

The Relationship of Structure and Material

Through the Lens of Three Catholic Chapels

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Daniel James Gilhene

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

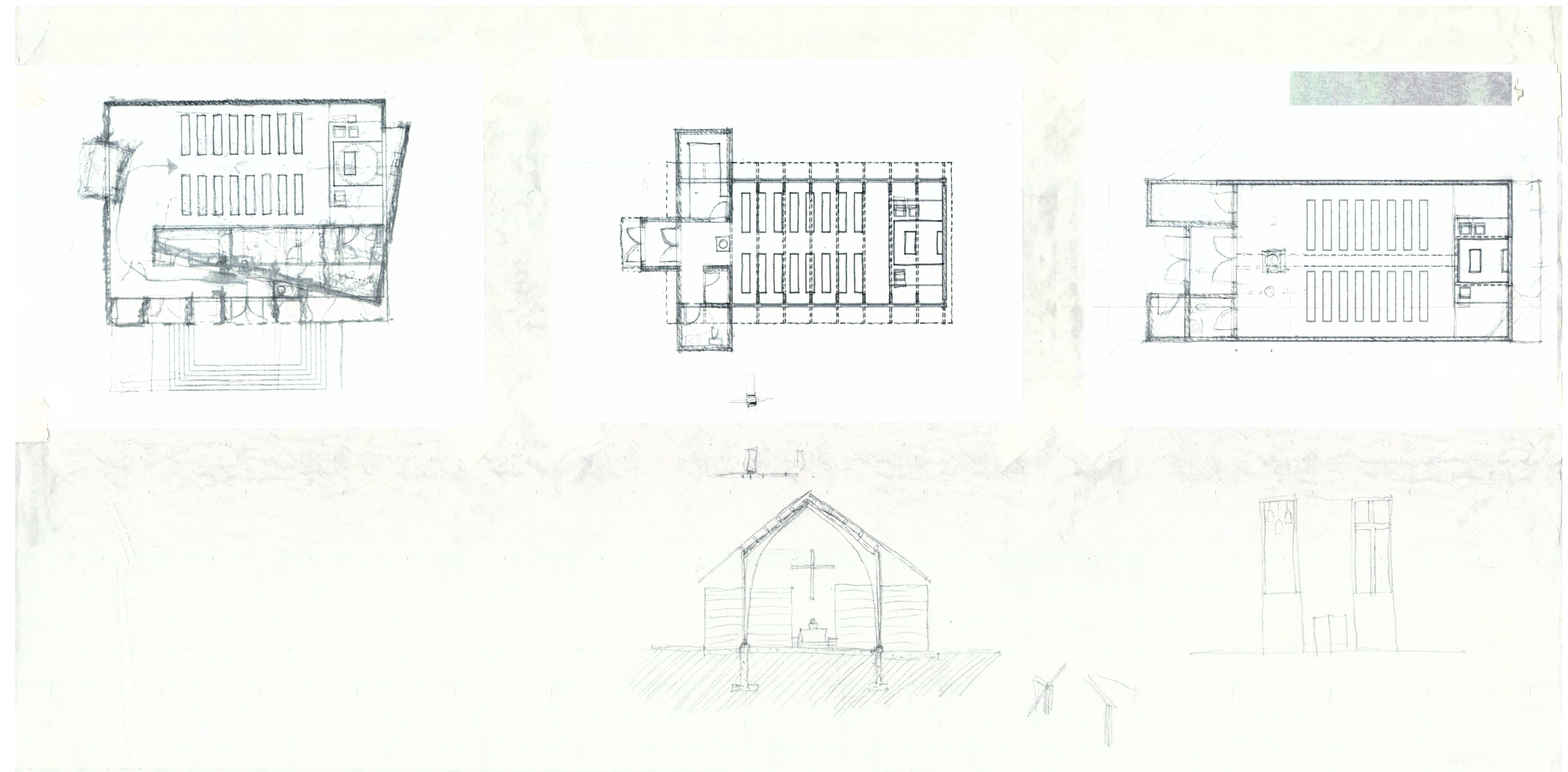
Master of Architecture
In
Architecture

Susan Piedmont-Palladino, Chair
Paul Emmons
Jaan Holt

September 30, 2016
Alexandria, Virginia
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Abstract

The architectural practice has long held several ideas about how a building should present itself relative to its structure. With modern building technologies and building codes, the structure of a building and the facade can often be very different. Modernist architects theoretically felt very strongly about the importance of material honesty in a buildings, as the 20th Century moved on, many architects moved towards buildings that used materials to create forms and atmospheres that were less dependent on the structural materials and forms of these buildings.

The following thesis explores these ideas about material and structure through three separate examples of buildings with a similar size, site, and program. The project is a theme and variation, with the theme being the building type, and the variation being the philosophy of the relation between structure and material. Researching drawings in Edward R. Ford's book *The Details of Modern Architecture*, along with specific details of Peter Zumthor's *Therme Vals* help to inform my personal thought process when it comes to detailing the buildings I have designed.

The designs propose three small chapels on a Catholic college campus in Northeast Washington, DC.

The Relationship of Structure and Material

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General Audience Abstract

The following thesis is an exploration of ideas about how a building's structure relates to its outward appearance. With modern building technology and building codes, the appearance and structure of a building are often very different. Architects have taken many different approaches to reconciling these differences.

My thesis explores how different architects I admire approach this disconnect, and I use what I have learned from these various approaches to design three similar buildings - all chapels on a college campus in Washington, DC - with varying approaches.

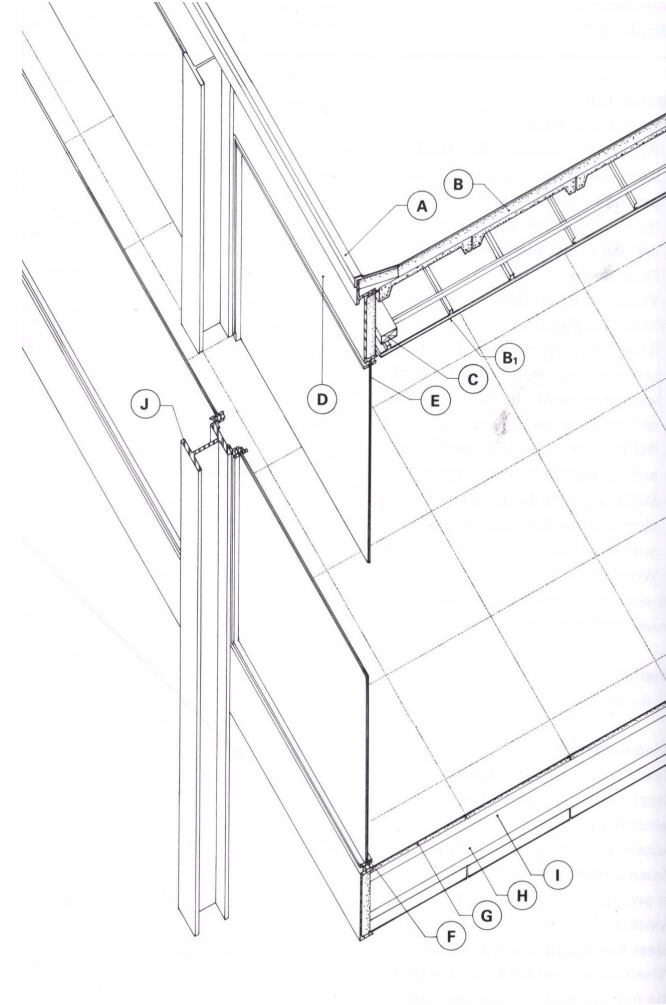
Acknowledgments

This project is for my parents, Daniel and Kathleen Gilhene, without whose unwavering support, it would not have been possible.

I would also like to thank my committee, Susan Piedmont-Palladino, Paul Emmons, and Jaan Holt. Your insight and advice have been invaluable, and my project is more developed and thoughtful as a result of your help.

Lastly, I would like to thank all of my friends at the WAAC. Without your late night advice, willingness to critique my work and encourage me in equal doses, and for your general passion for architecture, I would not have the thesis that I have today.

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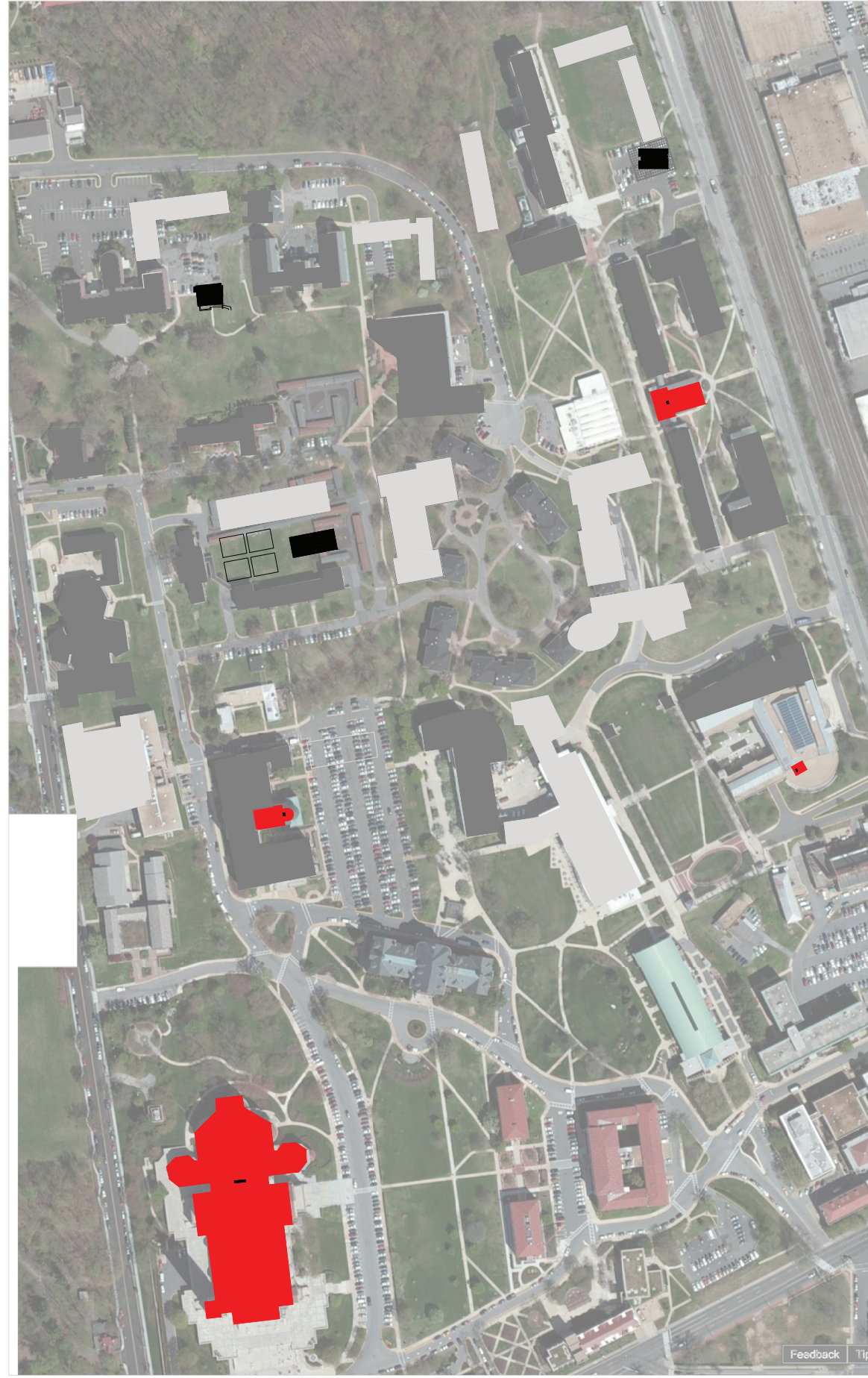


Farnsworth House by Greg Robbins (CC BY-NC-SA 2.0)

Before I began my studies in architecture, but knew that architecture was what I wanted to pursue a degree in, my first love was the Farnsworth House, by Mies van der Rohe. I was attracted to the simplicity, clarity, and apparent honesty of the building.

When I began my architecture studies, my love for the Farnsworth House guided my thoughts about design; not necessarily stylistically, but philosophically. Revealing the structure, a clearly rational layout, and a sense of minimalism are all very important to how I think about architecture.

This affinity for minimalism and modernism has grown into an appreciation for such architects as Le Corbusier, Richard Meier, and John Pawson.



