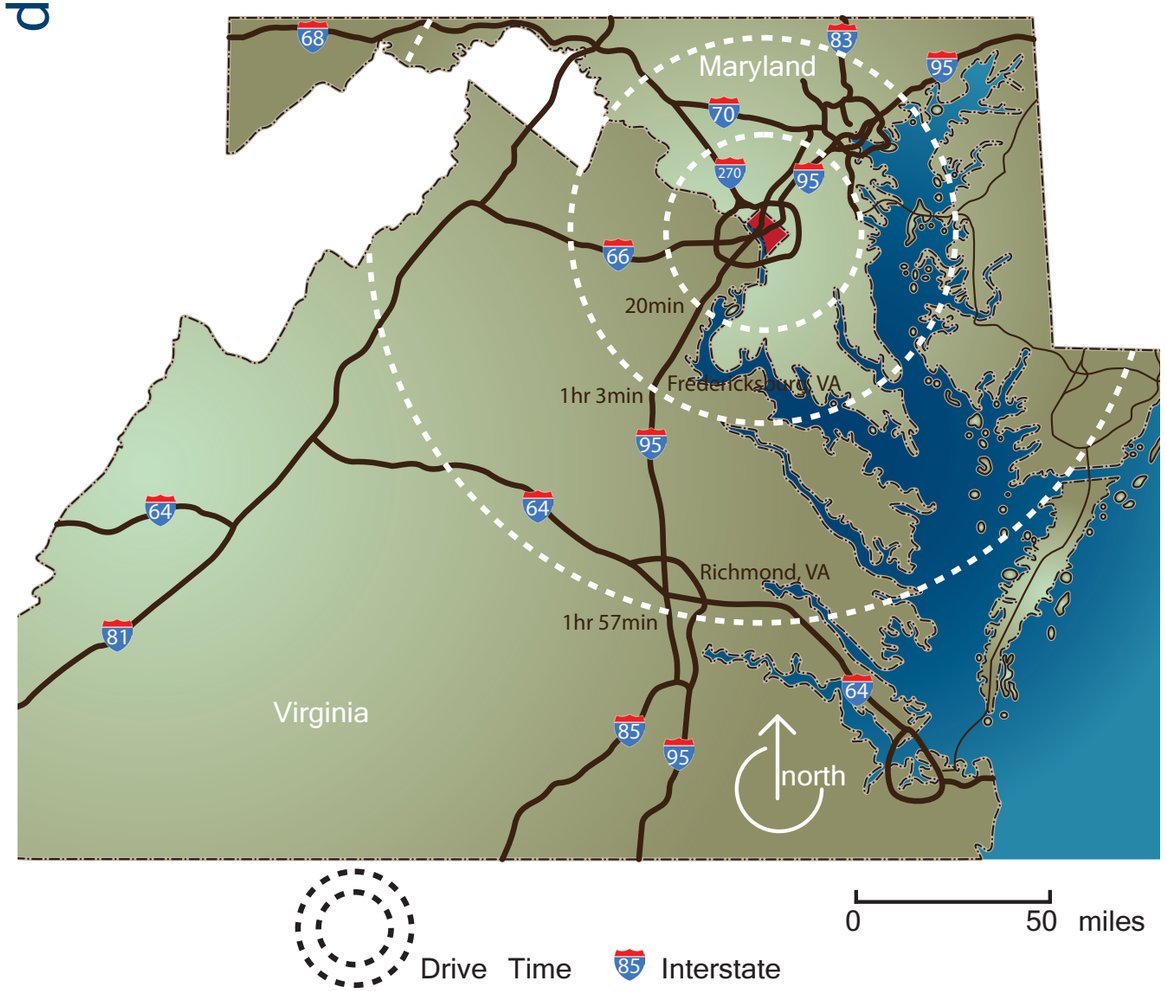

figure 2: regional map

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city map

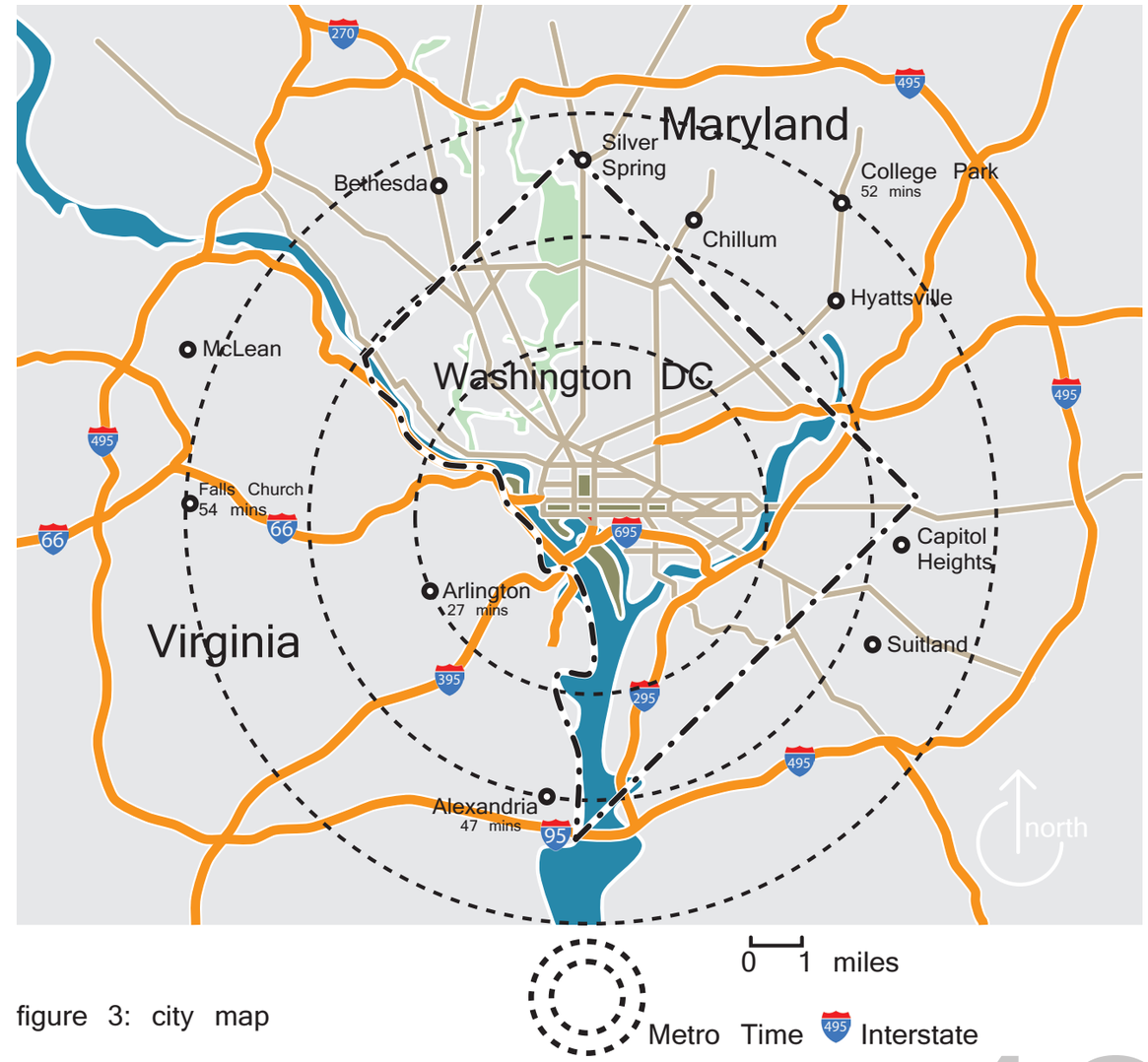

figure 3: city map

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metro map

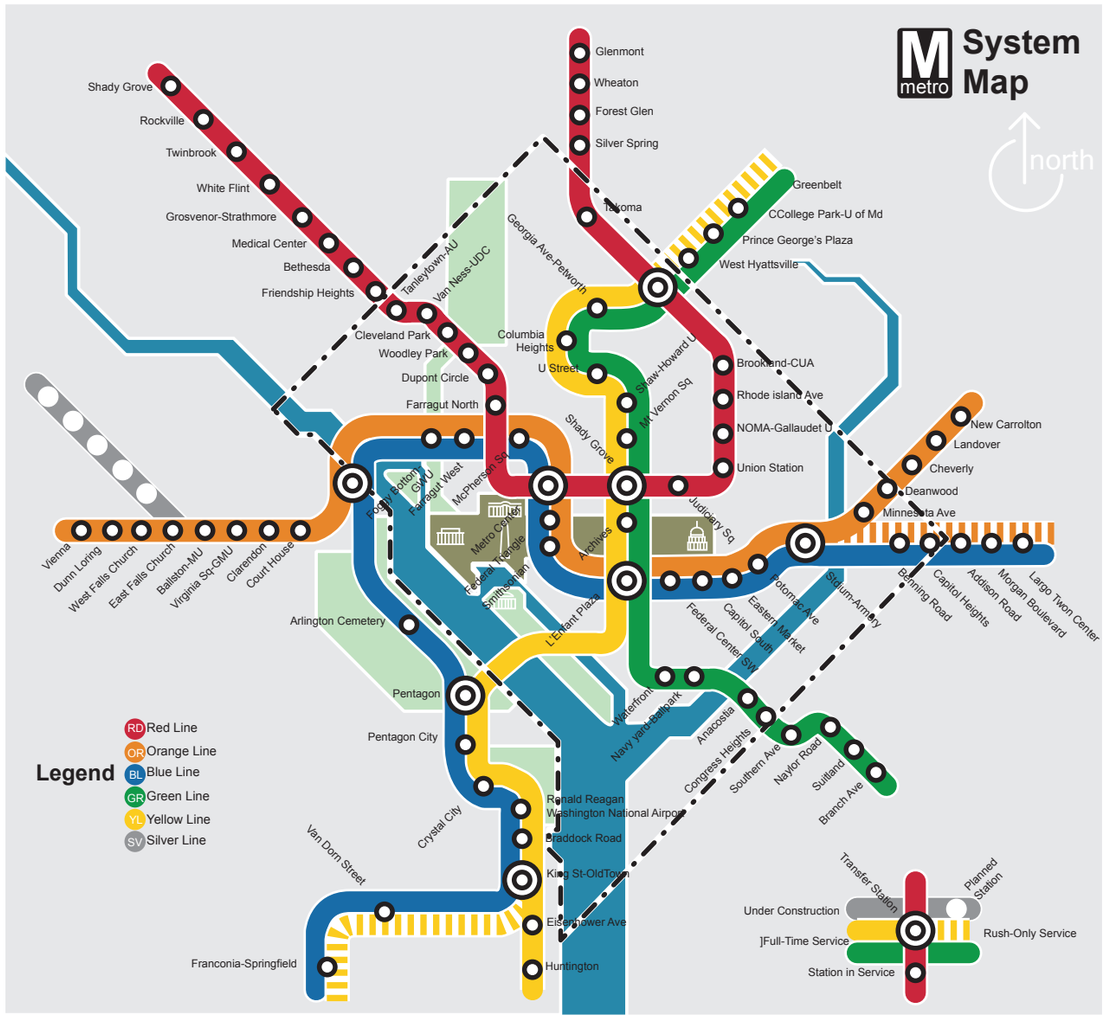

figure 4: metro map

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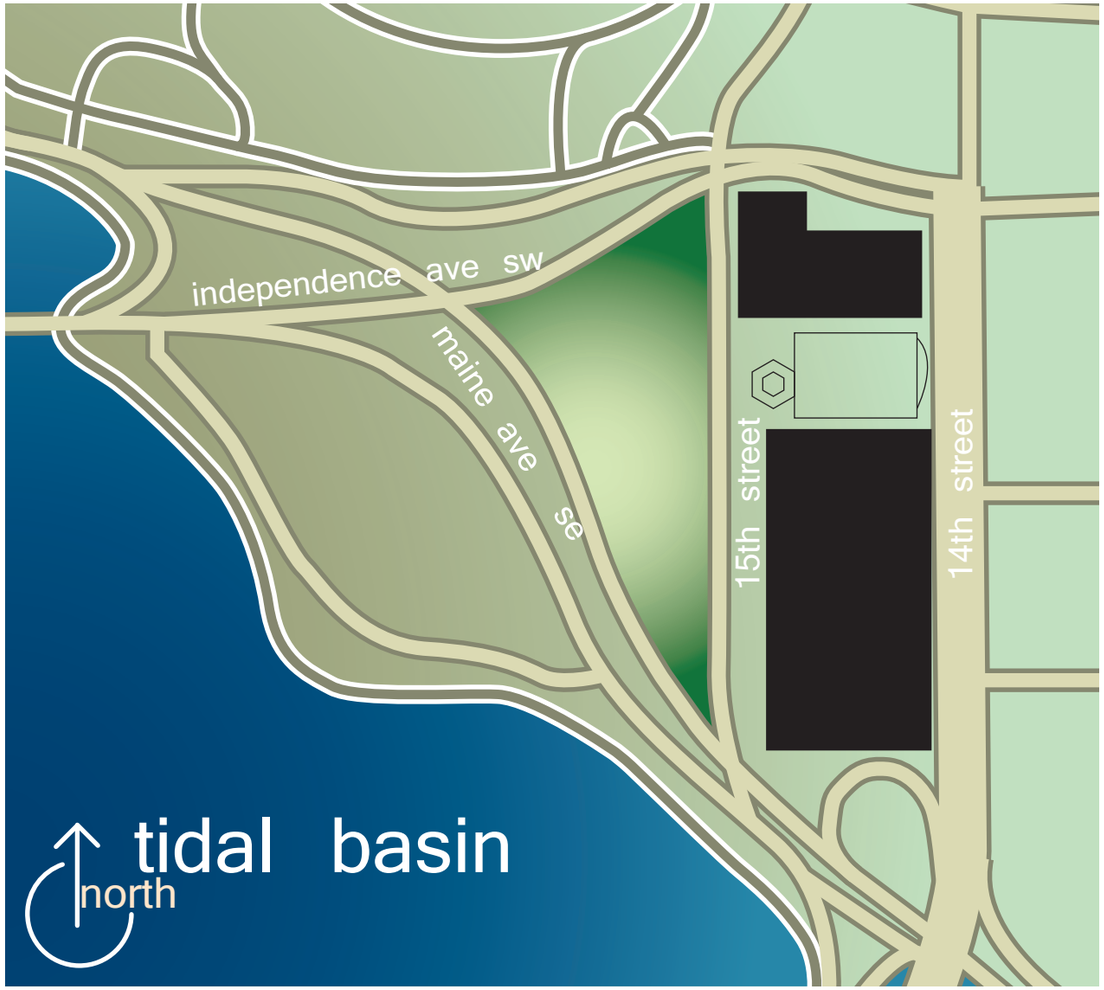

figure 5: site map

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project emphasis

This thesis will explore how designers and architects can create design solutions that creatively respond to the very specific and unique needs of deaf people in the community while not forgetting or ignoring the needs of the larger general public in an effort to create more barrier free and equal access designs for future generations that are beneficial to the whole.

This thesis gives architects the opportunity to understand how the deaf community operates and what their needs are. Through this understanding architects can connect two bodies of people in one common space. Creative design solutions will be derived from the understanding of the essential needs and limitations of the deaf user and will change the standards of design for a theatre/museum/school.

Through this examination we can develop design guidelines that are mutually beneficial to both the general public and the deaf community. An acceptable solution is one that does not limit either party but enhances and improves the quality of spaces inhabited by all users.

a plan for proceeding

research direction

Research will be collected by reviewing scholarly articles, journals, and documents pertaining to the deaf community, culture, and medical sciences. Research about museums, theatres, schools of higher education, light, sounds, and other pertinent information will be collected through case studies, scholarly journals and articles. Personal interviews and experiences will also be included.

All research will pertain to the theoretical premise/unifying idea. Research and analysis of light and sound will be implemented to gain a comprehensive understanding of their influences on persons who are deaf.

Analysis of light and sound will be collected to understand their influences on museums, theatres and schools of higher education individually as spaces.

Medical research will be consulted to better understand the past, present, and future understandings of deafness as a hearing impairment and its treatment. The analysis of this research will provide insight into the current needs of the client as well as inform the designer of the future clients 100 or 200 years from now.

Historical documentation of existing precedence in designing for the deaf will be considered and analyzed for information that will improve the quality of this design through case studies. Further documentation of similar typologies will expose programmatic requirements necessary to include in this design solution.

I will use a Mixed Methodology of research to include quantitative and qualitative analysis of graphic, digital, and personal interviews.

I will follow a Concurrent Transformative Strategy when gathering my qualitative and quantitative data. This strategy will be guided by my theoretical premise/unifying idea as an approach that will allow me to continually analyze, interpret and integrate the date observed in stages. The research will be guided by the theoretical premise/unifying idea and occur in a hierarchical order.

By following this strategy I will collect quantitative data, both statistical and scientific, through the in-depth analysis of journals and articles. I will collect qualitative date from direct observation and interaction with deaf people, documented interviews and research.

documenting process

All physical data related to the process and development of this thesis will be converted to a digital file. All process work, sketches, drawings, inspiration, will be scanned at a high quality and digitally saved according to date and stage of process.

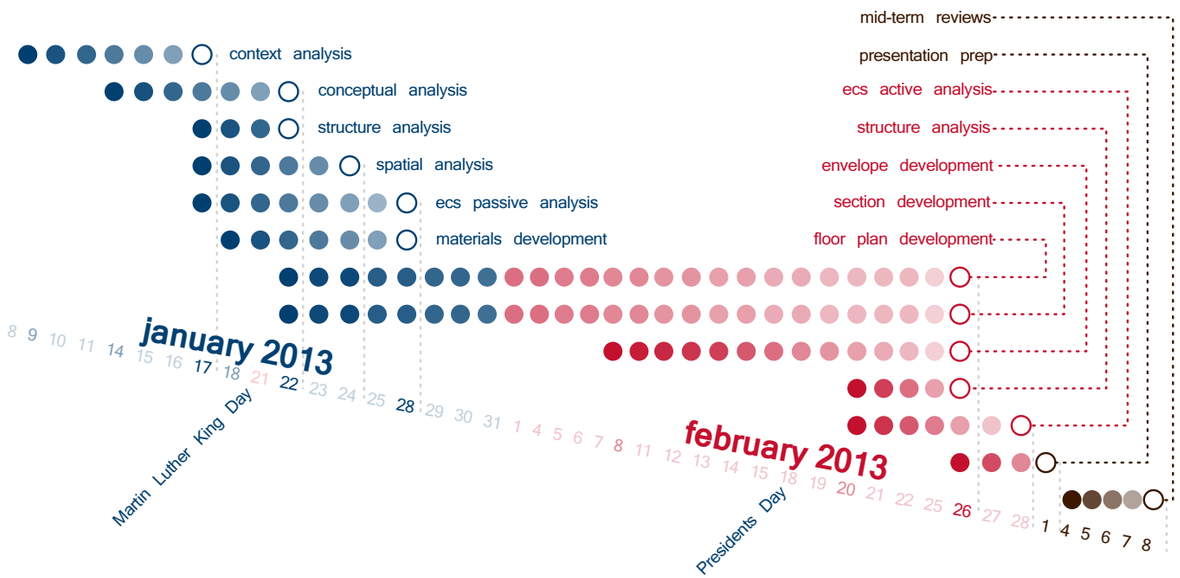
Pictures of three-dimensional objects will be taken at 16 mega pixels or larger and saved in a similar fashion. All digital work will be saved in the same fashion.

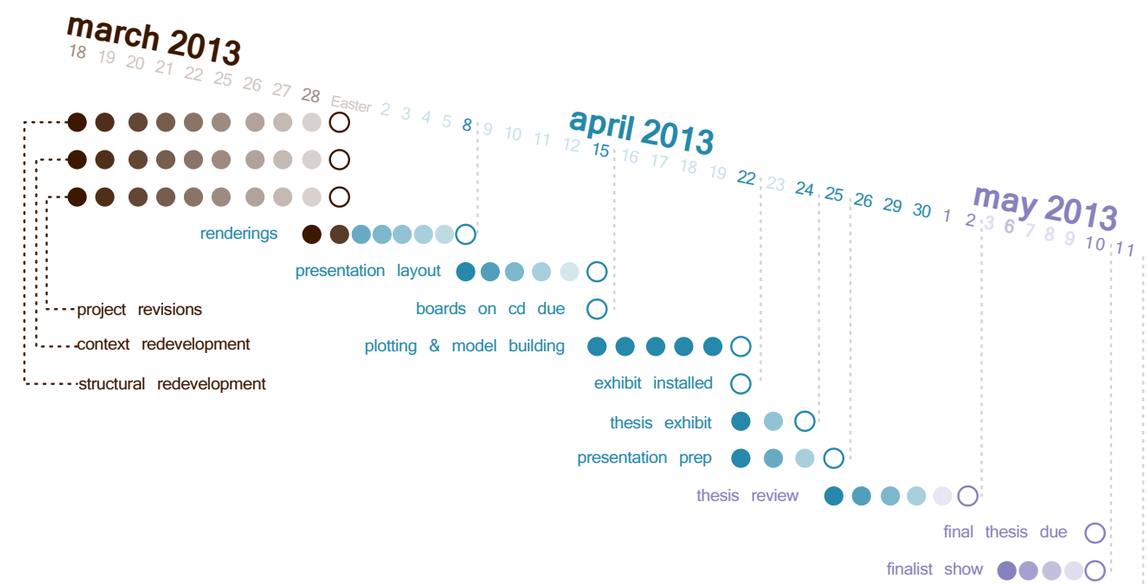
All digital data will be compiled and saved on an external hard drive. All work will be made available in a compressed file through my digital upload to the NDSU Repository and made available at my personal web site.

A page for my thesis will be updated and kept on my personal web site throughout the stages of this thesis and made available to the public.

