

concrete & memory

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(abstract)

concrete has a memory. It stores the construction sequences. It shows what it is made of and how it is made. The texture of the formwork, the color difference of the pours, and the shadows of the metal ties combine to layer the beauty of concrete. The aim of this study is to explore the instruments of a concrete surface in order to enhance this multi-sensory experience. This study began with the design of a concrete wall and evolved into the design of a single-family home.

sincere gratitude to my committee; Hans Rott, William Galloway and Patrick Doan for their support that challenged me and their guidance throughout the research and design.

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special thanks to;

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(acknowledgment)

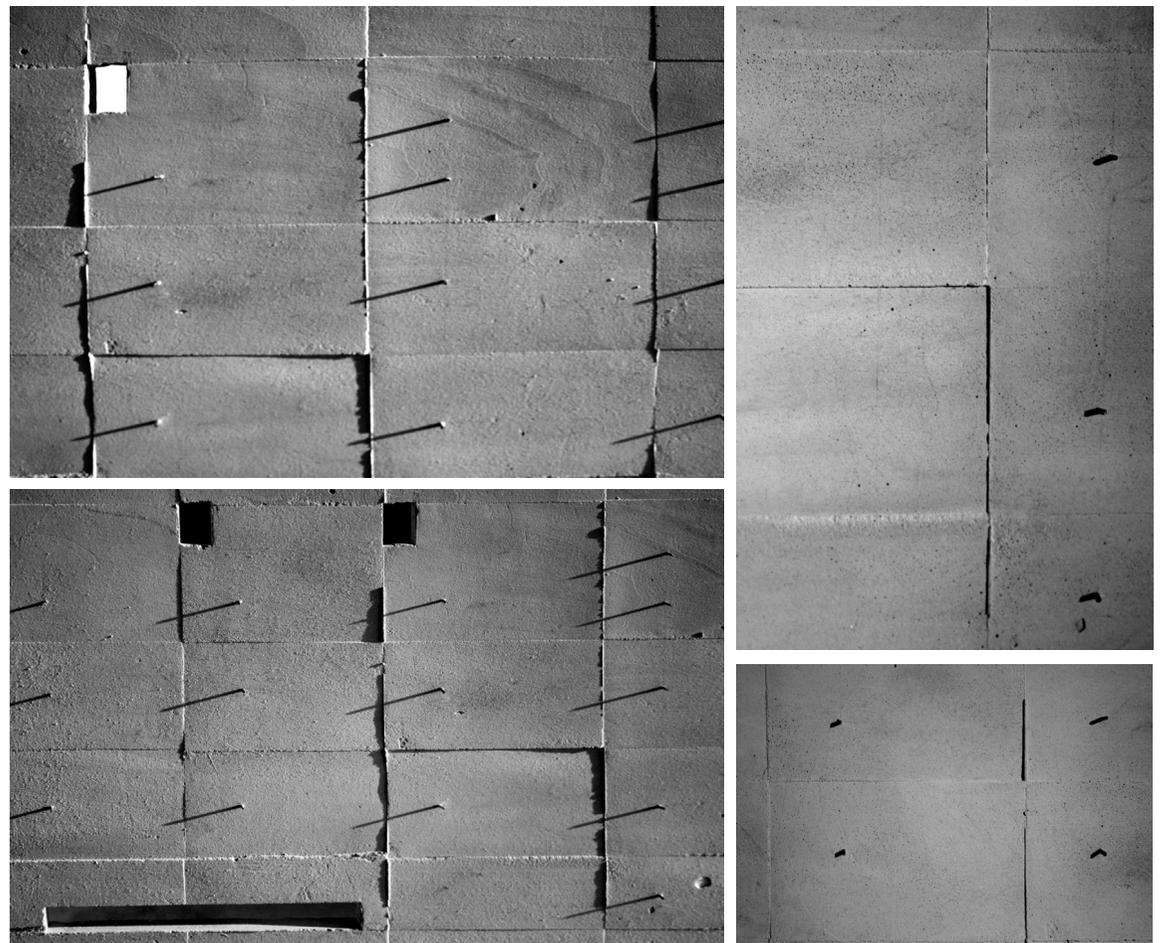
(content)

| | |
|-------------------|----|
| building a wall | 1 |
| formwork | 12 |
| texture and color | 17 |
| | |
| the house | 19 |
| | |
| bibliography | 36 |

list of figures

| | | |
|------|--|----|
| 1.1 | building a wall | 1 |
| 1.2 | formwork texture on concrete | 2 |
| 1.3 | the space between forms shows how fragile concrete can be besides being a strong material | 3 |
| 1.4 | the formwork connection details and form ties add a playful shadow on the concrete wall | 4 |
| 1.5 | site preparation and surveying | 5 |
| 1.6 | setting out the plan | 6 |
| 1.7 | leveling the site | 7 |
| 1.8 | rebar placement | 8 |
| 1.9 | reinforcement details | 9 |
| 1.10 | rebar connection details | 10 |
| 1.11 | reinforced footing details | 11 |
| 2.1 | connection joint detail | 12 |
| 2.2 | stop end detail | 12 |
| 2.3 | rod tie dimensions | 12 |
| 2.4 | leveling, excavation, placement of the rebars and the first pours of the concrete | 13 |
| 2.5 | setting up to framework and the framework details | 14 |
| 2.6 | study model of the concrete wall and the wooden sliding door | 15 |
| 2.7 | model photo series of concrete interior wall detailing | 16 |
| 3.1 | model photo of concrete wall study | 17 |
| 3.2 | a study about how the changes in the ingredients and their rates effects the concrete surface and texture | 18 |
| 4.1 | axonometric drawing of the house | 19 |
| 4.2 | the orchestrated gardens meet with the forest from every corner of the house | 20 |
| 4.3 | west elevation | 21 |
| 4.4 | the opening on the west wall gives a glimpse of the scenery | 22 |
| 4.5 | although the house has multiple entrances from the gardens, it is separated from outside by the thick cast in place concrete walls | 23 |
| 4.6 | the main entrance facade, facing north | 24 |
| 4.7 | entrance door detail | 25 |
| 4.8 | section axonometric drawing of the house | 26 |
| 4.9 | elevation facing east | 27 |
| 4.10 | the steel mullions frames the forest view | 28 |
| 4.11 | window details | 29 |
| 4.12 | the section looking through the study area | 30 |
| 4.13 | the structure continues after the facade facing south to frame the inner garden | 31 |
| 4.14 | door and door handle detail | 32 |
| 4.15 | sleeping area | 33 |
| 4.16 | roof plan and section through the stair | 34 |
| 4.17 | memory as an extension of the experience | 35 |

building a wall



1.1

a place is not only a shelter for the body but also for the soul. The choice of materials and textures as well as the intensity of light can evoke memories, feelings, images and imaginations. Whether conscious or not, the body is in constant dialogue with buildings.

in this sense, concrete is self-expressive. It talks by its texture and shadow. It shows the sequence of its construction; how the formworks and the ties are attached, how many pours it had, which building materials were used...

the study has started by exploring the steps of constructing a concrete wall. Before pouring the concrete, from the excavation to the attachment of the formwork, the construction has many steps that need to be carefully planned. More importantly, this liquid stone needs a strong framework that holds everything together and forms a beautiful texture. Building a formwork makes the builder think from the negative to the positive. Moreover, the position and the length of the form ties as well as the connection of the sheathings are the main elements to design beautiful details on the concrete surface.



1.2

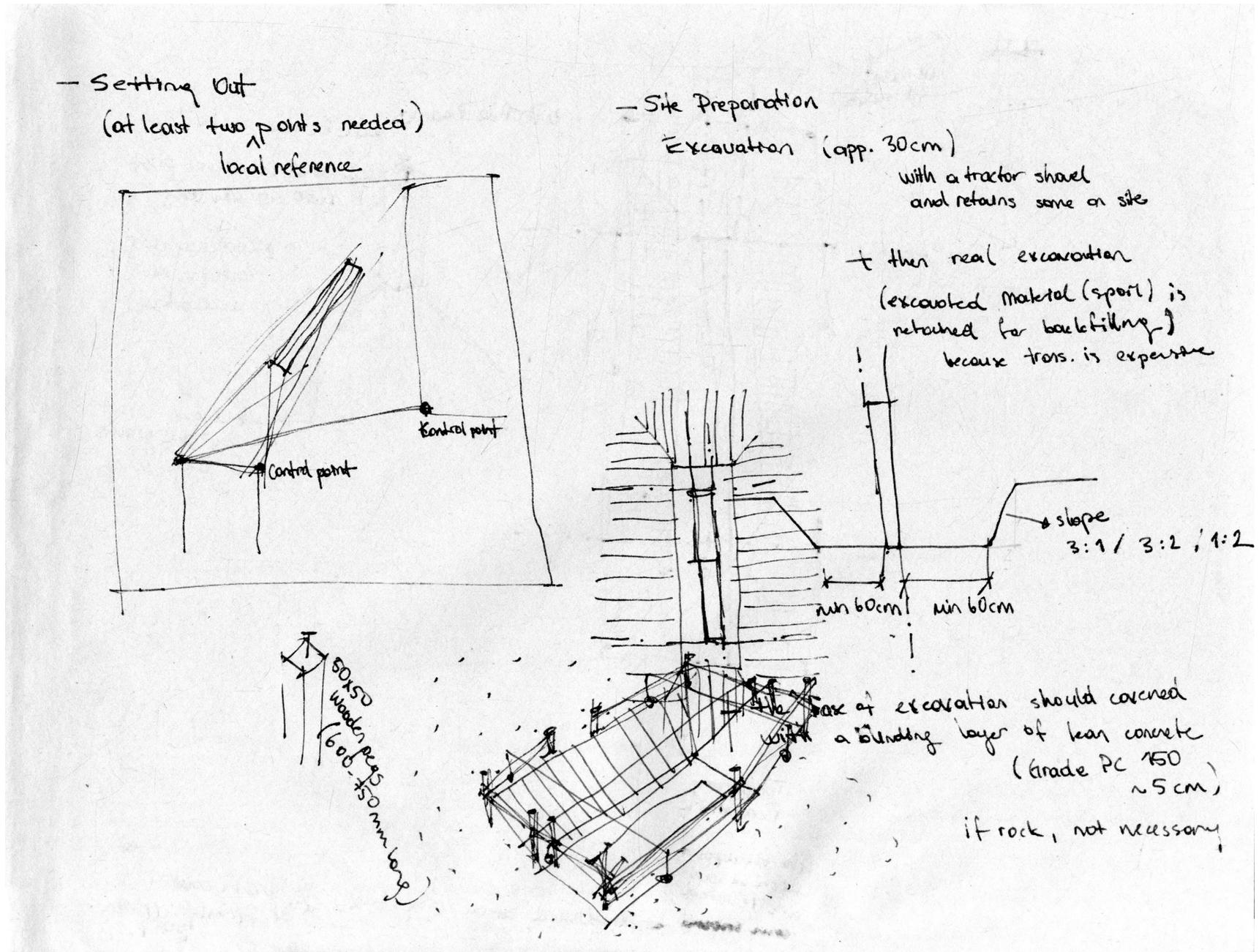


1.3 the space between forms shows how fragile concrete can be besides being a strong material