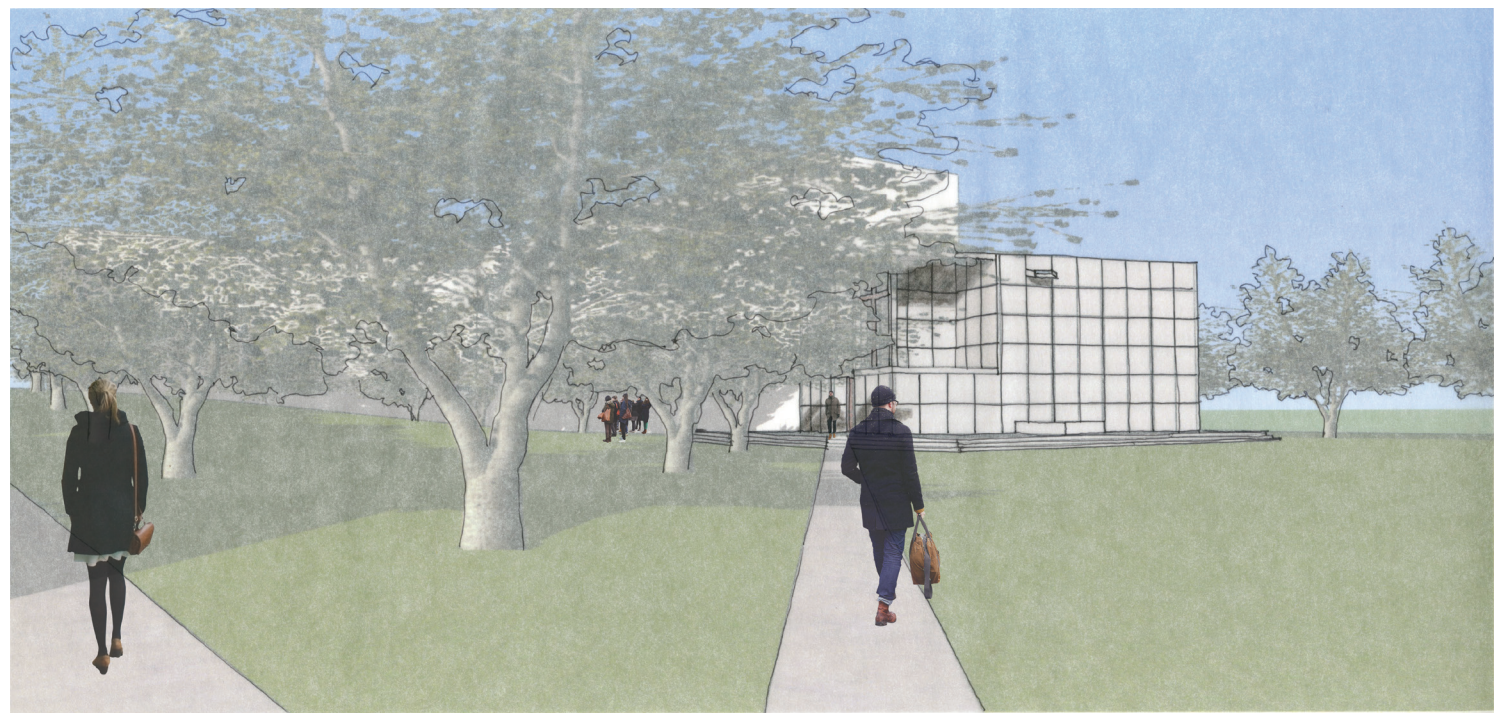
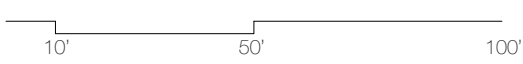
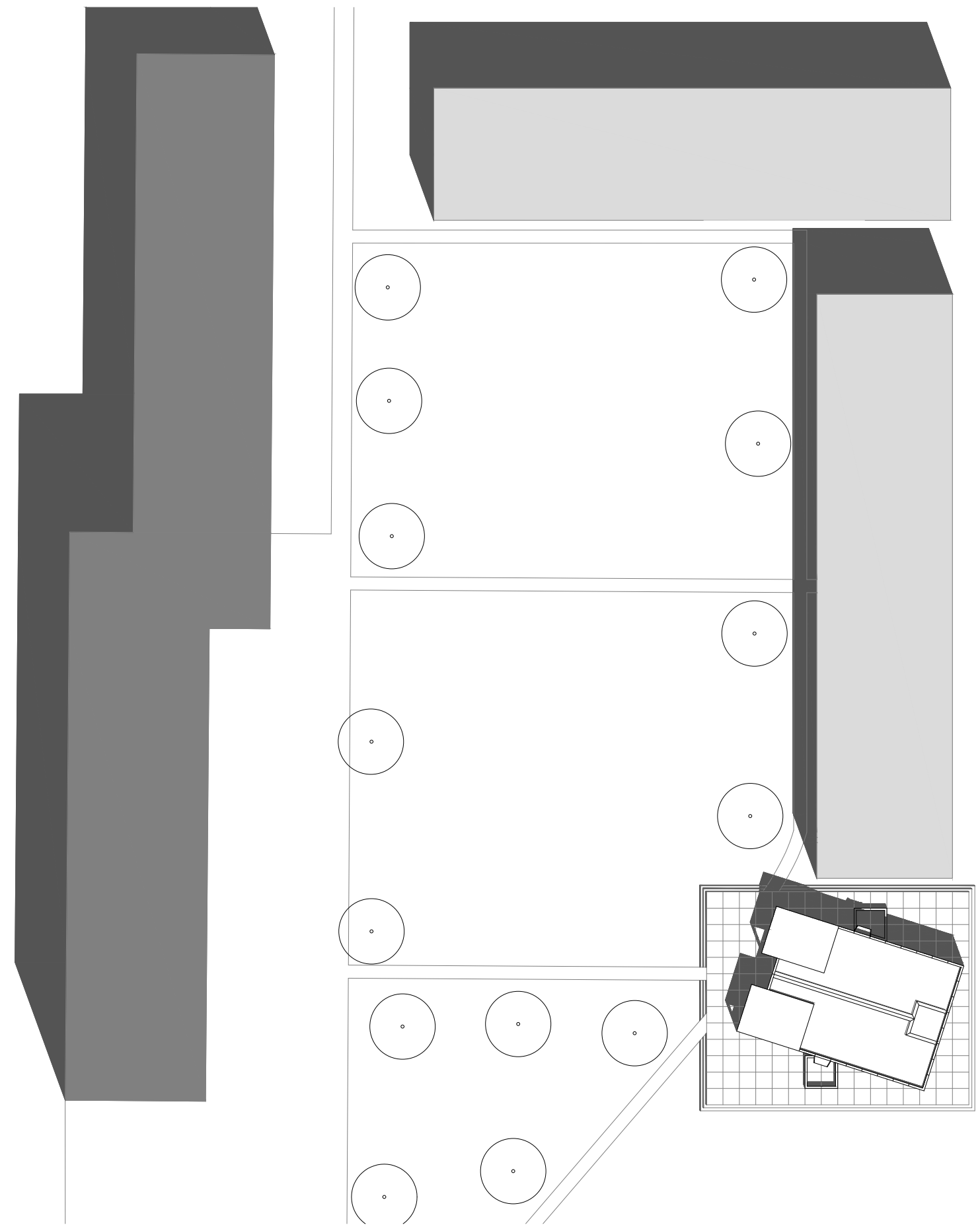
This work "Site Plan", is a derivative of "Exhibit 20: Proposed Building Uses" by Ayers Saint Gross Architects + Planners.

- New Chapels
- Existing Sacred Space
- New Buildings
- Existing Buildings

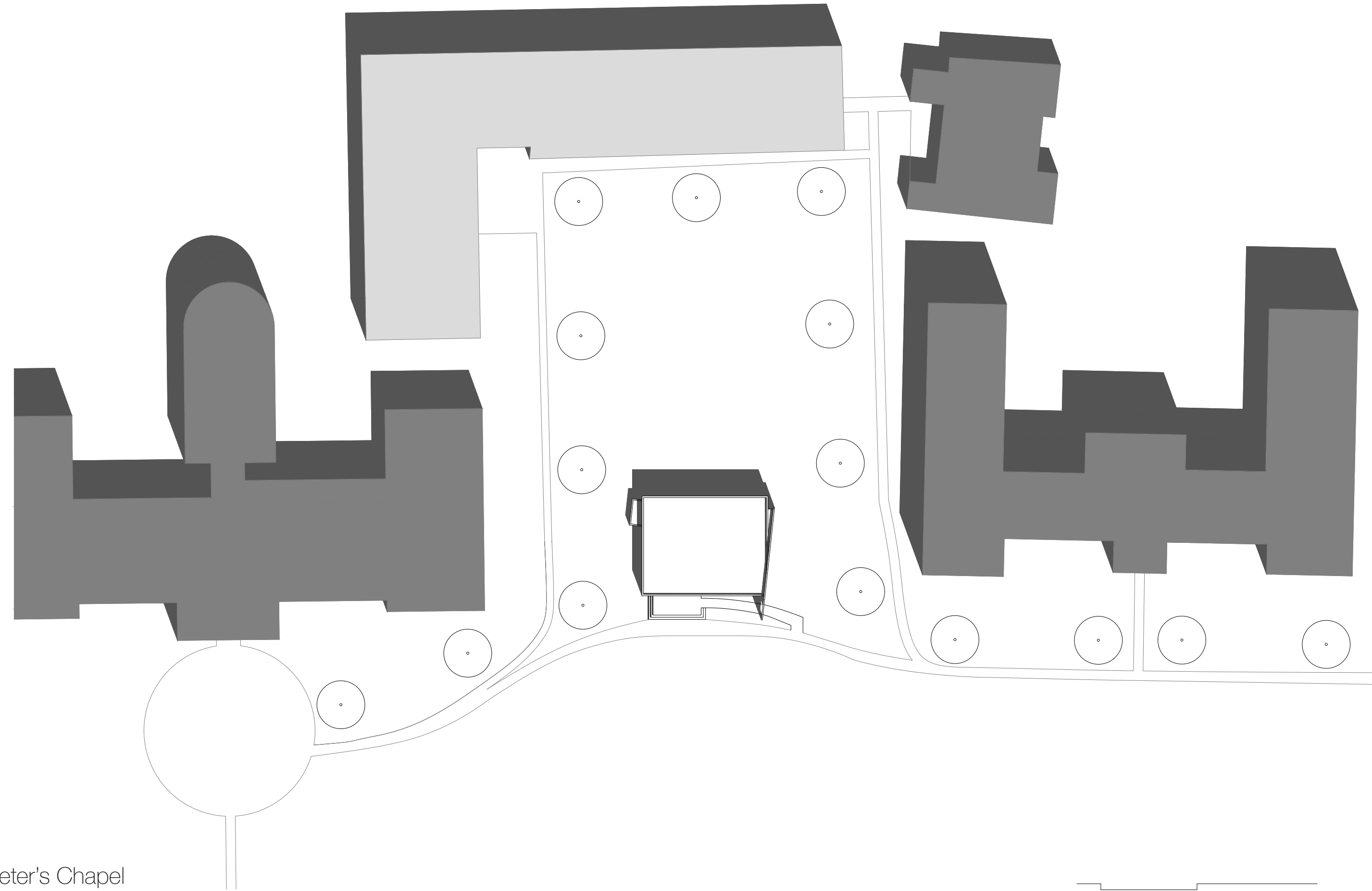
My experiences with the Farnsworth House and the Thorne Vals resulted from very different philosophies about the relationship of structure and material. My thesis is an exploration of how these different philosophies affect my thoughts on architecture. As an aspiring architect, do I feel that material honesty is more important, or is it possible to use a veneer that has no concern for the structure of the building if it is to create an atmosphere - an architectural experience that goes beyond the typical thoughts of architectural "honesty?"

In order to explore these philosophies, I needed to design a collection of buildings with similar programs, small enough to allow for enough design development to explore details.

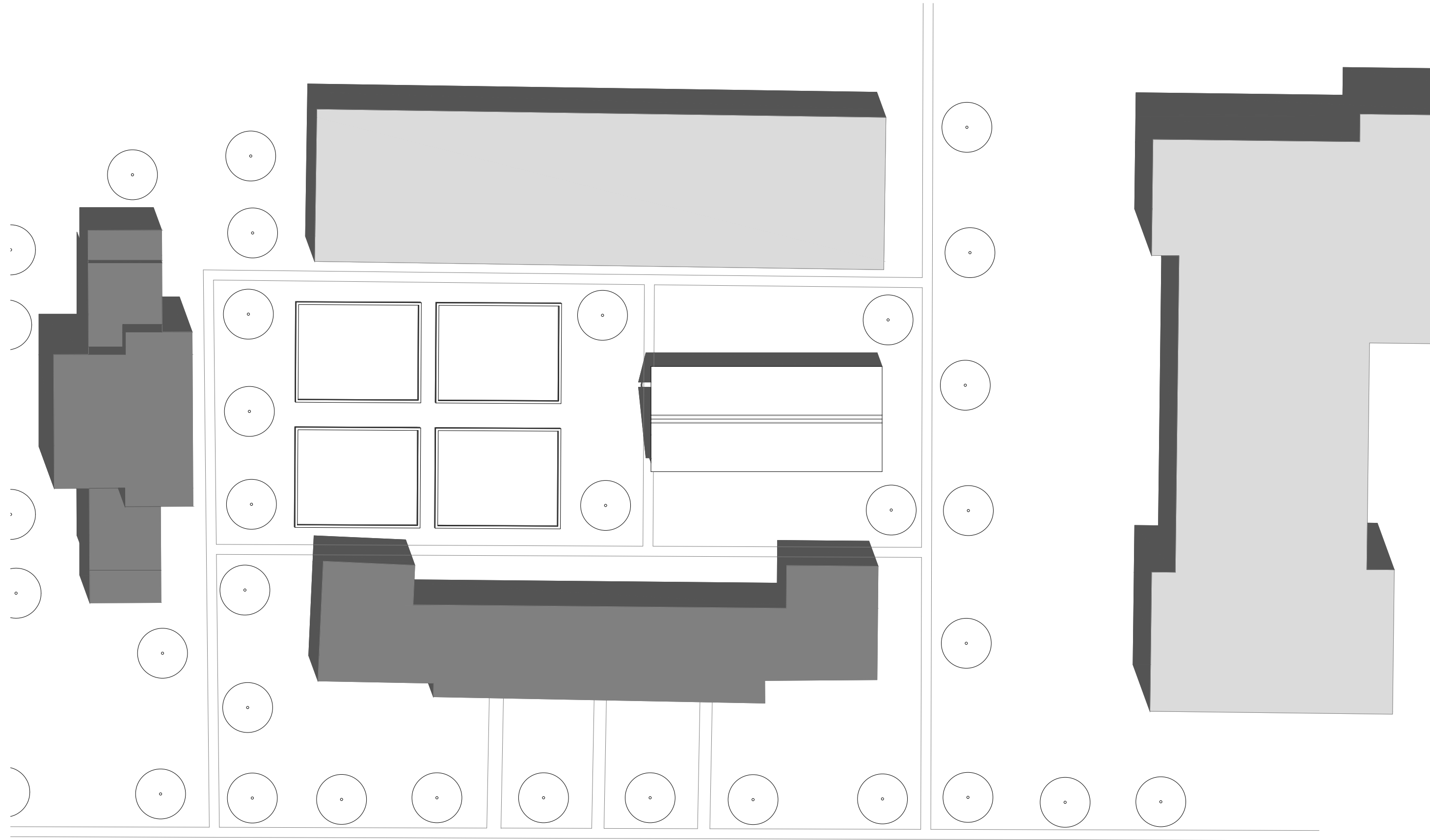
In 2012, the Catholic University of America (where I received my undergraduate degree in architecture) introduced a new master plan. Part of this plan was the building of new residence halls. These buildings would be built as three clusters, each cluster centered around a quad and a chapel. In these chapels I saw an opportunity. Sacred architecture has always interested me, and the chapels provided an opportunity to design with either philosophy.



The Holy Family Chapel is the center of the northernmost residence hall cluster. Two new residence halls complete the quad with the existing Opus Hall. The chapel is placed on a plinth, elevating it above the quad. The campus grid is slightly off from true North-South. The control joints on the concrete plinth align with the campus grid. The chapel shifts on the plinth to align the altar with true East. This has the added advantage of facing the entrance towards the center of the quad.