All scans will be completed on a biweekly basis and backed up on a daily schedule. At completion of this thesis, a public presentation will be provided to discuss with peers my findings and documentation.

thesis completion





studio experience

second year
fall 2009: Darryl Booker

tea house
moorehead, mn

boat house
minneapolis, mn

second year
spring 2010: Joan Vorderbruggen

dwelling
marfa, tx

montessori school
fargo, nd

third year
fall 2010: Paul Gleye

retail facility
fargo, nd

fire house
fargo, nd

third year
spring 2011: Ron Ramsay

shaker barn orchestra hall
new lebenon, ny

regional school for the deaf
chicago, il

fourth year
fall 2011: Bakr Aly Ahmed

highrise
san francisco, ca

fourth year
spring 2012: Cindy Urness

urban design - independent study
washington, dc

work experience - gallaudet university
washington, dc

fifth year
fall 2013: mark barnhouse

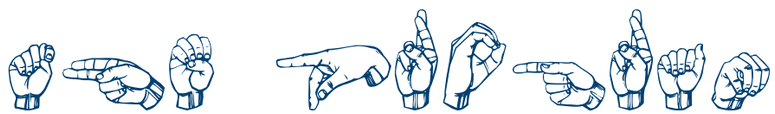
water rendering
digital animation

fifth year
fall 2013: Paul Gleye

shaker barn orchestra hall
new lebenon, ny

fifth year
spring 2013: Ron Ramsay

thesis : architecture for the deaf
washington, dc

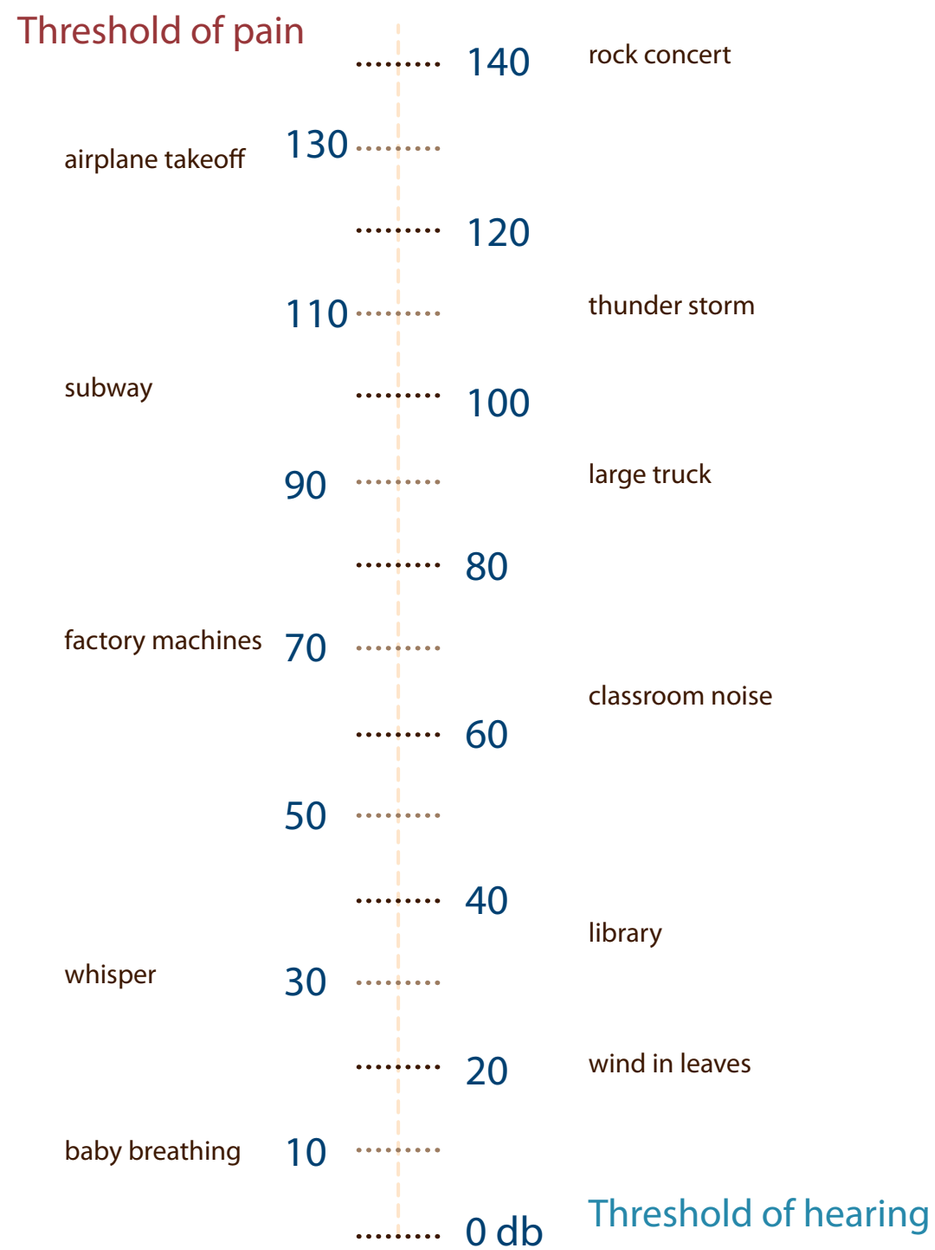


the program

Deafness is the loss of the hearing sense at a medically determined level. The loss of or inability to process linguistic information through the sense of hearing with or without amplification is another definition of deafness. (NICHCY, 2010) To understand what it means to be deaf it is important to understand what sound is.

Sound is measured in two different ways, loudness or intensity and frequency or pitch. (Nave, 2012) The normal range of human auditory processing of sound when measured in loudness or intensity is between 0 decibels and 140 decibels. (Smith, 1997) The following figure below plots different decibel levels of common sounds on a scale showing the thresholds of the human hearing. These are common sounds found in ever day life measured and plotted from zero decibels, the threshold of hearing, to 140 decibels, the threshold of pain caused by sound.

table 1 : decibel levels



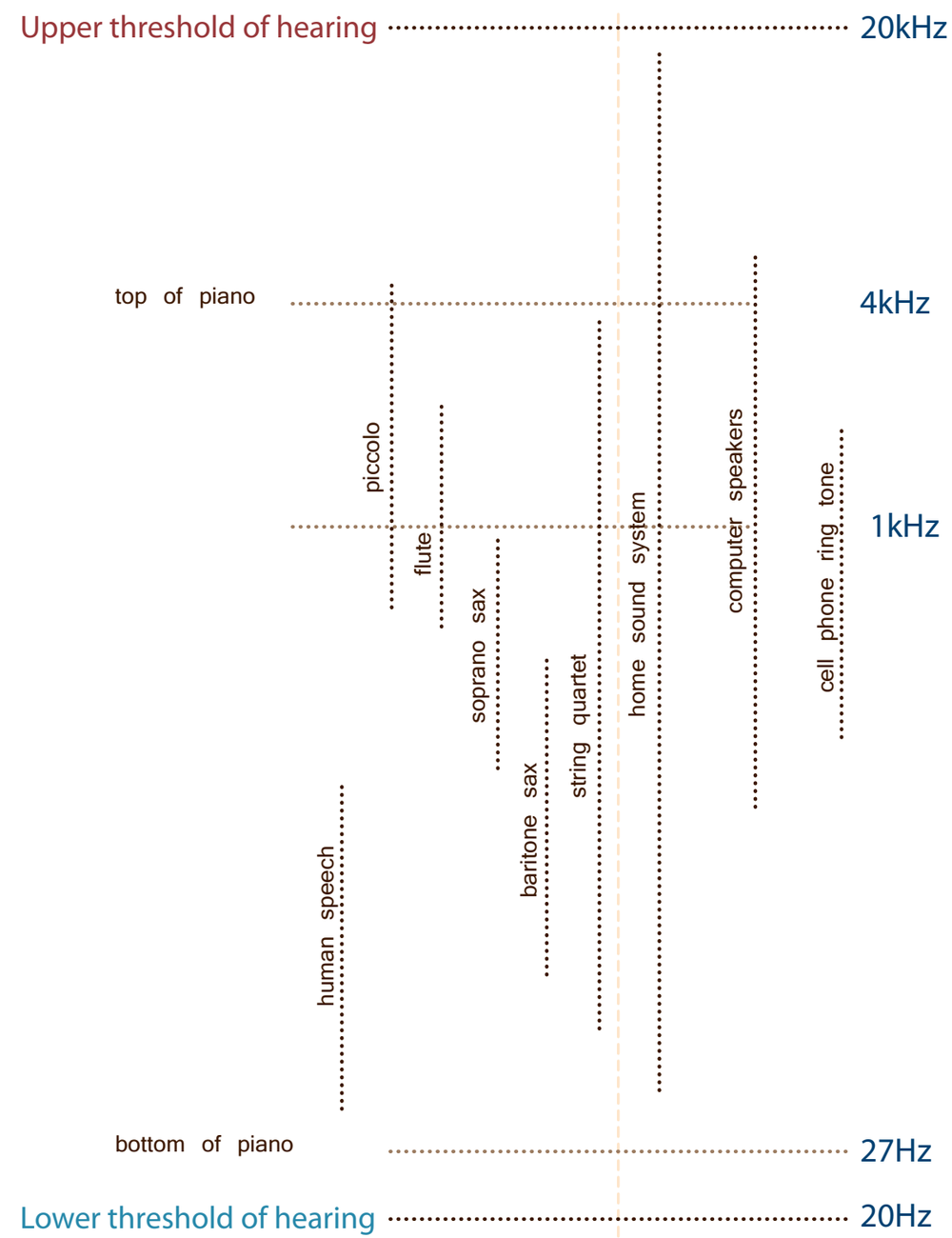
specht, t. 2012 date from: http://www.cyberphysics.co.uk/topics/waves/sound/decibel.html

The figure here plots the range of sound frequencies of pitches that the human ear has the ability to process. These frequencies are between 20 hertz and 20,000 hertz.

From this chart we can see the normal range of frequencies for the human voice, also known as the speaking voice, is between 85 hertz and 255 hertz. (Titze, 1994) Remember, deafness is the loss of or inability to process linguistic information through the sense of hearing with or without amplification. When determining the level of hearing loss doctors examine how well a person can hear sounds most closely related to the intensity and frequency of the human voice. (NICHCY, 2010)

With the general understanding we have of sound frequencies and intensities we can begin to understand what it means to be deaf. It is important to understand hearing loss is classified in three ways each having four levels of severity. (Slowik MD, 2012) Understanding the three classifications of hearing loss and the medical devices that can help correct the severity of loss, will

table 2: frequencies



specht, t. 2012 date from: http://www.dplay.com/tutorial/freqpaint.GIF

help develop architectural solutions that benefit the deaf community. This will be accomplished by considering how to design for each specific device.
In general hearing loss is classified as mild, moderate, sever, or profound. Mild hearing loss is considered as the difficulty to hear anything below 45 decibels. (Berke, 2011) This type of hearing loss would make it difficult to hear the sounds of a sleeping baby or the whispers of a loved one.

Whereas moderate hearing loss is considered as having difficulty hearing anything below 65 decibels. (Berke, 2011) At this level of hearing loss general speech and every day noises are lost in the silence or background noise. Some may have the difficulty hearing car horns, alarms, phones, or doorbells.

Sever hearing loss is considered as having difficulty hearing anything 85 decibels or lower. (Berke, 2011) As we interpret from the charts on the previous pages, this amount of deafness make hearing machine functions, and most car noises impossible to hear.

Finally, profound hearing loss is considered as having hearing difficulties of any sounds below 85 decibels or greater. (Berke, 2011)

Hearing loss is caused by many different factors including illness, genetics, injury and age. There are three classifications of hearing loss. It is important to understand what they are and how they effect the sense of hearing. The classifications of hearing loss are: conductive hearing loss, sensorineural hearing loss, and a mix of both classifications.

Individuals who experience hearing loss caused by diseases or obstructions in the outer to middle ear are considered to have “conductive hearing loss”. (NICHCY, 2010) Conductive hearing loss can be cause at birth, through an injury, or can be hereditary. Persons with conductive hearing loss often times improve their hearing through the use of bone conductive hearing aids, osseointegrated devices, or traditional hearing aids after surgical procedures. (Hearing Loss

Association of America, 2012)

The next classification of hearing loss is sensorineural hearing loss. Sensorineural hearing loss is often caused by trauma from loud noises, head injury, viruses, or infectious diseases. Often, the most common treatment for this type of hearing loss is to treat with a hearing aid. (Hearing Loss Association of America, 2012) Sensorineural damage is irreversible as it affects the hair cells of the cochlea. Once damaged, the hair cells cannot be repaired. (American Academy of Otolaryngology, 2012) Hair cells do not repair themselves and are currently not repairable through medical procedures or medication

The final classification of hearing loss is mixed hearing loss, a combination of the first two categories listed here. (Hearing Loss Association of America, 2012) Some deaf people prefer a cochlear implant to correct some forms of deafness, some prefer osseointegrated devices, while others prefer traditional hearing aid, and still yet some do not prefer any corrective devices. Three interviews included later in

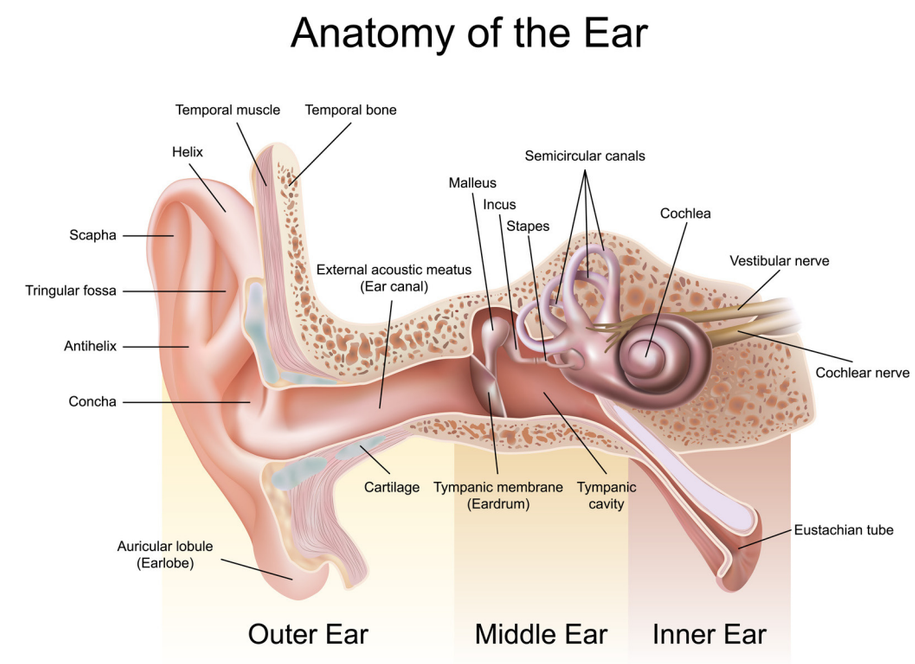


figure 6: ear detail

this document show the various cultural identity issues in the Deaf community.

It is important to this thesis to understand how each of the devices work. For the most comprehensive understanding of bone conduction hearing aids, cochlear implants, and traditional hearing aids, what they are and how they work we first need to understand how the ear works.

creative commons image from: http://www.bthchiroonline.com/wordpress/wp-content/uploads/2012/11/inner_ear.jpg

Sensorineural hearing is the involuntary process of converting vibrations from the air into intelligible and meaningful sounds. (Pujol, Lazarakis, Whitham & Blatrix, 2012) There is a fragile process that occurs between the air, the ear, and the brain to make the perception of sound happen. When a vibration is received by the outer ear, it is quickly funneled down to the middle ear through the ear canal, a small canal connecting the outer ear to the middle ear. Located at the end of the middle ear is the tympanic membrane, more commonly known as the eardrum. The vibrations from the air, which are differences in air pressure, cause the eardrum to oscillate. This oscillation directly causes three very small bones in the inner ear to vibrate. (Pujol, Lazarakis, Whitham & Blatrix, 2012)

These bones mechanically transfer the vibrations from the environment into the inner ear by creating waves in the fluid of the inner ear. The inner ear consists of the cochlea and thousands of small hair cells. Once the vibration has been transferred into the cochlea, the hair cells move to create a neural signal or electrical messages to be sent to the brain. (Pujol, Lazarakis, Whitham & Blatrix, 2012)

The electrical signals travel via the auditory nerve into the brain where different areas of the brain receive and process the electrical signals. Involuntarily the brain converts the electrical signals into intelligible perceptions of sound. (Pujol, Lazarakis, Whitham & Blatrix, 2012) With that very basic understanding of how the human body converts vibrations into sound we can better understand what it means to be deaf and how current medical devices help improve hearing loss.

If we recall from above, conductive hearing loss is the loss of hearing due to a disease or obstruction inside the middle ear. (NICHCY, 2010) Essentially, this means the eardrum is blocked and cannot complete the transfer of sound vibrations to the inner ear. One action available for correcting or improving conductive hearing loss is a procedure called osseointegration.

This surgical procedure places a small metal implant into the temporal bone of the skull just above the physical outer ear. Once the bone grows around the implant a sound processor can be affixed. Like the eardrum, when vibrations interact with the sound processor the temporal bone of the skull is vibrated. (Oticon Medical, n.d.)These vibrations transfer to the inner ear and help initiate the final processes to create the perceptions of sounds.

This process works only if the inner ear is working. How does the operation of this device influence architectural design solutions in a museum, theatre and educational atmosphere?

If a person's inner ear is slightly damaged, meaning they have damage to the hair cells in the cochlea, but no other damage to the middle or inner ear, a tradition hearing aid may be an option to improve hearing. A traditional hearing aid simply amplifies the incoming vibrations detected in the air. This amplification allows the surviving hair cells in the inner ear detect the stronger vibrations and complete the processes of creating the sense of sound. (NIDCD, 2008) How does the operation of this device influence architectural design solutions in a museum, theatre and educational atmosphere?

Finally when the inner ear is profoundly damaged, where the hair cells of the inner ear are not functioning, a cochlear implant may be a suitable option for some deaf people. The cochlear implant is a surgically implanted, electrical device that circumvents the damaged inner ear. (Hearing Loss Association of America, 2012) A cochlear implant consists of multiple pieces both internal and external. The internal component is a small electrical device that is implanted behind the physical ear, inside the skull, and connects to the hearing nerve via thread like electrodes. (Hearing Loss Association of America, 2012) The external component rest on the skin behind the ear and is held in place by an electromagnetic disk from inside the skull. (Hearing Loss Association of America, 2012)

The external component receives vibrations from the air and converts them into electrical signals much

in the same way the ear drum and inner ear convert vibrations into electrical signals. These electrical signals are sent to the hearing nerve directly, bypassing the middle and inner ear. The hearing nerve sends the signals to the brain where they complete the process of creating the sense of sound. (Hearing Loss Association of America, 2012)

With the implant of a cochlear implant, the hearing nerve is severed from the inner ear completely and permanently. This eliminates any remaining amount of natural hearing an individual may have. Echolocation is one process used in locating objects or sounds that our brain performs automatically and hearing people rely on. Echolocation is a process the brain completes by determining the directional characteristics of the sound as it is received by the ear. Persons with cochlear implants loose the ability to echo locate in most situations.

How does the operation of this device influence architectural design solutions in a museum, theatre and educational atmosphere?

Now that we have a basic understanding of the medical classifications and degrees of hearing loss we should investigate how many Americans experience hearing loss.
In 2003, Gallaudet University completed a demographic survey of deaf and hard of hearing individuals living in the United States. The Research Institute at the University has developed an estimation of how many people in the United States are living with a hearing impairment. According to their research, the approximate population of the deaf or hard of hearing community is 38,225,590 people. (Harrington, 2010) This is approximately 13 percent of the population of the United States. (Harringotn, 2010)

In 2008, the United State Census Bureau completed a demographic analysis of deaf and hard of hearing people living in the United States. The Census Bureau estimates nearly 10,528,767 deaf or hard of hearing people are living in the United States, approximately three percent of the populations.. Why such a difference?

When comparing the estimations

of the deaf population created by the United States Census Bureau and the Research Institute from Gallaudet University a very different statistical representation is presented. In 2003, Gallaudet University's Research Institute estimates of 38,225,590 people are based off reoccurring surveys and data from the National Center for Health Statistics. This survey accounts for the number of children with hearing impairments and tracks the population over time as the children age and pass away. The United States Census Bureau does not specifically count real people who are deaf. The Census Bureau makes estimations based on data submitted by regional and state associations who have made their own estimates about how many deaf or hard of hearing people are in their immediate region. (Harrington, 2010) At best, the current population of deaf or hard of hearing people in the United States safely ranges from 10 million to 40 million people.

The deaf community has a unique social culture and language. Culture generally expresses a sharing of religious beliefs, clothing preferences, rituals, language, and social formalities of a specific group. To define the deaf as having a culture when they do not share a specific religion, manner of dressing, or special rituals is hard for some to understand. The deaf culture describes a specific group of people who share the distinctive use of Sign Language in their community. (Padden & Humphries, 2006)

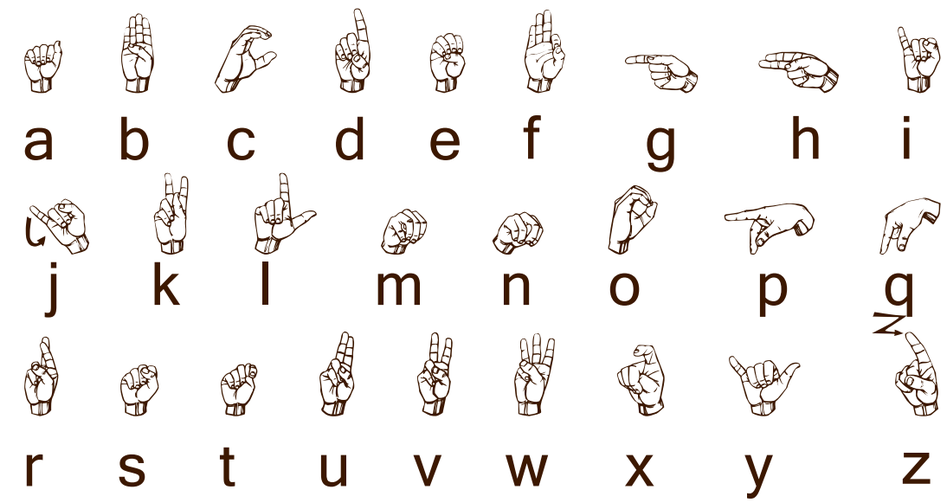
Other key actors that make up the deaf culture are Children of Deaf Adults (CODA) and interpreters. Children of Deaf Adults or CODA are hearing children born to deaf parents. These individuals are very important members of the deaf community associating and identifying with the deaf community and adhering to the deaf culture but also identifying with the hearing world and identifying as a hearing individual. Often times CODAs feel stuck in between two cultures and do not feel completely comfortable in the signing world or the hearing world. (Padden & Humphries, 2006)

Interpreters are the other group of individuals who are often the most connected public people to the deaf community and widely

accepted in the deaf culture. Interpreters are a medium for communication between the deaf and the hearing. Interpreters receptively receive sign language, convert the information from sign language into vocal language to be spoken to the other person in the conversation or visa versa. This process is done as objectively as possible with the interpreter having the ability to be flexible with the vocal words used to create an accurate depiction of what the deaf individual is expressing.