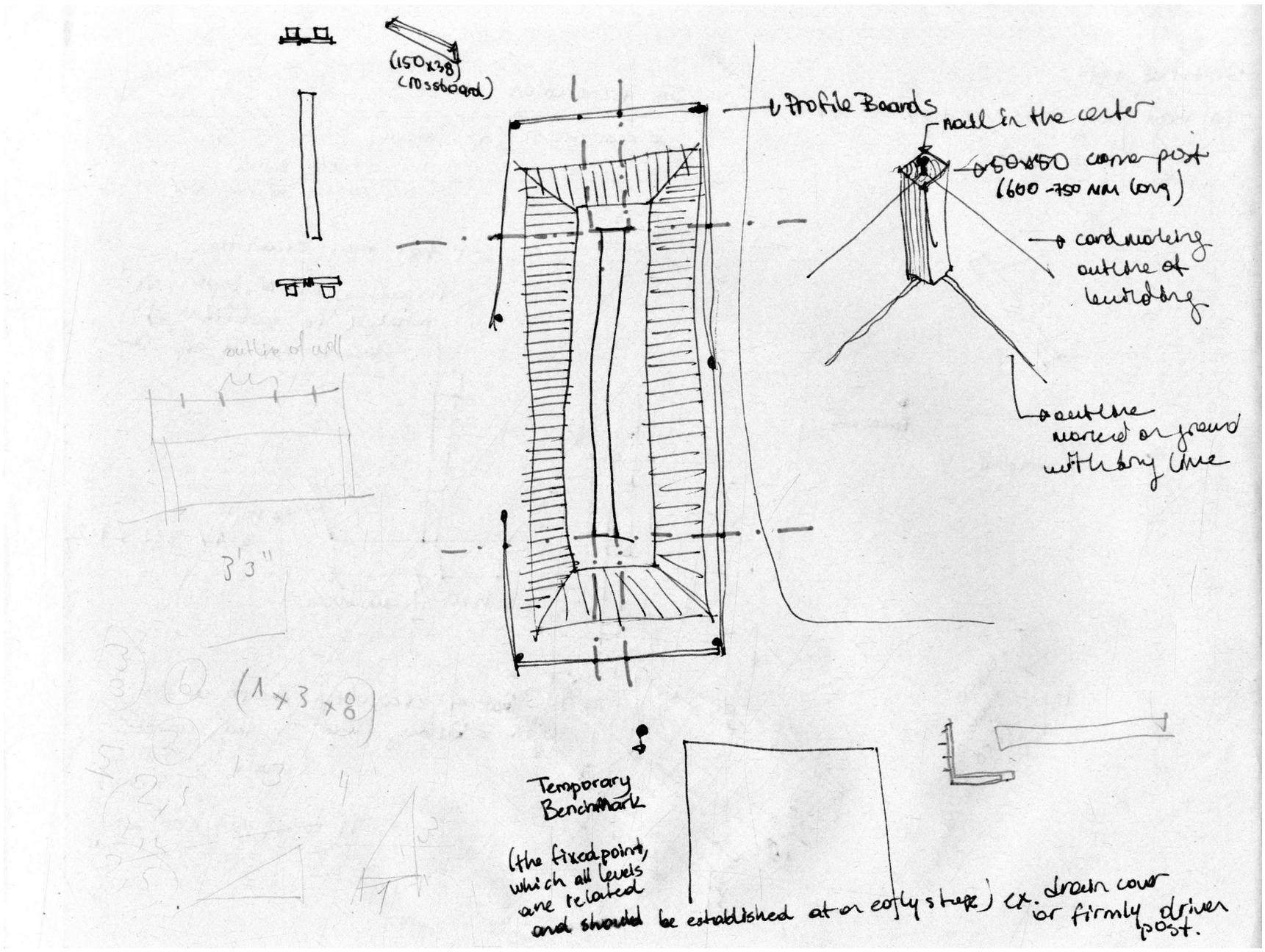


1.4 the formwork connection details and form ties add a playful shadow on the concrete wall