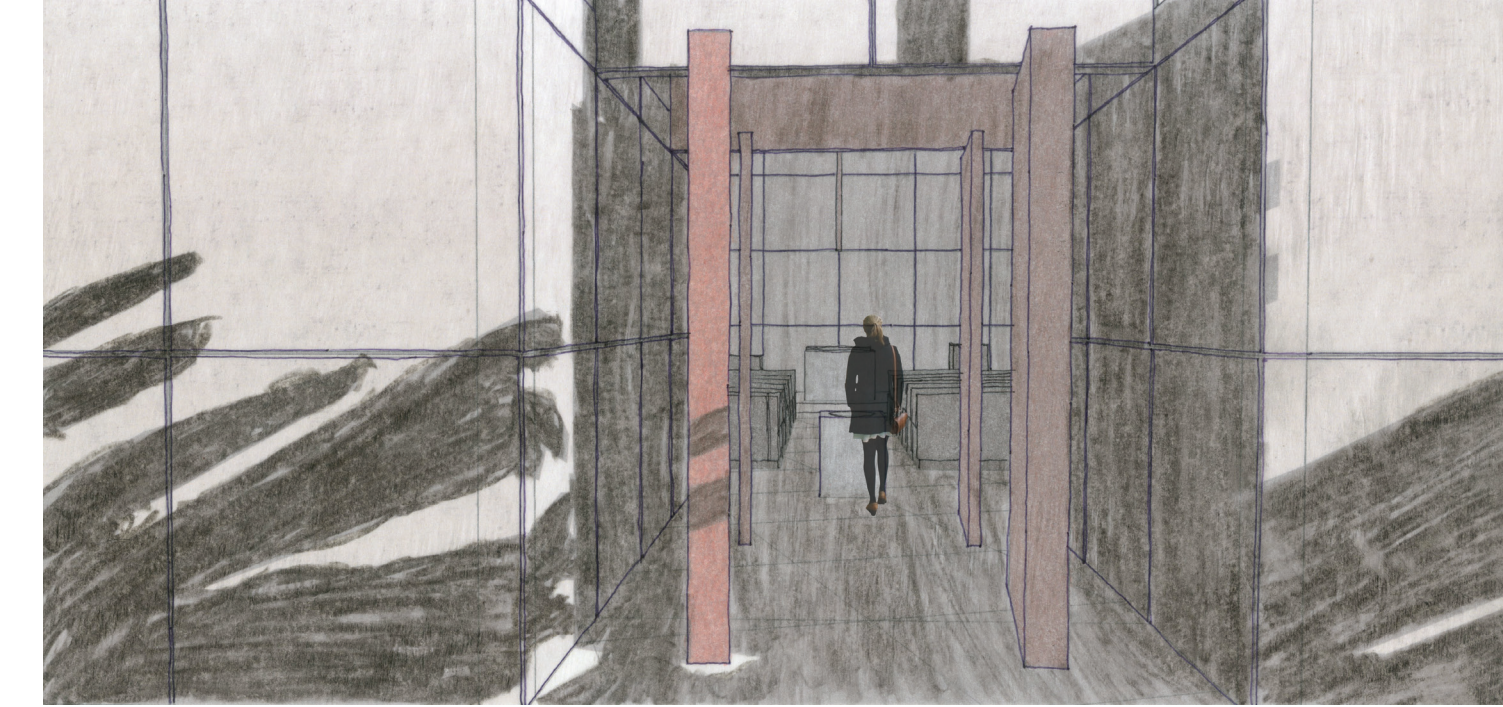
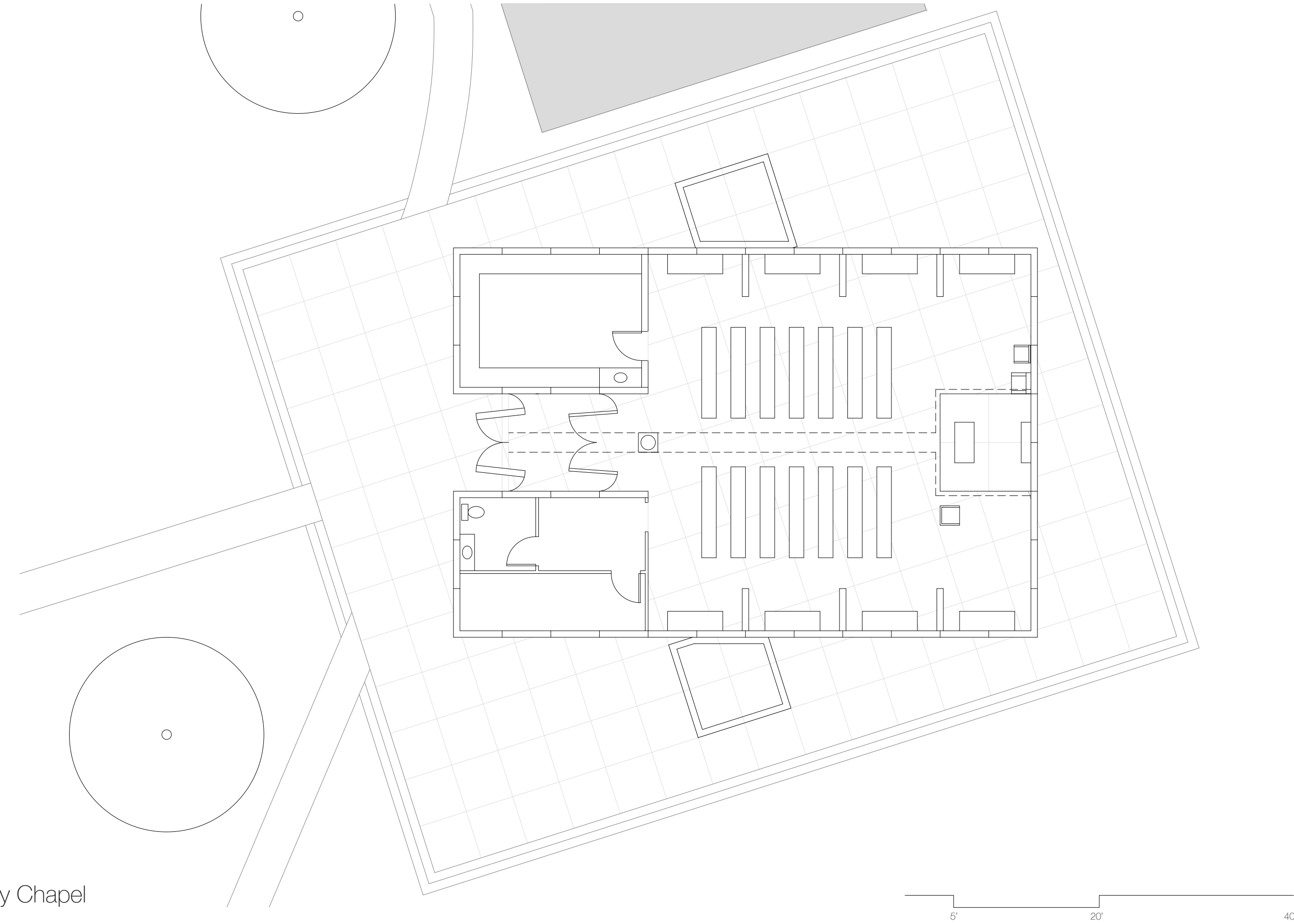


St. Peter's Chapel is located on a hill overlooking the campus, between the existing buildings of Marist Hall and O'Boyle Hall - to be converted to residence halls - with the quad completed by a new residence hall. Marist and O'Boyle take advantage of their site with porches that view the campus. In siting the chapel, I wanted to take advantage of the same view for worshipers leaving mass.



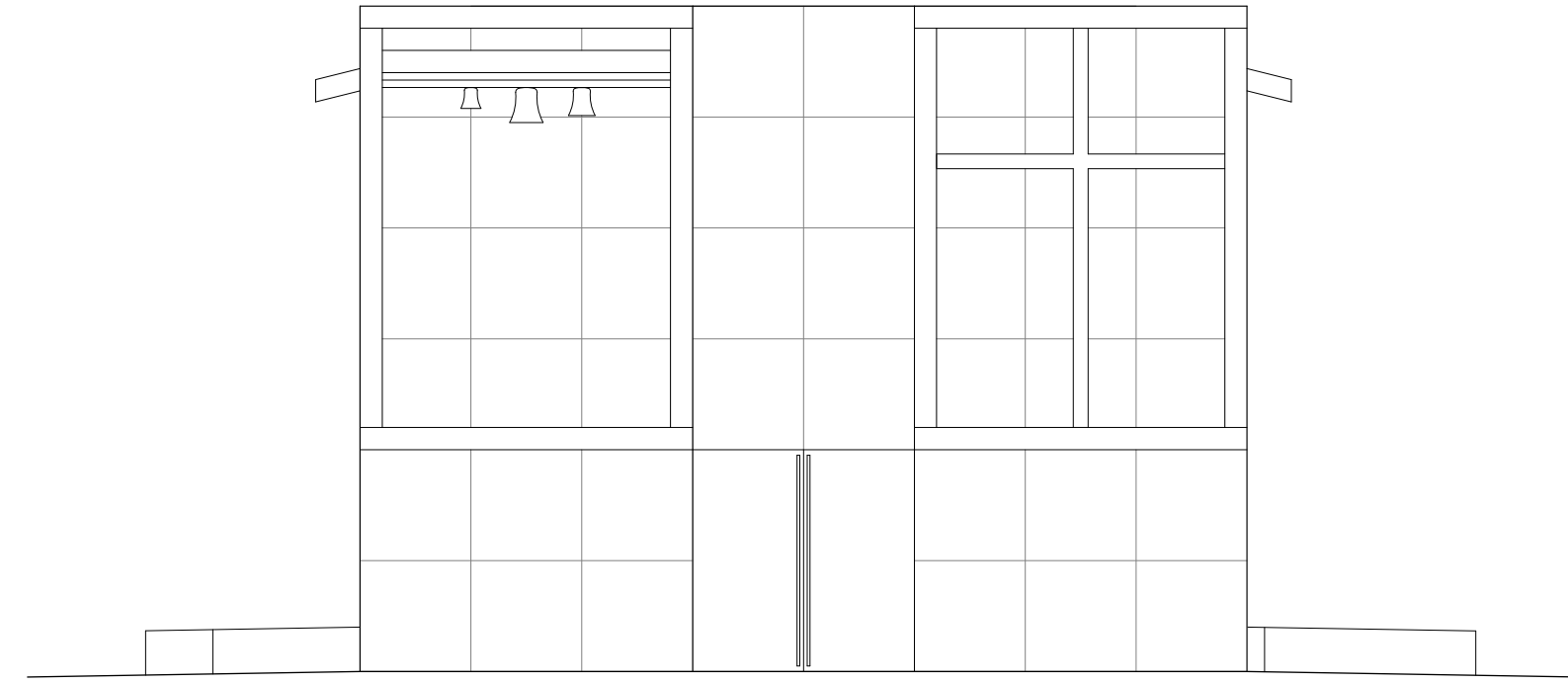
St. Francis of Assisi Chapel is sited on a quad enclosed by housing for priests to the west and south, and by a residence hall to the north. Composed of humble forms and built of humble wood and simple glass, the chapel presents itself at the worshiper's level and in the worshiper's world. It is aligned with the campus grid, and is entered at ground level. It is accessible and open, like its namesake. The quad has been used as a community garden for the Green Club, and the harvest is donated to local food banks. The site design expands on these gardens to compliment the chapel.



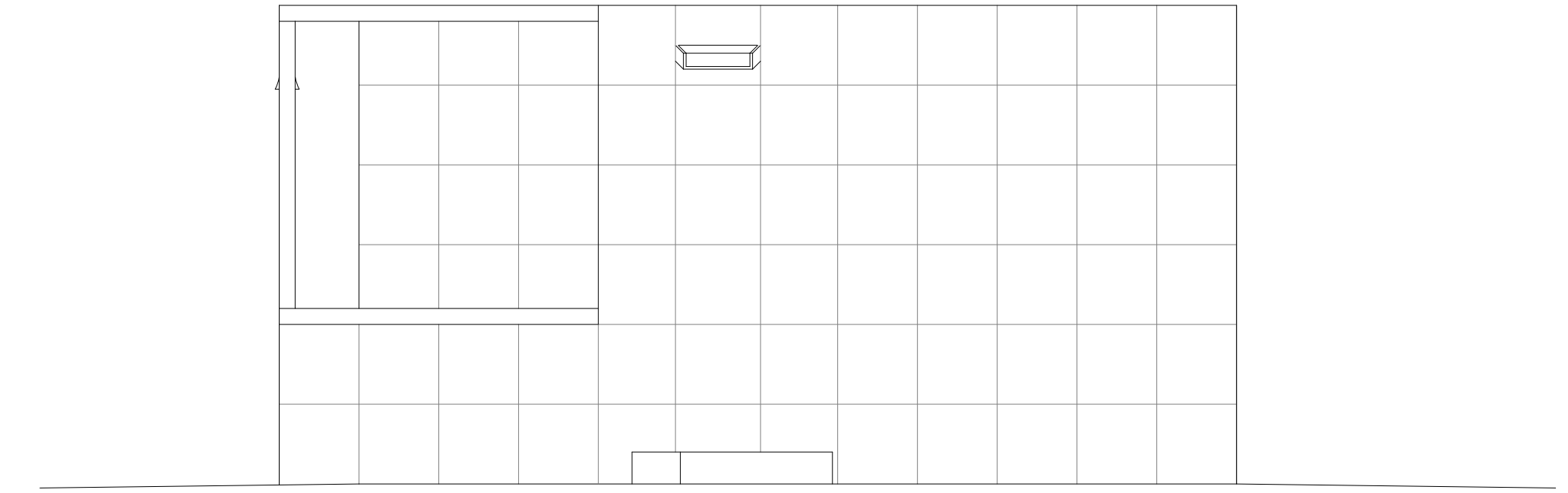


Holy Family Chapel reflects its name in the reference it makes to the tripartite nave, with its side chapels, and the tripartite divisions in its entrance facade. Natural light enters the space through a skylight that runs the length of the nave, and opens wider over the altar. The floor of the chapel continues the grid that the plinth it rests on introduces, reminding the worshiper of their place in the campus and the shift to facing true east.