Persons within the culture who identify as deaf, who are proud to be deaf, use the term Deaf with a capital “D”. I will use this term in this thesis appropriately as it is meant to be used. The use of the lowercase version of the word deaf describes the physical impairment of having hearing loss. The word deaf with a lowercase “d” also can describe people who have developed deafness later in life but do not associate with the deaf community and do not identify as being deaf.

figure 7: asl alphabet



The language used by the deaf community is a form of sign language. A common misconception in the hearing world is the idea that sign language is a universal language. This is false. Every country has their own version of sign language. Above is the American Sign Language alphabet.

American Sign Language is a language of its own just as English, French and Chinese are. Sign language was brought to America by a French man named Abbe Charles Michel de L`Epee. In the 1700s he showed the public that deaf people could communicate through the use of sign language. At this time persons who were deaf were called Dumb, meaning they could not respond vocally because they could not hear. (Allen, 2005)

American Sign Language is a visual language composed of gestures, signs, finger-spelling, facial expressions, inflections, dialect, register, and accent. Similar to any spoken language, sign language has linguistic structure, including proper grammar rules and variation based on location. (Vicars, 2009) The proper grammar structure for a signed phrase is Time+Topic+Comment. A simple sentence, “I went to the grocery store last night”, translated into sign language would be signed in the following way. “me+ last night+ Go Where? food store+” Word order of American Sign Language when compared to English has its own unique form.

The general public often does not understand that English is not a deaf person’s first language but their second.

Similar to any spoken language around the world, Deaf communities around the world have developed accents or dialect over many years. Some signs are regional, unique to a specific place or group of people, while others are common nationwide and worldwide. For instance the sign for cactus in Arizona is not understood in North Dakota to be any sign. Whereas, the sign for Korea is understood around the World. The complexity of their language is more than just gestures and random movement of the arms, hands, and fingers. The key to understanding sign language is facial expression. Without facial expressions the message sent can be misunderstood.

A small portion of the deaf community is also blind. Deaf-Blind people use a special form of sign language developed specifically for their condition called tactile sign. This form of sign language is specialize for people who can not see or hear but desire to

communicate. To perform this type of sign language the receiver holds the hands of the messenger and reads the signs as they are performed in the palms of their hands. By holding the hands of the messenger, Deaf-Blind individuals are able to follow the arms and hands as they create gestures, context, and communicate the messengers voice.

Less today as in the past, deaf communities exist across the United States as large groups. Some of the largest populations of deaf people exist in Washington, D.C., and New York City, N.Y.. (Berke, 2009) (Berke, 2012)

Historically, deaf people have seen discrimination in the work place due to a misunderstanding that their hearing impairment has a direct correlation to their intelligence. This misconception is changing and more and more deaf people are becoming mainstream citizens because of legislation and medical advancements that allow them the opportunity to hear.

As this shift occurs, it is becoming apparent that office buildings, classrooms, and theatres alike are not Deaf Friendly. Deaf Friendly spaces are spaces that permit good signing conditions by providing proper lighting, barrier free signing zones and distraction free signing backgrounds. Just as designers consider functionality for persons with limited mobility, designers should begin to consider design for deaf persons as well. In the appendix of this thesis, I have included a design guide for Deaf Friendly Spaces.

We understand that there are many ways for hearing loss to occur. I am curious, will hearing loss ever be cured? The Stanford School of Medicine believes a biological cure to hearing loss is in the foreseeable future.

Mainly, the researchers are focused on the inner ear, the part of the ear that can not and does not regenerate itself after damage occurs. As earlier stated some of these parts that do not regenerate after damaged include the hair cell. Stanford is focused on studying this area of the ear.

According to Stanford School of Medicine, two of every 1,000 infants are born with hearing loss

of some degree. They estimate 17 percent of the current United Stated population suffers from some amount of hearing loss, minor or sever. (Stanford School of Medicine Stanford Initiative to Cure Hearing Loss, 2012)
Stanford researchers are developing four different methods to cure deafness caused in the inner ear. Their methods include stem cell therapy, gene therapy, molecular therapy, and targeted neural stimulation.

The researchers believe through the science of medicine and technology they will be able to regenerate lost or damaged hair cells in the inner ear by injecting stem cells into the organ of the inner ear. The organ of the inner ear is rarely the part that is damaged, it is the hair cells themselves, as described above, that become damaged. The process of injecting stem cells into the inner ear may encourage hair cells to regenerate and essentially cure deafness. (Stanford School of Medicine Stanford Initiative to Cure Hearing Loss, 2012)

This process of growing hair cells would change life for deaf people. Instead of enduring dangerous surgeries to have hardware implanted into their skull, this new process would restore hearing, in a nearly noninvasive way, eliminating deafness.

Researchers at Stanford School of Medicine are also trying to understand the genetic deformities that cause deafness. They believe they have discovered three genes that contribute to the development, or non development of hair cells, causing hearing loss. Scientist feel they can introduce or force these deformed genes to work properly to repair hearing loss rapidly within the human body based on similar studies they have done with lab mice. (Stanford School of Medicine Stanford Initiative to Cure Hearing Loss, 2012)

The third area of research the team at Stanford School of Medicine is exploring is molecular therapy. Simply stated, their intentions are more preventative or restorative in this research. They desire to find a chemical solution that can be administered in the form of a pill that will provide a protecting layer to the hair cells or stimulate them to regenerate.

They hope this medicine will act similar to how other animals in nature automatically recover from hearing trauma by regenerating hair cells, specifically similar to how birds do this. This type of research may make cochlear implants more useful and effective for some users. (Stanford School of Medicine Stanford Initiative to Cure Hearing Loss, 2012)

The final form of research being performed at Stanford School of Medicine is Targeted Neural Stimulation. Researchers also believe they can strengthen the effectiveness of a normal hearing aid by introducing direct, pinpointed, optical stimulation on the remaining hair cells. This process would help increase hearing potential when paired with a hearing aid. (Stanford School of Medicine Stanford Initiative to Cure Hearing Loss, 2012)

Again, will hearing loss be eliminated? In the world of science and medicine, yes. Advances in medical research and technology will help to eliminate, prevent, or cure hearing loss either post trauma or pre-birth due to genetics. Will hearing loss be eliminated in the deaf community? I feel no. Does the Deaf Community want hearing loss to be cured?

There is a whole different view to being Deaf that comes from the Deaf community and Deaf people. Medical doctors and scientist want to cure deafness, the research being performed by Stanford School of Medicine proves that. Why do they want to cure it? The deaf community does not feel that their hearing loss is an impairment and often find it offensive when labeled as a person with an impairment. Some even feel very strongly against the idea of being forced to hear.

For instance, in an interview of Ross Jandt, a deaf man from Fargo, North Dakota, says doctors think being deaf is a bad thing. Medical doctors do not give parents an opportunity to understand what it means to have a deaf child. Doctors present it, deafness, as a problem and offer only one solution, fix it. (Jandt, 2012)

“They (the doctors) say your baby is deaf. You want a good life for him, right? Ok! Slap, here a cochlear implant, fixed!”

Ross explains in American Sign Language. Cochlear implants strip the person of their identity, pulls them out of the culture and the community. (Jandt, 2012)

A deaf child should always learn sign language and should be the only one to decide for themselves if they want to have a the ability to temporarily restore hearing. This should happen only when they are old enough to understand what it means to have a cochlear implant. (Jandt, 2012)

When Ross talks about a temporary restoration of hearing, he feels a cochlear implant is not permanent. If the device fails, breaks, or is damaged the person is still deaf and can not function to survive.

other interviews still interpreting them

There is an innate difference between some people in the deaf community and some people in the sciences when discussing solutions to being deaf. None of the people interviewed would ever deny their children or family members of devices that may make life better for them, but they all feel it is important to keep their identity true to them.

Deafness will survive into the far future. Cultures change and people change. Medical advancements will prevail and the population of the deaf community will reduce. Morals make it impossible to deny a person the opportunity to have something they feel will better their life, their survival, or their success. Culture is an identity, something that holds people together. If deafness were to be cured not everyone who is deaf would willingly choose to become hearing.

There is a level of pride and identity the deaf community has about themselves. Cultures do disappear and things will change. How they will change is a direct effect of the understanding of the culture and its people by the people not in the culture. Population level will without a doubt reduce making this architectural solution less important in the future than it is today. How the architecture evolves and remains usable will be the true success. The intention is not to create an architectural solution for only the deaf here

and now, but an architecture that supports all users now and is able to evolve in the future for users unknown today.

summary

Deaf people around the world are a unique group of people. From early times in history they have been brought together, sometimes through prosecution and sometimes through a common bond of deaf culture. The issues of hearing loss, culture, and langue presented here are the foundation of this thesis. All the research should be analyzed under the idea that architecture can improve the quality of life for this specific group while not impeding or hindering the quality of life of others.

Changes in design thinking and the process of design are required to develop a new form of architecture that can achieve this total inclusion. The use of universal design principles can be a method to creating spaces that are more equally accessible to all users regardless of ability.

Architecture has the ability to cure physical ailments by reducing the barriers that make them more difficult to cope with. The thoughtful consideration of details, space arrangements, site design and way finding methods can create an atmosphere that is more inviting and usable by all. The atmosphere of the facility will be what people remember. How they feel in and around the facility and how they feel about themselves will determine a level of success for the architecture.

By incorporating specific design details and solutions that will support the use of a visual language like sign langue, we will hopefully create an architecture that provides barrier free access and creates a feeling of familiarity and equality. The intent is not to design a facility only usable by the Deaf community but to create

a new architecture. An architecture that responds to the needs of all users through the collaboration of universal design principles and DeafSpace principles. The result will be facilities where all users have the same architectural experiences and access, including the Deaf community.

The following is a summary and description of a few design criteria I propose for use within DeafSpace design. I will consider this set of criteria as I address my design challenge. This set of criteria will address the use of hearing aid devices in architectural solutions. It will address the visual needs of sign language and the physical design needs of the deaf. These principles are developed through personal experiences as part of the Deaf community and participation within their culture as well.

design criteria

topic	description	design criteria
signing zone	The signing zone is the area around the body where sign language is formed. The zone also includes the foreground and background of the signer.	The color, pattern, and design of elements in the background of the signing zone should be distraction free and provide a solid appearance to sign against.
color	Contrast is vital to make sign language intelligible	Color as an element of design should be carefully considered. Mixtures of colors that does not provide adequate contrast between the signer and the background can make intelligible sign difficult same is true with colors that create dissonance between the background and foreground
color	Contrast is vital to way finding	Member of the deaf community often walk while signing. Contrast of light vs dark to delineate edges and warn of pending danger is important to create barrier free paths.
patterns	patterns and repetition are essential to way finding	It is not uncommon to see a deaf person walking backwards while signing to a group of people. Patterns and rhythm that subtly change to warn of pending danger is important to safety and accessibility while also providing visual guidance, even if only through the peripheries

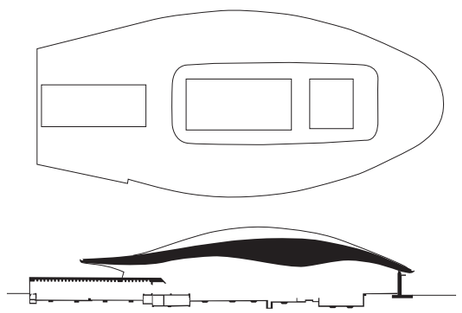
topic	description	design criteria
vibrations	When one sense is reduced or eliminated, as happens with deaf people, the remaining senses are enhanced	The slightest of vibrations can be detected by deaf people. Vibrations can be used as a way to alert an individual of various different situations or they can also be a distraction, they may become disturbing and be considered a nuisance
sight lines	Sight is nearly essential to make intelligible sign language	Objects that hang into or create and obstruction within the signing zone are considered preventable. Unless intentionally creating privacy, avoid sight line obstructions
light	Light quality indoors is important to creating intelligible sign language and way finding	Studies are being performed to determine the best type of lamp for signing. Current understanding is florescent tubes create the most acceptable color of light. Light should fill the space without creating shadows on faces or in the signing zone.
light	When entering or exiting a structure the pupil of the eye adjusts according to the intensity of the light	A constant and nearly equal intensity of light between the indoors to outdoors is preferred in lobbies and entrances where egress occurs. Drastic changes in light intensity cause the pupils of the eyes to dramatically enlarge or decrees. The time waiting for the eyes to adjust can be vital in a visual culture and language

topic	description	design criteria
intersections	Hallways, corridors, sidewalks and walls all intersect at some time, causing potential collision dangers	Providing clear visual connection from one space to the next to prevent collision is important.
furniture	Sign language is not a linear language and can not be performed without eye contact	Typical furniture layout in straight rows is not conducive to sign. Curved and circular arrangements help create clear eye contact in all spaces and functions
classroom	Sign language is not a linear language and can not be performed without eye contact	Typical classroom layout in straight rows is not conducive to sign. Curved and circular arrangements help create clear eye contact in all spaces and functions
backlighting	Sign language requires proper and visual cues from the body and face to be intelligible	Intense, direct light, in the background of the signing zone can create sharp contrast that makes sign unintelligible
backlighting	Sign language requires proper and visual cues from the body and face to be intelligible	Intense, direct light, in the background of the signing zone can create sharp contrast that makes sign unintelligible
materials	When one sense is reduced or eliminated, as happens with deaf people, the remaining senses are enhanced	Wood is considered to be a good material to transfer vibrations in design for the deaf

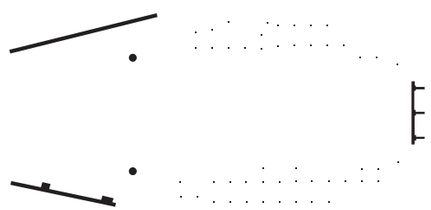
case studies

aquatic center rendering : figure 8

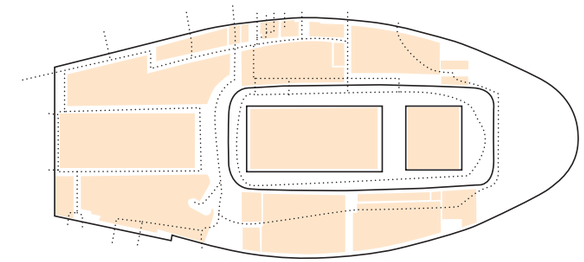
For the 2012 Summer Olympics, British-Iraqi Zaha Hadid was award the contract to design the competition athletic arena for swimming and diving events. Her design, The London Aquatic Center, is a remarkable facility that will morph from one use during the Olympics to a permanent use after the Olympics, while displaying incredible sweeping curves and angles she is known for. Located in London, United Kingdom the facility sits opposite the Olympic stadium connected by a bridge and a plaza to the main Olympic Park. The facilities three-stories measures to approximately 29,000m2 making the Arena the second largest facility at the Summer 2012 Olympics, competing only with the main stadium. The Olympic Arena houses two 50 meter competition pools, one 25 meter diving pool and 17,500 seats, some of which will transform after the Olympics. (ArchDaily, 2011) Hadid designed the facility to transform after the Olympics as part of a design she calls “The Legacy”. After the completion of both the 2012 Summer Olympics and Paralympics deconstruction will commence and the removal of 12,500 seats and re-organization of interior space use will reduce the Olympic Arena to a world competition Arena. (ArchDaily, 2011) Through this process of deconstruction all materials will be recycled, sold, or reused in other structures or areas of the Arena. Many of the environmental design decisions that were made in this project are influenced by both the cultural thinking of the European Nations where sustainability is a necessity and by the Olympic Delivery Authorities regulations. (GreenWise Staff, 2011) The facility is constructed on a once



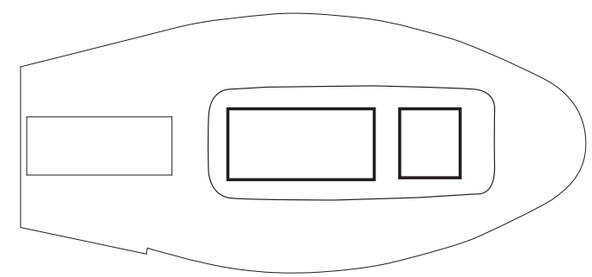
plan to section - figure 9



structure - figure 10



circulation to space - figure 11



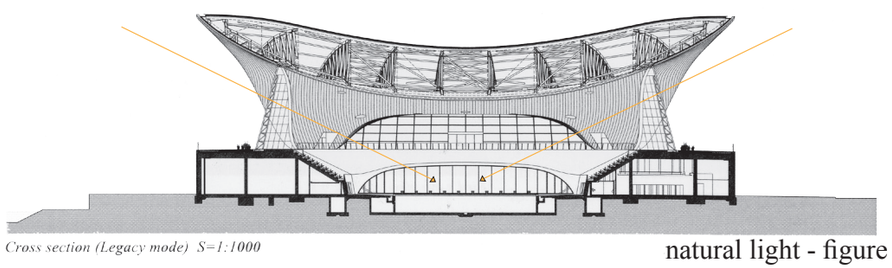
hierarchy : figure 12

hadid (architect), nd. images from: http://www.zaha-hadid.com/architecture/london-aquatics-centre/

brownfield site where oils, gasses, and chemicals were dumped. Through considerable reclaiming efforts the site was freed of all toxins and construction of the Arena began. Following a plan set forth by the London 2012 Sustainability Plan and the Olympic Delivery Authority, this facility used low carbon, readily available and renewable resources for construction. Over 50 percent of the aluminum used in construction was from recycled materials, all PVC wrap is phthalate free, and 50 percent or more of the materials were delivered by train instead of truck. (GreenWise Staff, 2011) Sustainability is a driving design intent on this project and in my opinion, a leader for future Olympic arenas to be inspired by.

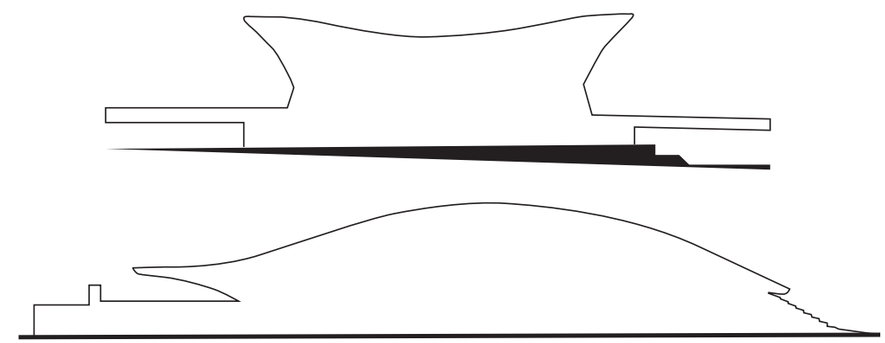
Despite the arenas size, it is similar to the Cangqian Performing Arts Center, Art Museum and Arts Quadrangle of Hangzhou, China. When comparing the Arena and the Performing Arts Center, it is evident that site design had an influential role on design solutions and decision. Both projects integrate controlled pathways and sight lines created through the use of linear bridge like structures over waterways. These pathways frame views and guide, or push and pull, users from one node to the next. The unique three-point super structure of the undulating and sweeping roof is unlike any of the other case studies here. I feel Hadid was inspired by water and the form of the wave in all parts of her design. The Legacy design she has created for the Aquatic Center mimics the form of a wave and is successfully used to delineate use by the volume of the space.

This case has informed me as a designer how to consider volume as an element to define space rather than defining space with solid objects. The use of open space, with barrier free access both physically and visually supports my theoretical premise/unifying idea by reinforcing the idea that good design for one group benefits the needs of another as a whole. Even though this design may not have considered deaf people a need for barrier free visual access, a need of the deaf, is also beneficial to the larger public in a facility like this.

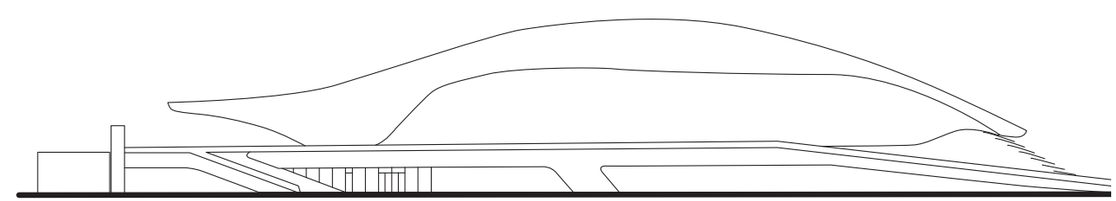


natural light - figure 13

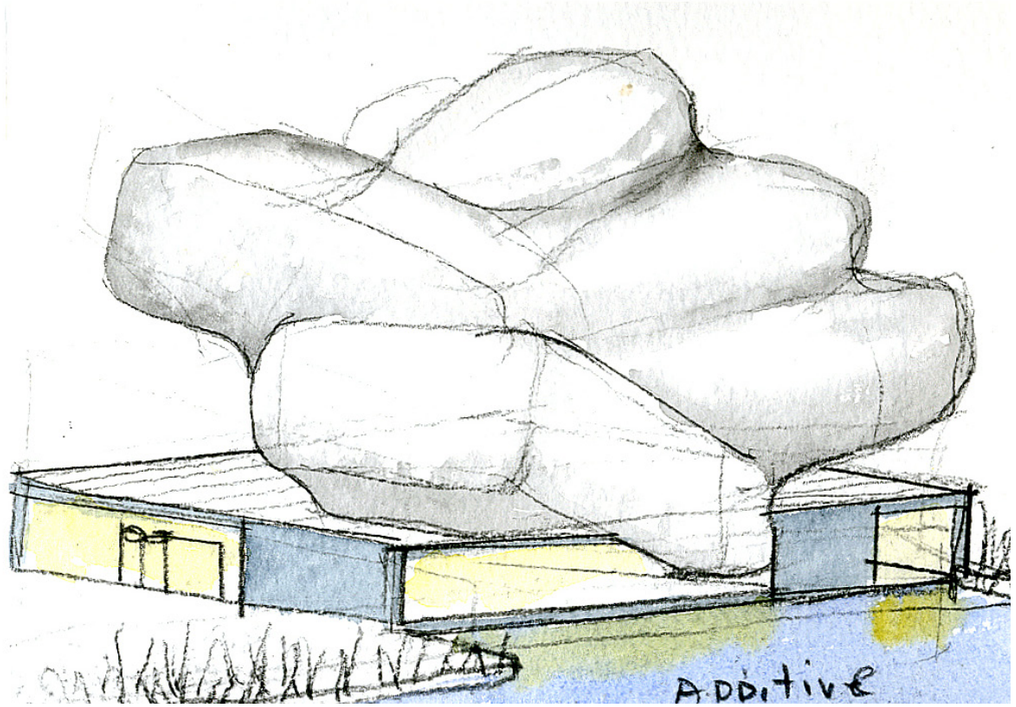
zaha hadid (architect), 2011. Cross Section (architectural drawing), from: GAdocument 118 p. 61



mass - figure 14



geometry - figure 15



concert hall - figure 16

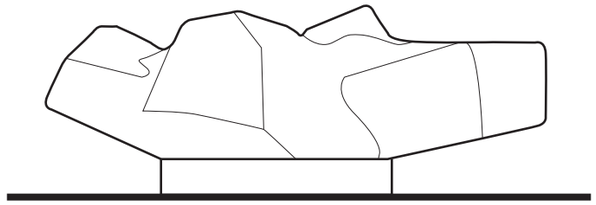
Designed for the Normal University of Hanzghou, China, the Cangqian Performing Arts Center and Arts Quadrangle designed by architect Steven Holl is a two facility campus where music, performing arts, and visual arts combine. The two structures are connected through constructed walkways and waterway connections that guide users from one area to another. The subtractive nature of the museum allows for breakout spaces, large terraced facades, that provide great outdoor spaces for students to sit and interact. However the spaces are not as organic as the performance center and tend to be squared in form. The squared off shape of the terraces is not conducive to DeafSpace design as communication and visual connections are limited to one direction. Spaces that are more organically formed provide the best opportunity for signers to sit and have visual connections in multiple direction.