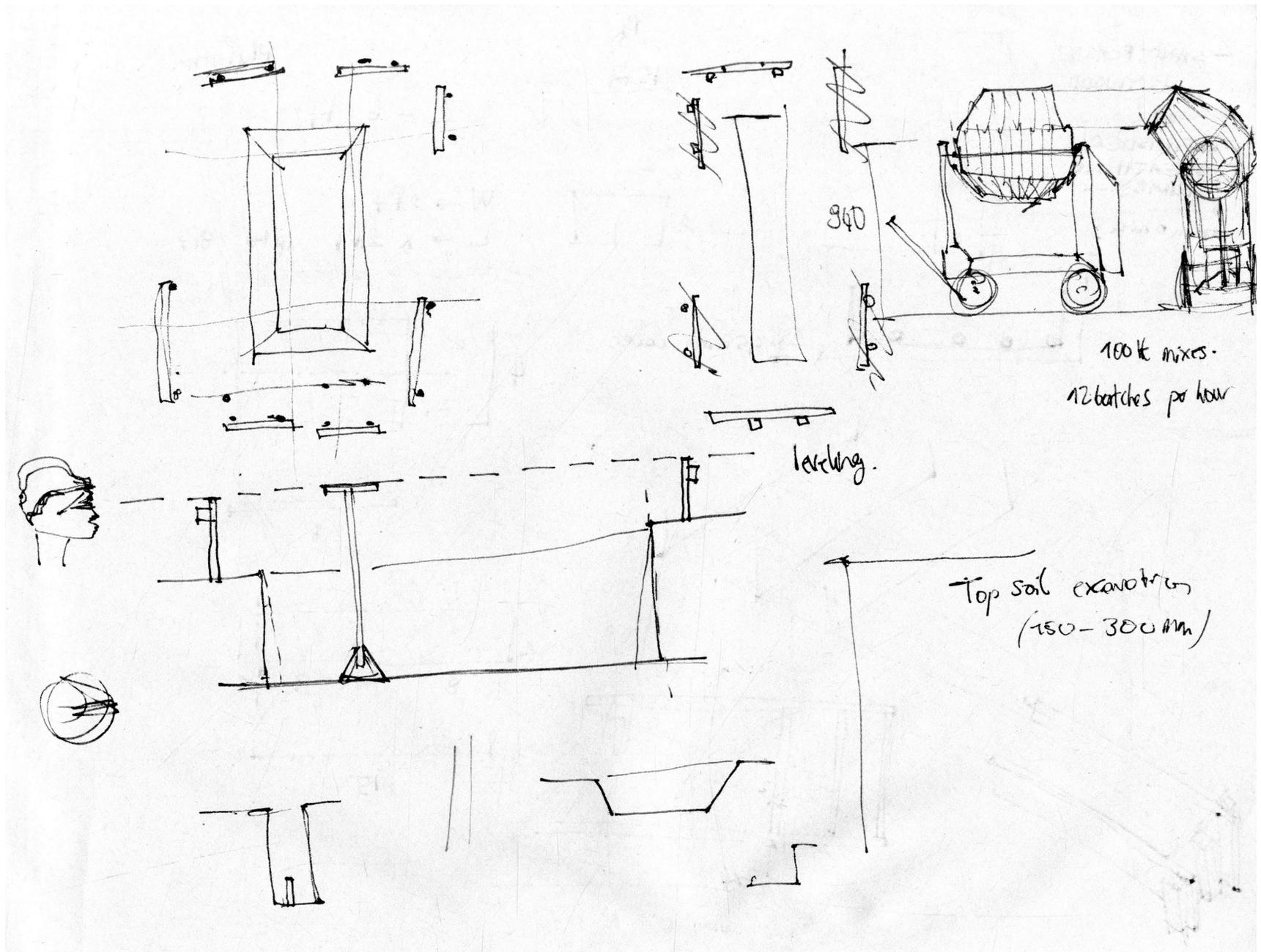
construction steps



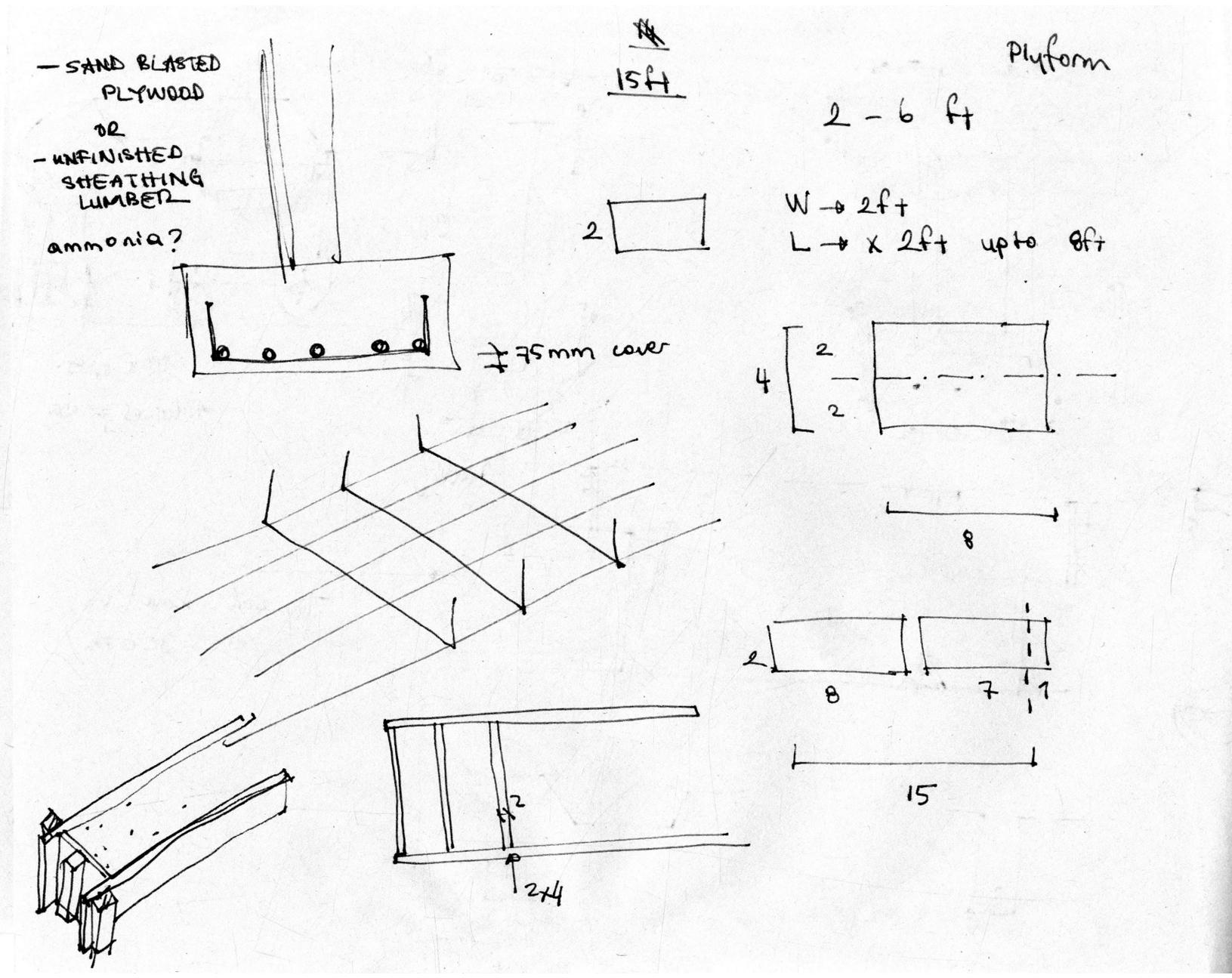
1.5 site preparation and surveying



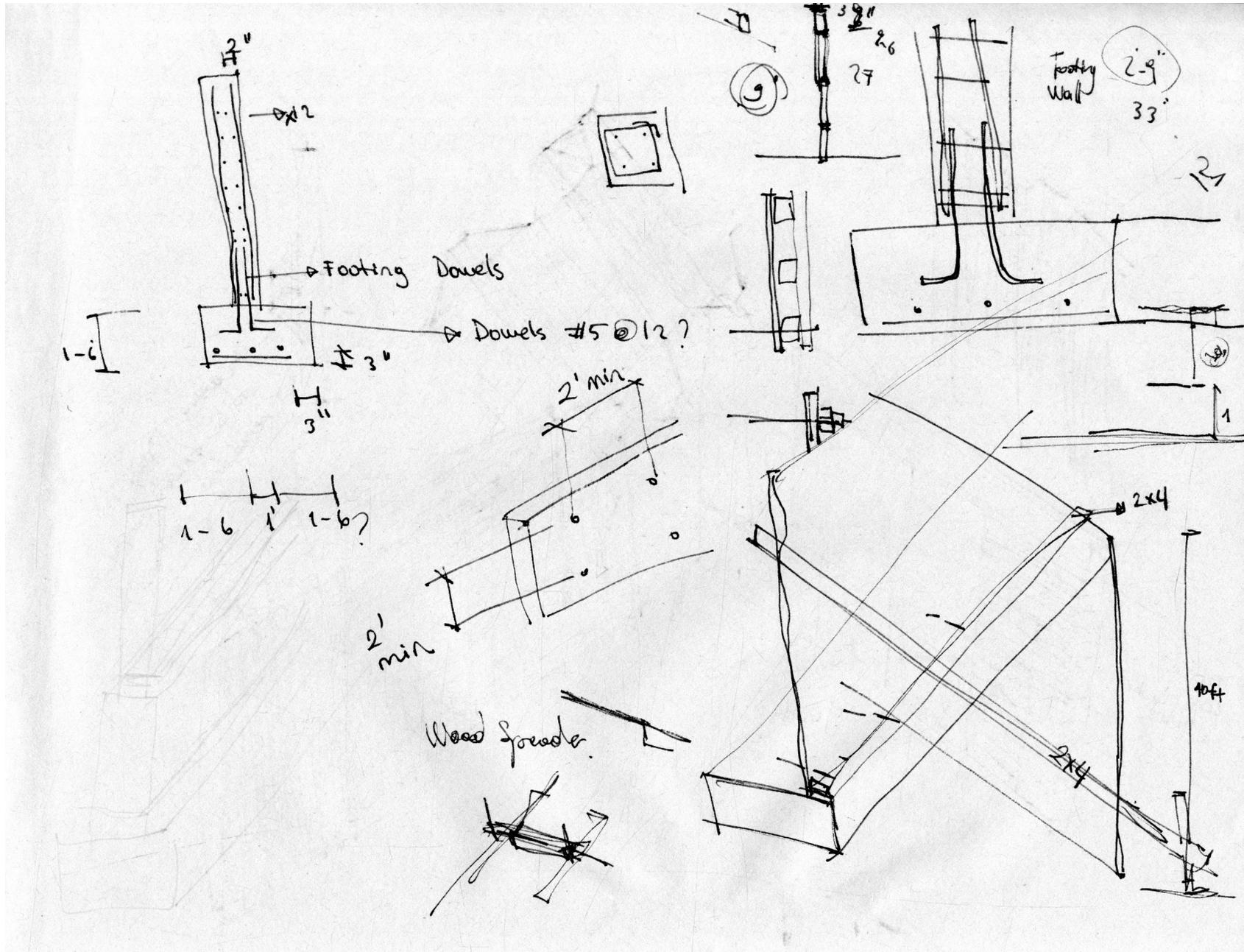
1.6 setting out the plan



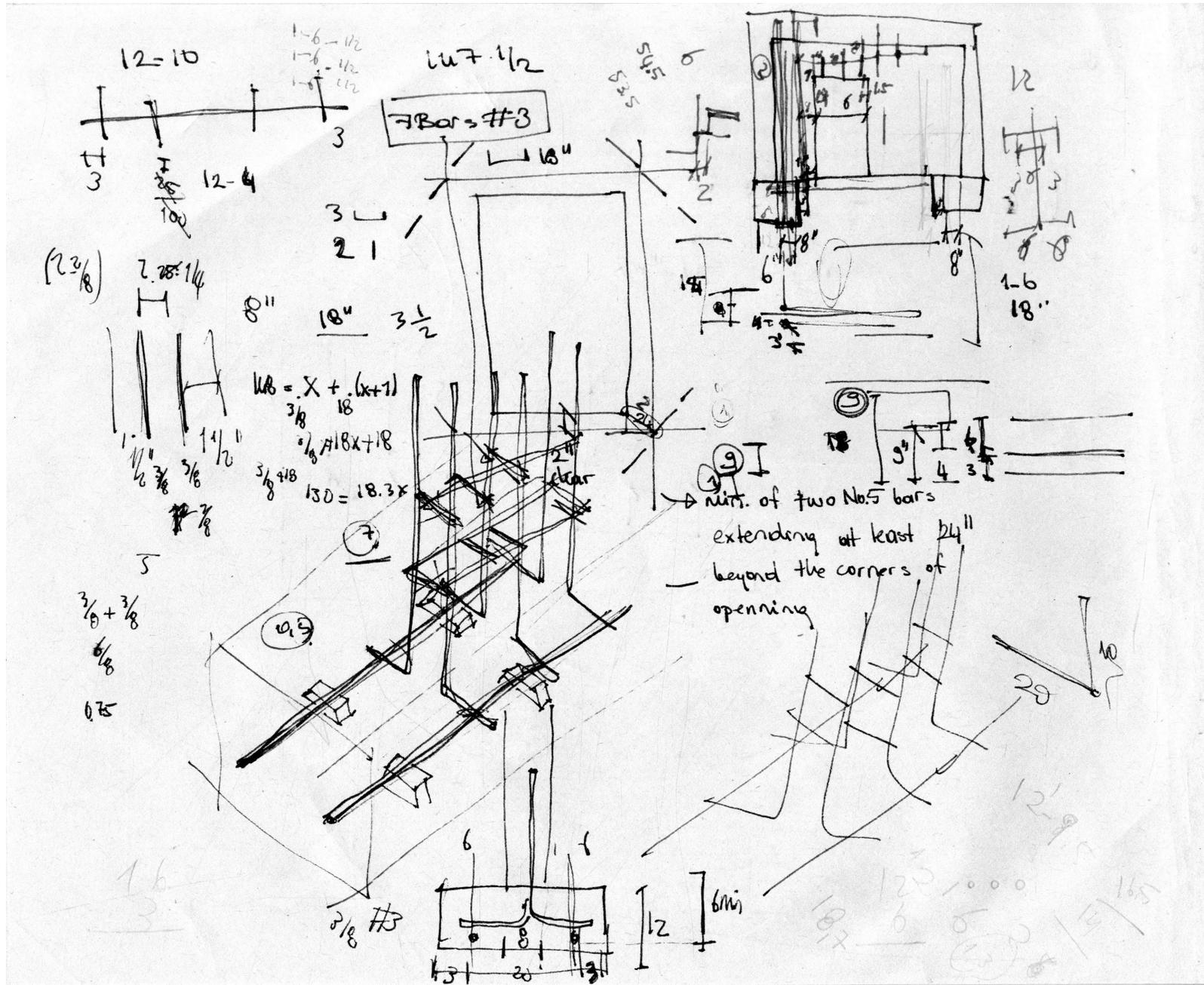
7. leveling the site



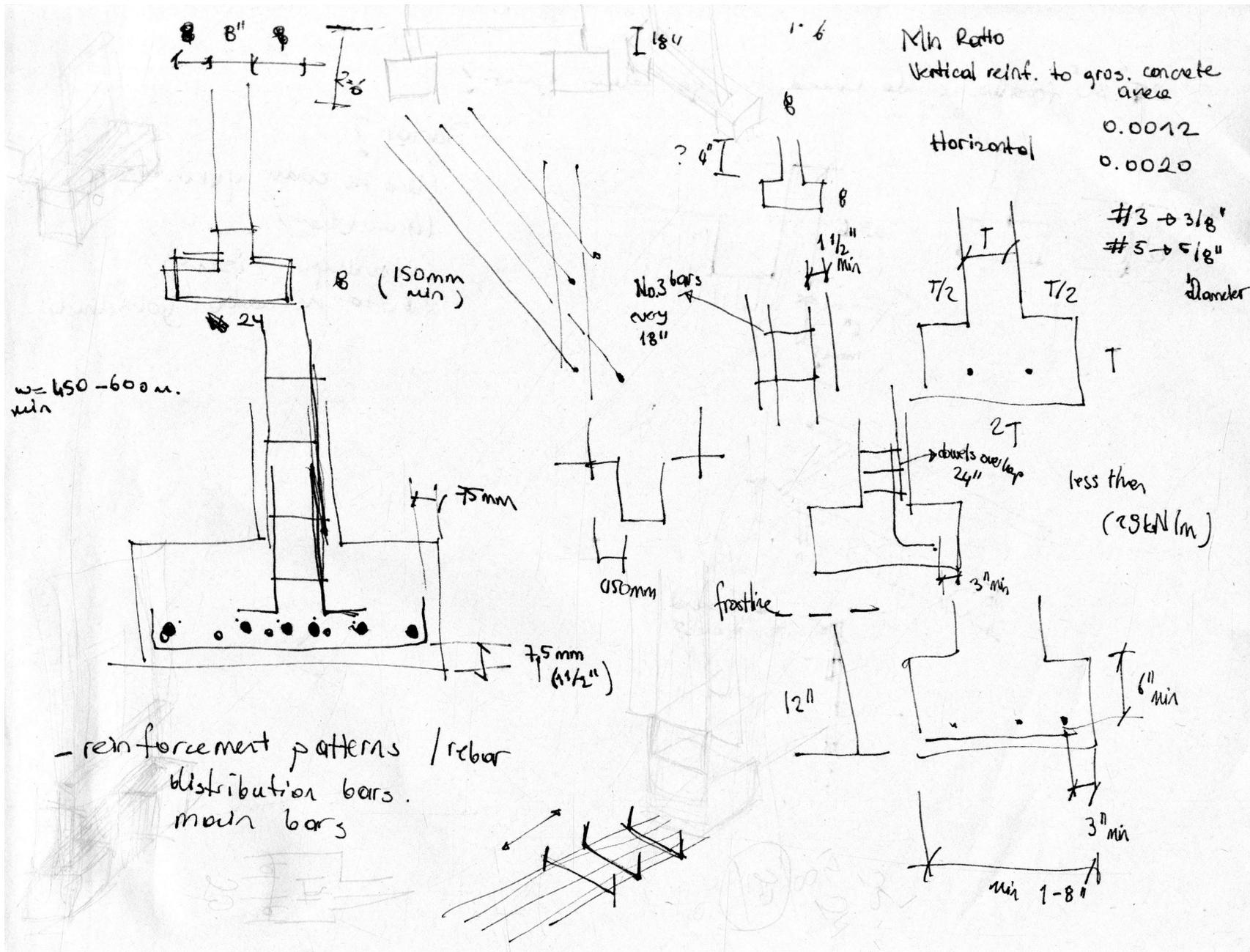
1.8 rebar placement



1.9 reinforcement details



1.10 rebar connection details



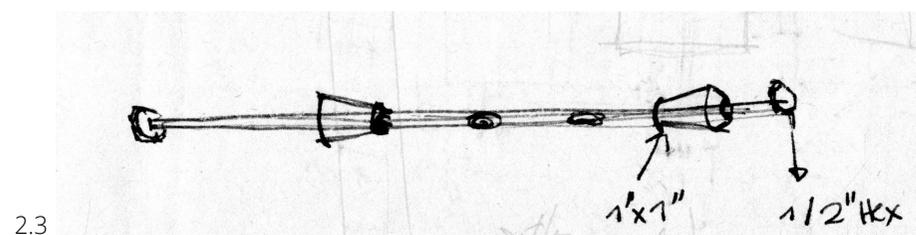
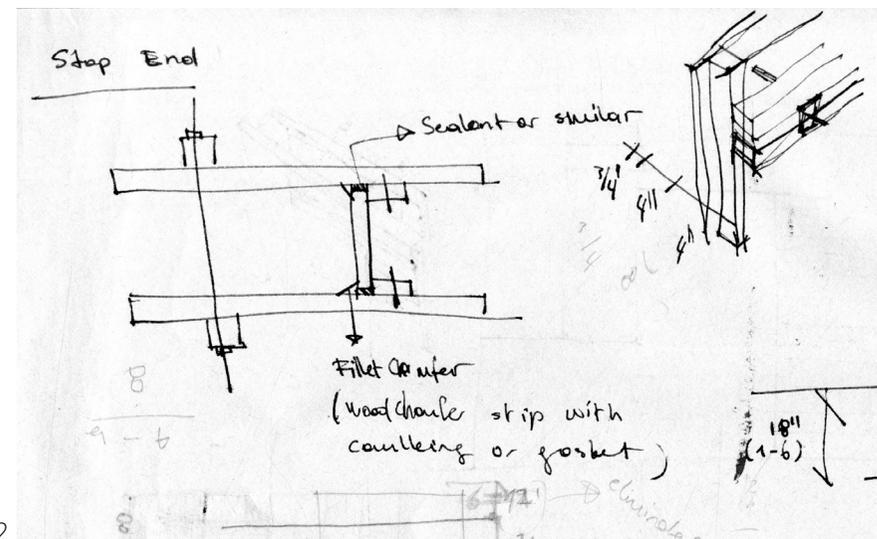