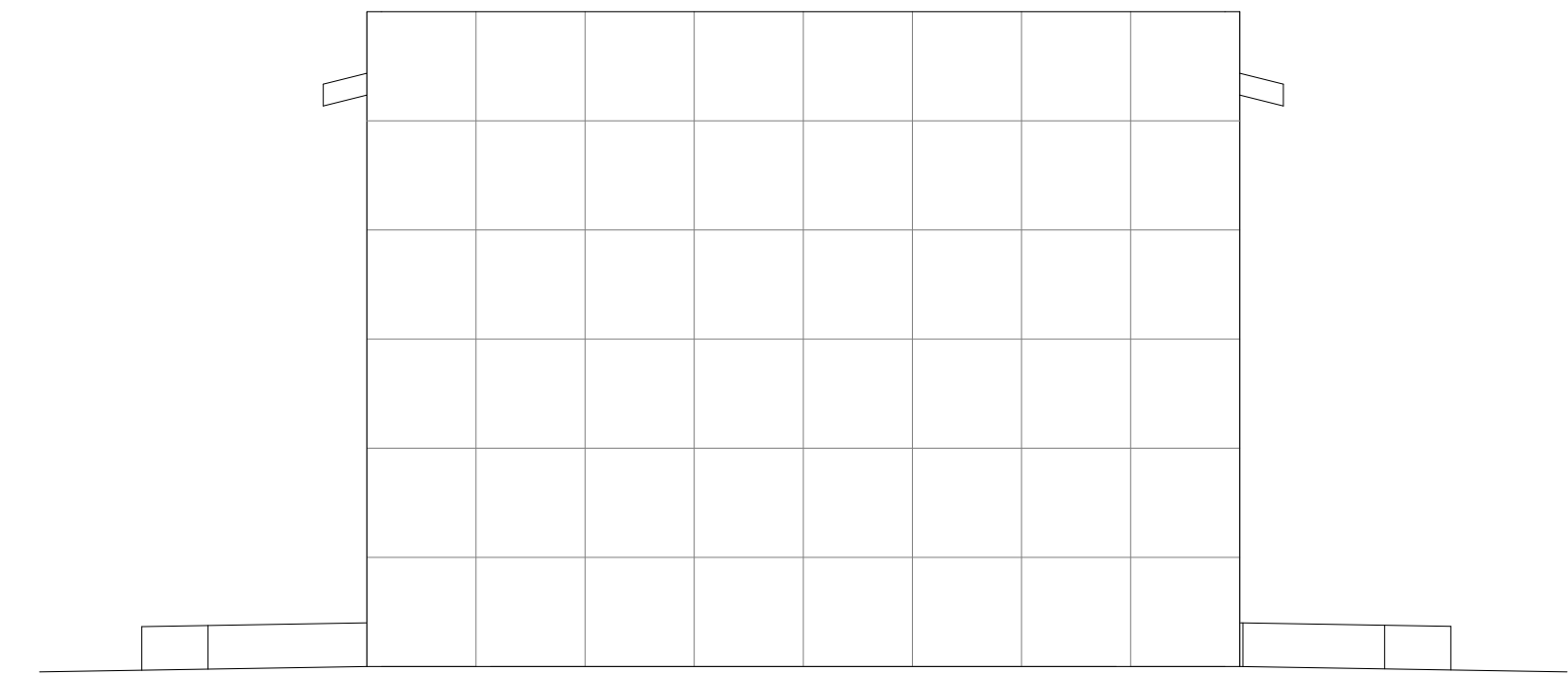
West Elevation



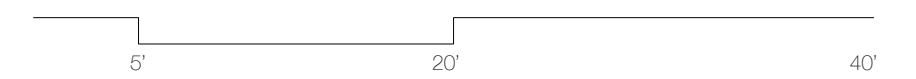
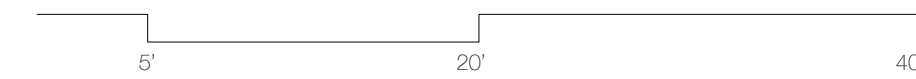
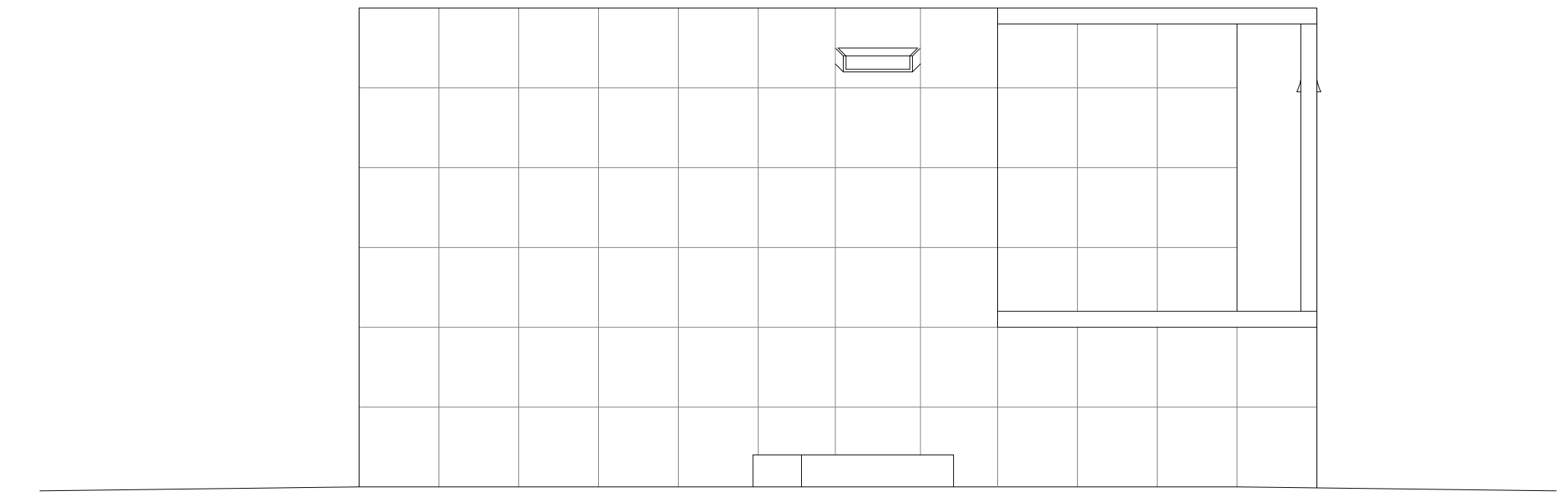
South Elevation

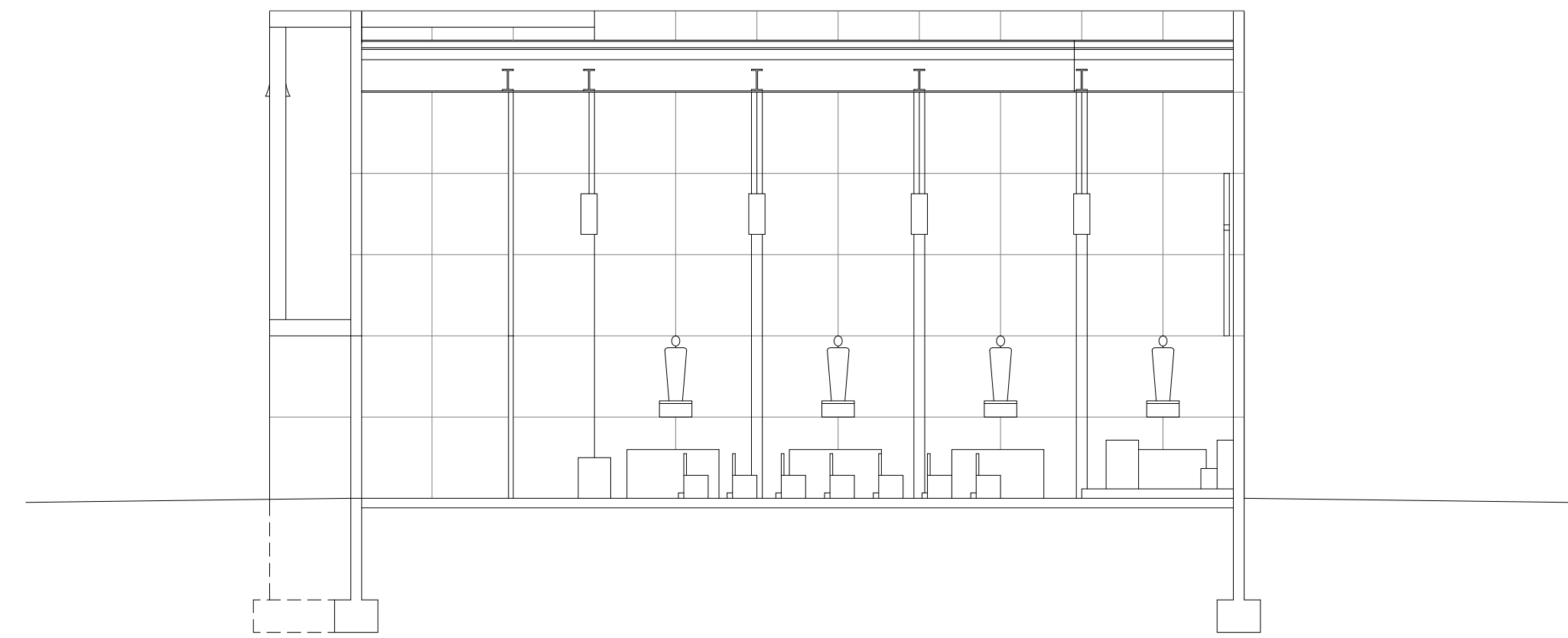
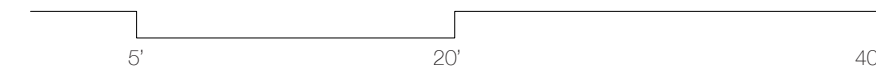
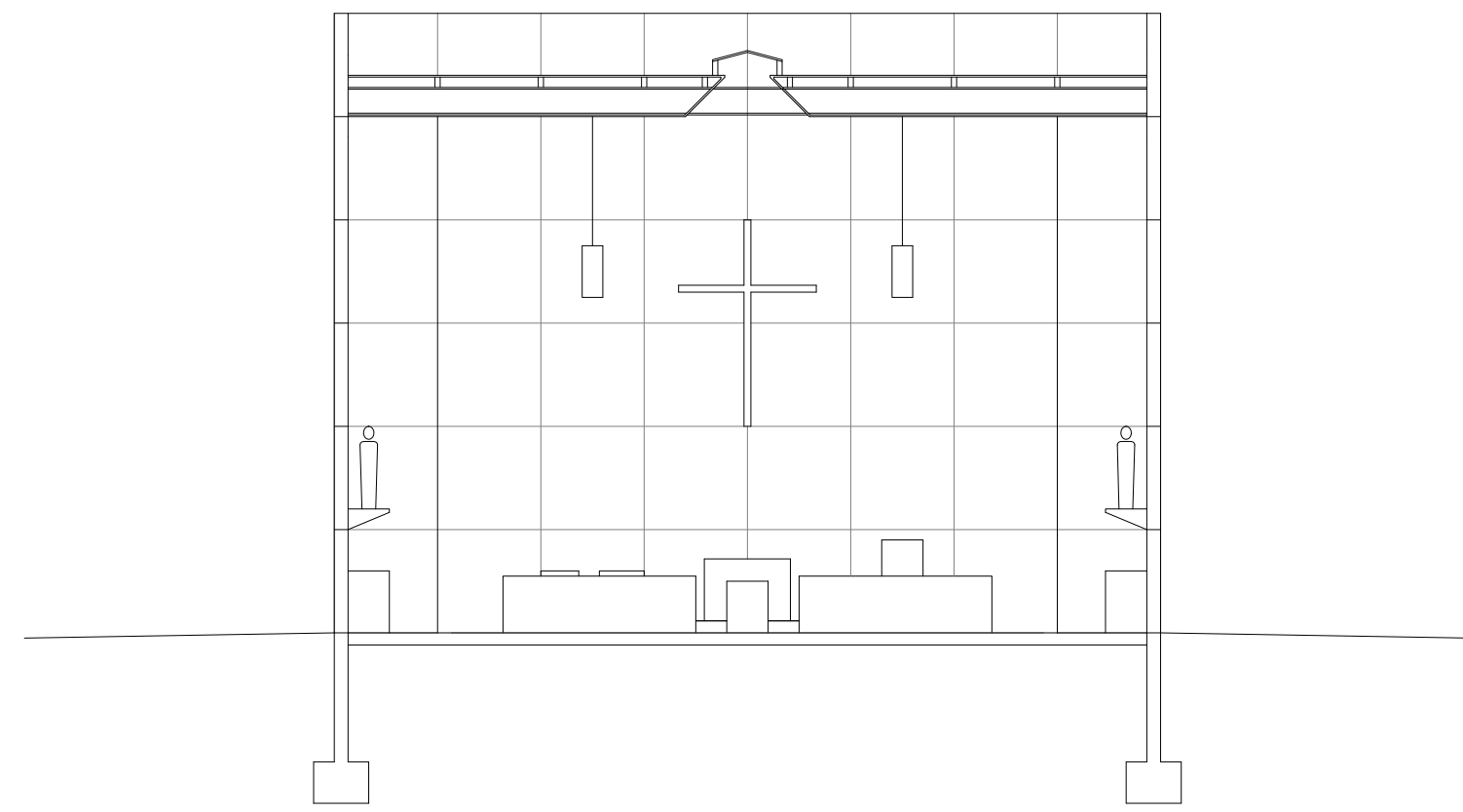