The interior of the Center, even with its mainly open central core, appears to be very busy with crisscrossing escalators and walkways. As modern and interesting this may appear, visual distractions of such kind can make a space difficult to communicate in, as the signing zone may be filled with background distractions.

The use of escalators is helpful for some persons who have difficulties traversing stairs, however there are not standard, manual stairs for users who can not use an escalator but may still be able to climb stairs.

The design of the escalators also creates a visual disconnect between the starting and ending points of travel. This happens because the escalators pass through or behind secondary walls and spaces. There is not a direct

concert hall lobby - figure 17



geometry - figure 18

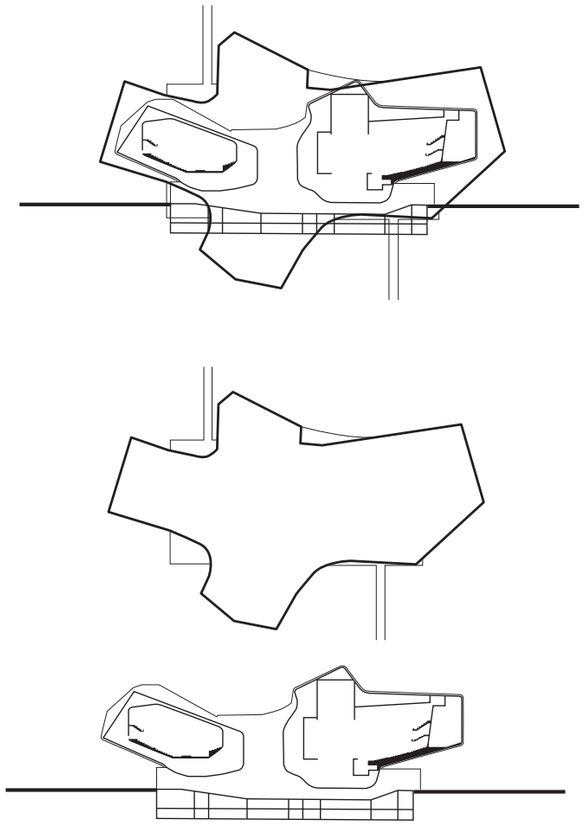
steven holl (architect), 2010. image from: http://ad009cdnb.archdaily.net/wp-content/uploads/2011/01/1295878765-b-concerthall.jpg

steven holl (architect), 2010. image from: http://ad009cdnb.archdaily.net/wp-content/uploads/2011/01/1295878765-b-concerthall.jpg

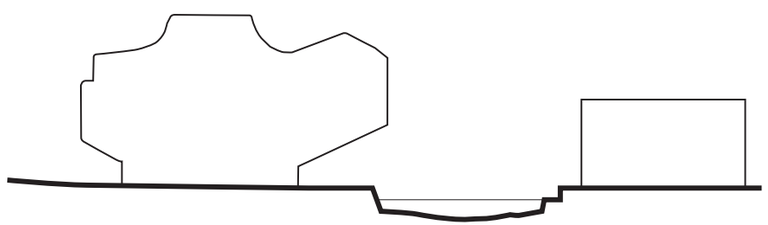
visual connection from start to end. This creates confusion in navigation and is not conducive to signing as visual connections are obstructed.

As with the London Aquatic Center both spaces have large open central cores and provide prominent universal design elements in their site planning. Entrances are at grade and mobility through the structure appears to be fair with equal access providing the same architectural experiences.

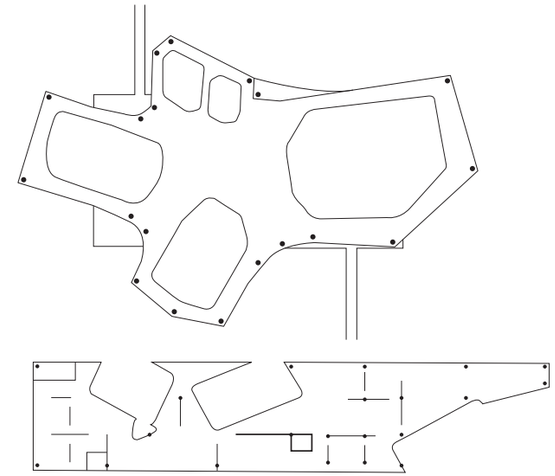
This design, when compared with the London Aquatic Center is very busy. Interior spaces are large in volume but natural light access is limited and visual distractions are prominent. The Performing Arts Center and connecting Museum are master planned to be directly adjacent a river known for flooding. Site design and constructed path



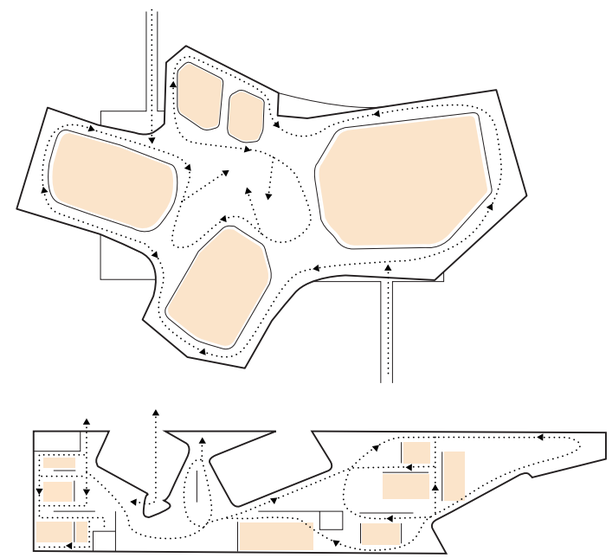
plan to section : figure 19



mass - figure 20



structure - figure 21



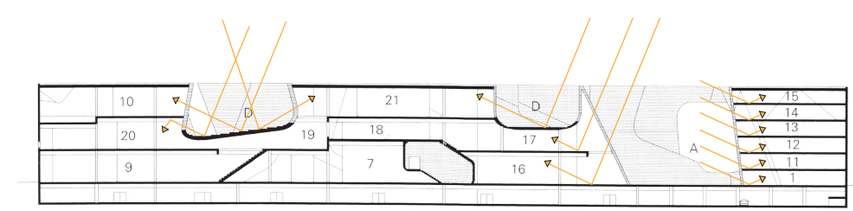
circulation - figure 22

raise the structure approximately five feet above the 50 year flood levels to protect the facility without blocking views of the river.

The facility will be connected to a central utilities loop from the main university consisting of a proposed campus wide geothermal loop. (Minner, 2011) This form of energy will help reduce the environmental impact this new facility will have on the community.

Socially this structure is adding a new gathering place on the campus and in the neighborhood. With its interactive form and facade, users are encouraged to interact with the architecture and engage with visitors around them.

In my evaluation of the Performing Art Center and Museum the architect uses an additive/subtractive approach as a driving influence in



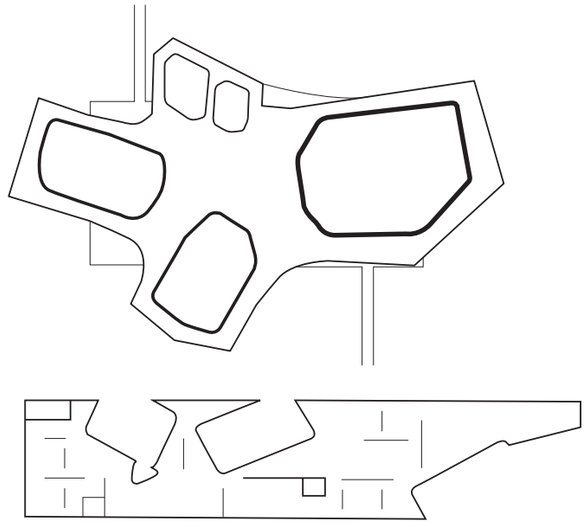
natural light - figure 23

steven holl (architect), 2010. art museum: section (architectural drawing), from: GAdocument 118 p. 29

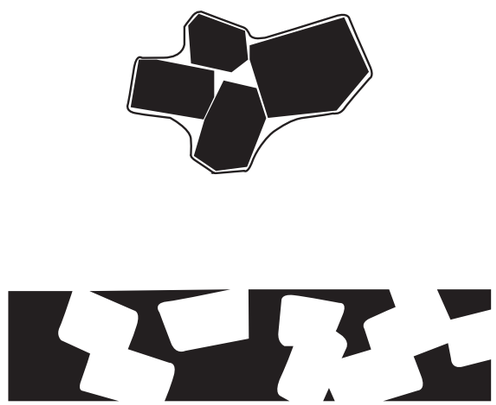
his design. Spaces that required more light, the museum, used a subtractive approach allowing natural light into the spaces. The auditoriums and concert halls, where controlled lighting and HVAC systems are essential, additive and enclosed spaces were designed.

This case has cause me to question my theoretical premise/ unifying idea, specifically the idea that design solutions that benefit one ability also benefit the larger community.

When reviewing the design of the interior atrium of the Performing Arts Center I feel visual connections between spaces are limited, creating a poorly designed space, in my opinion. However, after some contemplation, I am curious if my theoretical premise does not consider the sometimes required design requirements of some architectural spaces. I feel it is appropriate to enclose, with complete opacity, a theatre. This solution is appropriate for the



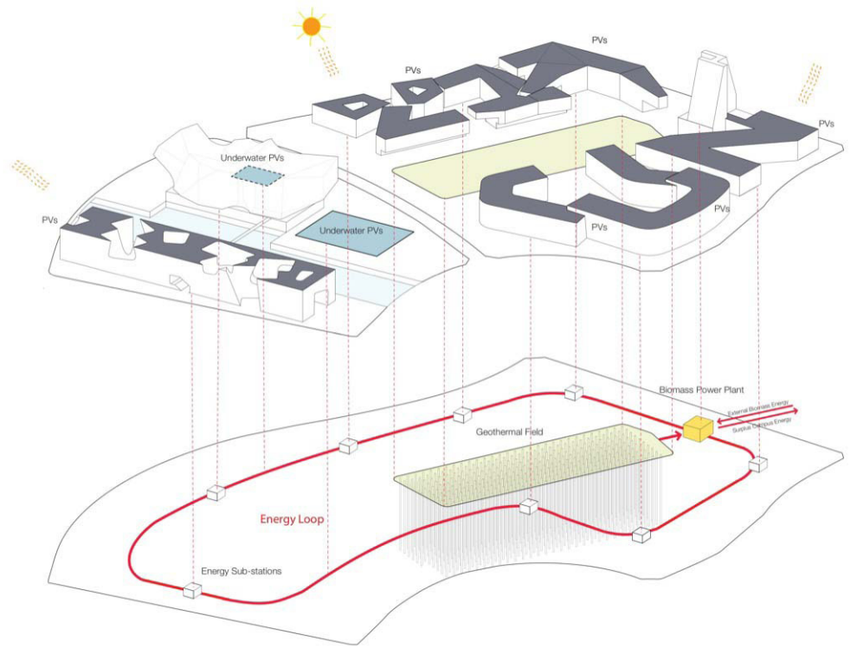
hierarchy - figure 24



additive/subtractive - figure 25

requirements of a theatre and creates the appropriate atmosphere of a theatre, but may not allow for visual access into the space from outside. This limits the potential visual access required by some users.

I am considering, what has more importance, visual access or architectural atmosphere? Is there a common ground?



geothermal field - figure 26

steven holl (architect), 2010. image from: http://ad009cdnb.archdaily.net/wp-content/uploads/2011/01/1295878694-0001hh.jpeg

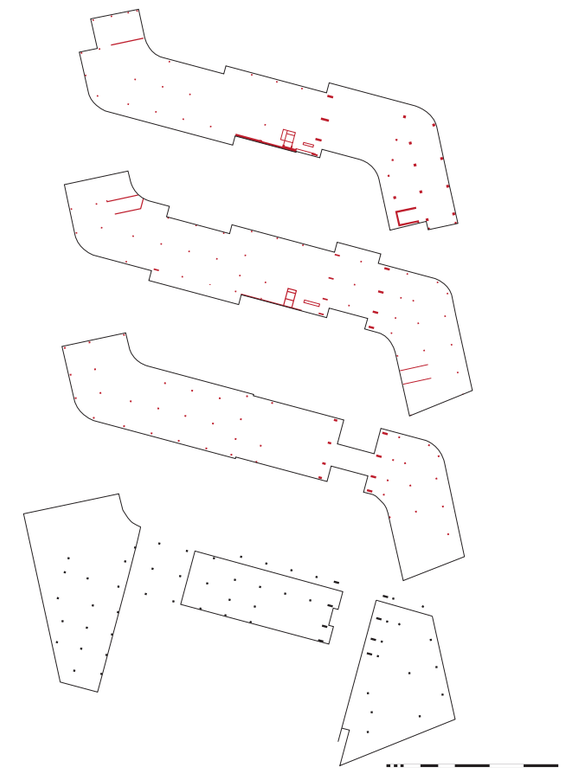
E.G. School : figure 27

When the client Absolute Return for Kids selected Zaha Hadid as the architect for their charter school in Brixton, London she knew she had to create a different kind of school. The 115,700 sqft school is four schools within one, weaving together two middles schools and two high schools while also integrating a library, sports hall, student garden, and dance studio into this neighborhood scales facility. (ArchDaily, 2010)

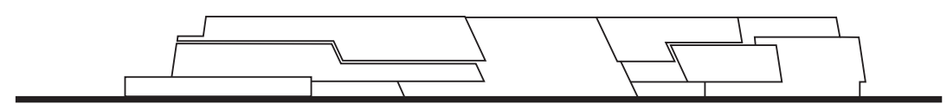
E.G. student entrance : figure 28

hayes (photographer), nd. images from: http://www.archdaily.com/95234/evelyn-grace-academy-zaha-hadid-architects/

The client, Absolute Return for Kids, requested a secondary charter school for under privileged students in South London. The area is known for its high rate of gang related crime and low levels of educated students. The school is designed to support its surrounding community by admitting special needs and emotionally or behaviorally challenged students. (Turner, 2012) The school is designed to reduce bullying and encourage learning. Each classroom and corridor is naturally lit, eliminating dark hidden areas where crime can occur. (Turner, 2012) The four story school is carefully stitched into the community and its site, not looming over the neighborhood as many schools do. To achieve this, Hadid integrated the lower level into the ground making the facility feel smaller, while still supporting the functions of four schools. (Turner, 2012)



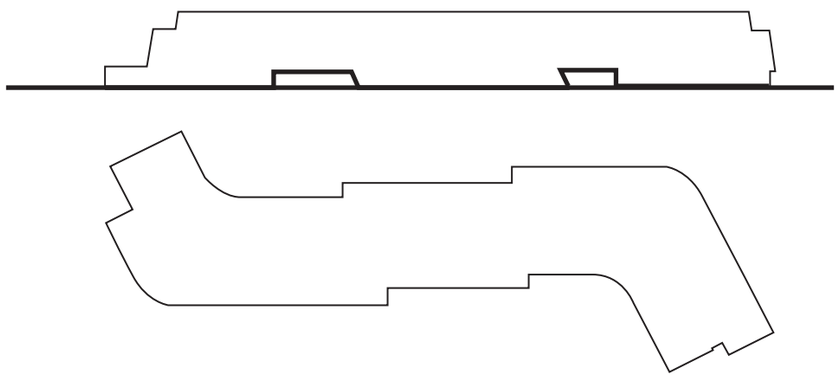
structure : figure 29



geometry : figure 30

Her work on the Grace Evelyn school is very similar to her work on the London Aquatic Center in regards to her separation of space. In both the Aquatic Center and the Grace Evelyn school she employs the use of visual separation to delineate one space and function from another. In both cases she uses height and volume as separating factors. In the Aquatic Center, the volume of the main pool varies by use, visually separating the warm up areas from the diving pool, from the competition racing pool. In the Grace Evelyn School, she employs the same use of volume and height to separate passageways from breakout spaces and classrooms from common areas. At the point where these areas converge, Hadid has developed shared, multifunctional, non-specific, teaching areas.

The School has a very different structural system in comparison to both the Quadrangle by Holl and the Aquatic Center by Hadid. The Aquatic Center utilizes a super frame structural roof, pinned at three points with minimal interior columns while the Grace Evelyn School utilizes a gridded structural system to form interior spaces and classrooms.



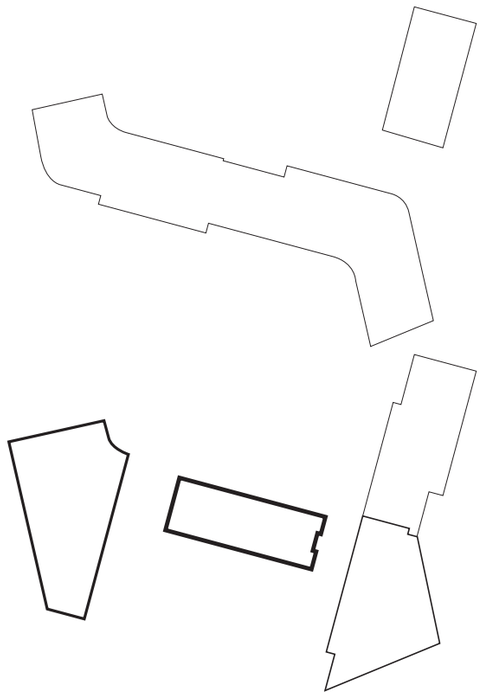
plan to section : figure 31

mass : figure 32

One can gather, the facility is supporting a re-growth of the community and encouraging local change. The facility is providing residence of the low income neighborhood an opportunity to give their children a safe and valuable education.

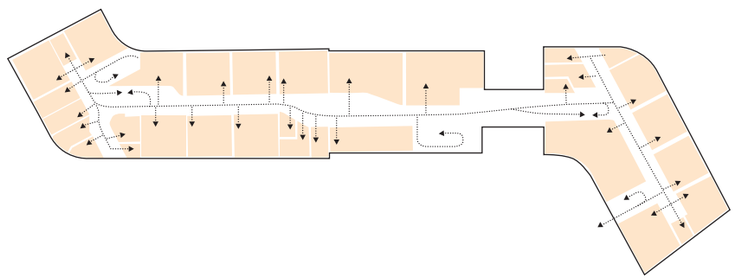
My understanding, after reviewing her work, leads me to believe light and connections were driving influences in her design. Light can be an element of comfort that may create a feeling of security and safety. The region where the project is designed for is rough and full of crime. Bringing light into all spaces and connecting students in large collaborative areas appears to have high importance when reviewing the work.

Similar to the first case by Hadid,

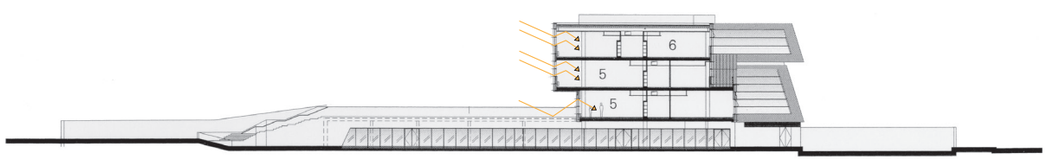


hierarchy : figure 33

I feel this case support my theoretical premise/unifying idea through its use of large on grade terraces, and large corridors with maximum light access. All design decision may not have been made in consideration of deaf students or persons in wheel chairs, but the design provides easy access for both. While providing for these needs, the large volume spaces and extra wide corridors benefit the other students by providing breakout and common areas where chance interactions occur, a win-win for all users.



circulation to space : figure 34



natural light : figure 35

zaha hadid (architect), 2010. section (architectural drawing), from: GAdocument 115 p. 54

summary

This brief series of case studies lightly touches on all three typologies of interests this thesis will attempt to acknowledge; auditoriums, schools, and theatres. This series is only snapshots compiled for their individual characteristics. Like a person sitting at their kitchen table designing their dream home by clipping images of bathrooms, bedrooms, and living rooms out of a design magazine these case studies are my clippings of desirable architectural spaces that are worth of consideration with regard to my theoretical premise/unifying idea.

From each study I have clipped my preferred elements, individually these elements are not strong enough to form the architecture I envision for the Deaf. However, through thorough understanding of the individual concepts and combination and collaboration of them together strengthens the idea that all users deserve the same architectural experiences regardless of their physical ability. The elements when brought together create a design base for this vision.