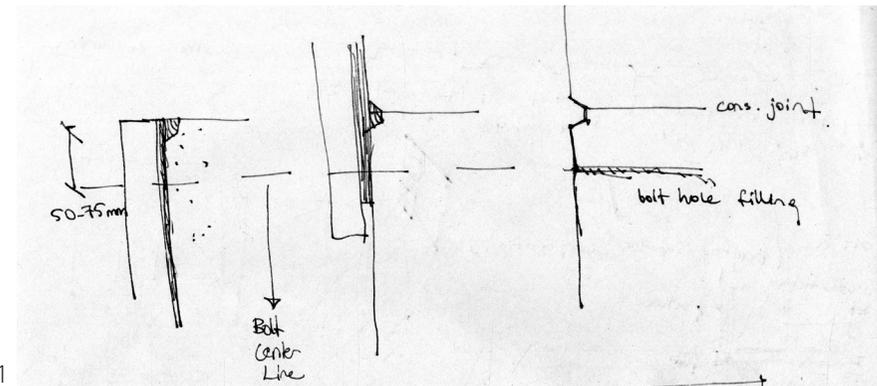
1.11 reinforced footing details

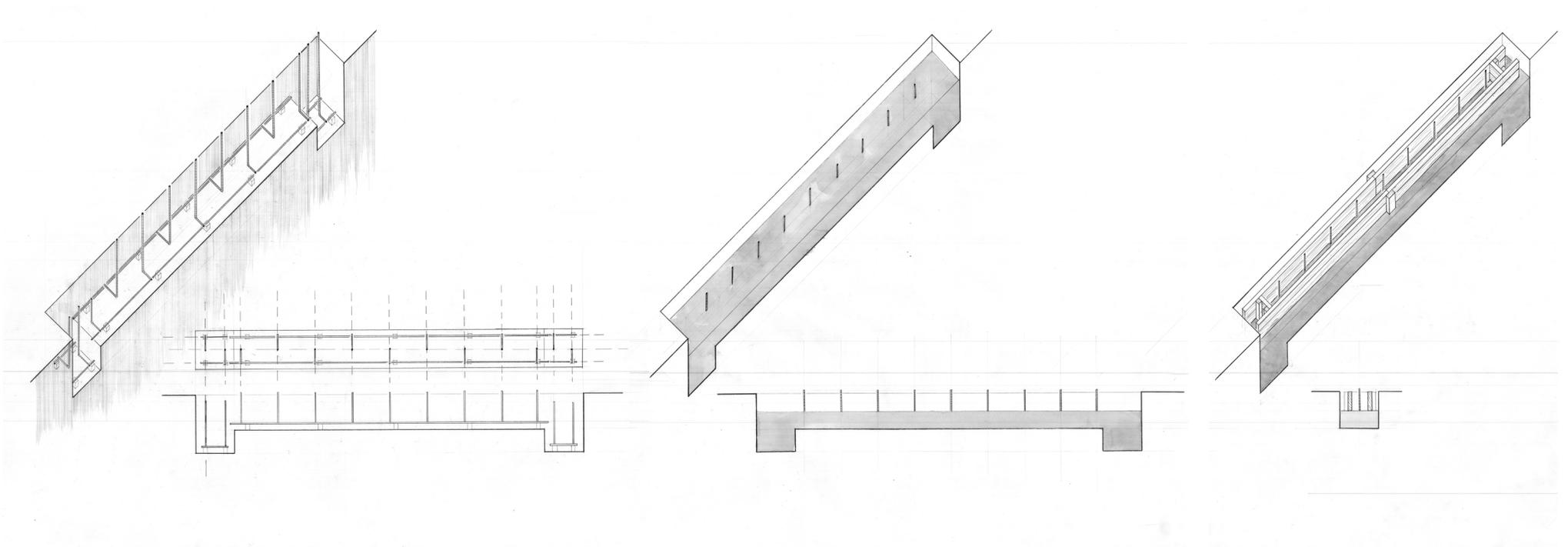
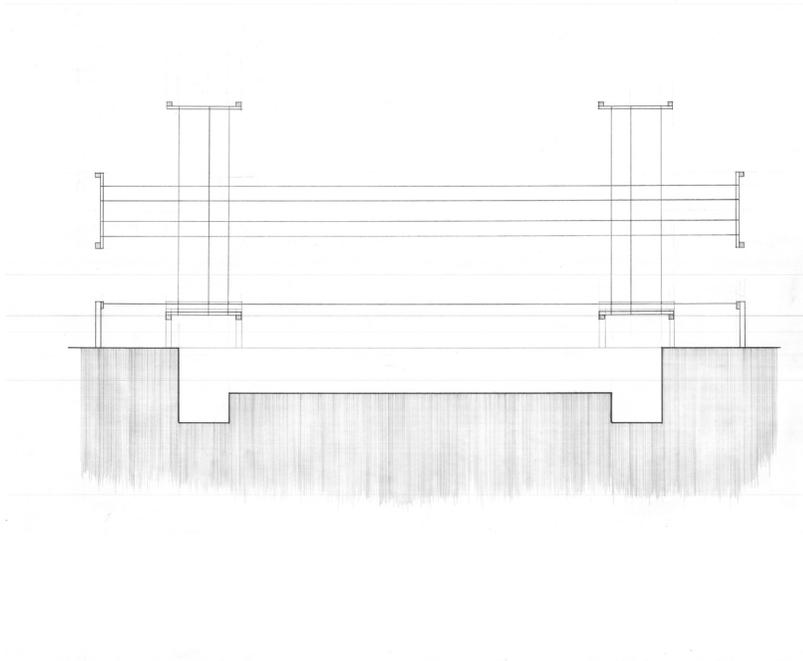
formwork

in concrete structures, designing the formwork is one of the main steps during construction. This process provides a sensual quality to the wall. The choice of material, specifically the sheathing, and the connection details define the haptic quality of the wall. It allows designers the ability to think from an inverted point of view.