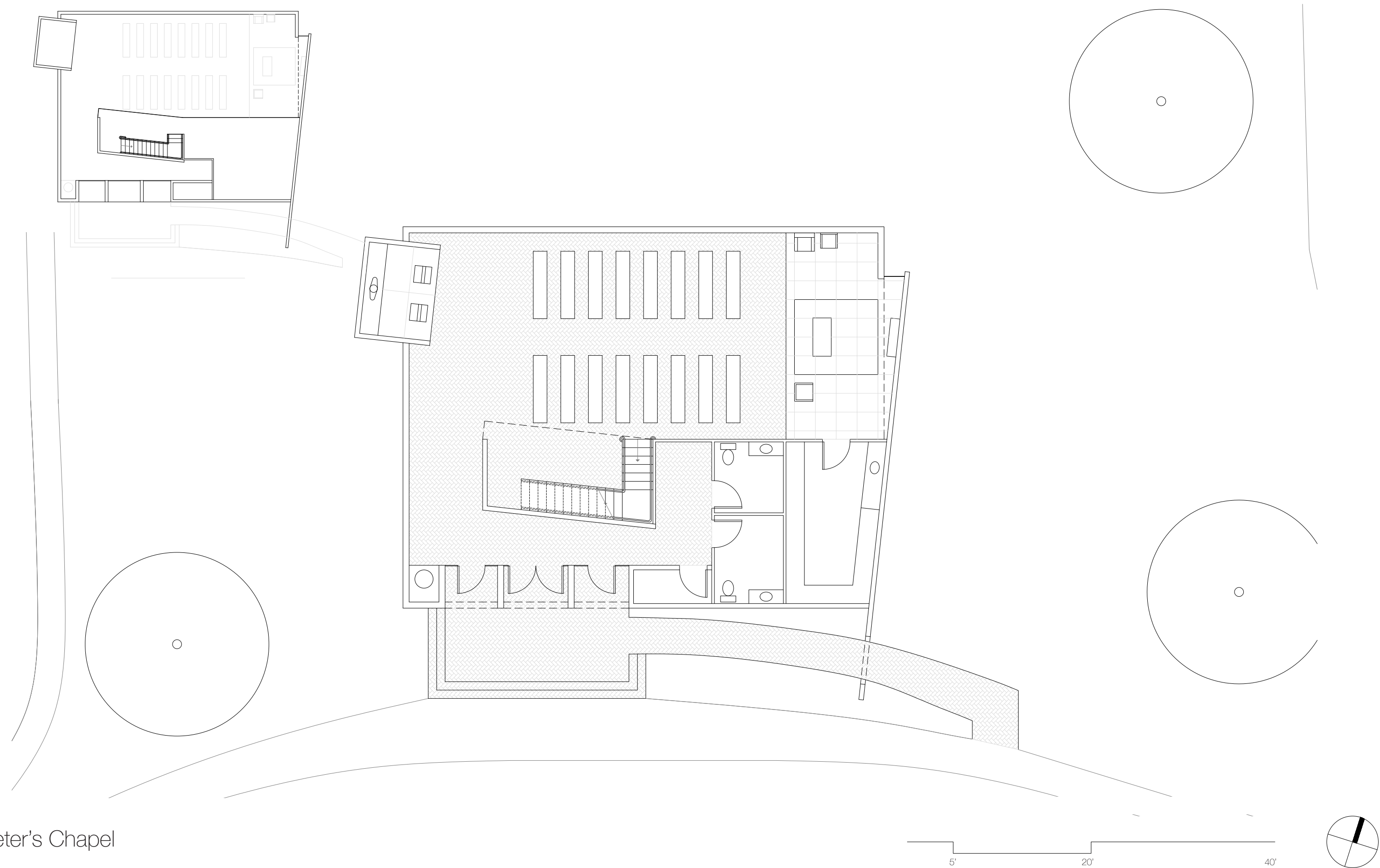
East Elevation



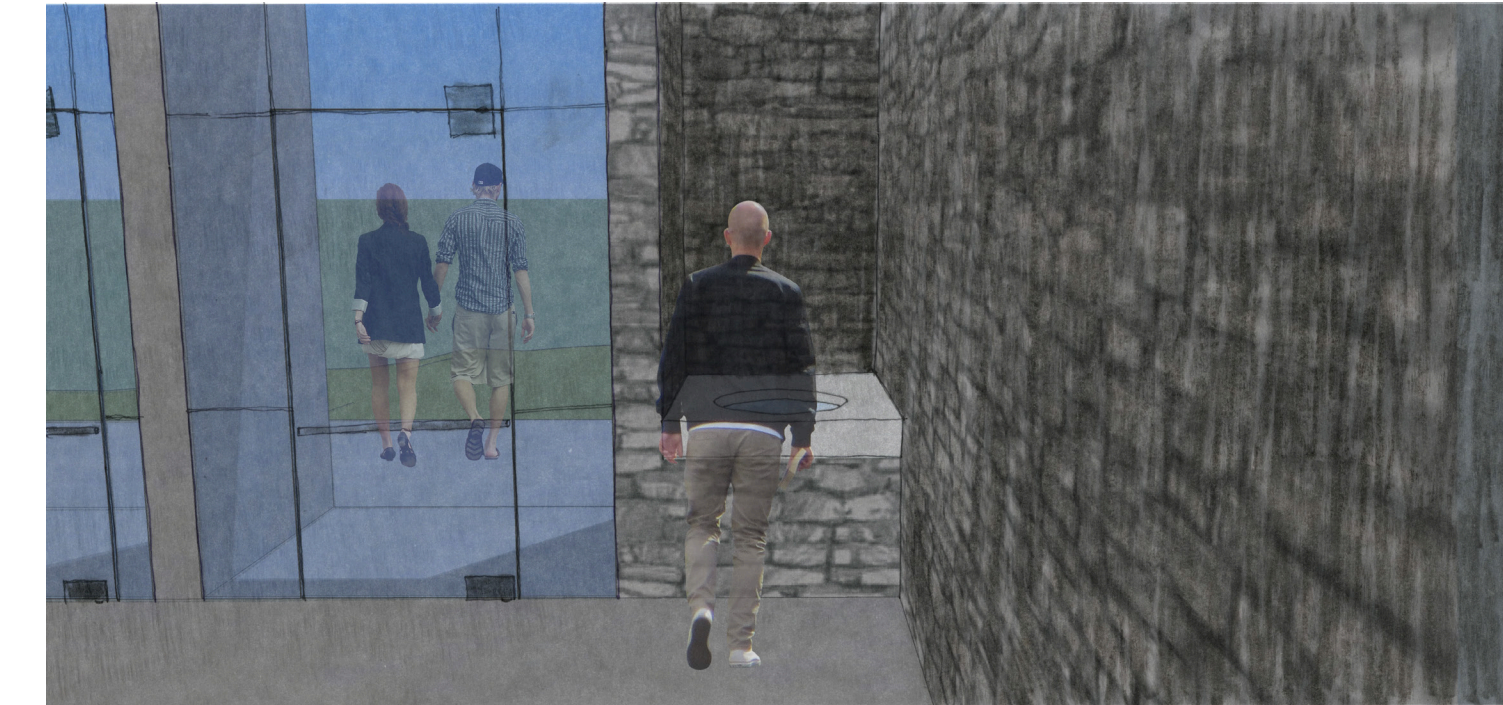
North Elevation





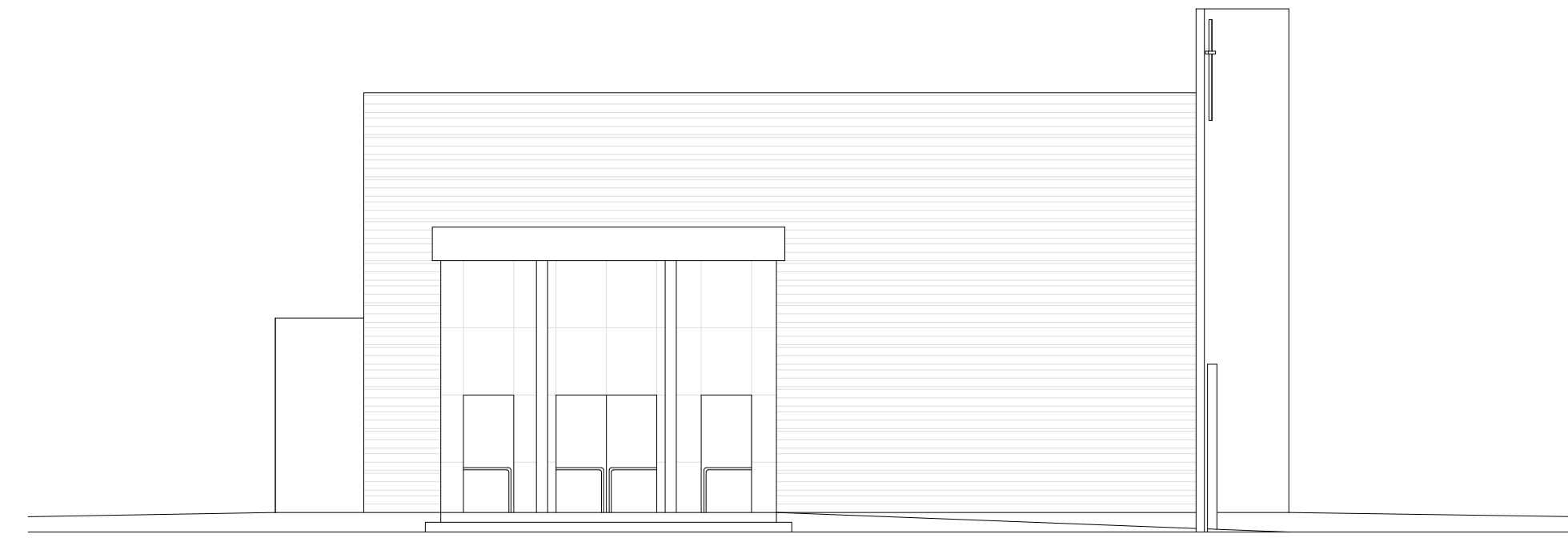


St. Peter's Chapel
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St. Peter's Chapel is built of stone, after its namesake. The main form of the stone box is broken at two locations. The east wall of the nave shifts to gesture towards true east, and lets natural light in the wall. Opposite this, a small chapel to St. Peter breaks the west wall, rotating to provide a focal point to worshippers exiting the nave, or entering around the service spaces that create the circulation path.

South Elevation



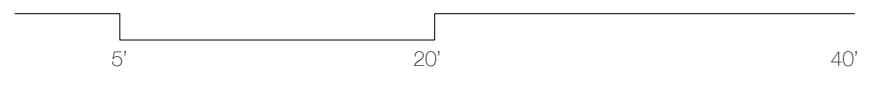
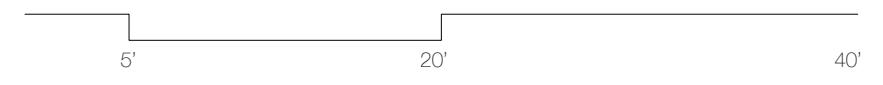
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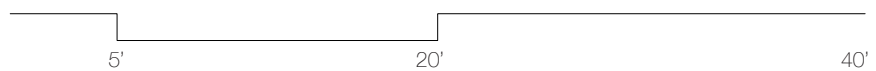
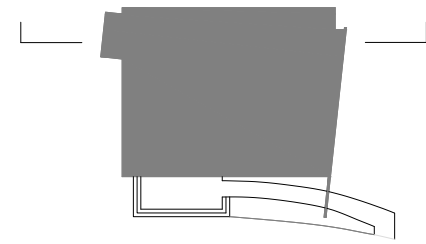
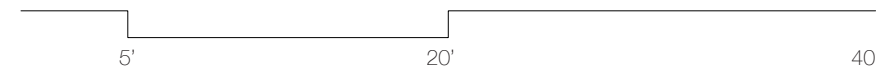
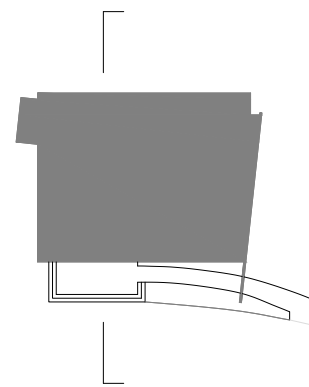
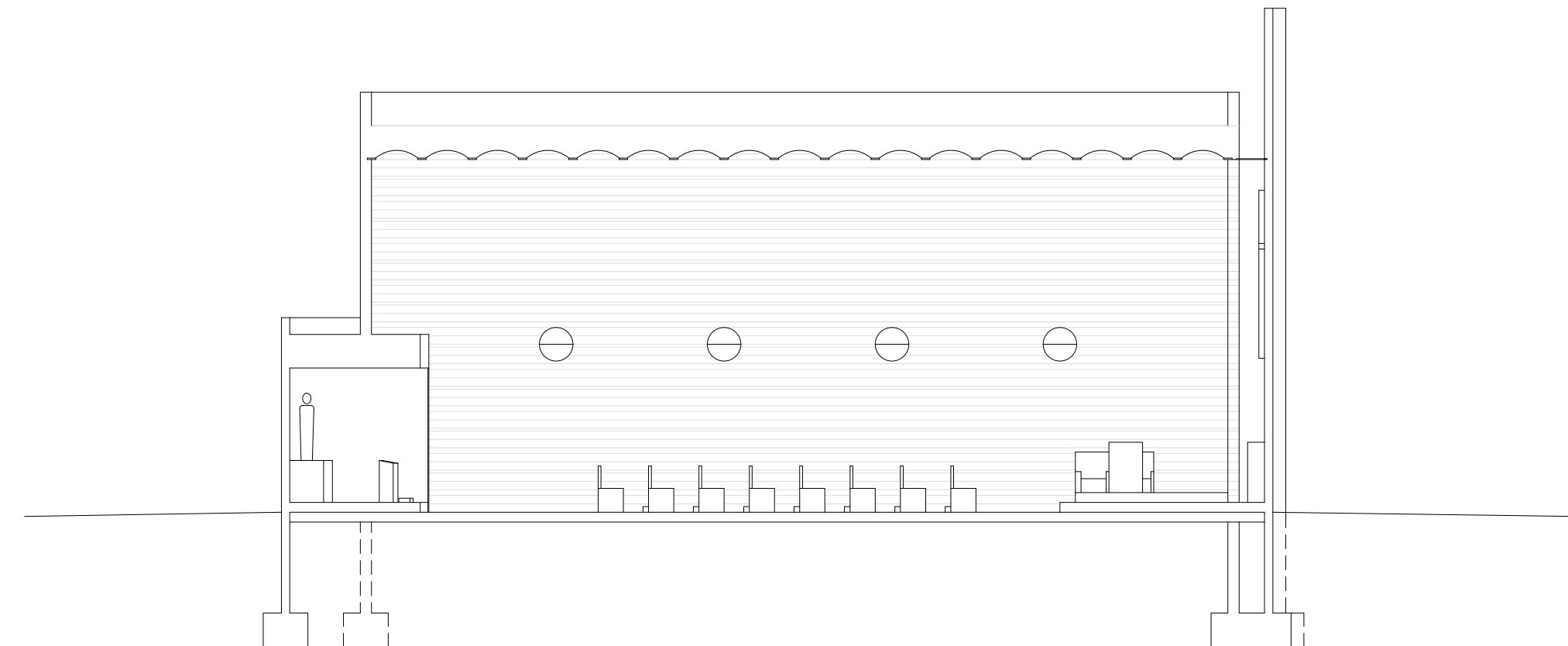
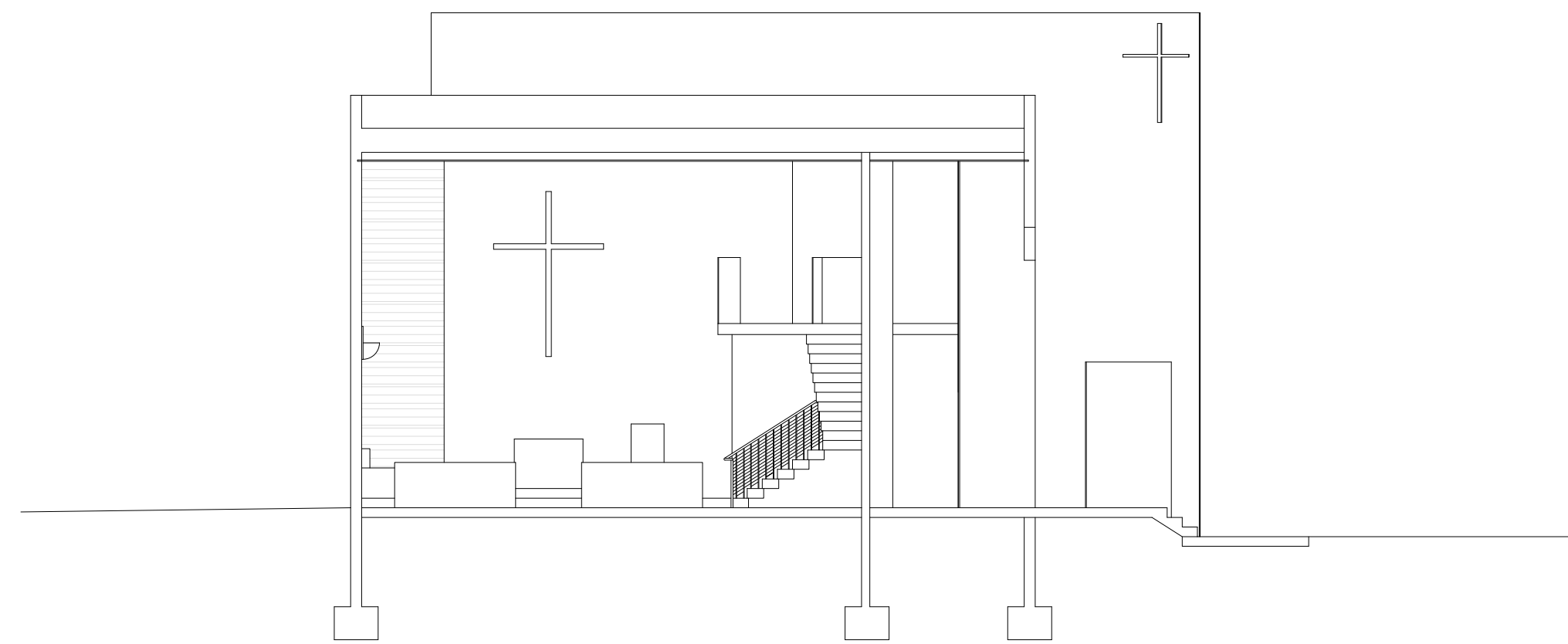