First was a look at the 2012 Olympic Aquatic Center, designed by Zaha Hadid, featuring stunning organic forms and large barrier free interior spaces. providing all users with the same architectural experience requires eliminating the physical barriers we can control through design. The large facades of glazing employed in this design allow for maximum natural light infiltration that fills the space contained under a single roof element. These two simple elements provide more equal visual access for all users and more equal mobile access to all users regardless of ability.

The Performing Art Center, designed by Steven Holl, appeared to illustrate some of the same concepts as the organically shaped Olympic arena. The main core of the Performance Center utilizes large open volumes from ground to ceiling, creating negative space between forms containing the performance halls. However, the space does not provide equal architectural experiences as it promotes the use of escalators and stepped paths to traverse long distance from level to level. In this case, the open space may provide visual access but the design limits mobility and creates visual noise.

My final study looked at organization and the creation of spaces through intersection. Different than both previous studies, the Evelyn Grace Academy designed by Zaha Hadid explores how to create a feeling of security and comfort through the use of light and common space. By creating large volume corridors and intentional intersections of those corridors, Hadid brought light into the smallest of spaces while also creating natural feeling breakout spaces.

Each study has its own driving concept. The Olympic Aquatic Center emphasizes organic forms, where the Performing Arts Center emphasizes an additive and subtractive design method,

and still yet the Evelyn Grace Academy expressed collaborative space design. All three elements support this thesis theoretical premise/unifying idea not because of what they are but by how they can be used.

Natural forms can create spatial relationships that allow for better communication access by creating a hierarchical focus towards the center of a facility or room. Additive and subtractive elements can allow natural light to penetrate further into the facility where a solid design would not have allowed. Large open spaces developed by both these elements can provide all users with more universal access while promoting the needs of the deaf community.

The collaborative approach to design utilized by the Evelyn Grace Academy informs me of how functional relationships can be shared or achieved between spaces without the explicit designed barrier to define the space. Approaches to design like this will positively influence my thesis.

Site selection and analysis can drive the development of the design. All three studies respond to their location, environment and culture in different ways. Collectively they all respond to their site by integrating the site into the final function of the facility. Through this integration, barrier free access and on grade entrances become readily available. This integration also encourages user interaction with the grounds of the facility. Analyzing and understanding these studies in their entirety will prepare me to develop a solution more comprehensive and complete.

historical context

The history of designing schools for the deaf is not a new idea. Throughout history nearly every state has established a state run program for educating Deaf students. Along with their state programs, each state constructed schools for the deaf in remote locations where parents simply sent their deaf children to become educated.

A school for the deaf 100 or 150 years ago was designed for sighted, hearing, abled people in a similar method that other mainstream schools were designed. The prescriptive nature of these schools made them block like in plan and often had no design considerations to help facilitate the cultural and communication needs of the deaf.

At that time in history, it was common to send a child away to an institution if the main public school could not educate them, sometimes for the rest of their childhood. It was not until the 20th and 21st centuries that true DeafSpace design practices began to develop, the same practices that I will use to inform my design decision for this thesis.

Gallaudet University has been the leader in design community, developing their institution to meet the needs of the deaf culture and their communication requirements. Throughout American history, as early as 1856, legislation has encouraged the development of better facilities for the deaf. Many of these design improvements have occurred at Gallaudet University in Washington, DC. Present DeafSpace design was developed by this University and as it considers the user's needs as well as their culture. DeafSpace design develops ways to make communication and way finding easier. Through this process we attempt to enhance the lives of deaf users instead of prescribing mainstream design elements onto them, which may not be easily adaptable for their use.

Since the 1990s when the ADA laws were established, more deaf persons are now obtaining jobs in mainstream careers, while Deaf students are also continuing to become educated at a higher level. While social progress is occurring, many schools for the deaf have not changed remaining as they were 100 or 150 years ago. In the early 2000s many project

types at different locations around the United States were developed specifically for the Deaf. A few of these facilities include:

- Phoenix Day School for the Deaf, Phoenix AZ, DLR Group
- Sorenson Language Communication Center, Washington DC, SmithGroup
- Living Learning Residential Housing Six, Washington DC, LTL Architects

These architects designed for, to the best of their understanding at time, the communication needs of the deaf. They included the best way finding techniques and the best type of light and color for clear signing. They also created spaces with visually unobstructed access through multiple consecutive spaces.

Recently at Gallaudet University two project have been produced using very specific and modern DeafSpace guidelines. The first project, listed about, Sorenson Language Communication Center was the university's first attempt to change how all spaces on campus would be designed for their students needs. Learning from their mistakes and unforeseen problems caused from their first attempt, new guidelines were created or revised. In 2012 the University completed construction on a student residence hall, listed above. The Living Learning Residential Housing Six is now operable and research is being performed to understand the areas of success and failure in their design. This research will help develop and improve their guidelines. My project will respond to the same design challenges both these facilities are facing. I will attempt to connect the user and their culture to the architecture.

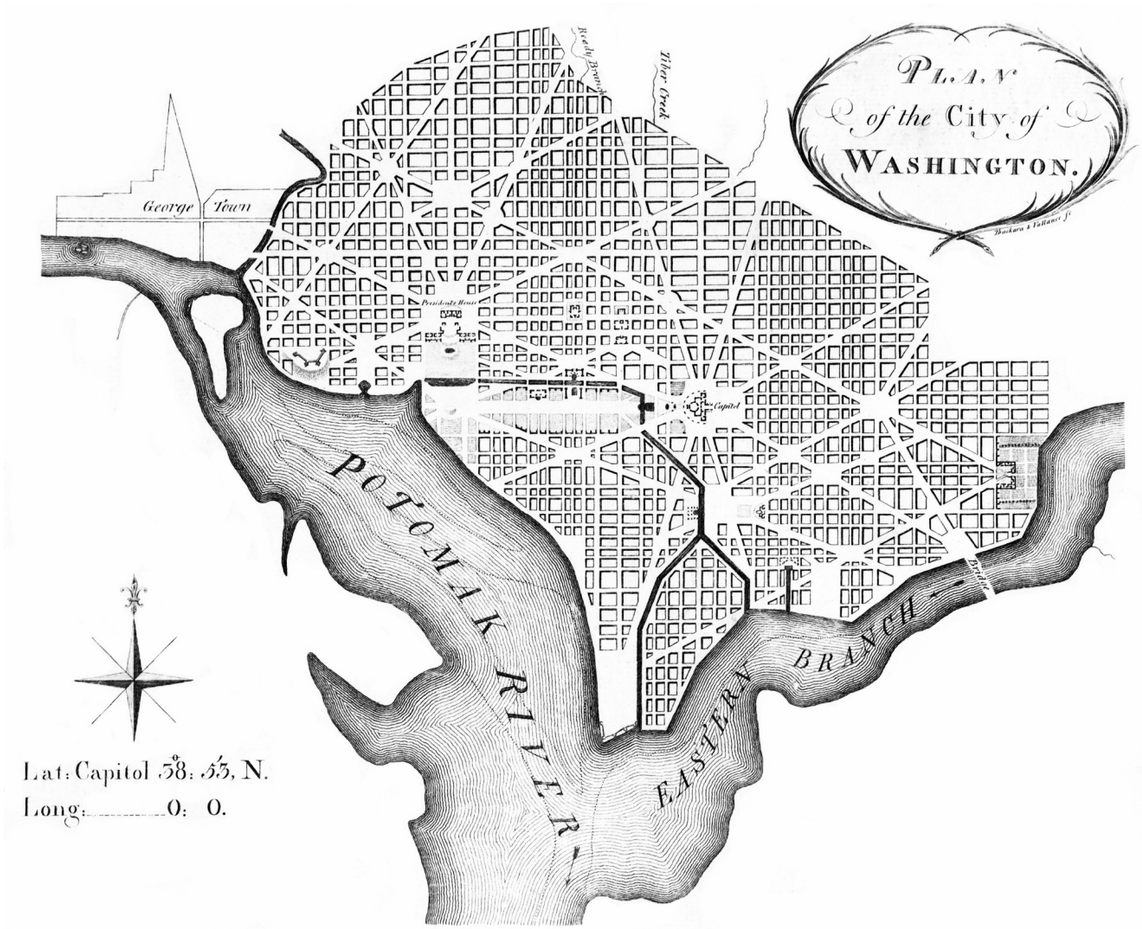
Washington, District of Columbia is located on the North bank of the Potomac River between Maryland and Virginia. (History, nd) The diamond shaped city is the Capitol of the United States laying about 90 miles inland from

the Atlantic Ocean. (Smithsonian.com, 2007) The location of the District was selected by George Washington as a compromise between the North States and the South States. (Smithsonian.com, 2007)

The District is named after President George Washington and world explorer Christopher Columbus. (Smithsonian.com, 2007) At the present time, the District is not a state nor is it under the control of any state. The District is a federal district established by the Constitution to hold the seat of Government established in the year 1791. (Smithsonian.com, 2007)

The city was laid out and designed by Frenchman Pierre Charles L'Enfant. His inspiration for the cities large boulevards, and grand scale comes from his home city of Paris. Benjamin Banneker, an African-American mathematician, assisted in the surveying of the city. (Smithsonian.com, 2007)

In 1800 the government took its seat in the city, at that time there were a total of 18 employees. (Smithsonian.com, 2007) Twelve years later, the city came under attack by the British. The city was burned including the White



washington dc map: figure 36

figure 10: l'enfante plan: image retreived from Library of Congress http://hdl.loc.gov/loc.gmd/g3850.ct000509

House and the Nations Capitol.

Today the city is approximately 68 square miles, split into four quadrants and eight wards. The population has grown ever since it was established as the government has grown with every war or conflict domestically and abroad. Today the population of the city is about 618,000 people (city-data, nd)and the metro area has an approximate population of 5.8 million people. (CRA, 2011)
The city is self-governed with elected officials from the public, however Constitutional restriction prevent the city from becoming a state. This restriction on the city does not give the people of the District voting power in the Congress.

City Data:

Airports-
BWI - 45 Minutes from the City
DCA- 15 Minutes from the City
IAD- 60 Minutes from the City

Education-
65 Elementary Schools
14 Middle Schools
18 High Schools
17 Universities
(DC Public Schools, 2012)

Average Income-
$59,290

Average Rent-
$1,059/mth

Average House-
$443,000

Median Age-
33.8 years
(city-data, nd)

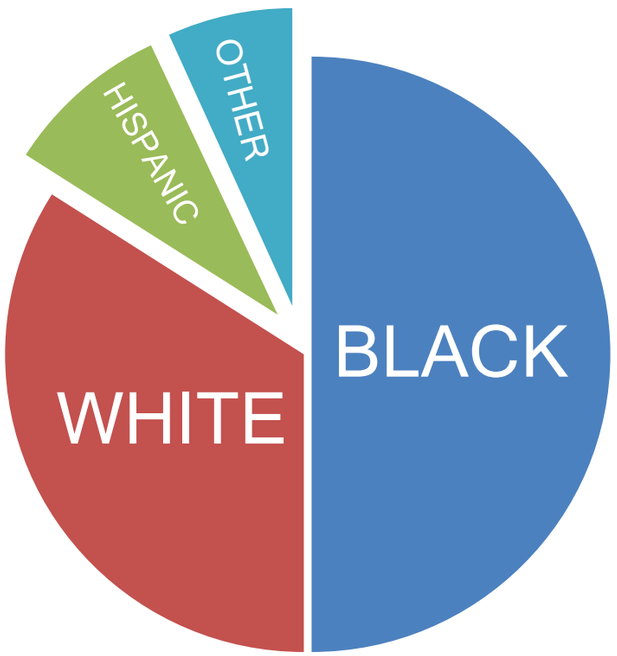


figure 37: city demographics (city-data, nd)

project goals

This thesis is my personal discovery and development of myself through the experience of an architectural education. I believe education is a means to help one develop some of the necessities needed to survive in our world today. My research and investigation efforts put into this thesis are meant to help myself and others gain valuable knowledge that my help us solve problems in the future. How we will grow from this study is unknown, but these are my goals for this thesis.

Architecture for the Deaf, my thesis, is more than a document to fulfill my requirements for graduation from North Dakota State University; this document is a culmination of years and years of dreaming about becoming an architect. The countless hours spent designing my dream home out of Legos, or searching for that perfect condo in the big city, or attempting my hand at landscaping and interior design at my parents home as child lead me to my education in architecture.

I knew my path to success was through an academic experience, an experience that would allow me to discover my passions and make dreams reality. The draw of the big city, the enjoyment I get from art, from creative thinking and my desire to help others who are in need are all reasons why a degree in architecture is my calling. My passion for design has grown with every project, eventually helping me discover architecture is a medium I can use to help others. I want to use this experience to continue to grow and appreciate design on a deeper level.

I see and understand how subtle design choices can change the quality of life for someone. Even if it is only one person, then it is a success to be proud of.

academic

Academically, I want to achieve my Masters of Architecture because I believe education is a foundation and no one can take away your experiences and knowledge.

professional

I intend on moving to a large metro area where I can work at a multifocal firm. I want to complete my IDP requirements and become a licensed architect in an efficient manner.

Eventually, I would like to own an architecture firm that is self-sustaining with revenue coming from design and property development. Owning a firm that is both the client, architect, and developer is the ultimate goal. Someday I desire to teach and pass my knowledge

and experiences onto the next generation of architects. To share my knowledge and inspire others to grow would be a satisfying experience.

I want this thesis to be successful, something I can share, look back to and be proud of. This thesis is as much for me as it is for my family. I intend to be as thorough and complete as possible, knowing I can not include everything but I hope I will at least inspire a dialogue.

I have the ability to use architecture to change lives, to move our world into a more barrier-free environment. I want to design for those who are in need, understand their requirements and bring joy into their life. I do not want to do this for fame and praise but because I just want to help.
Where will this take me, how will me design approach help others? What will I bring to your life? Right now, I can only dream what those might be.

personal

Finally, thank you to my entire family who has funded and supported my every adventure through school. The greatest opportunity you have all provided me with is this, the opportunity to earn a graduate degree, to better myself and my future. None of this would have been as manageable or possible without your love and support. This is for you!

I love you and Thank You!

site analysis

cherry blossom: figure 38

A warm spring morning starts with the hot sun rising in the east over the Nation's Capitol as a thick white fog rolls off the Basin and across the site, obscuring the sun and slowing traffic. Softly, in the American Sycamore trees song birds sing as a light breeze blows through the rustling leaves from the south west. The constant buzz of cars and busses fills the air with the occasional piercing siren of a Capitol Police car. As the sun rises the warmth burns away the fog. The air becomes humid and the morning breeze slowly calms. The scent of the Japanese Cherry Blossom's fill the air as locals and tourist from around the world flock to the Basin to capture a glimpse of Martin Luther King Jr. gazing across the water, surrounded by a silken sea of

district of columbia: figure 39

pink flowers. By mid-afternoon a group of students stand on the site taking picture with the Washington Monument as their background. Evening begins to fall and the sky melds into a soft pink and purple mural as the sun sets behind the Lincoln Memorial, shimmering off the Reflecting Pool. As night falls, the city comes to life as the monuments light up bright white against the night sky. The silence of night settles onto the site as the occasional homeless sets up home under the pine trees. Another day in Washington DC.

victoria (photographer), 2012. images from: http://victoriadevine.files.wordpress.com/2012/03/588.jpg

tyler specht (photographer), 2012.

site image 1: figure 40

site image 2: figure 41

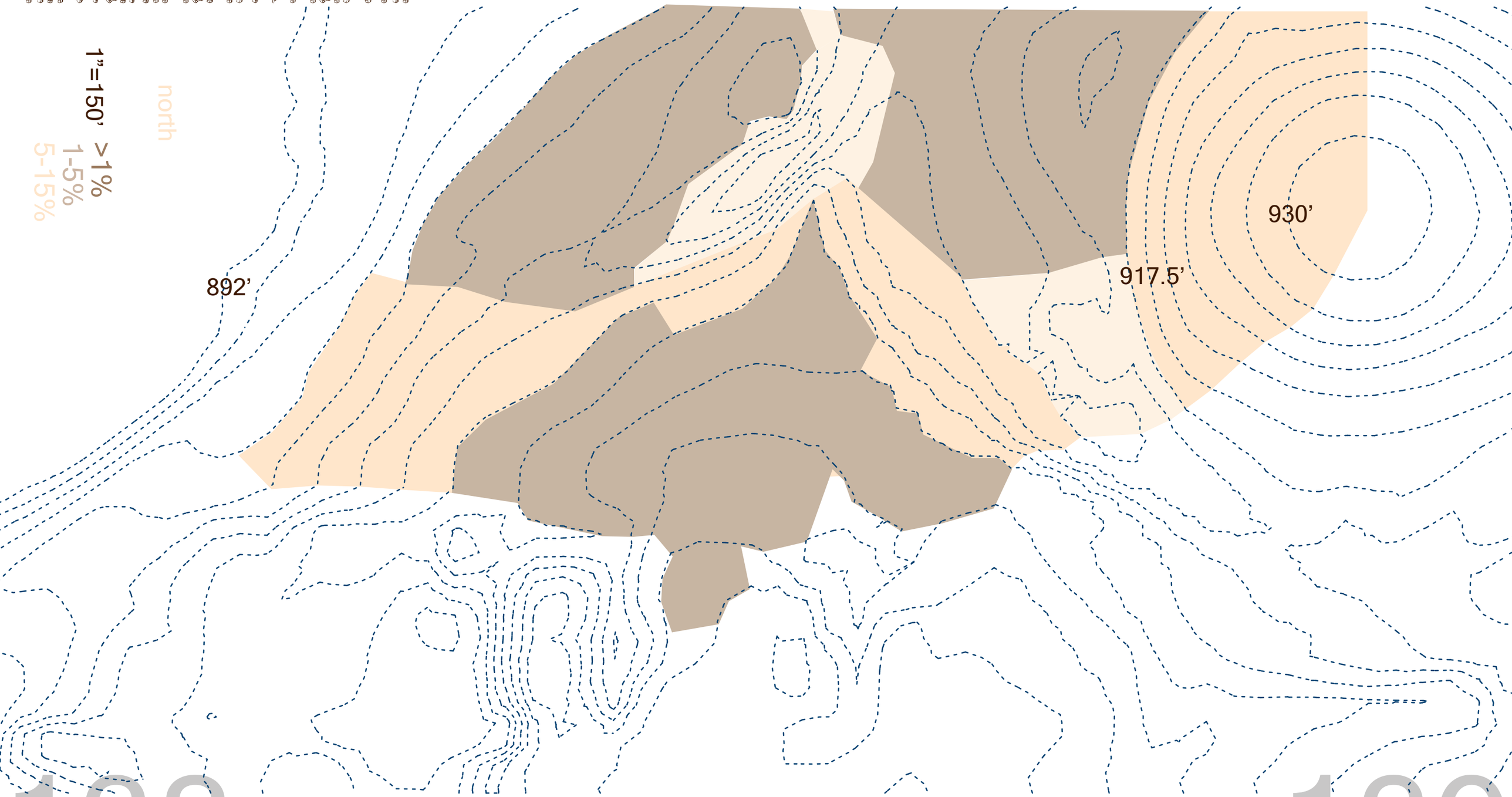
To begin describing the site it is important to understand it is a relatively flat, maintained grass area with a fairly steep incline on the west corner. Backed up to 15th Street SW, the site is bound by the Bureau of Engraving and the Holocaust Museum on the East side. The Holocaust Museum is a large brick and mortar building with an suburban feel, the architecture resembles that of the time in Germany during World War II. The Holocaust Museum is built up to the property line of the Bureau of Engraving and Printing. In similar style to other government offices and facilities in the District, the Bureau resembles classic Greek order and proportions. On the physical site there is no construction or built facilities. The boundaries of the site are determined by three main thoroughfares, Maine Avenue, Independence Avenue and 15th Street.

Visible from the site are the Washington Monument and the Jefferson Memorial, as well as the Tidal Basin and the Japanese Cherry trees. Light access to the site is not obstructed by any built forms. Direct sunlight can be achieve

tyler specht (photographer), 2012.

tyler specht (photographer), 2012.

site contours and slope analysis

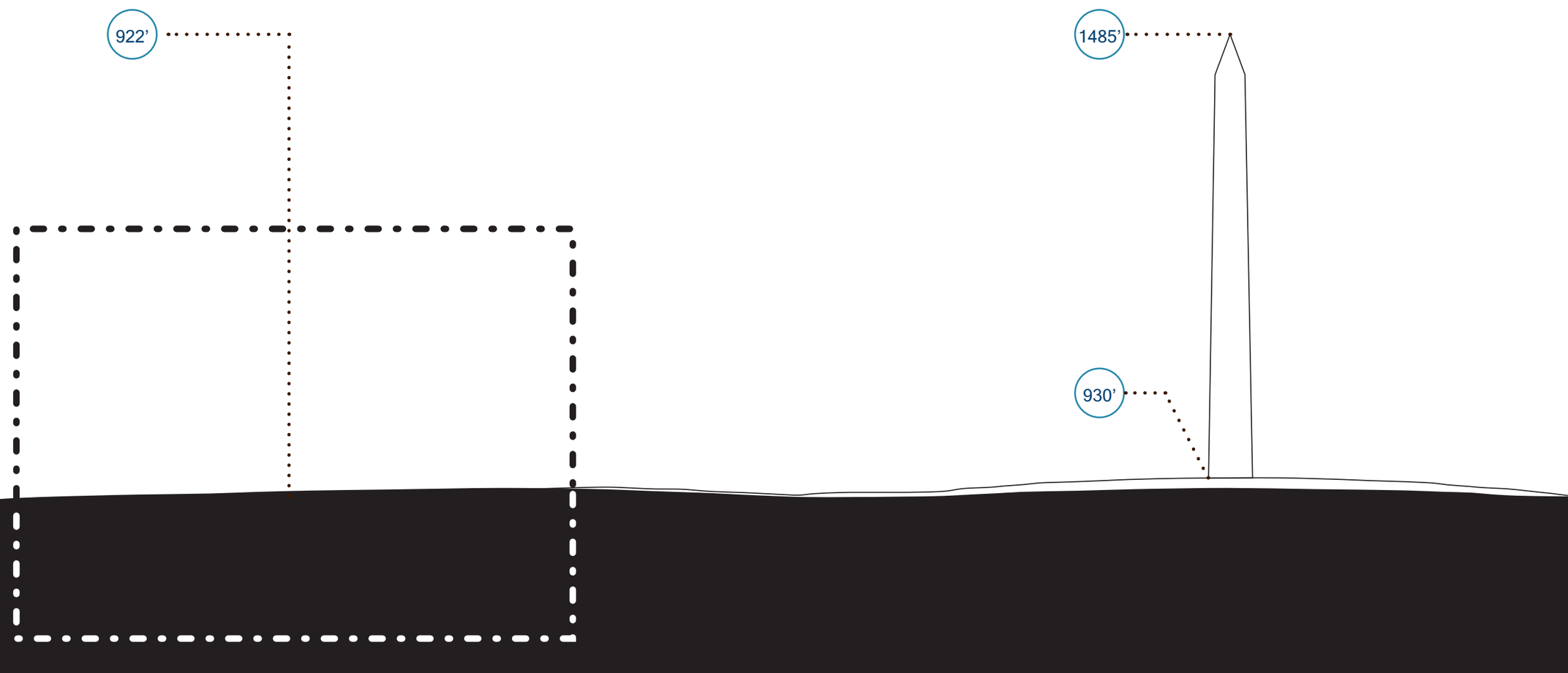


specht, t. 2012 date from: date retreived from Google Earth

at all times of the day, shadowed only by vegetation on the site. From my multiple visits in January, March, June, August, and December I did not recognize any signs of standing water or the possibility of running water through the site. However, the summer of 2012 was uncharacteristically dry for the Nation and the District. The only observation of standing water was during the hours that followed a heavy rainfall, presumably because of the severely dry grounds.