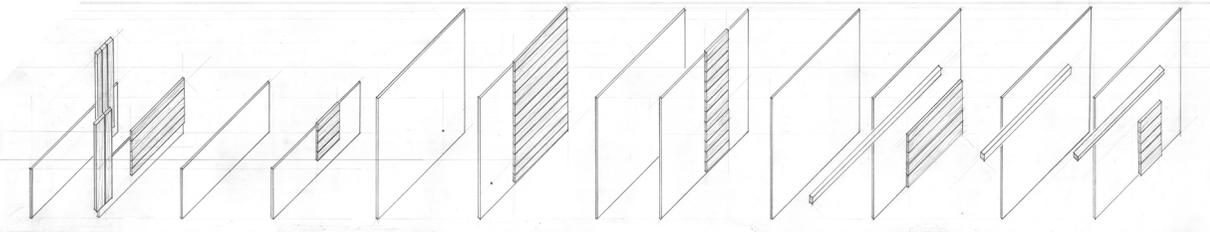
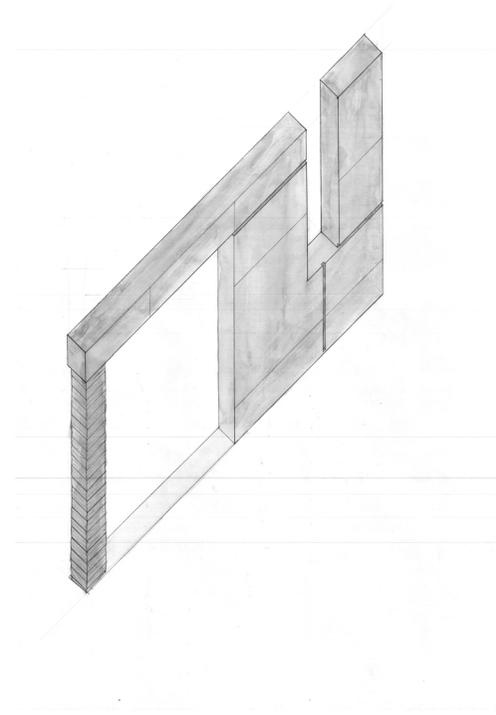
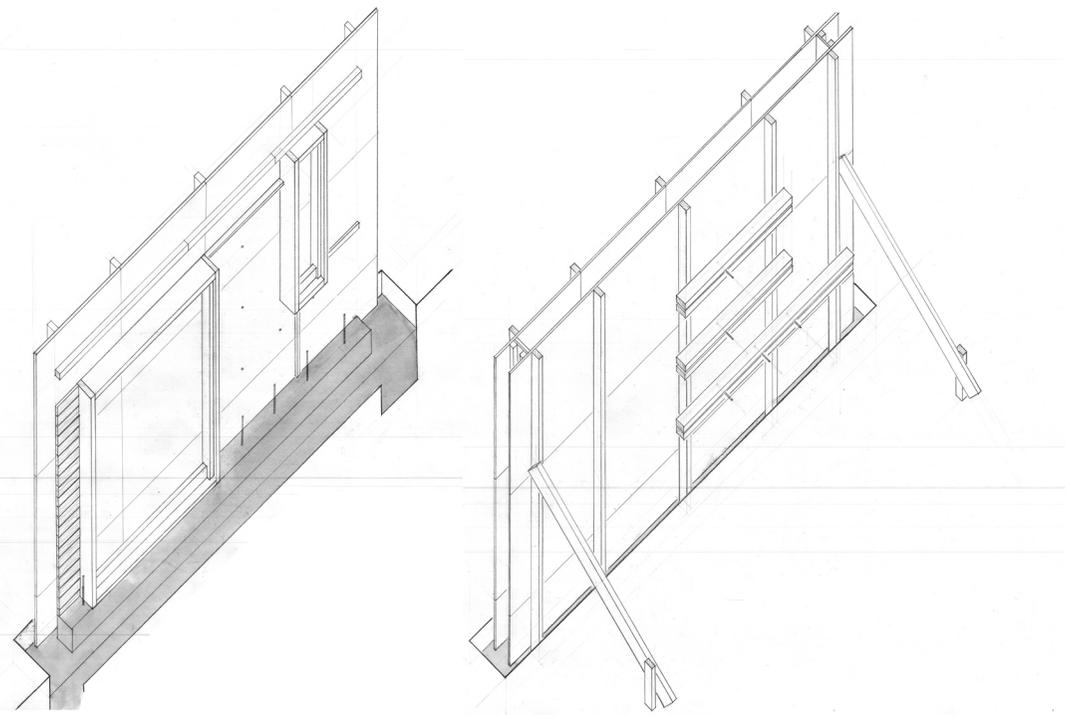
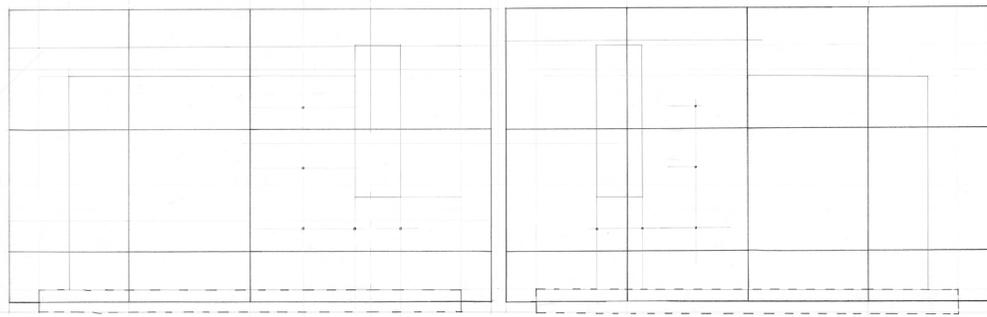
the sheathing gives character to the wall. Depending on the surface area of the sheathing, some textures can be stronger than others. Using a flat material like metal will create a smoother surface than using a sand blasted plywood. Another element that affects the surface is the choice of ties which attach the formworks together. They can either be visible and used as a design element on the surface or hidden within the wall.

the human body is the scale of this study. The sheathings are designed to be fragmented based upon human proportions. The sand blasted 8x4 oak plywood sheathings divide into smaller 4x4's. On one side 1x2 oak sidings cover the sheathing to give a more expressive texture. The connection joints and rod ties are located around the openings in order to provide a sense of scale.





2.4. leveling, excavation, placement of the rebar and the first pours of the concrete



2.5. setting up to framework and the framework details



2.6 study model of the concrete wall and the wooden sliding door

'a place is a location of experience, it evokes and organizes memories, images, feelings, sentiments, meanings, and the work of imagination. The feelings of a place are indeed the mental projections of individuals, but they came from collective experience and they do not happen anywhere else. They belong to the place.'

E.V. Walter, Placeways: A Theory of the human environment



2.7

texture and color

concrete is the reminiscence of its construction. Therefore, detailing plays a big role on the language of the wall. Not only does the choice of the materials of the formwork affect the language, but also how they are attached. In addition to that, color has a communicative role on this sensory experience. It gives information about the substance of the concrete, the weather and the environment, and the pouring of the concrete.

3.1





1 part portland cement
4 part coarse gravel
1-1/2 part water
2 part sand



1 part portland cement
4 part coarse gravel
1-1/2 part water
2 part sand
1/16 part red dye



4 part coarse gravel
1-1/2 part water
1 part portland cement
2 part sand
1/16 part mica powder



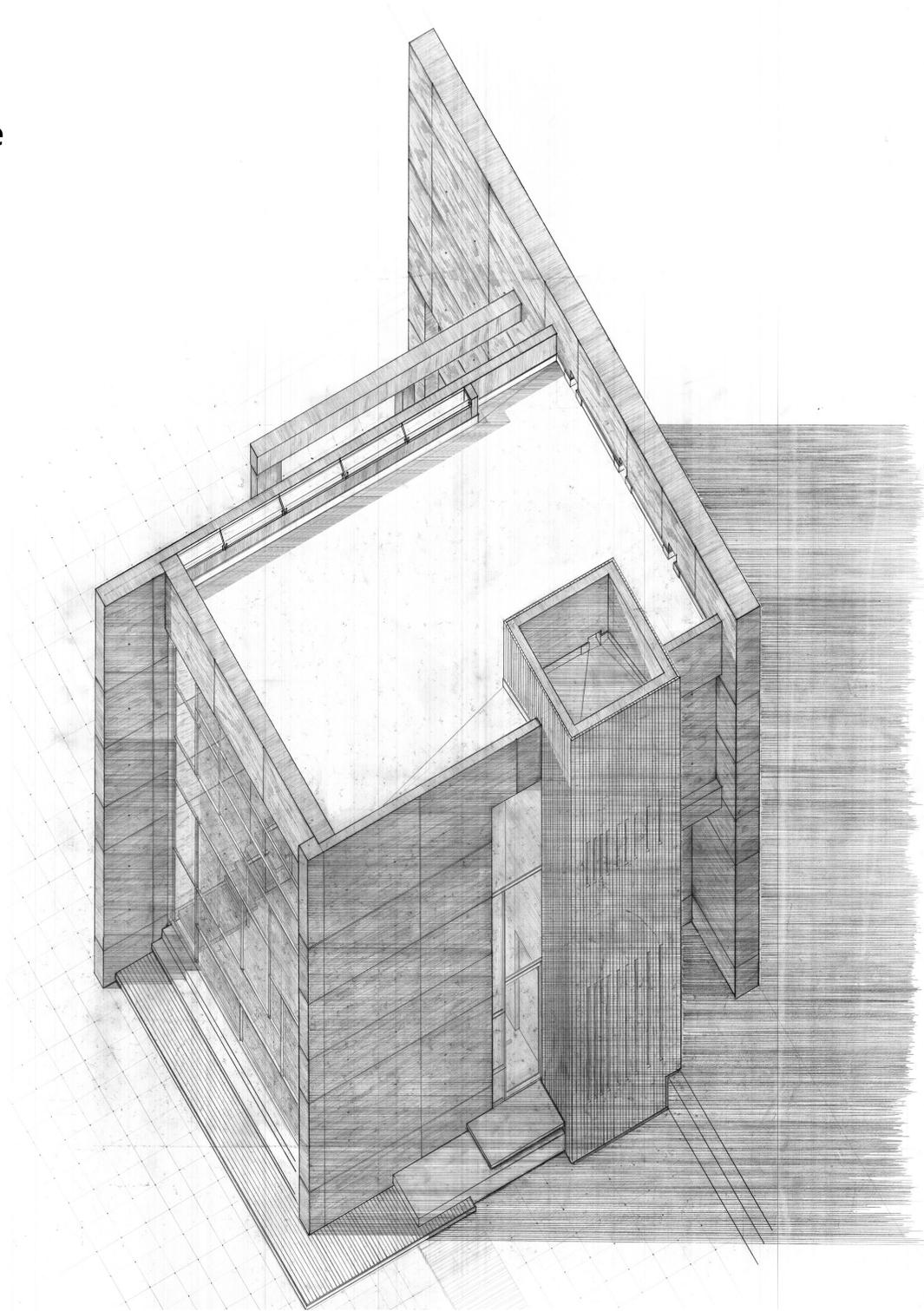
1 part portland cement
4 part coarse gravel
1-1/2 part water
1 part sand
1 part marble powder