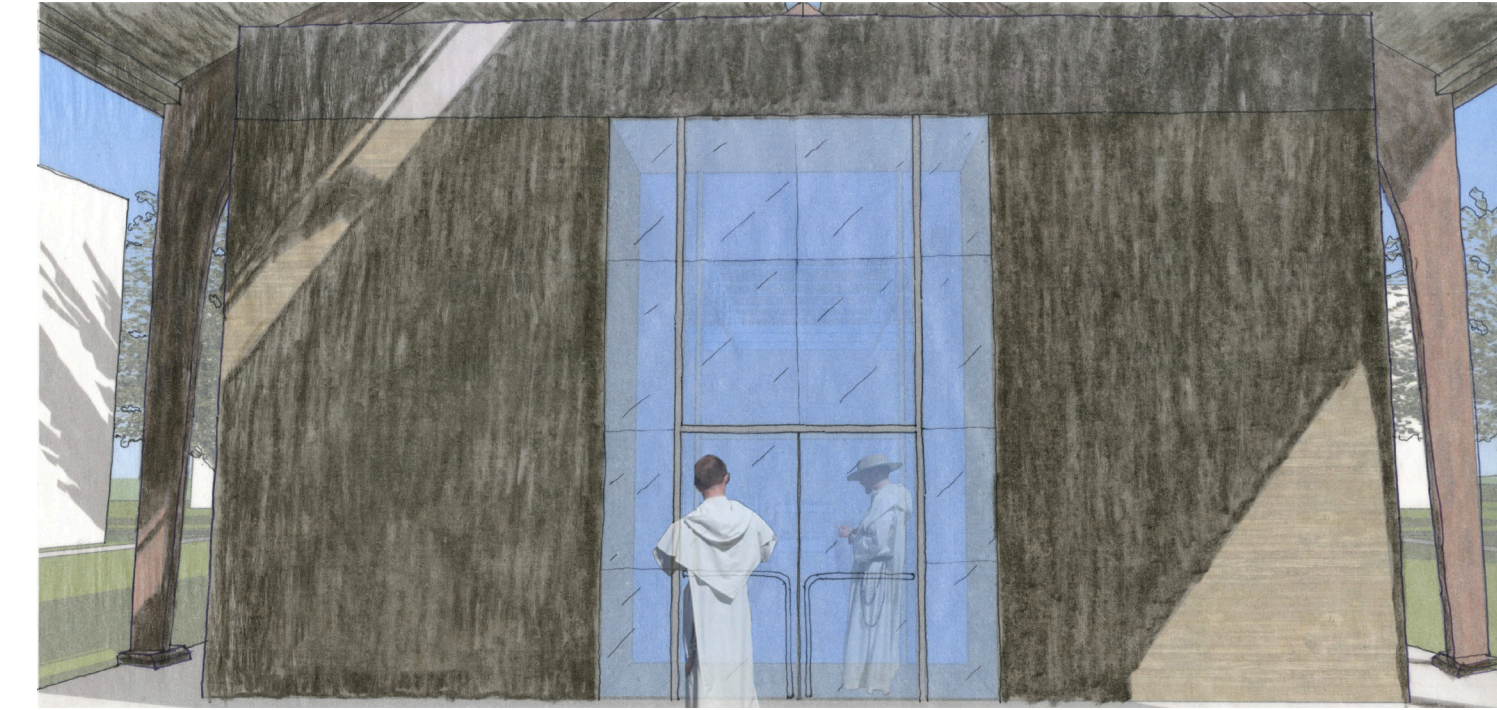
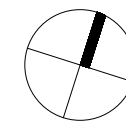
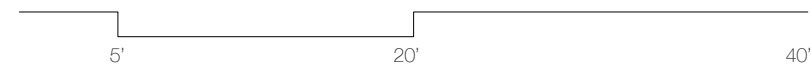
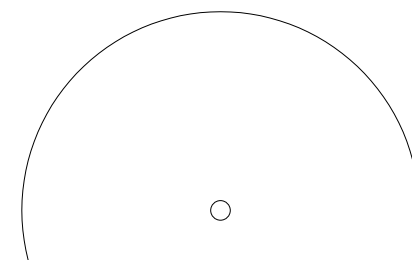
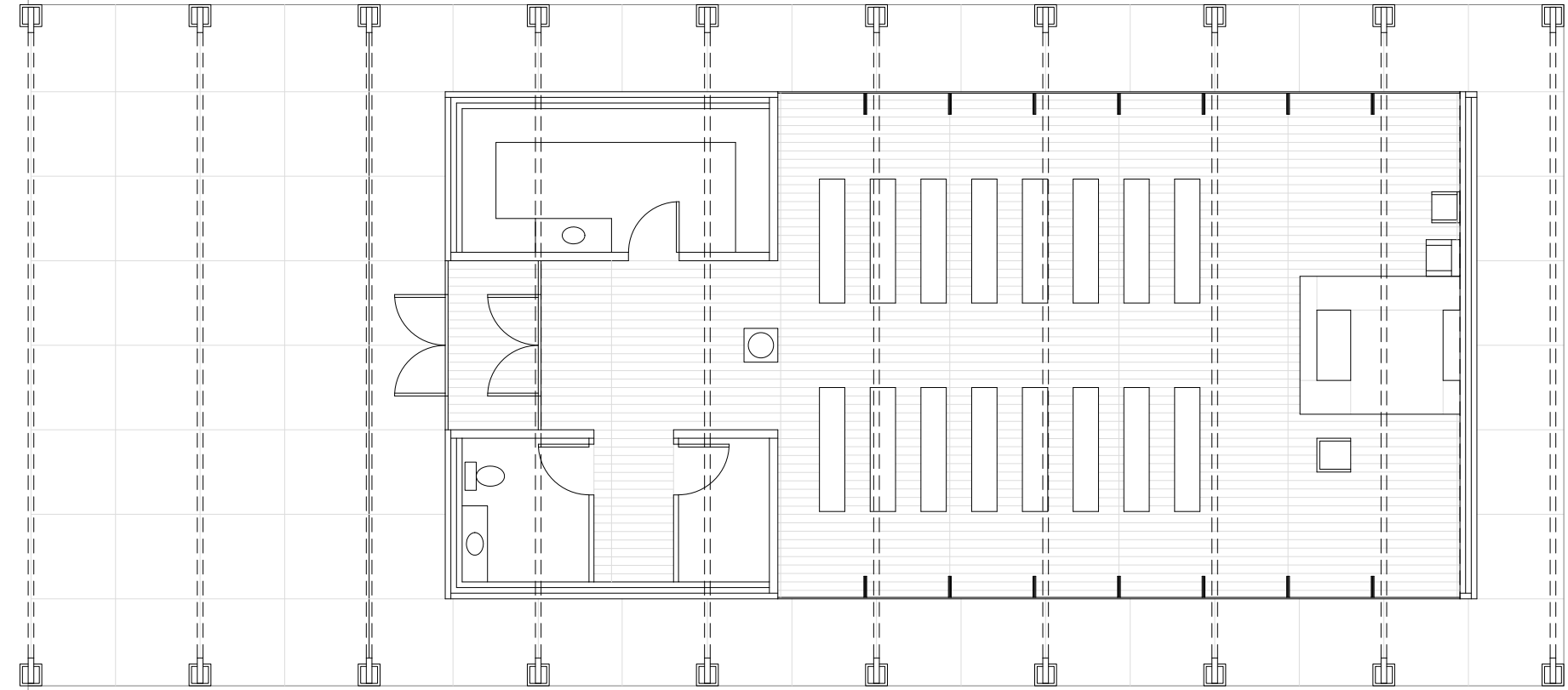
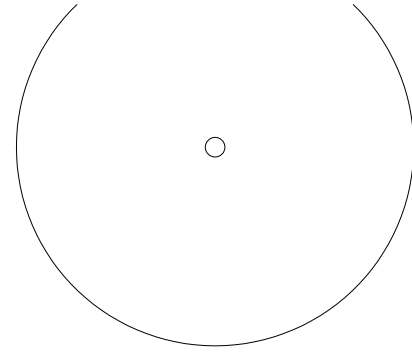
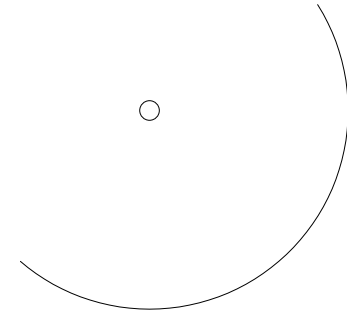
North Elevation