Located just north of the Tidal Basin, a constant, cool breeze flows across the site from the southwest to the northeast. Tree lines of Japanese Cherry, American Sycamore, American Sweetgum, and Saucer Magnolia located along the south and west edges shelter the site from strong winds. There is viable ground distress and pedestrian traffic wear crossing through the site. The site does show marking of a seasonal football or soccer field as well. The area is very dry, most grass appears to be sun burnt while woody vegetation appears to be healthy and helps shade some areas. There are no dead or dying trees on the site and no signs of erosion or fracturing soils.

After reviewing the United State's Department of Agriculture's soil survey, it is understood that this part of Washington D.C. is composed of Udorthent soils. Udorthent soils do not have an agricultural classification nor do they have any

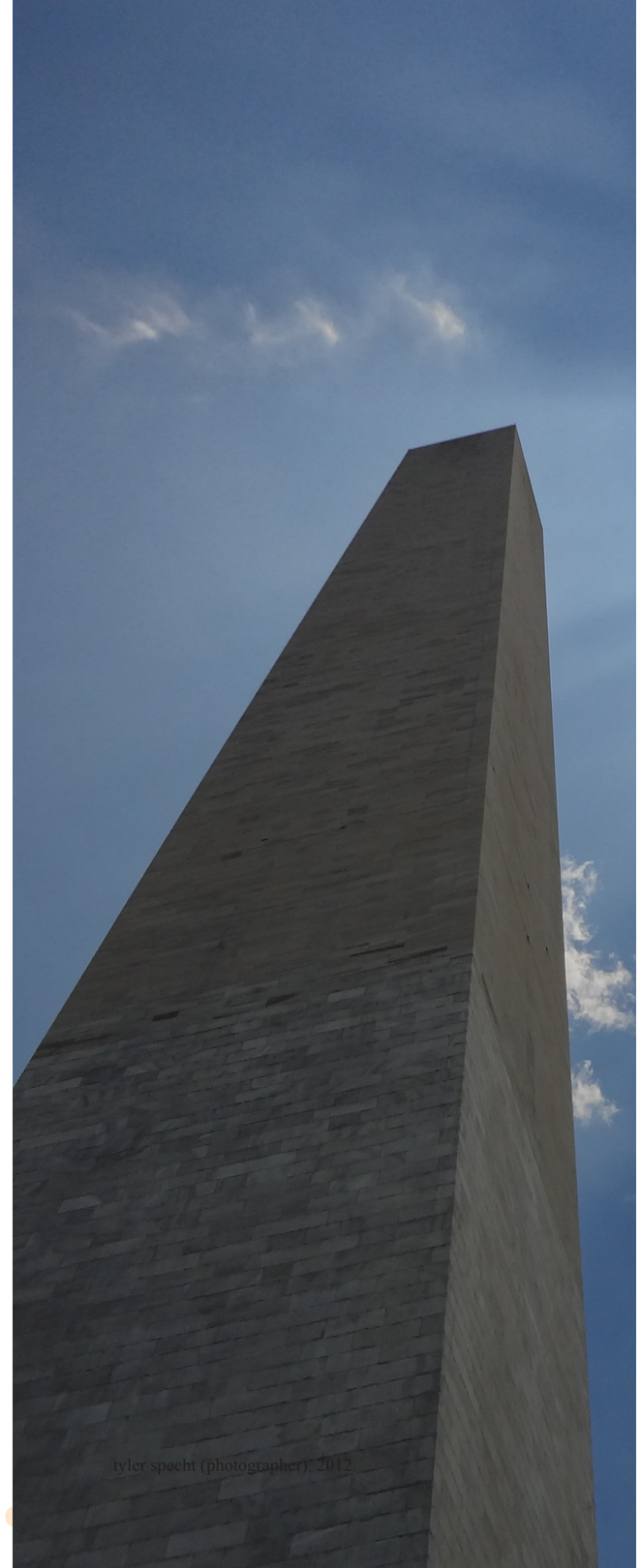


engineering classifications. In general, it is understood that Udorthent soils are formed by placing organic and inorganic fill onto uplands, terraces or flood plains to create new land forms suitable for construction. (United States Department of Agriculture, 1976)

In the case of this site, and all of the National mall and White House Grounds, the fill came from the Potomac River bed through dredgging of the river. The fill make up is uncertain but could contain up to 80% soils and 20% human made waste like bricks, cinder blocks, wires, pipes, metals and other waste construction materials. Sites that contain larger amount of human made waste are subject to subsidence as the soils compact and degrade. (United States Department of Agriculture, 1976)

The only visible utilities at the site are street lights and traffic lights. The triangular site is bordered by Maine Avenue South West, Independence Avenue South West, and 15th Street South West. Both Maine Avenue and Independence Avenue are one-way

tyler specht (photographer), 2012.

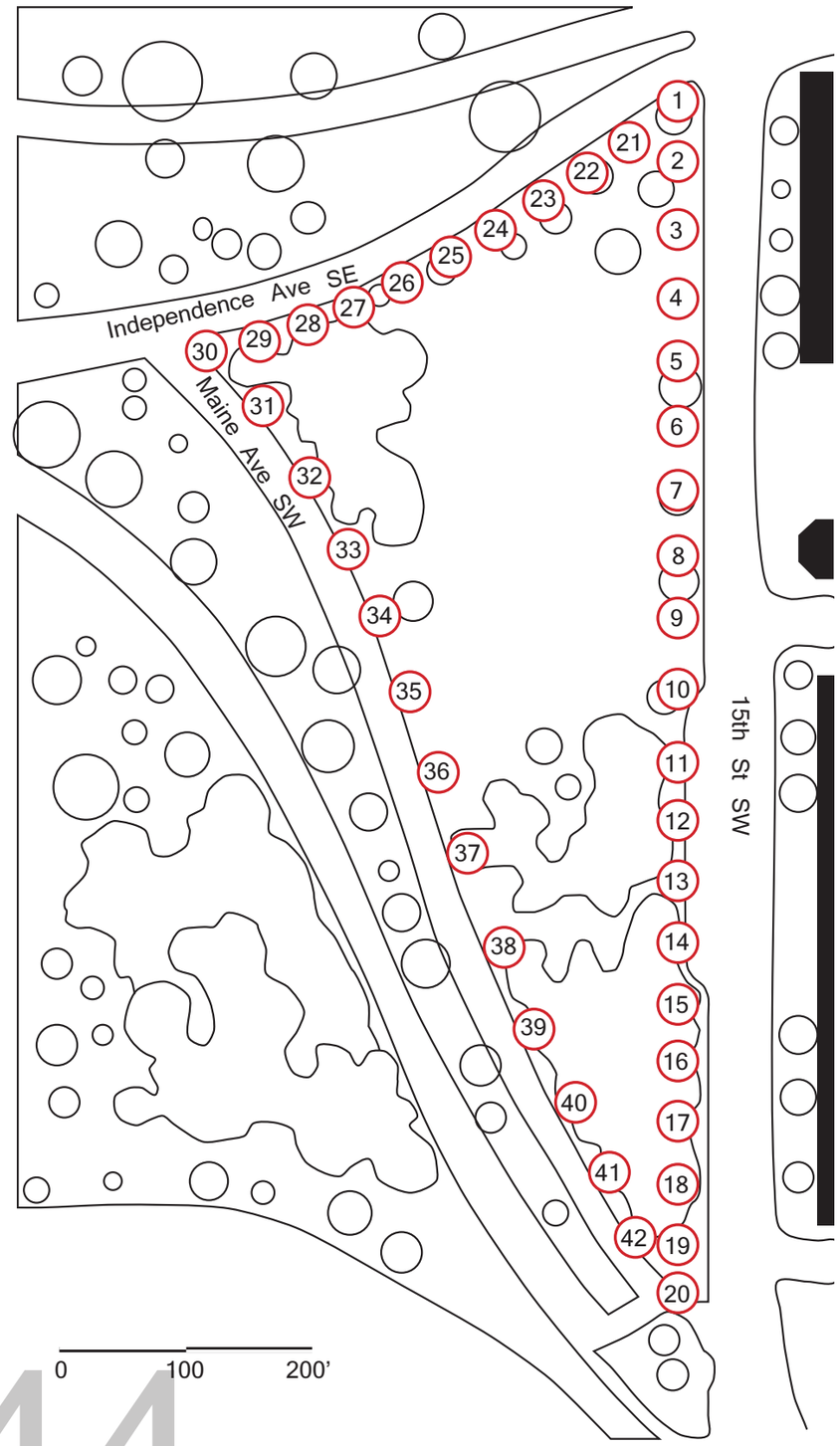


tyler specht (photographer), 2012.

streets.

Independence is a three lane street entering the downtown with an average traffic volume of approximately twenty-thousand cars daily. Main Avenue is a two lane street leaving the city with an average volume of thirty-thousand cars daily. 15th Street is a four lane, two-way street with approximately twelve-thousand cars a day. (DC DOT, 2010) Pedestrian traffic is fairly constant through and around the site. Less than three block away is the nearest Metro Rail station and at the southeast corner of the site is a Metro Bus stop. Both locations are the nearest stops within walking distance of the Tidal Basin.

The topography of this site ranges from less than 2% slope to no more than 8% slope. some exceptions apply, specifically at the west end of the site where Independence Avenue bridges over Main Avenue. The civil engineering of the topography at that location is the steepest and not suitable for development.



north east south west

tyler specht (photographer), 2012.

north east south west

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tyler specht (photographer), 2012.

north east south west

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tyler specht (photographer), 2012.

north east south west

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tyler specht (photographer), 2012.

north east south west

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tyler specht (photographer), 2012.

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tyler specht (photographer), 2012.

north east south west

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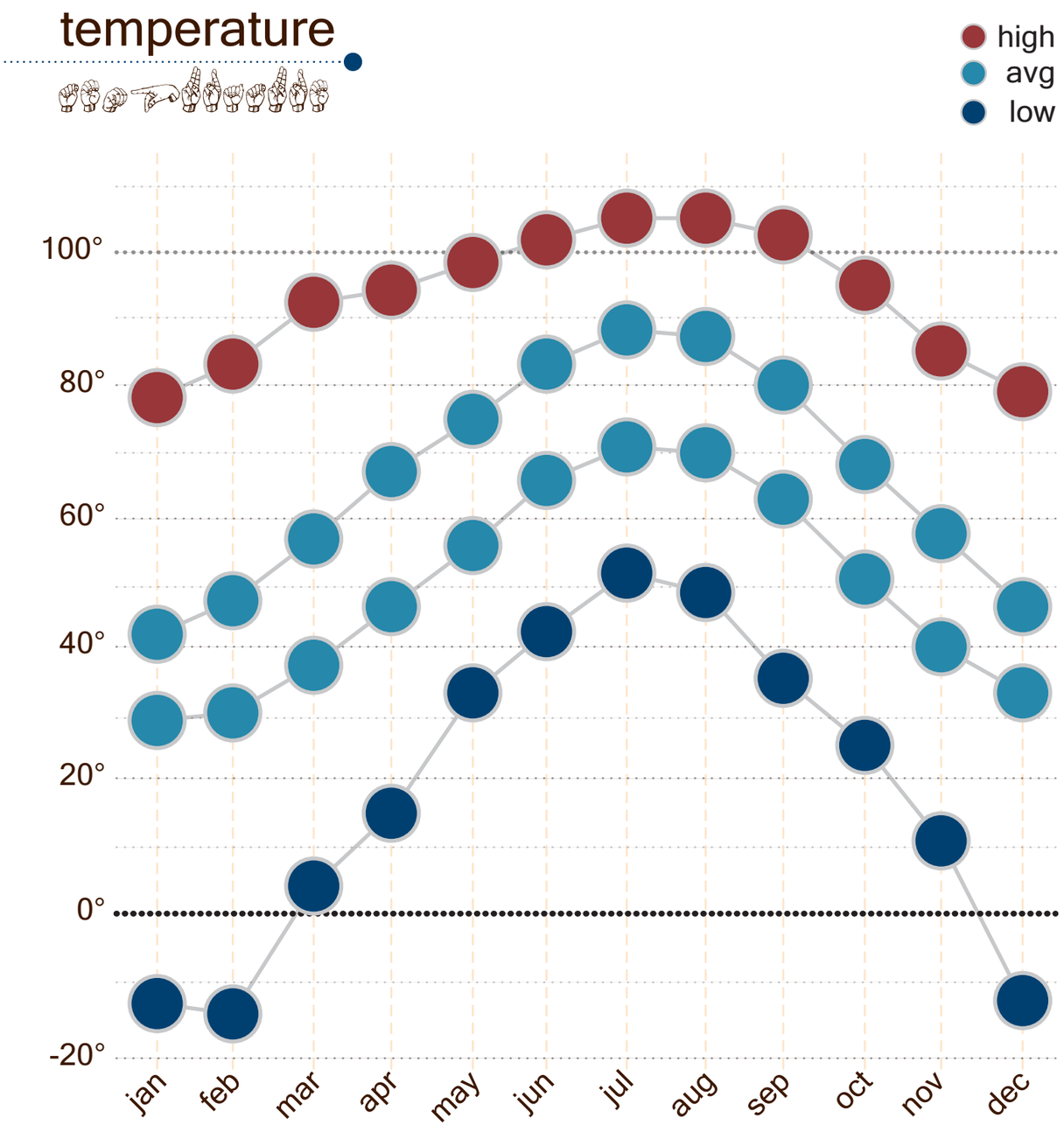
tyler specht (photographer), 2012.

temperature



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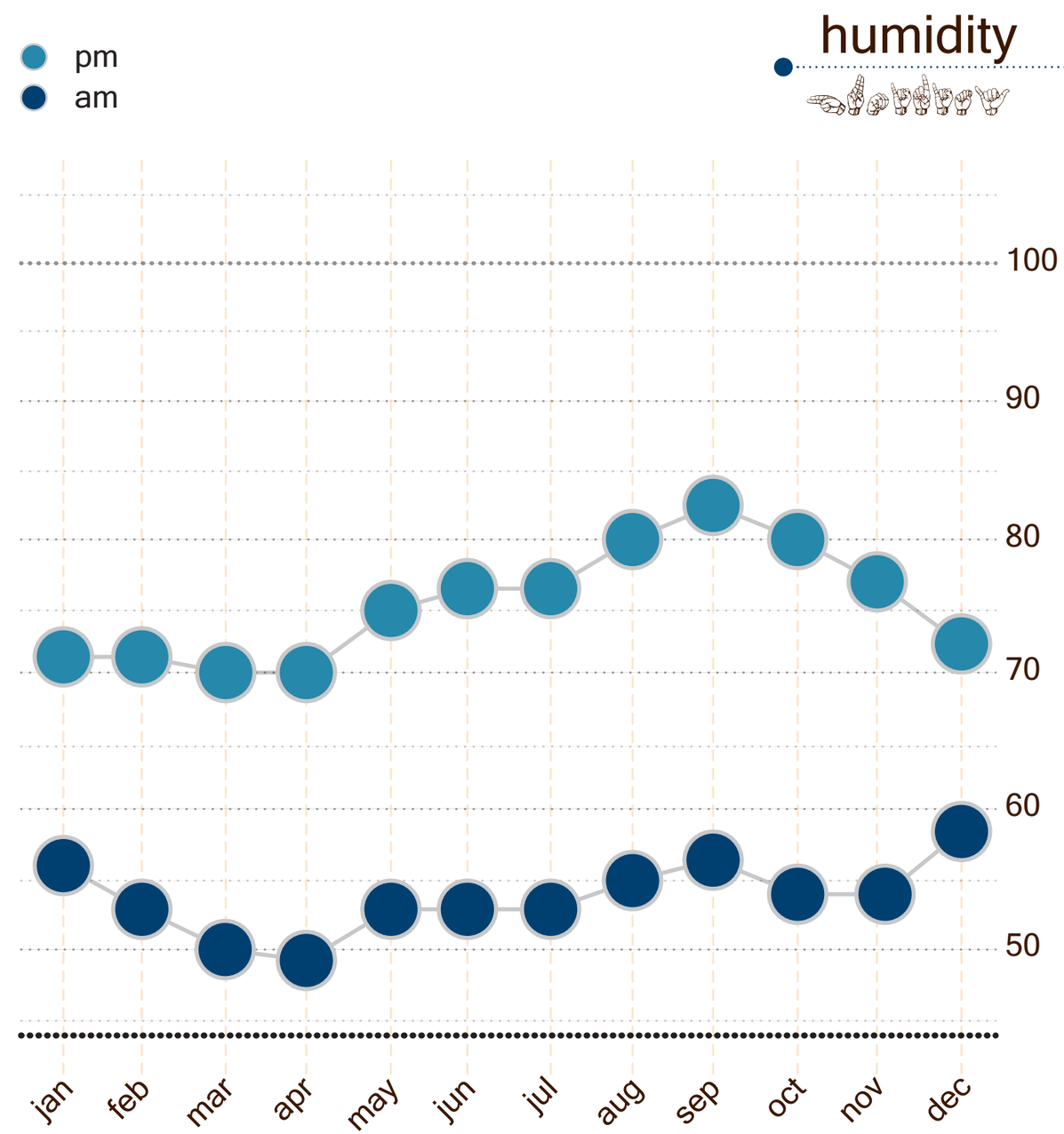
humidity