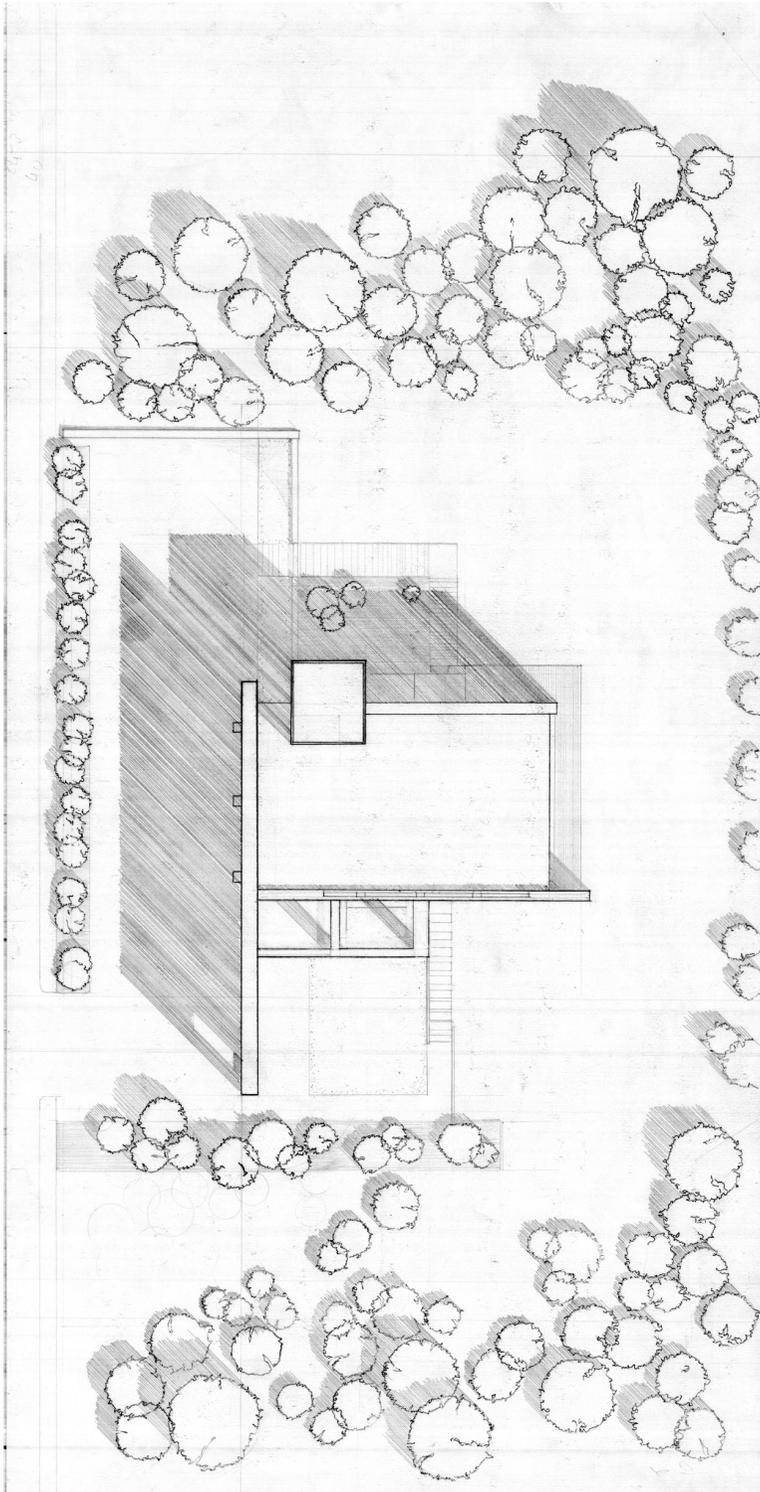
1 part portland cement
4 part coarse gravel
1-1/2 part water
2 part sand
3/8 part red dye

3.2 a study about how the changes in the ingredients and their rates effects the concrete surface and texture

the house



4.1



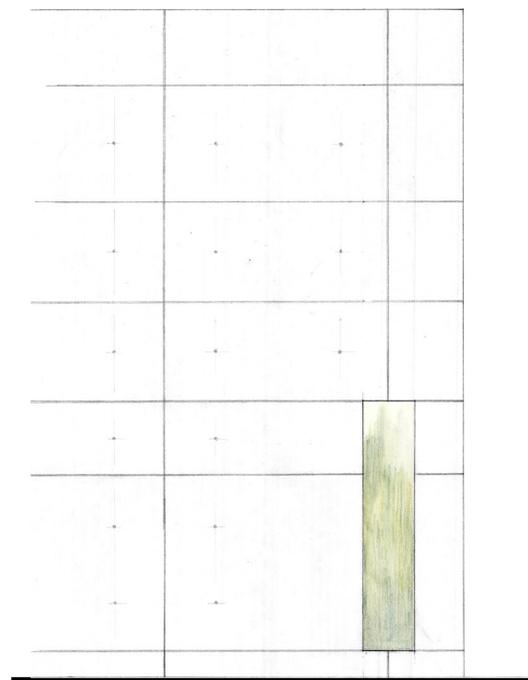
located in an oak forest in Virginia, this retreat house closes itself to the surrounding by thick cast-in-place concrete walls. The walls divide the site into smaller gardens on different levels. This change in direction and level enhance the beauty of the captured scenery.

4.2 the orchestrated gardens meet with the forest from every corner of the house

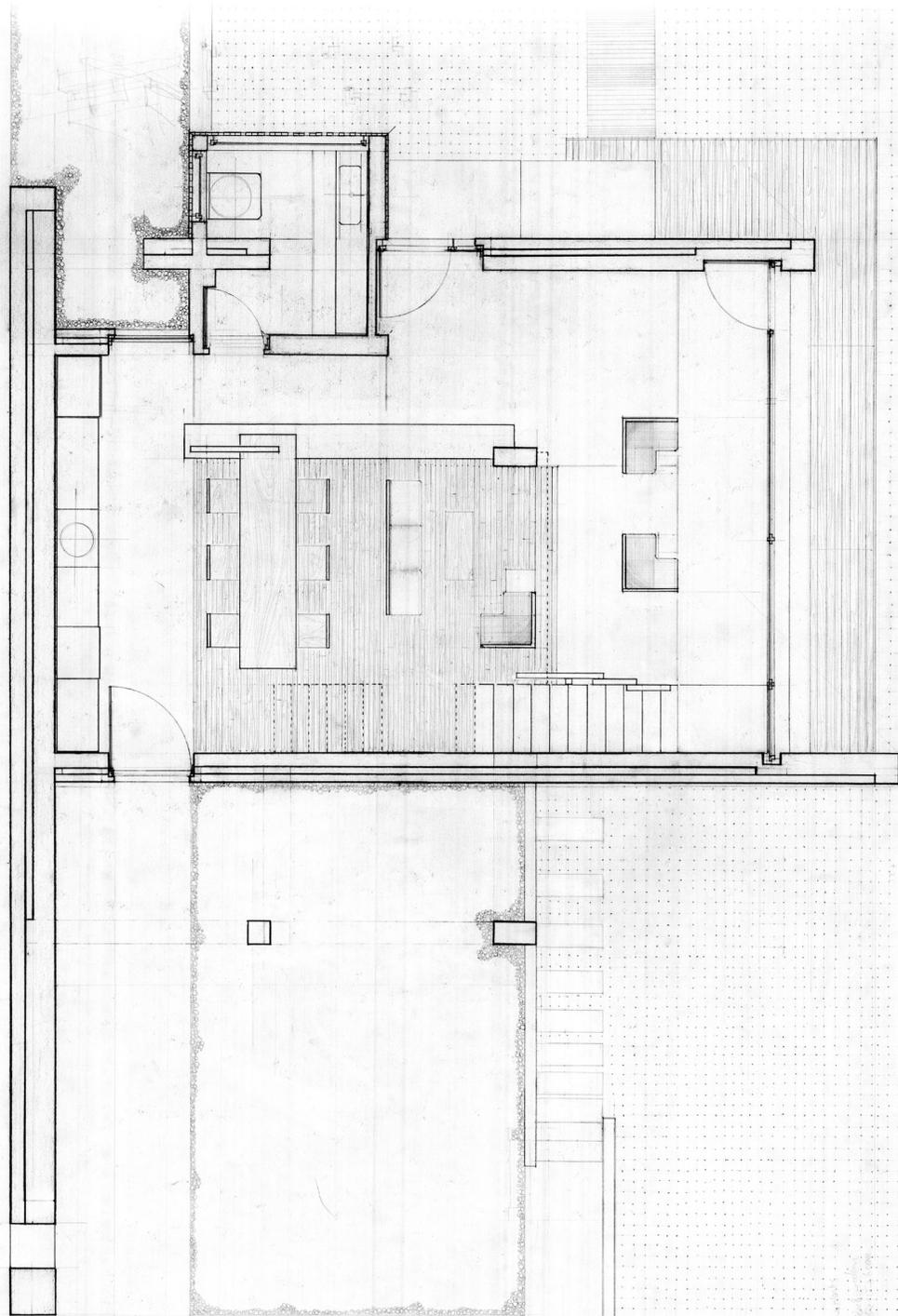
once you enter the site from the west, the 50 ft long, 2 story tall concrete wall stands in front of you, hiding the house behind it. The sand blasted oak plywood sheathing adds texture to this great concrete wall. The 8'x4' sheathings divide into smaller pieces in order to give a scale. The scuppers, the strip window and the opening provide a glimpse of green behind the wall and playfully organize around this texture.

4.3





4.4 the opening on the west wall gives a glimpse of the scenery

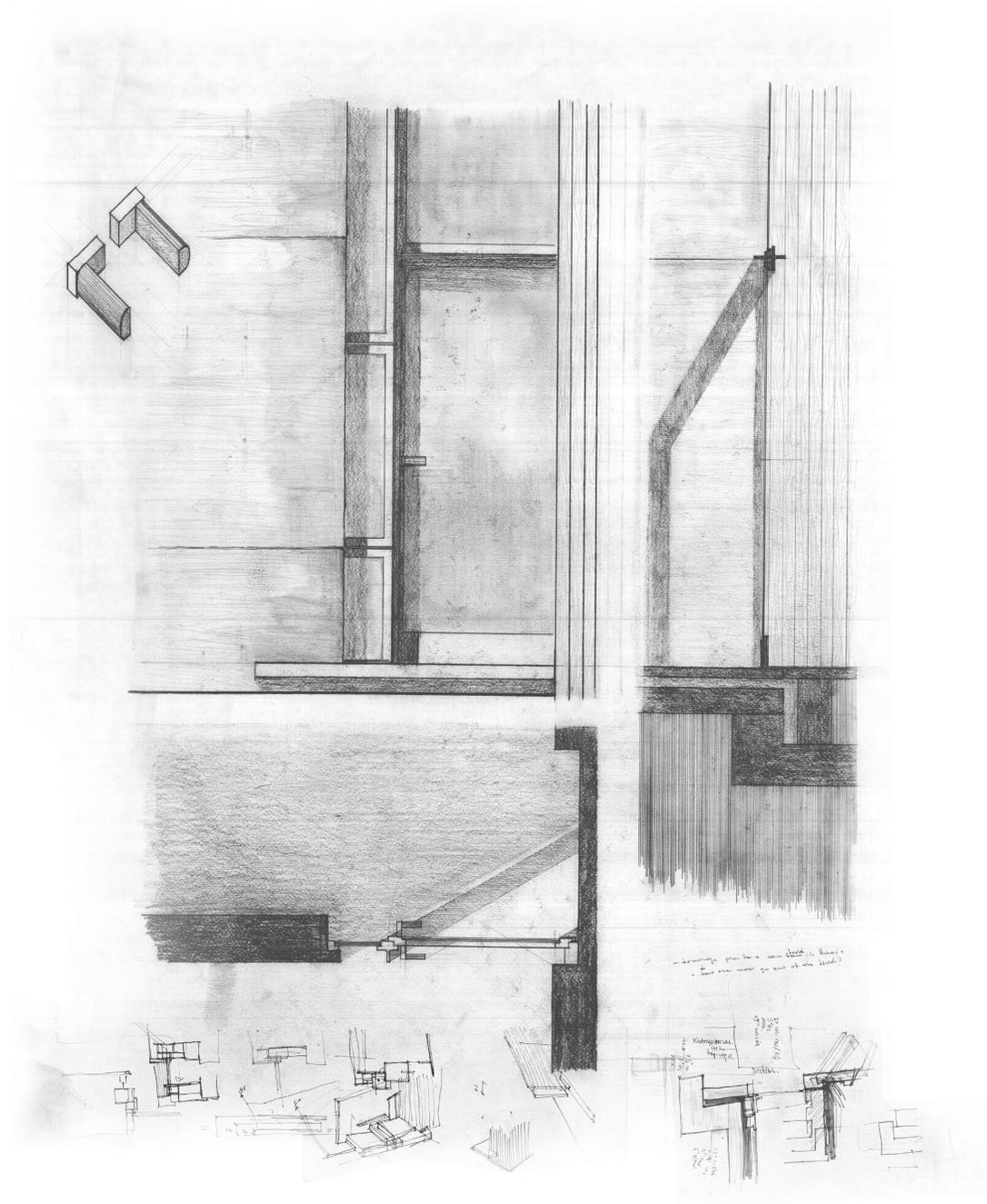


4.5 although the house has multiple entrances from the gardens, it is separated from outside by the thick cast in place concrete walls

the wet surfaces located on the west side of the entrance is covered by the oak 1x3 sidings on the exterior. In order to give privacy, repetitive sidings partially cover the windows to provide just enough light while retaining privacy.