East Elevation

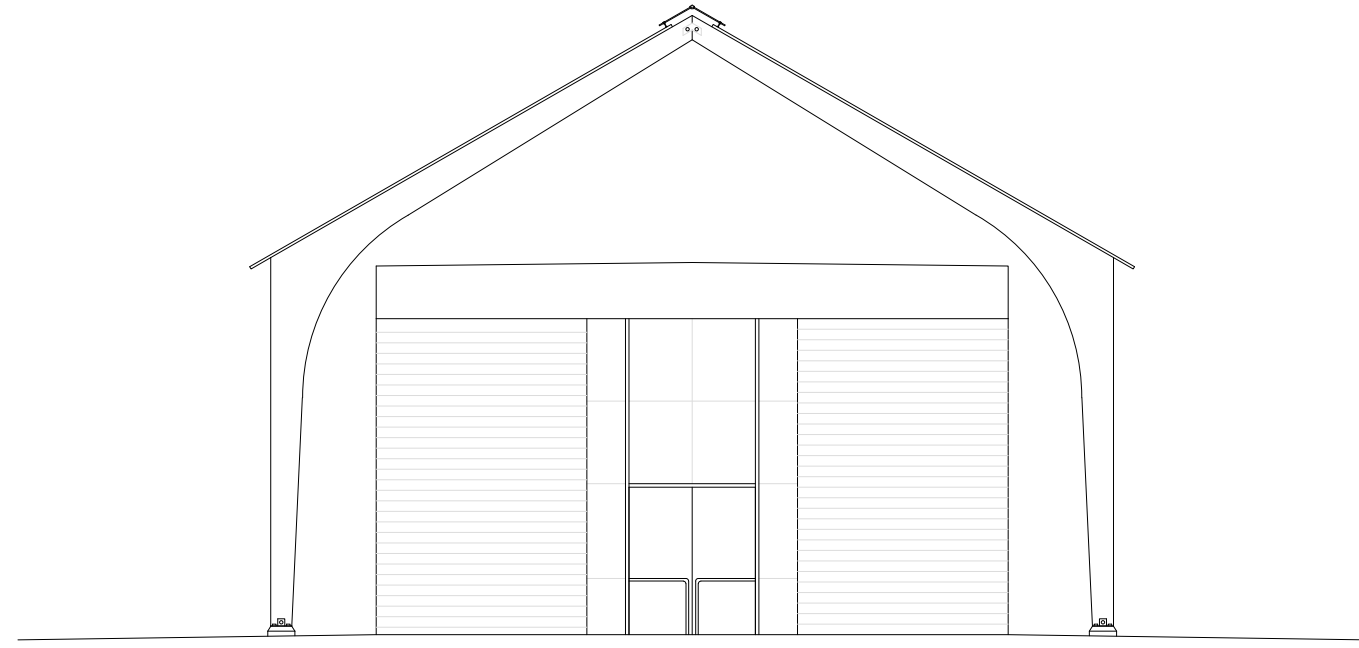




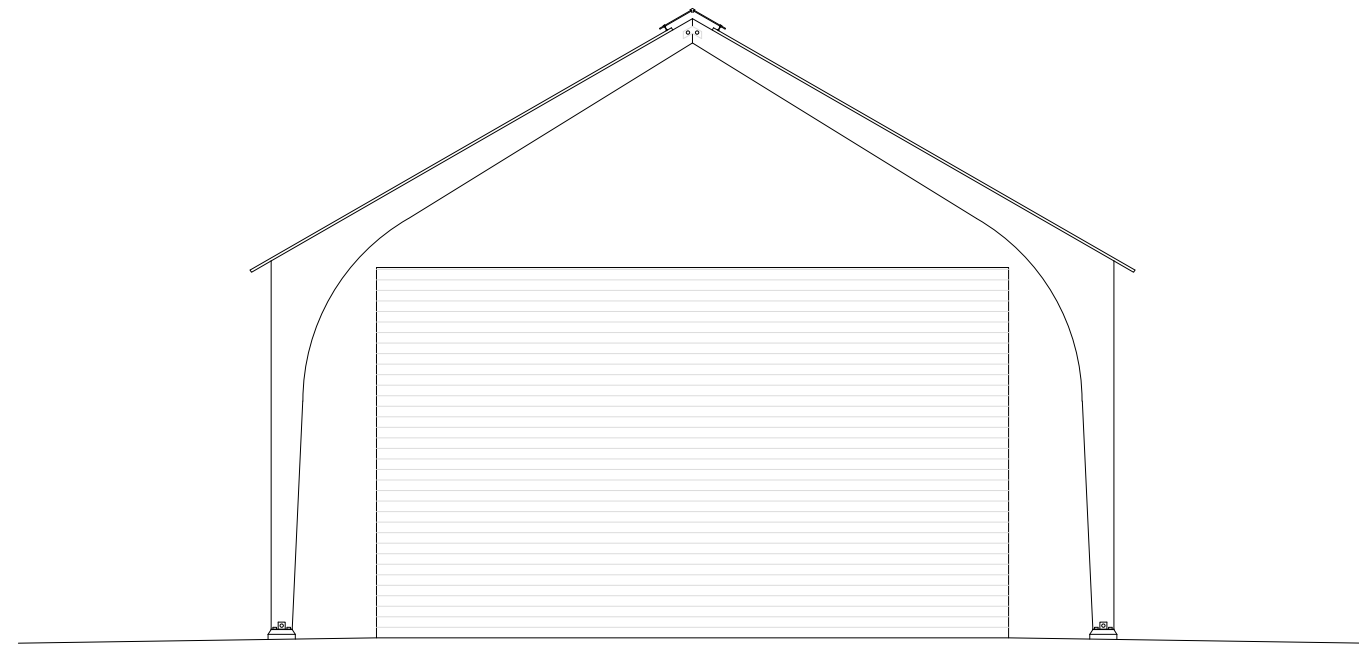


Like its namesake, St. Francis of Assisi Chapel is simple and humble. It takes the form of a box underneath a canopy. The canopy is supported by glulam tudor arches. The box consists of two parts: the service spaces - contained in stacked timber, and the nave - built of structural glass. The glass nave heightens the connection to the world outside the physical confines of the chapel, as St. Francis is known to have had a great love for the environment.

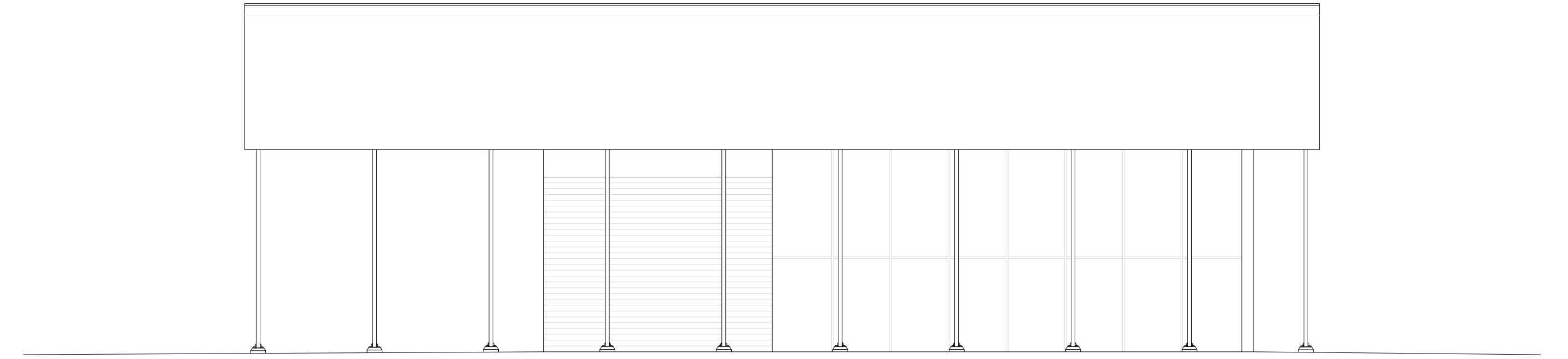
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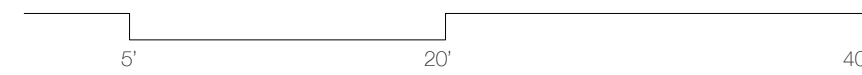
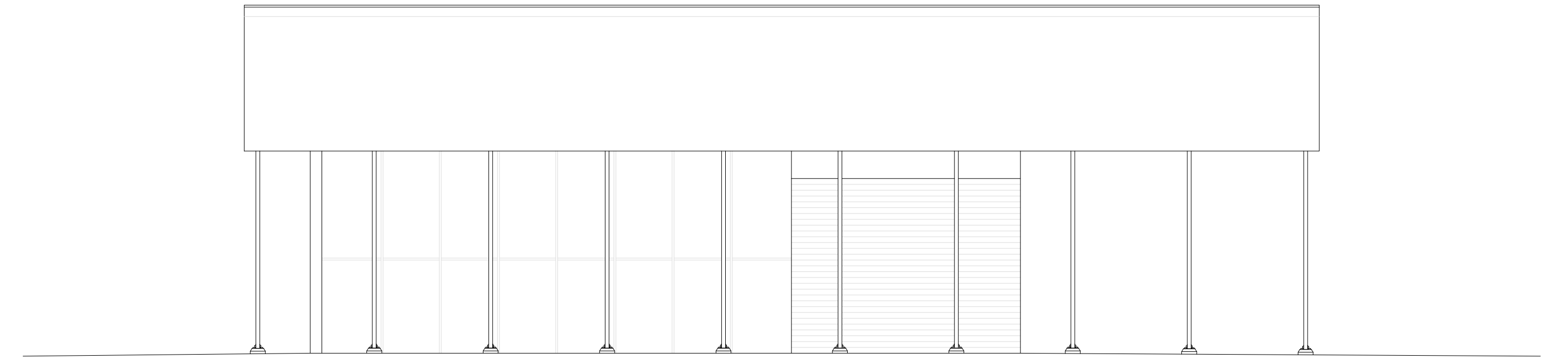
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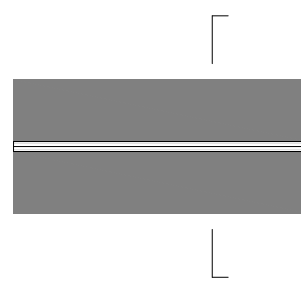
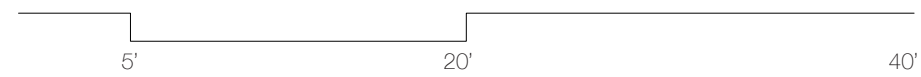
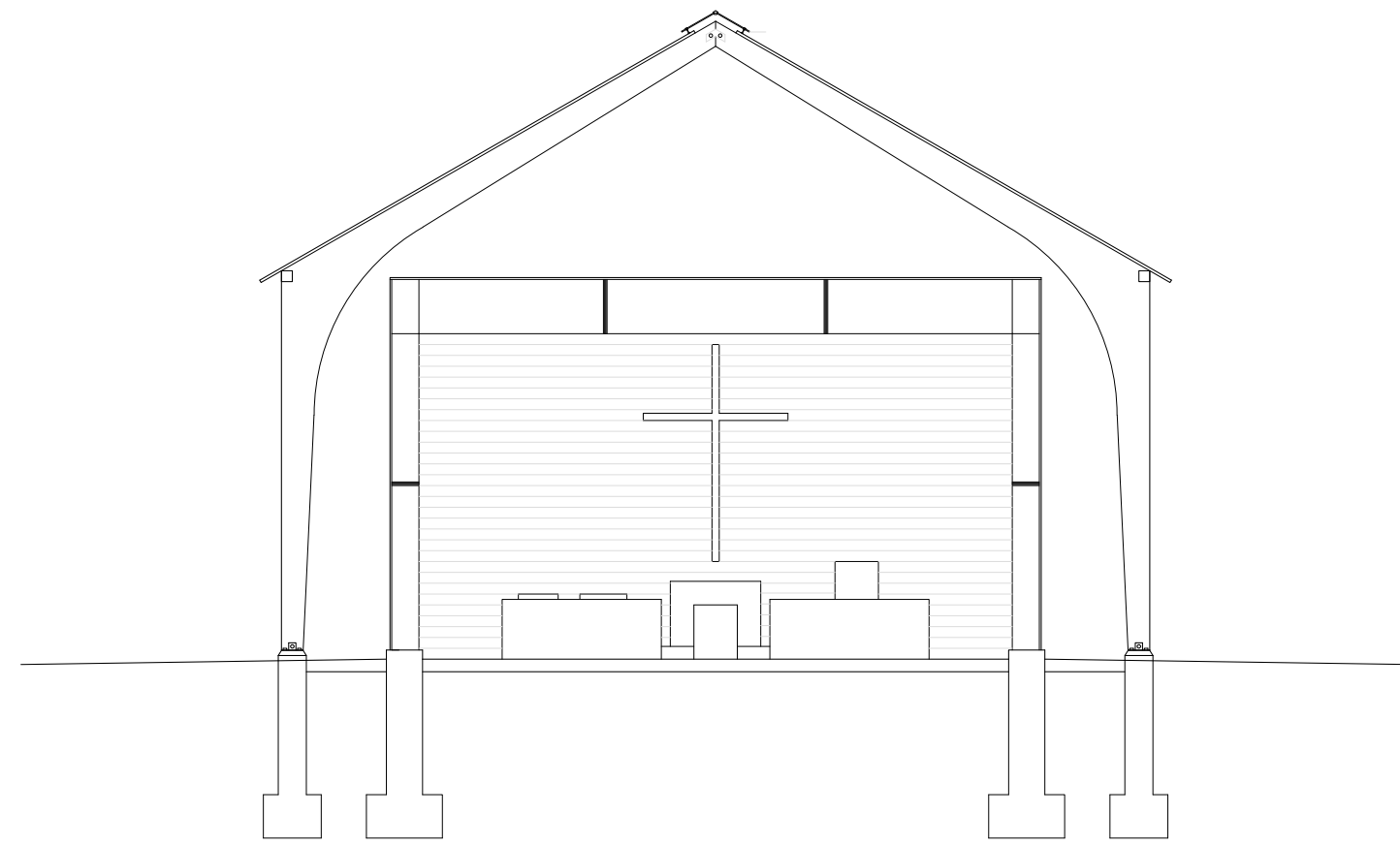


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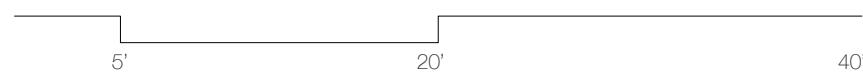
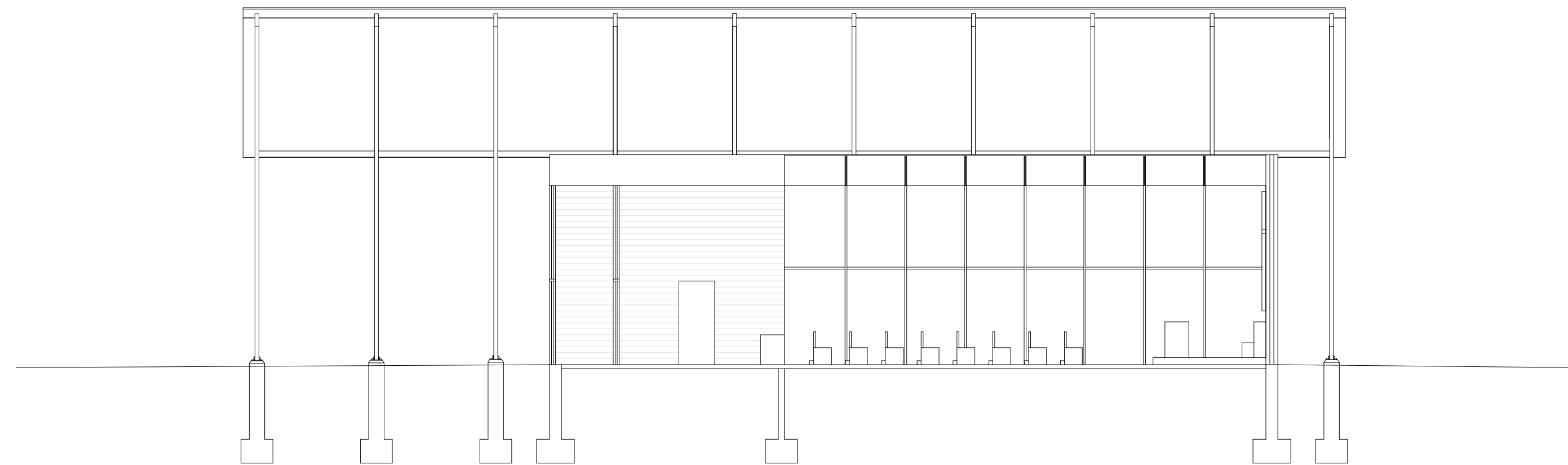