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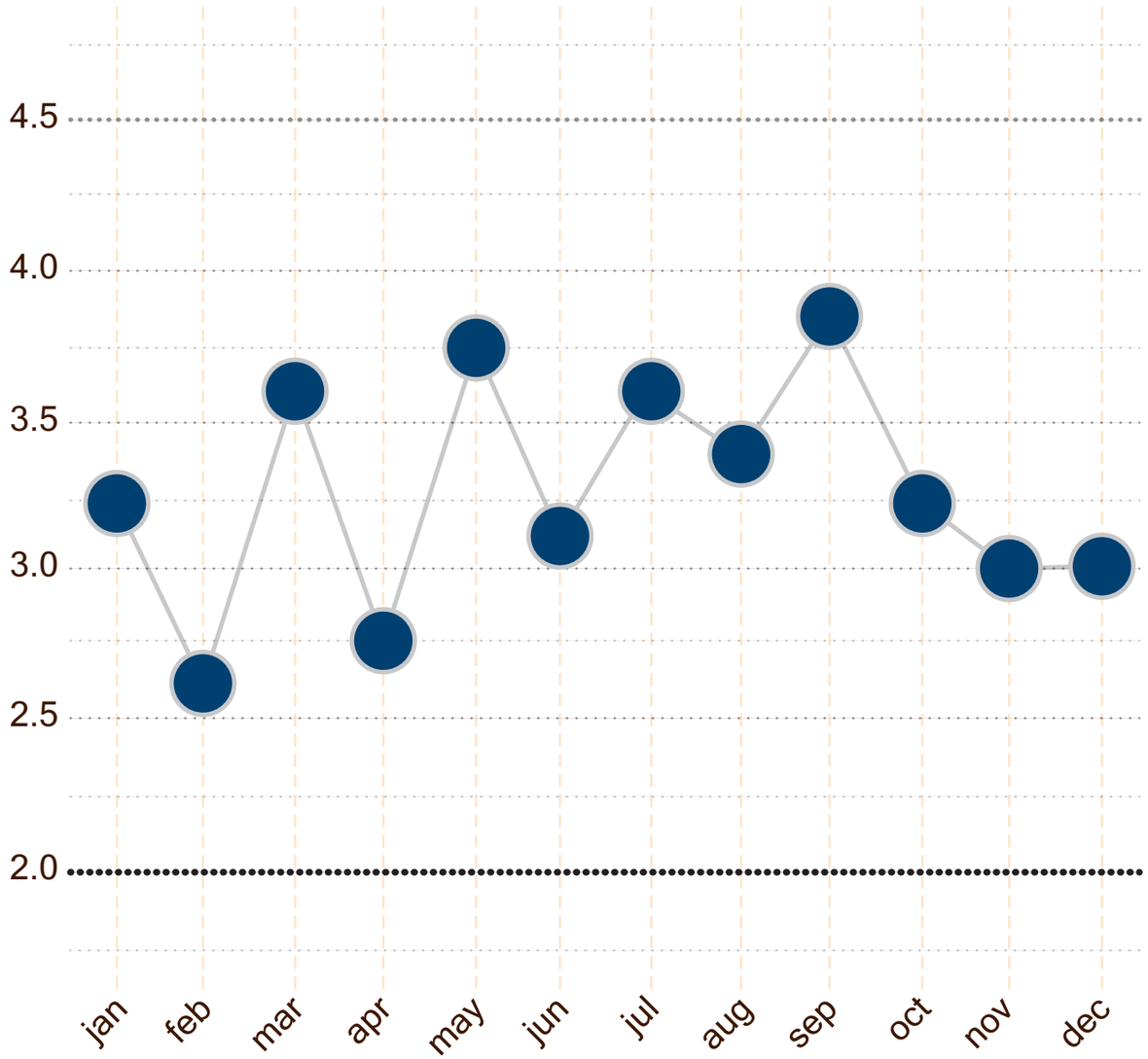
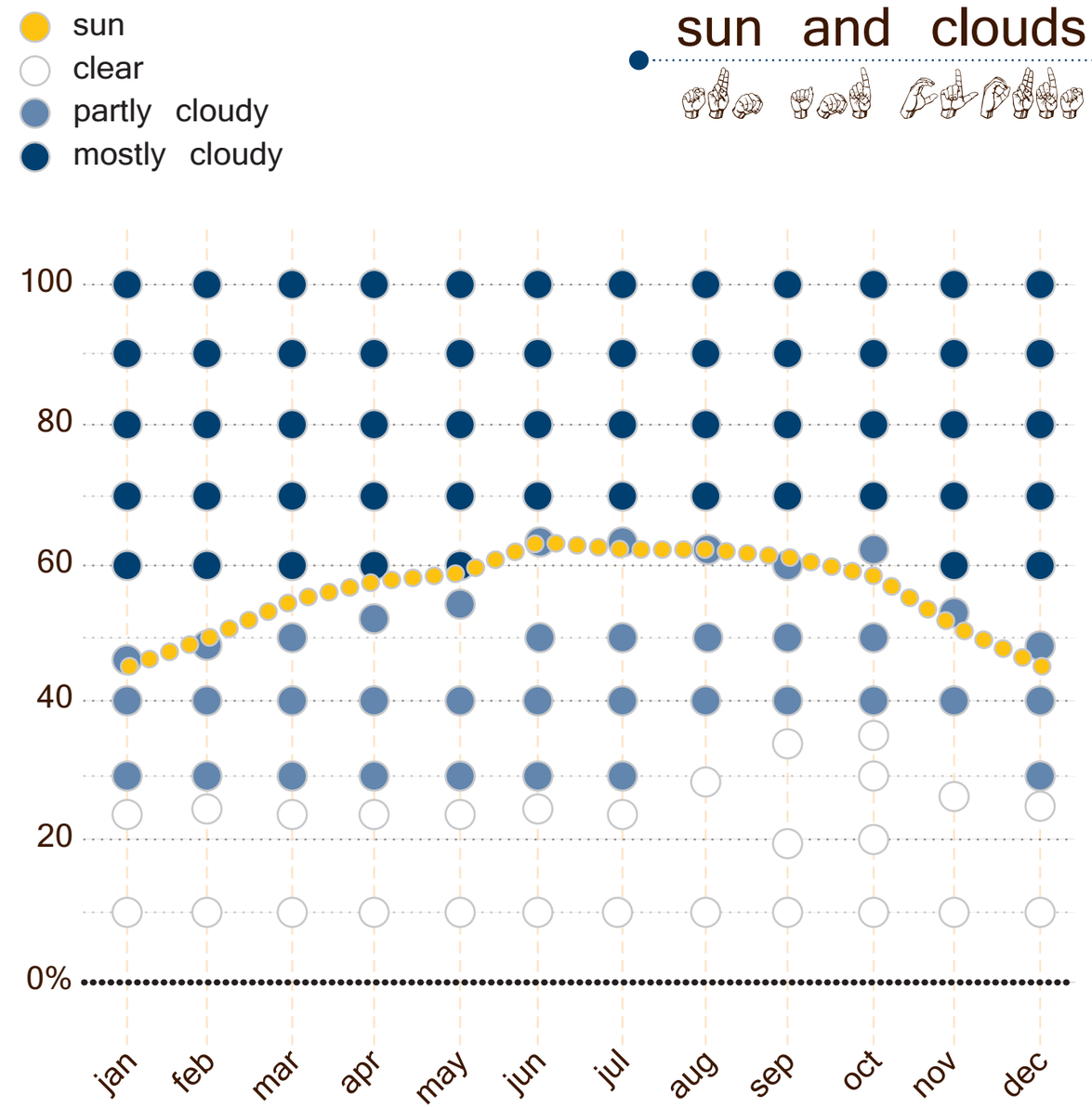


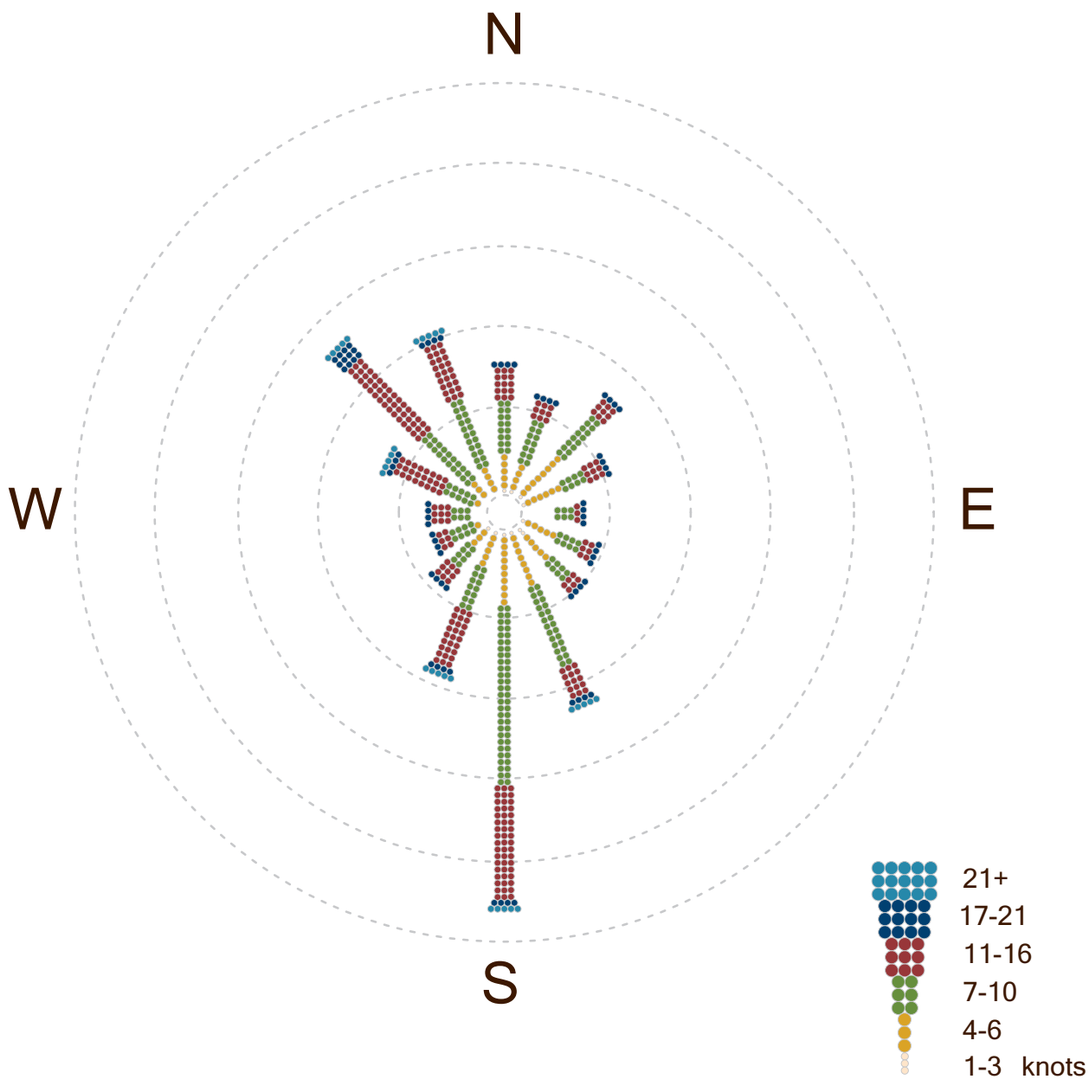
specht, t. 2012 date from: http://www.ncdc.noaa.gov/oa/climate/online/ccd/nrmlprcp.html

sun and clouds



specht, t. 2012 date from: http://www.ncdc.noaa.gov/oa/climate/online/ccd/avgsun.html
http://www.ncdc.noaa.gov/oa/climate/online/ccd/cldy.html

wind speed and direction



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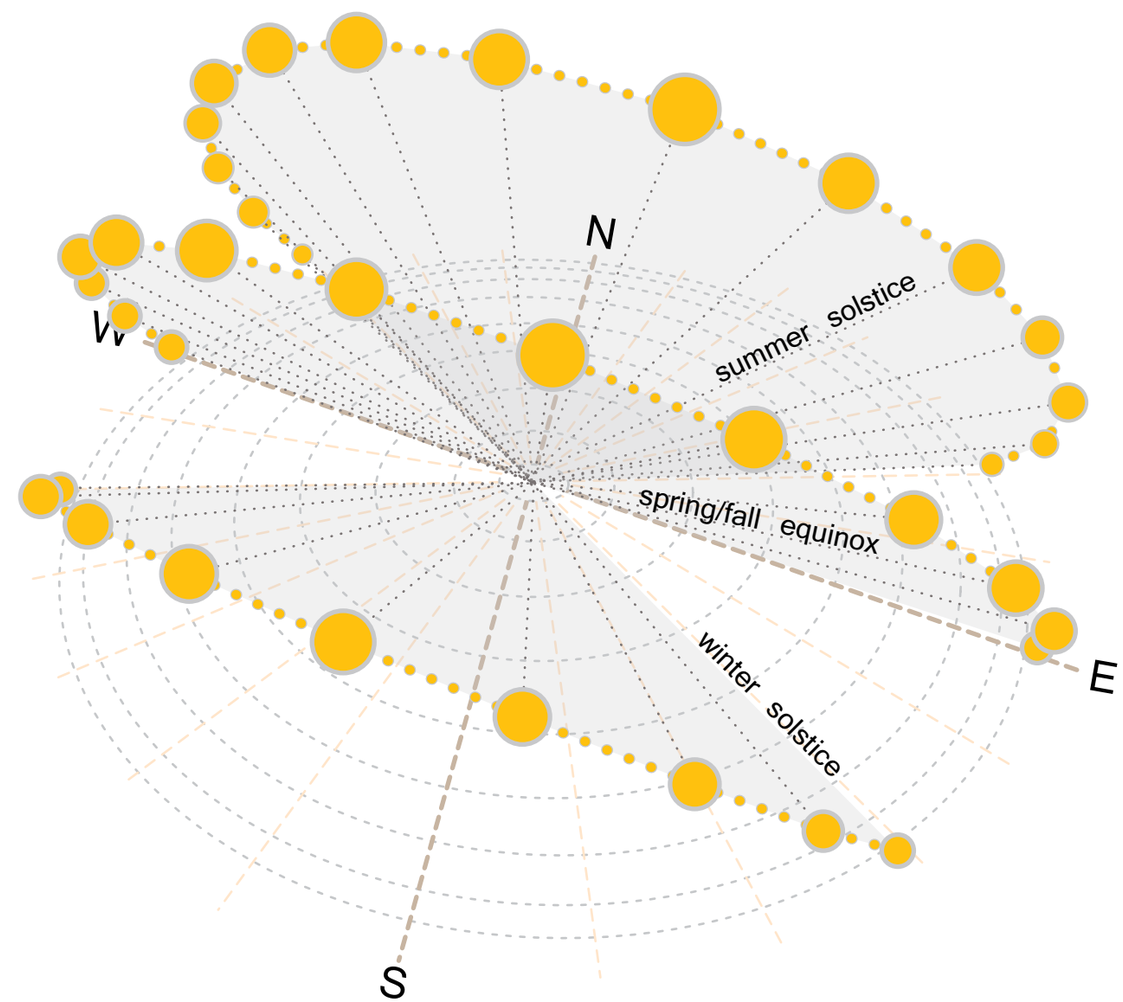
solar diagram



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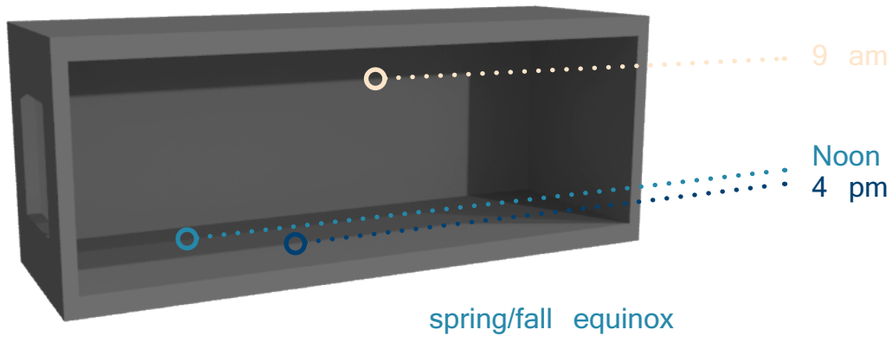
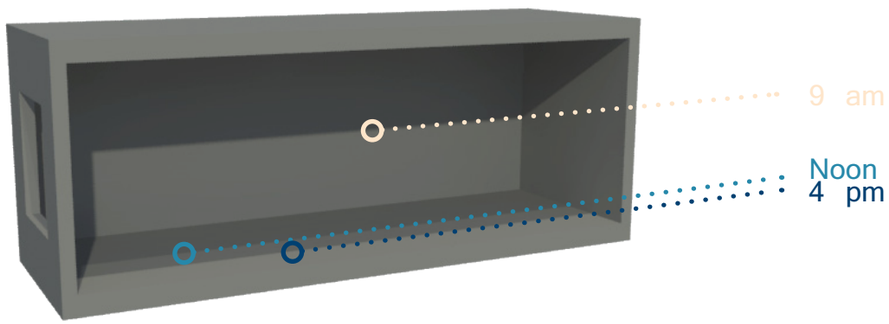
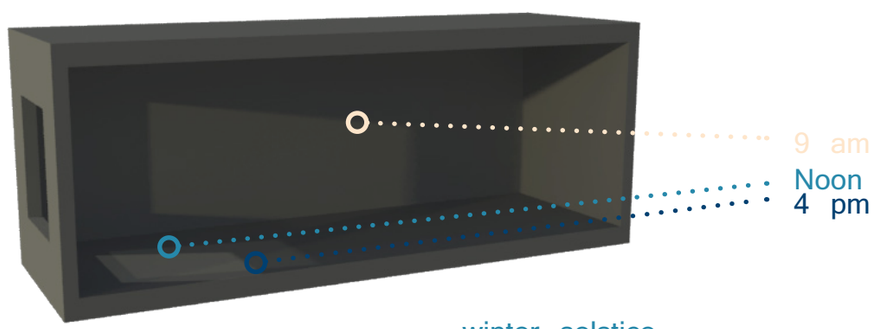
shadow study



spring/fall equinox



summer solstice



winter solstice

specht, t. 2012 date from: image rendered with 3ds Max

site diagrams

specht, t. 2012 date from: date retreived from Google Earth

programmatic requirements

Common Space

lobby/box office	25920
rest rooms	2610
auditorium	45000
mechanical room	1725
janitorial rooms	360
storage	5610
office	265

School of Arts

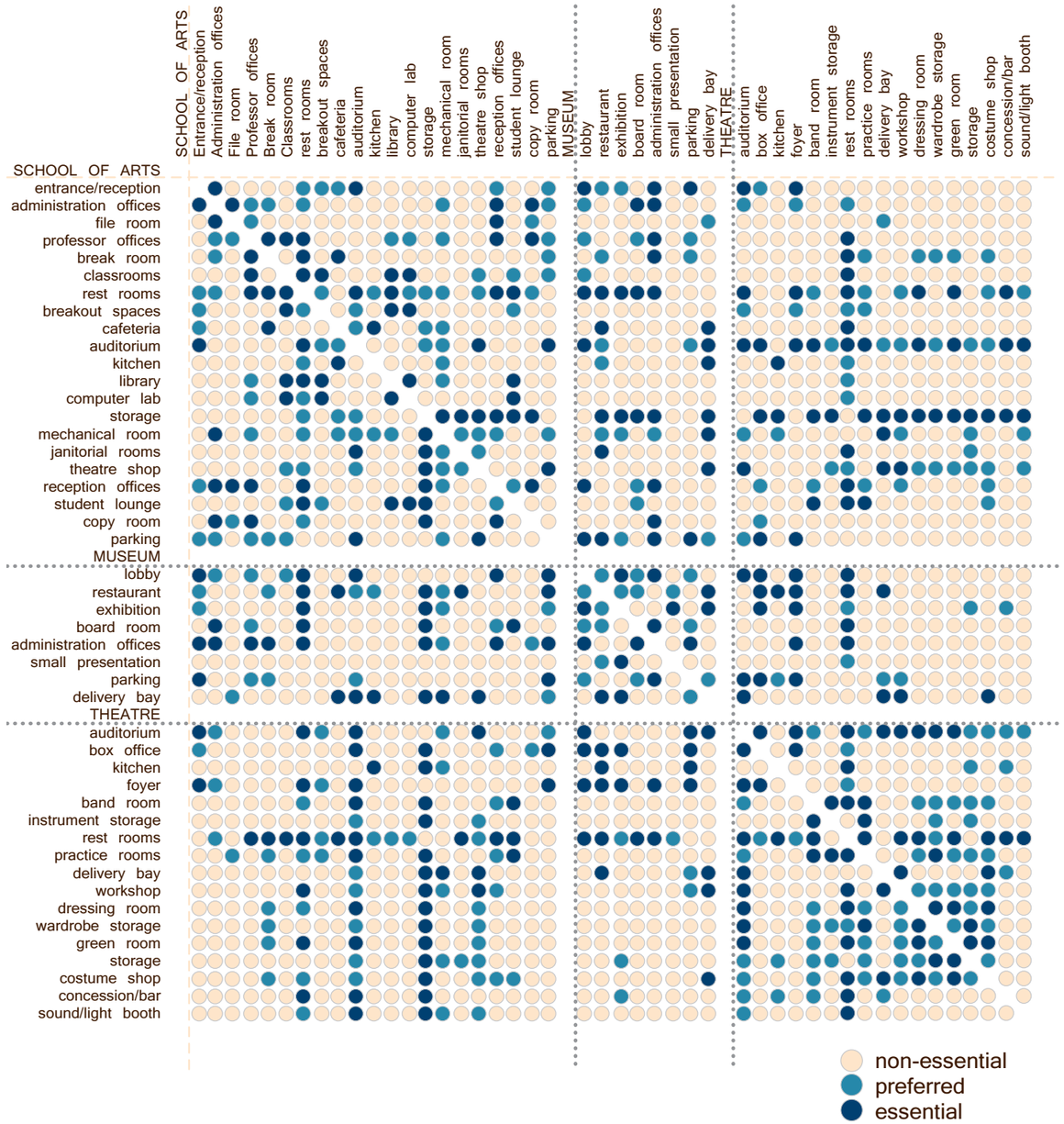
administration	862
file rooms	222
professor offices	3990
break rooms	270
classrooms	8375
computer lab	1545

Theatre

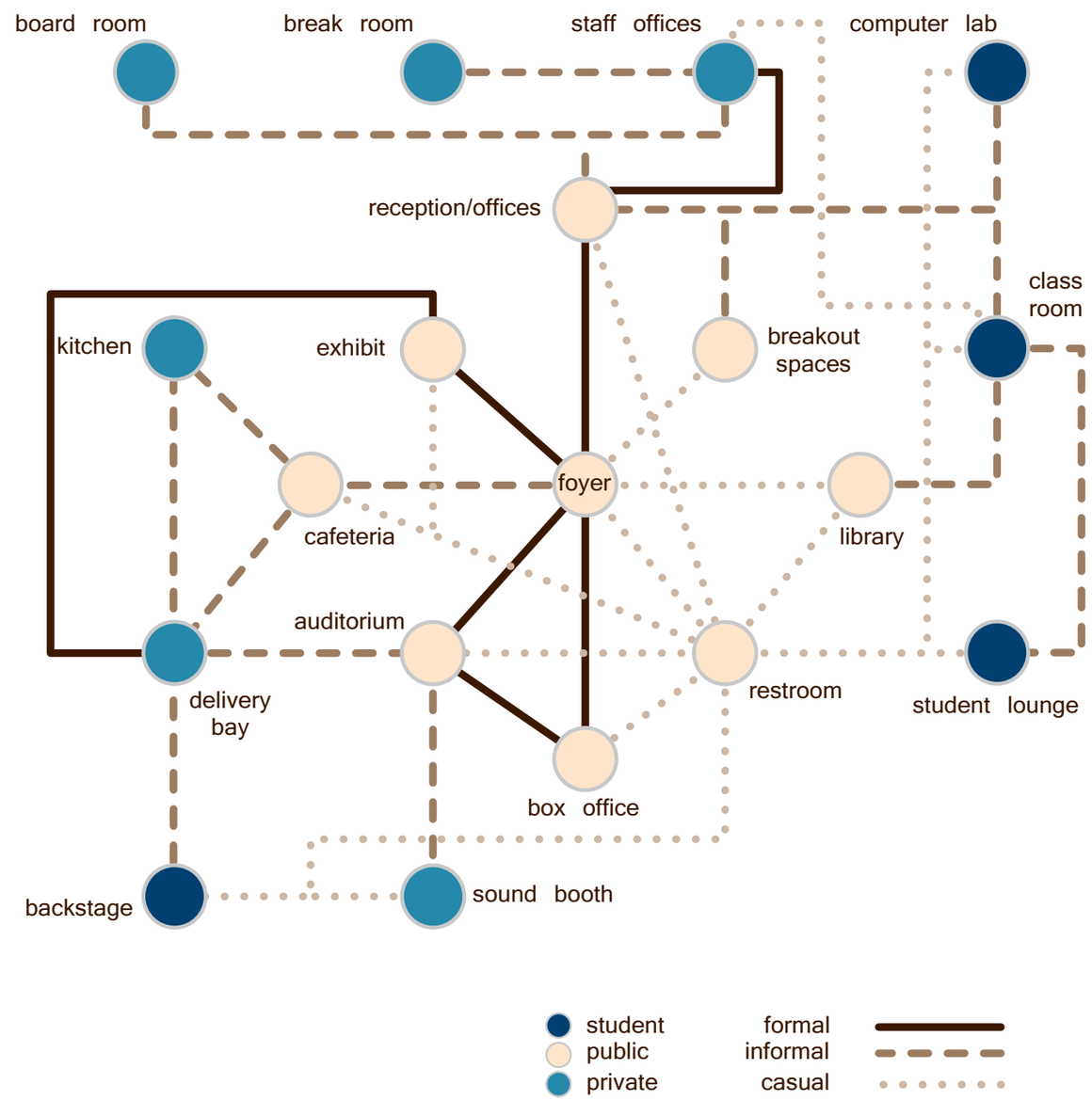
band room	280
practice rooms	2270
workshop	1885
dressing room	1490
storage	555
green room	935
costume shop	800
concession/bar	500
sound/light booth	595
office	470