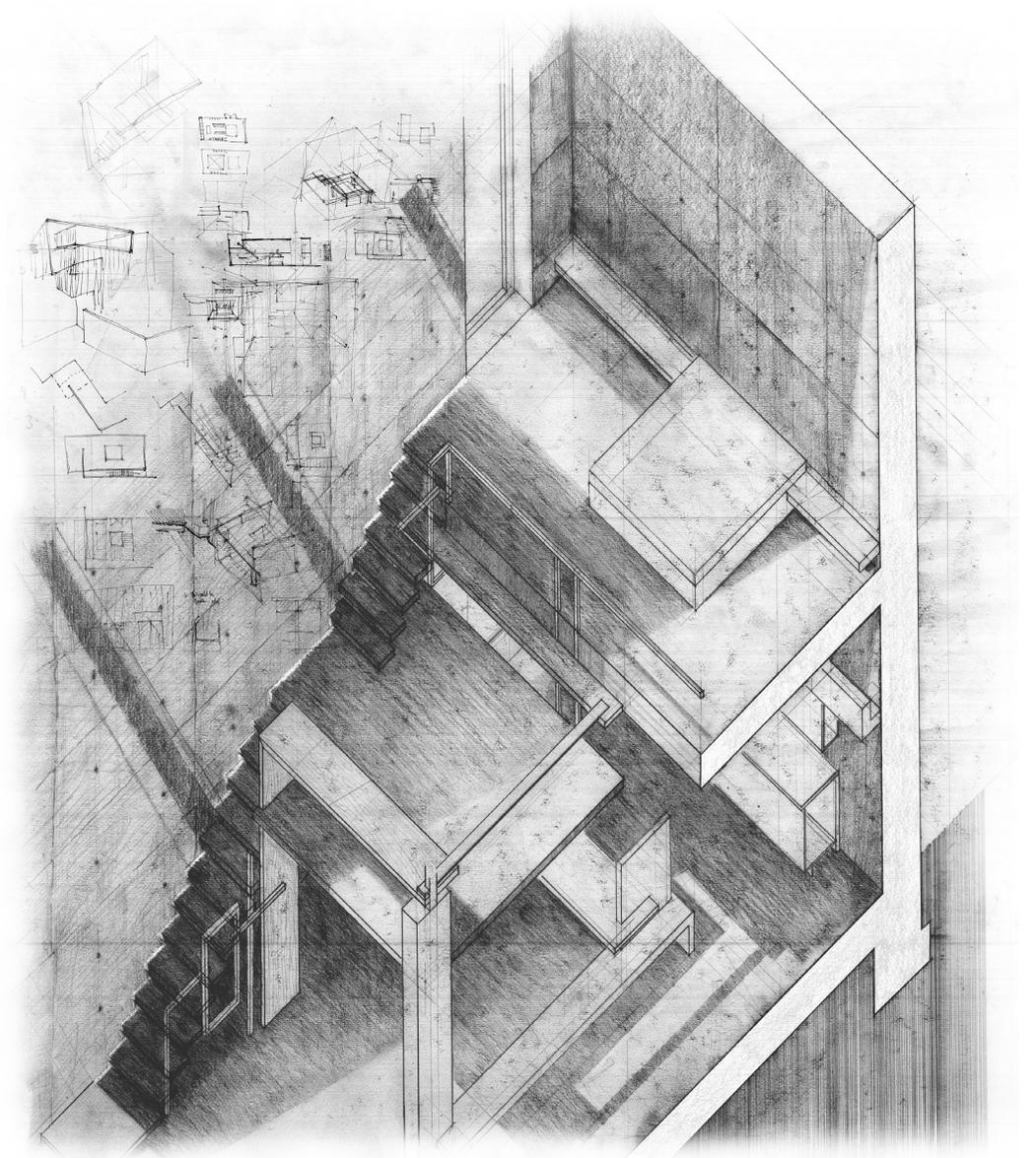
4.6 the main entrance facade, facing north



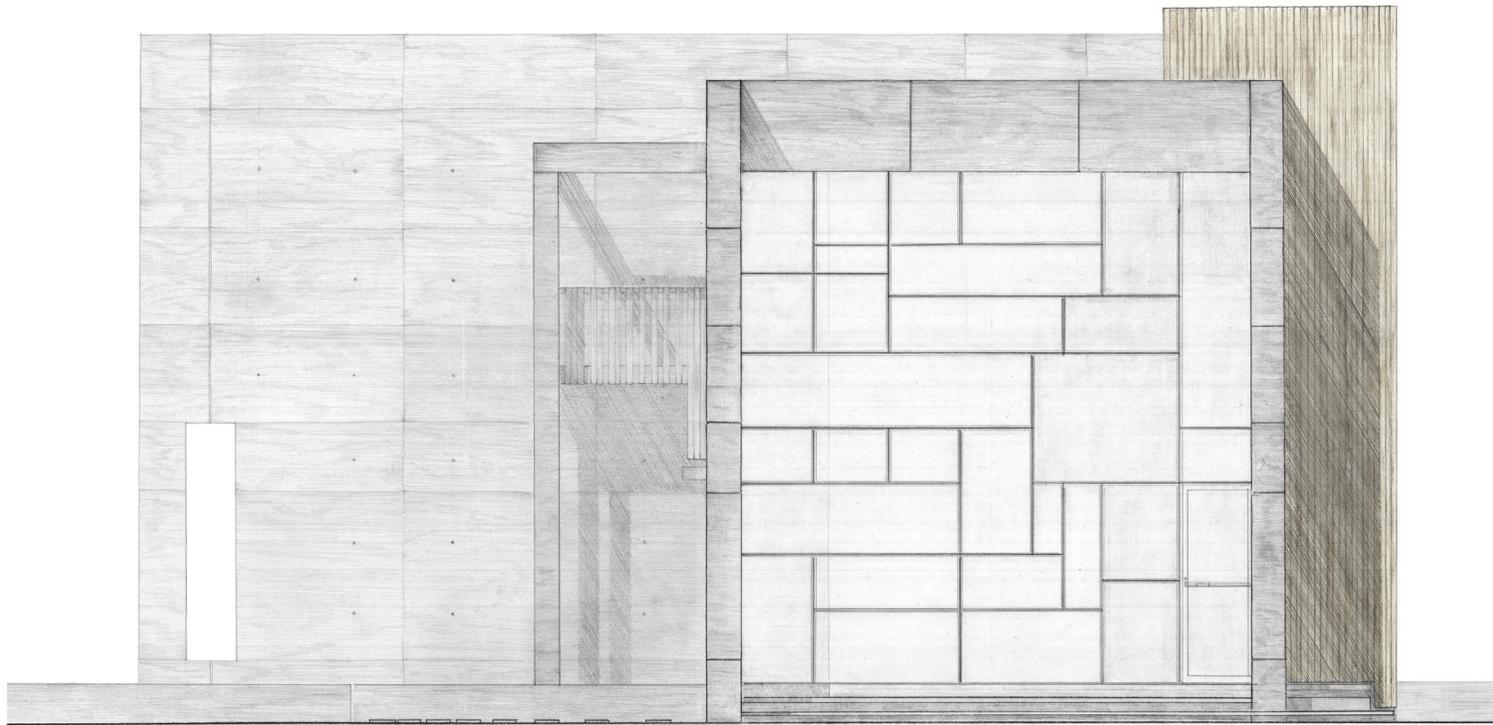
4.7 entrance door detail

the space is multi layered. It is a combination of what we see, what we feel, what we measure by our bodies and what we experience next. We don't only see what is in front of us but also feel what we come across.

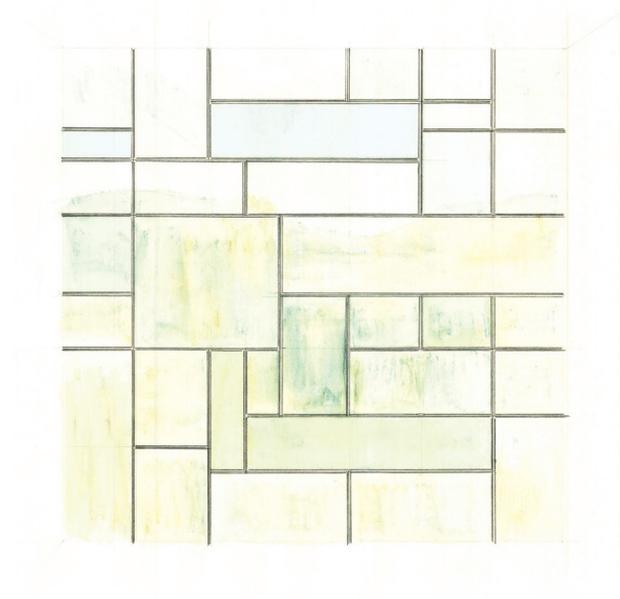
similarly in this project, the divider walls have been eliminated to allow visual continuity between spaces. By this, the concrete walls become the unifiers, and allow the study area and the sleeping area to melt into the main living area. In addition to that, the light coming from the skylight goes through the precast stair steps to enhance this continuity.