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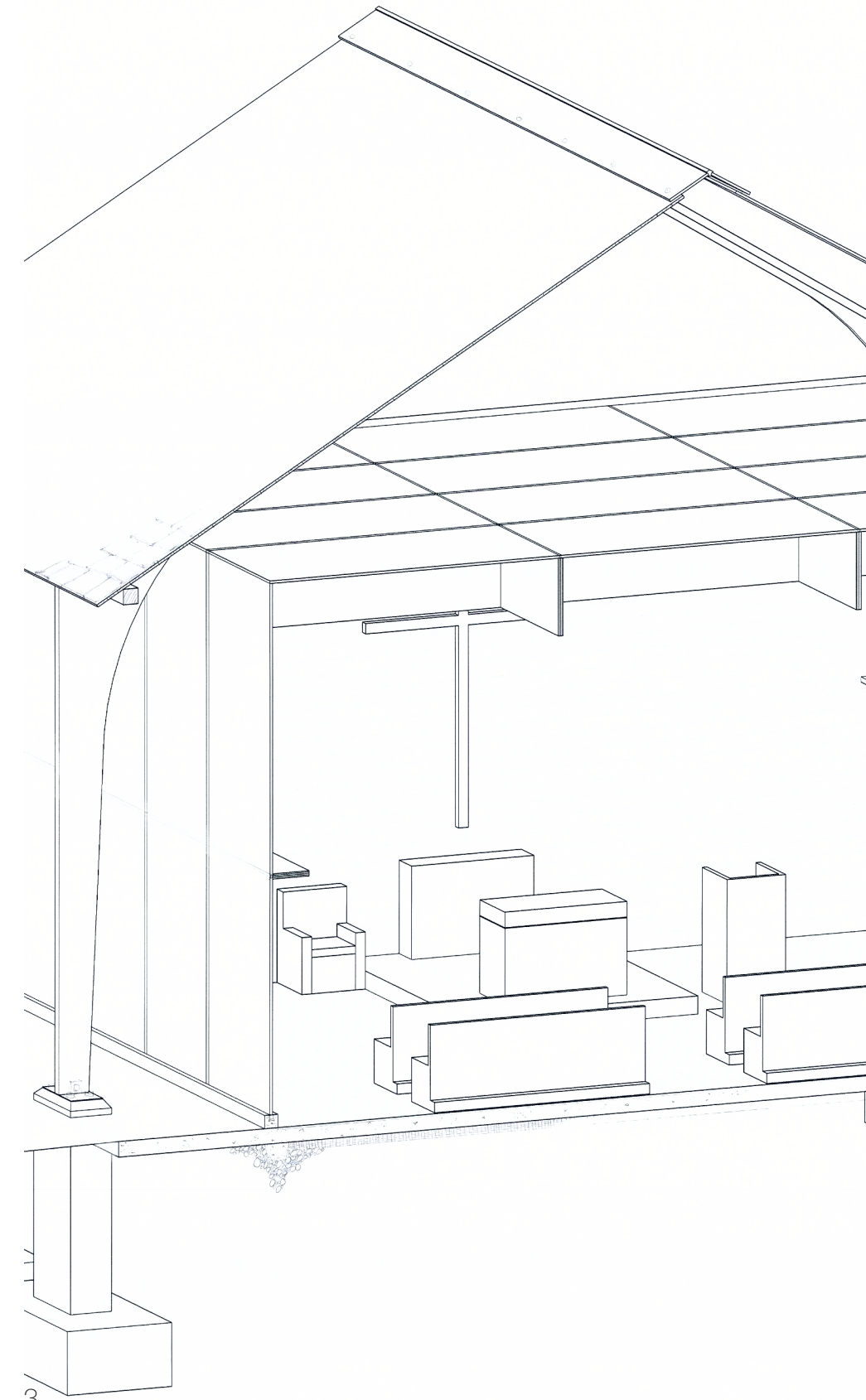
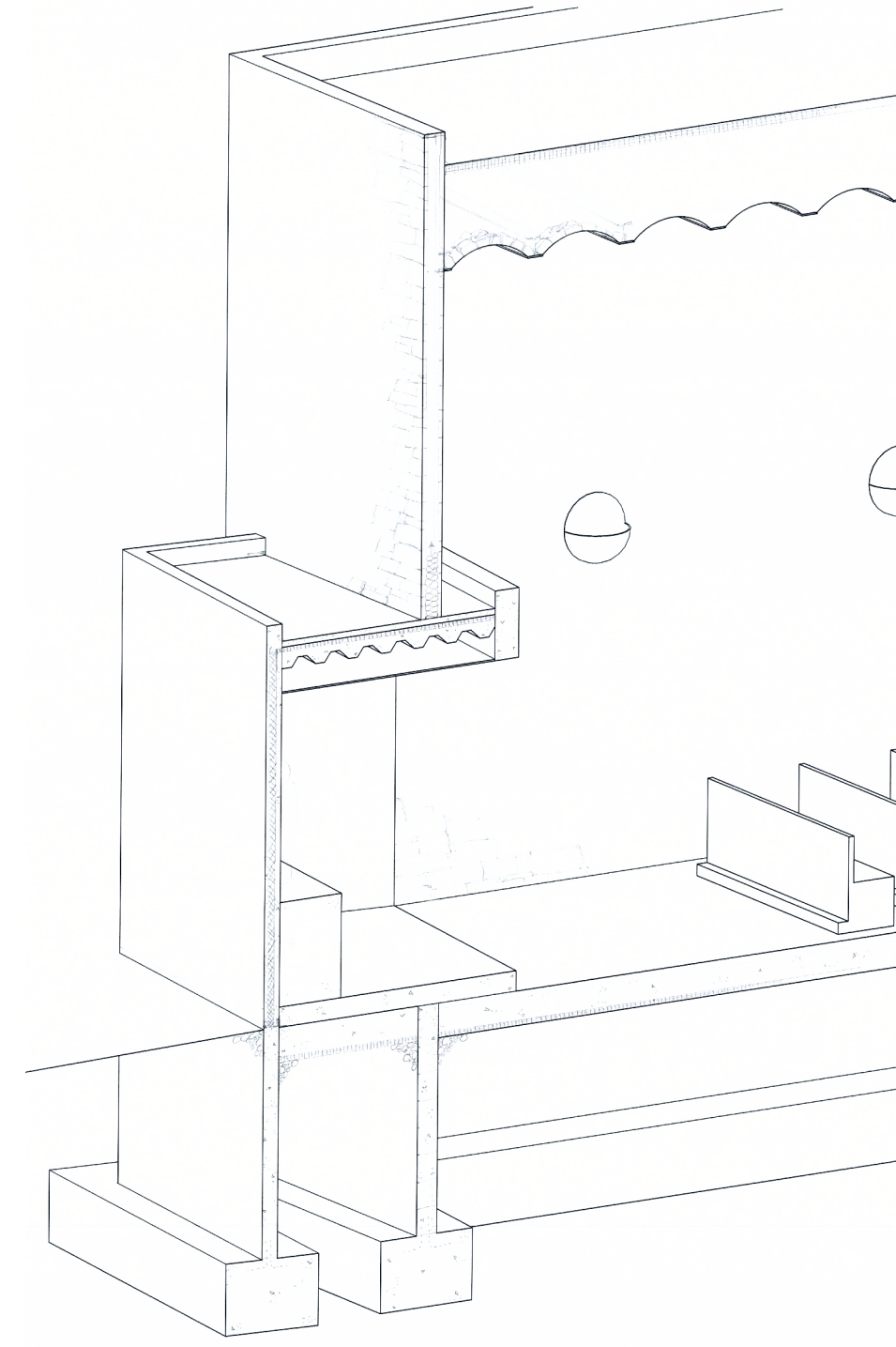
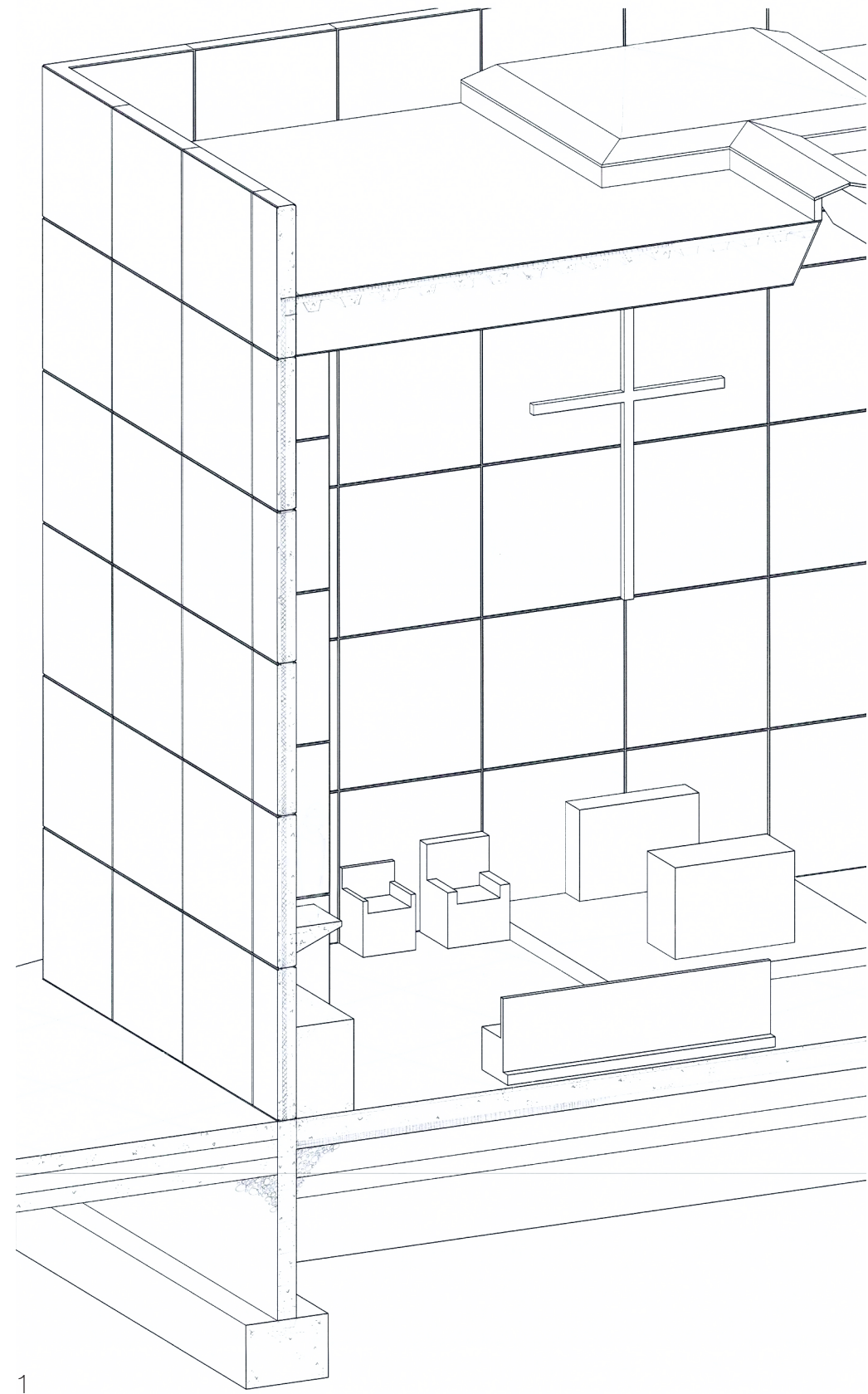




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Early in my exploration of this thesis, I studied the drawings in *The Details of Modern Architecture*, by Edward Ford. These drawings are detail axons of a large collection of buildings. Using an axon helps to show how the layers of construction relate to how the building reveals itself to the user. Taking this as inspiration, I drew a wall section axon of each building.

1) Holy Family Chapel is built with insulated precast concrete panels. The interior and exterior of each panel are concrete. The panels between the side chapels act as piers for steel beams that span the chapel. The skylight passes over these beams in one continuous cut through the roof.

2) St. Peter's Chapel is a steel stud frame construction, with stone veneer. The concrete pieces that break from the stone box are insulated precast panels. The ceiling is a series of masonry arches, carrying the stone theme to a completely surrounding experience.

3) St. Francis of Assisi chapel has two parts. The canopy is a series of glulam tudor arches with wooden decking running between them for lateral support. The box that is covered by the canopy is made of structural glass, 15 inch deep columns and 30 inch deep beams. The service spaces and the west wall of the nave are made of stacked timber, with one foot thick exterior walls comprised of 4x4 timber with insulation between.

In conclusion, my exploration of my thesis question hasn't so much resulted in an answer, as resulted in a way I intend to think about architecture for the rest of my life. Naturally, one wants to aspire to architectural "honesty", but necessities of the real world - such as budget, environmental concerns, and building codes - mean that it is not always possible. As an architect, one has to create the best possible architectural experience for the user.

During my thesis defense, a comment was made in relation to the religious nature of my project. The creation myth of Adam and Eve results in humanity's state of original sin. As a result of original sin, humans can never be perfect. In the same way, no one will ever design a perfect building. Measurements will be off, a miscue will be hidden behind some architectural element, even in the Pantheon the perfect circle must be broken by a door. But just because we will never achieve perfection, doesn't mean we should ever stop striving for it.

"A great building, in my opinion, must begin with the unmeasurable, go through measurable means when it is being designed, and in the end must be unmeasurable."

- Louis I. Kahn

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Pg. 7 Left: Ford, Edward R. *9.10 Wall Section*. 1990. *The Details of Modern Architecture*, by Edward R. Ford, The MIT Press, 1990, p. 67

Pg. 7 Right: Robbins, Greg. *Farnsworth House*. 2006. Online image. Flickr. https://www.flickr.com/photos/greg_robbins/282855644/in/album-72157594350732180/. Accessed 27 Oct. 2016.

Pg. 9 Left: Zumthor, Peter. *Installation*. 1996. *Peter Zumthor 1990-1997 Buildings and Projects Volume 2*, ed. Thomas Durisch, Verlag Scheidegger & Spiess, AG, 2014, p. 54

Pg. 11: Ayers Saint Gross Architects + Planners. *Exhibit 20: Proposed Building Uses*. 2012. *The Catholic University of America 2012 Campus Master Plan*, The Catholic University of America, 2012, <http://masterplan.cua.edu/res/docs/Campus-Master-Plan-2012-Final.pdf>, p. 73. Accessed 20 Oct. 2015.

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