112,000 sqft
with circulation

matrix connection



net relations

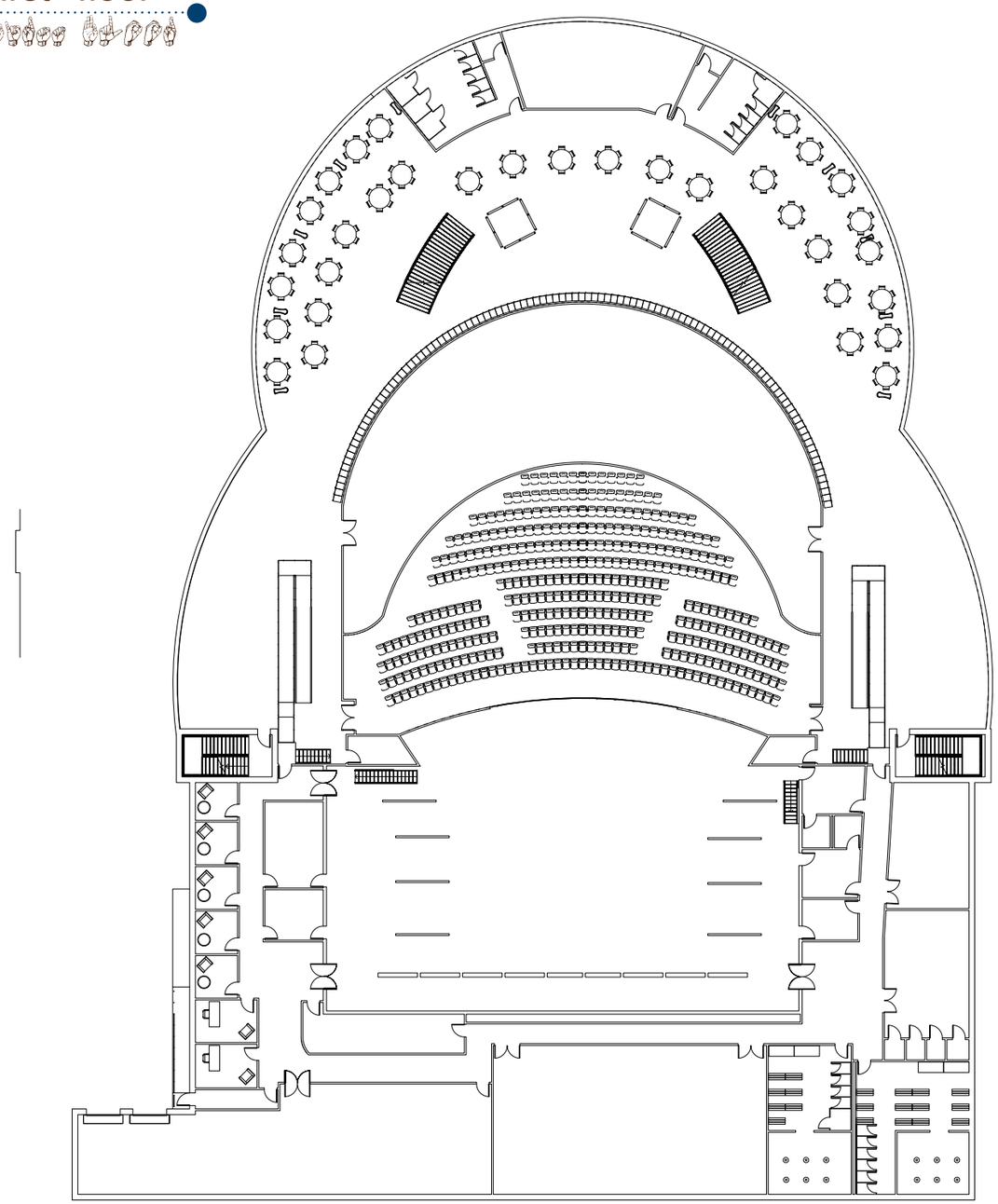


final design

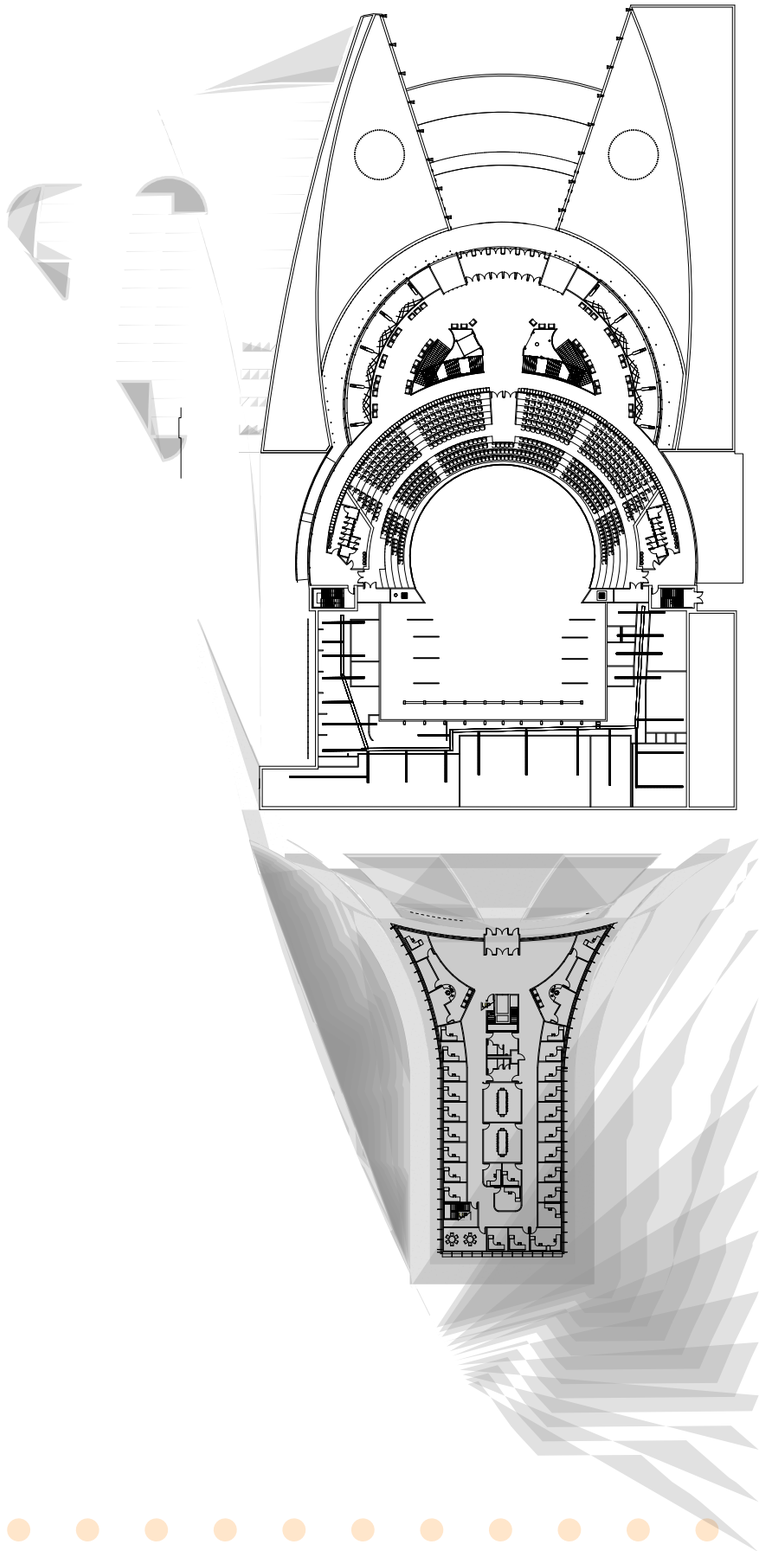
lobby rendering

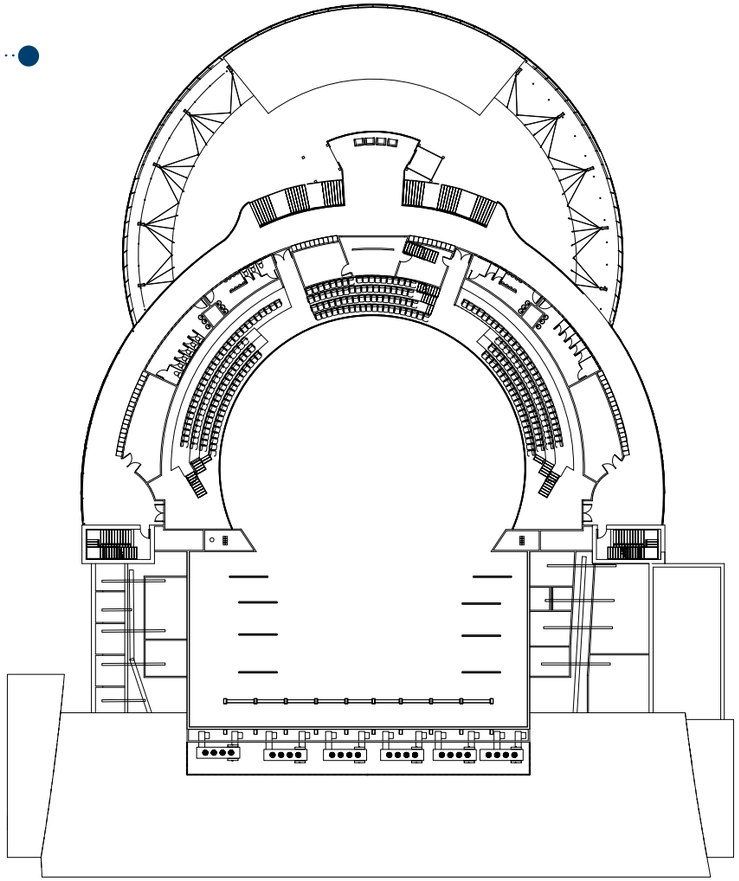

theatre rendering

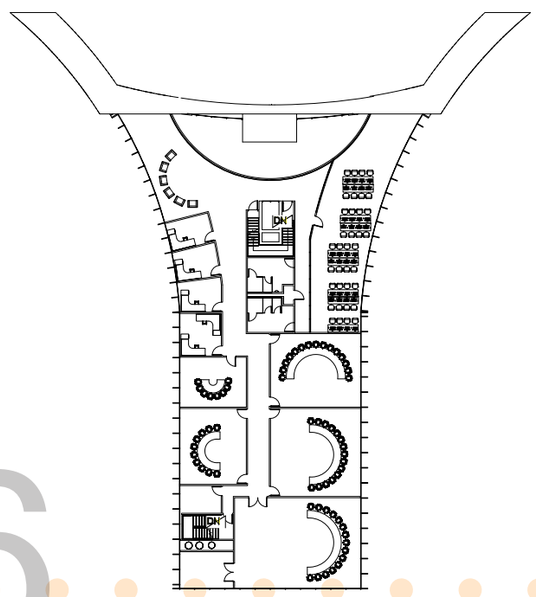
first floor

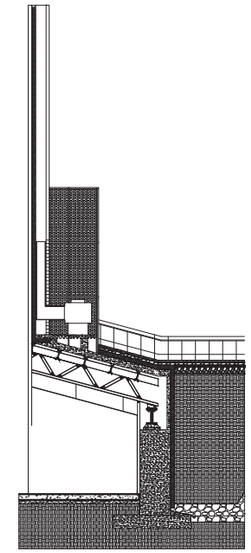


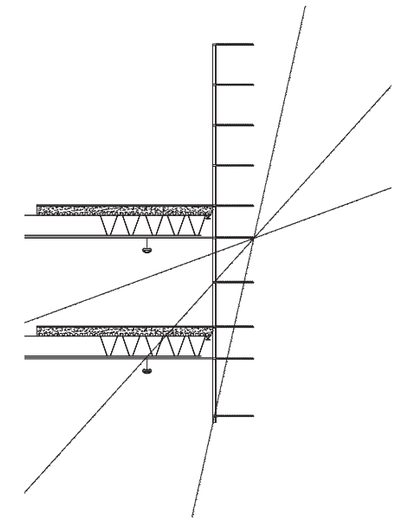
main floor

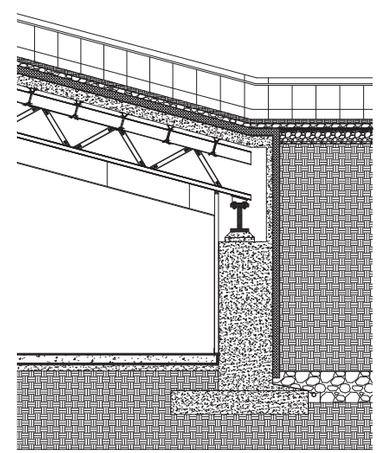


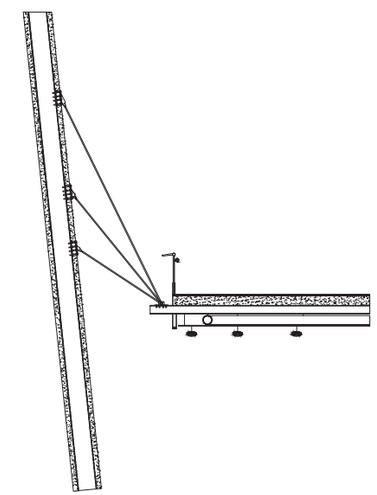


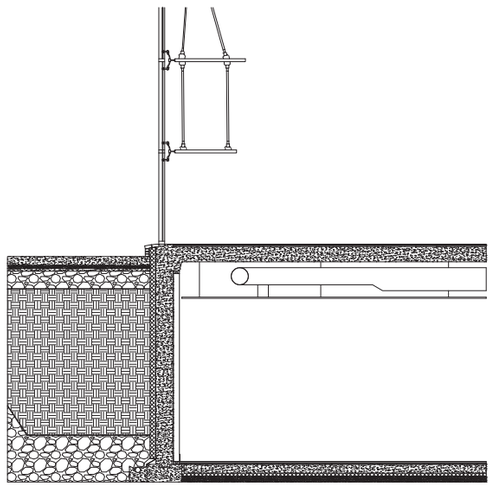


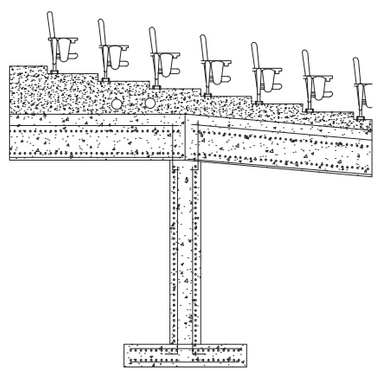


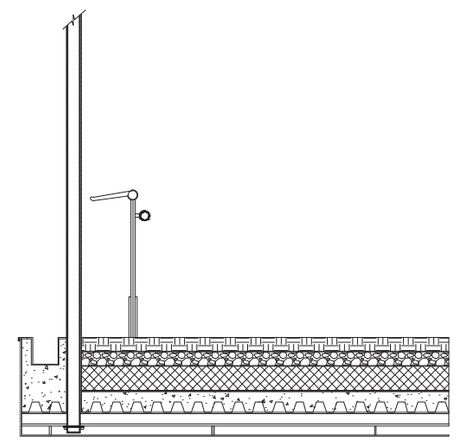


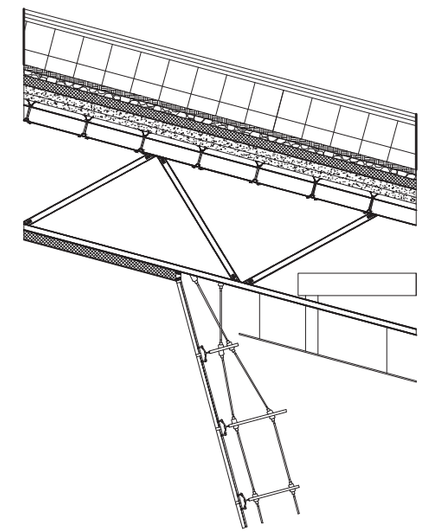


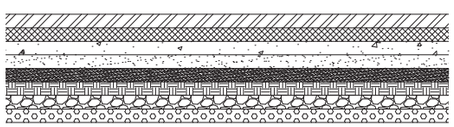


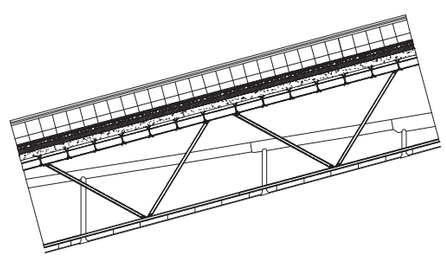


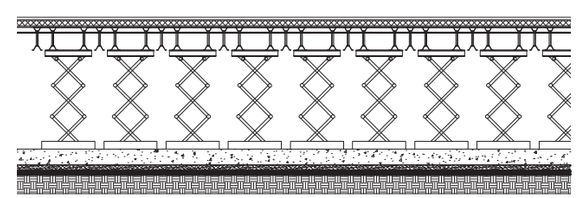


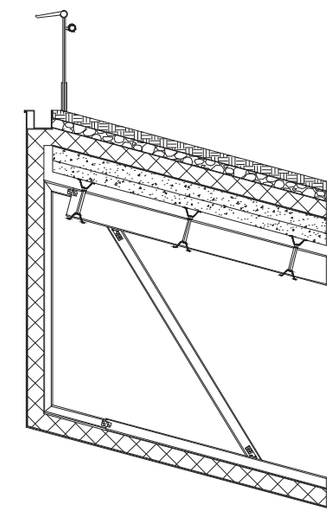


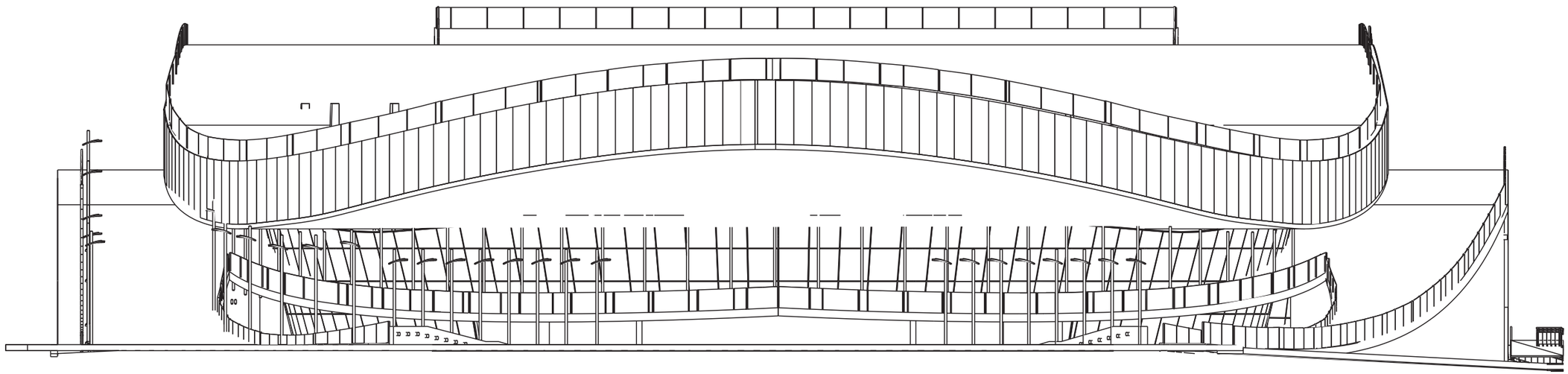


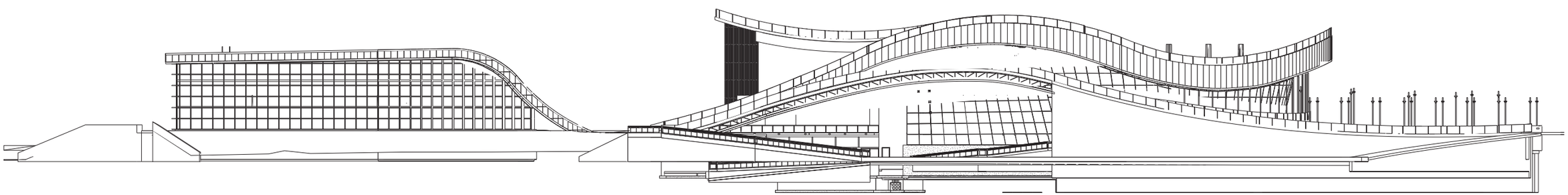


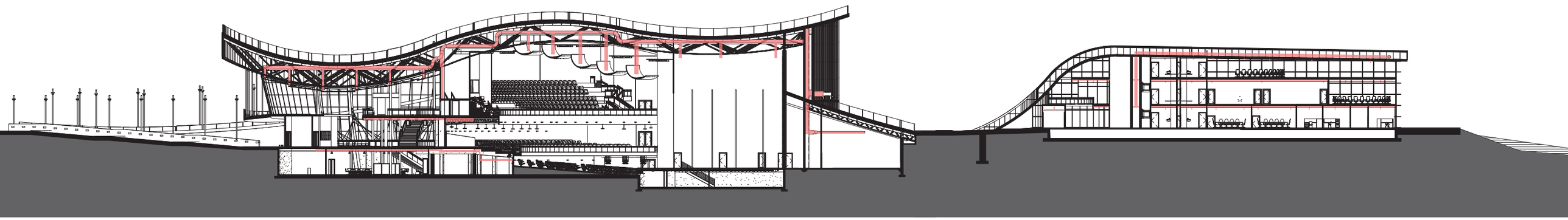












US map

DC map


Madison Dr SW
National Mall
Jefferson Dr SW
US Dept. of Agriculture
Independence Ave SW
US Forest Service
DC National Agricultural Library
US Holocaust Memorial Museum
Bureau of Engraving and Printing
US Financial Management Service
Main Ave SW
15th St SW
14th St SW
12th St SW
C St SW
D St SW
Maryland Ave SW
M

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tyler scott specht

The family I have gained at NDSU will forever be special to me. The experiences I had here will show through in all my work and character as a “Thank You” to the Bison Family!

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