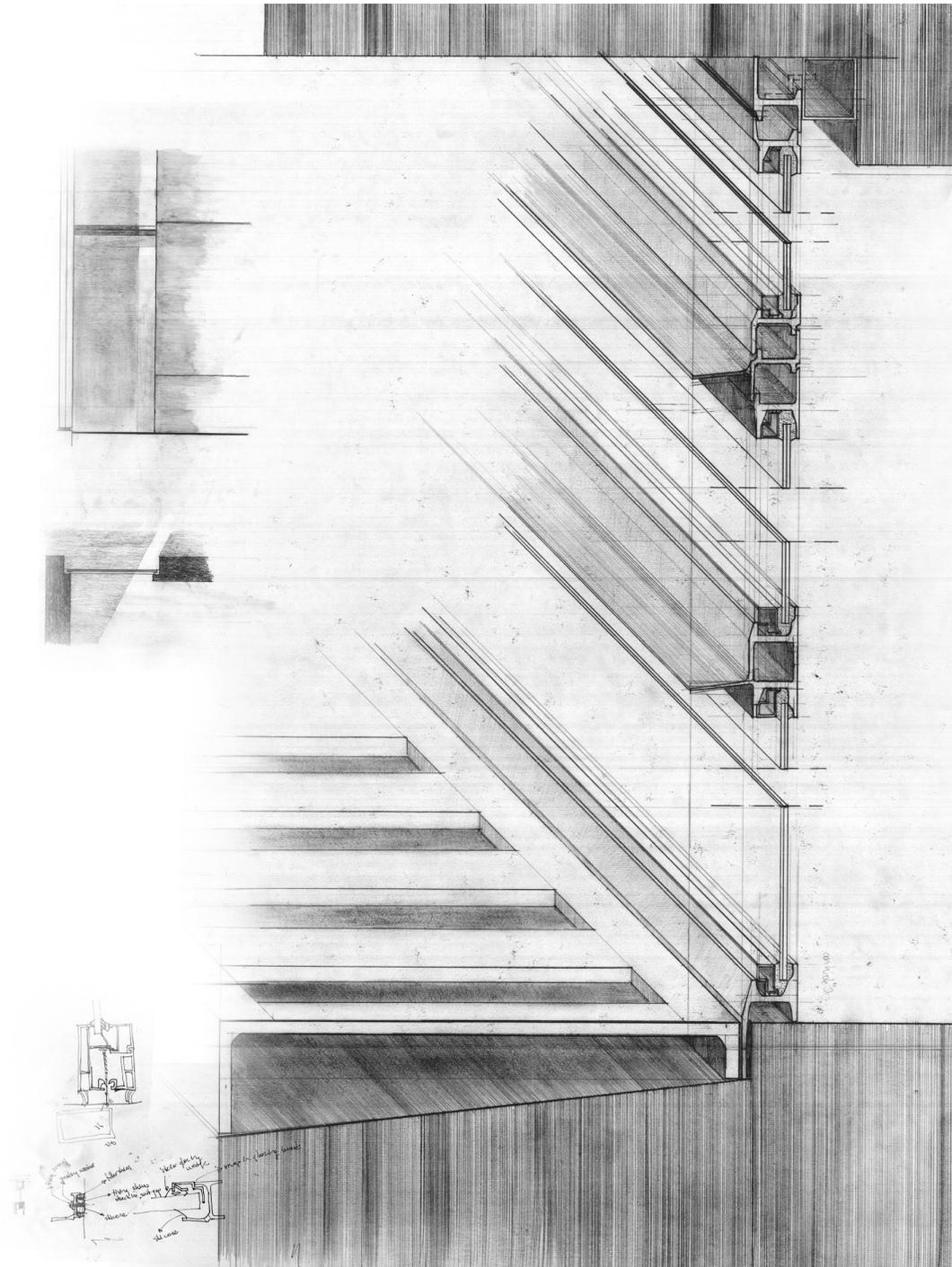
4.8



4.9 elevation facing east

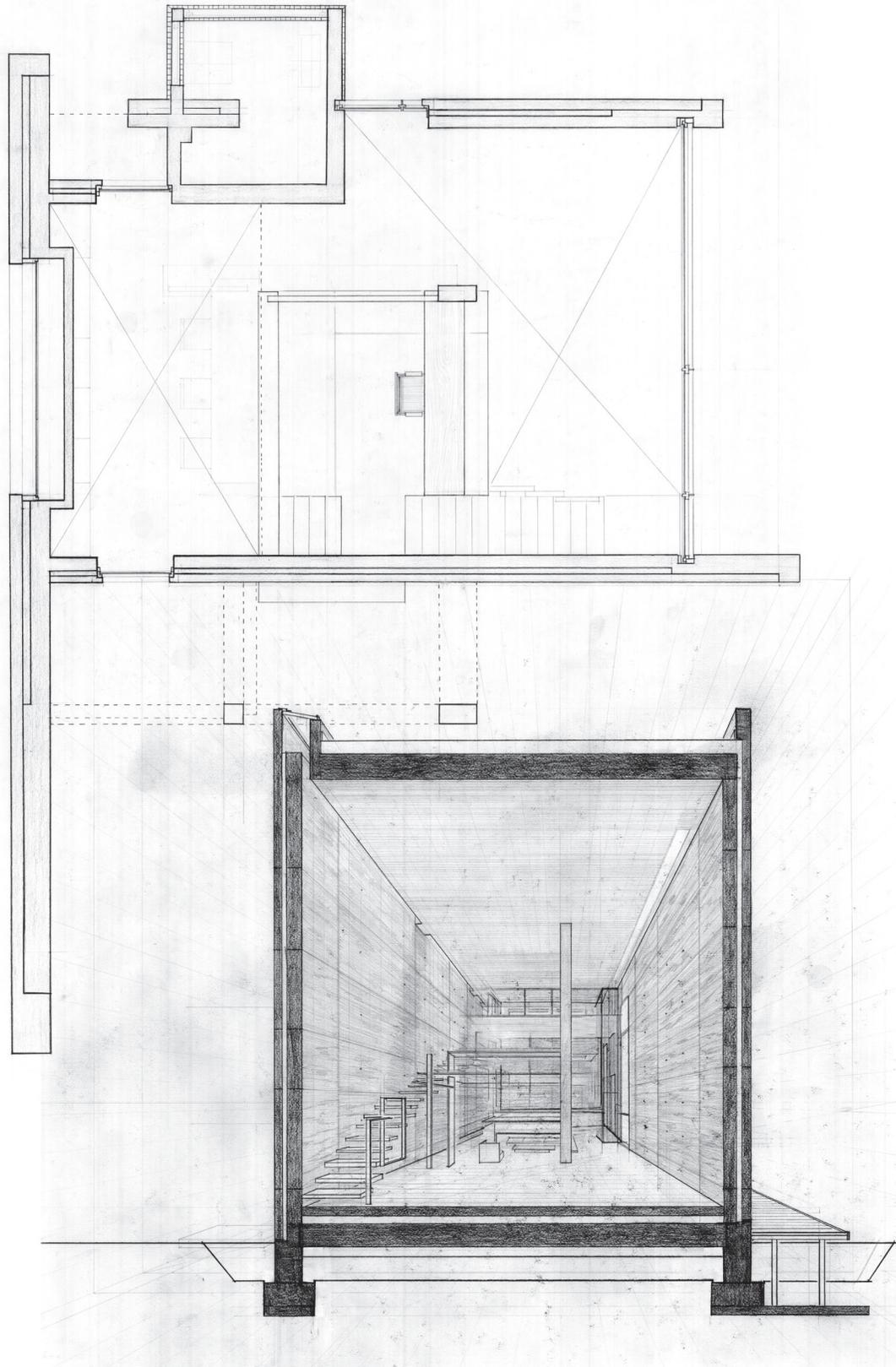


4.10 the steel mullions frames the forest view

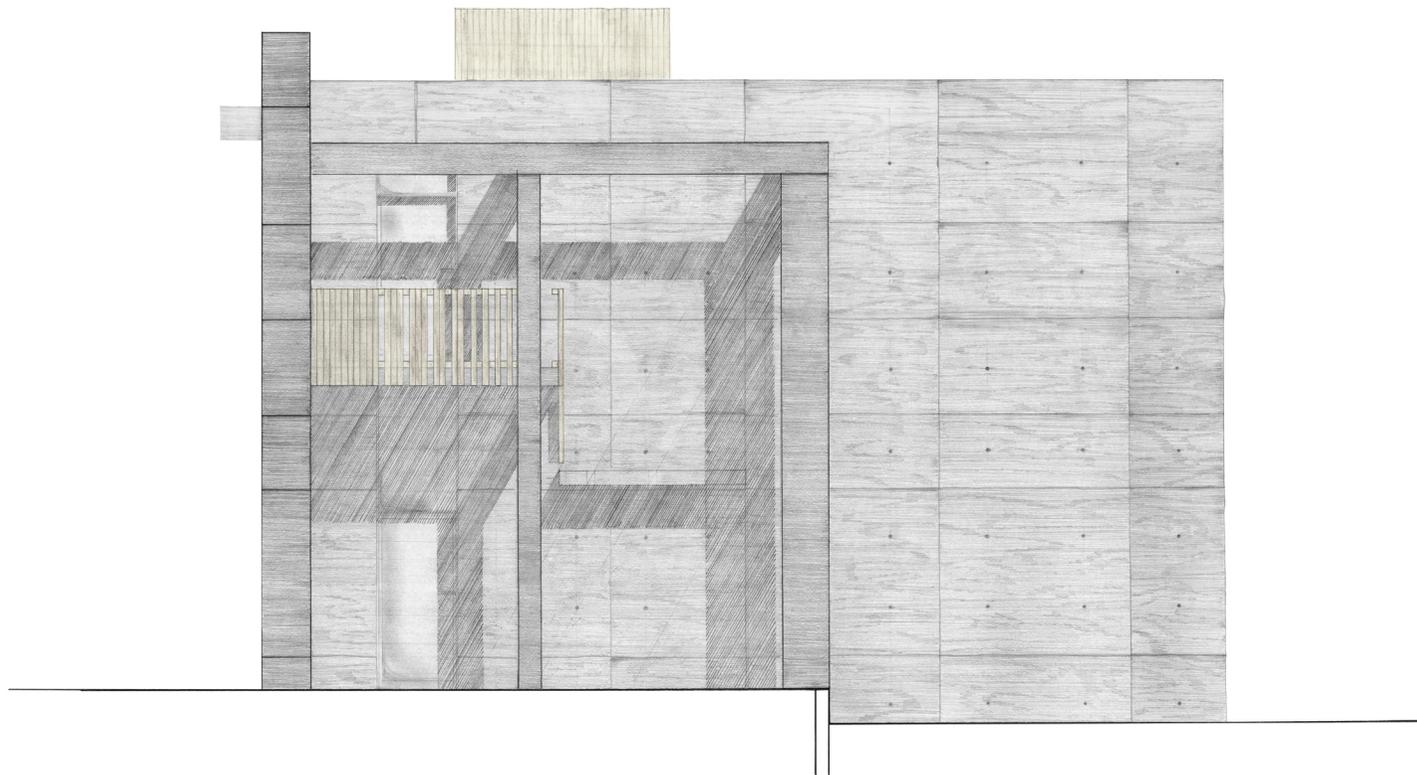


4.11 window details

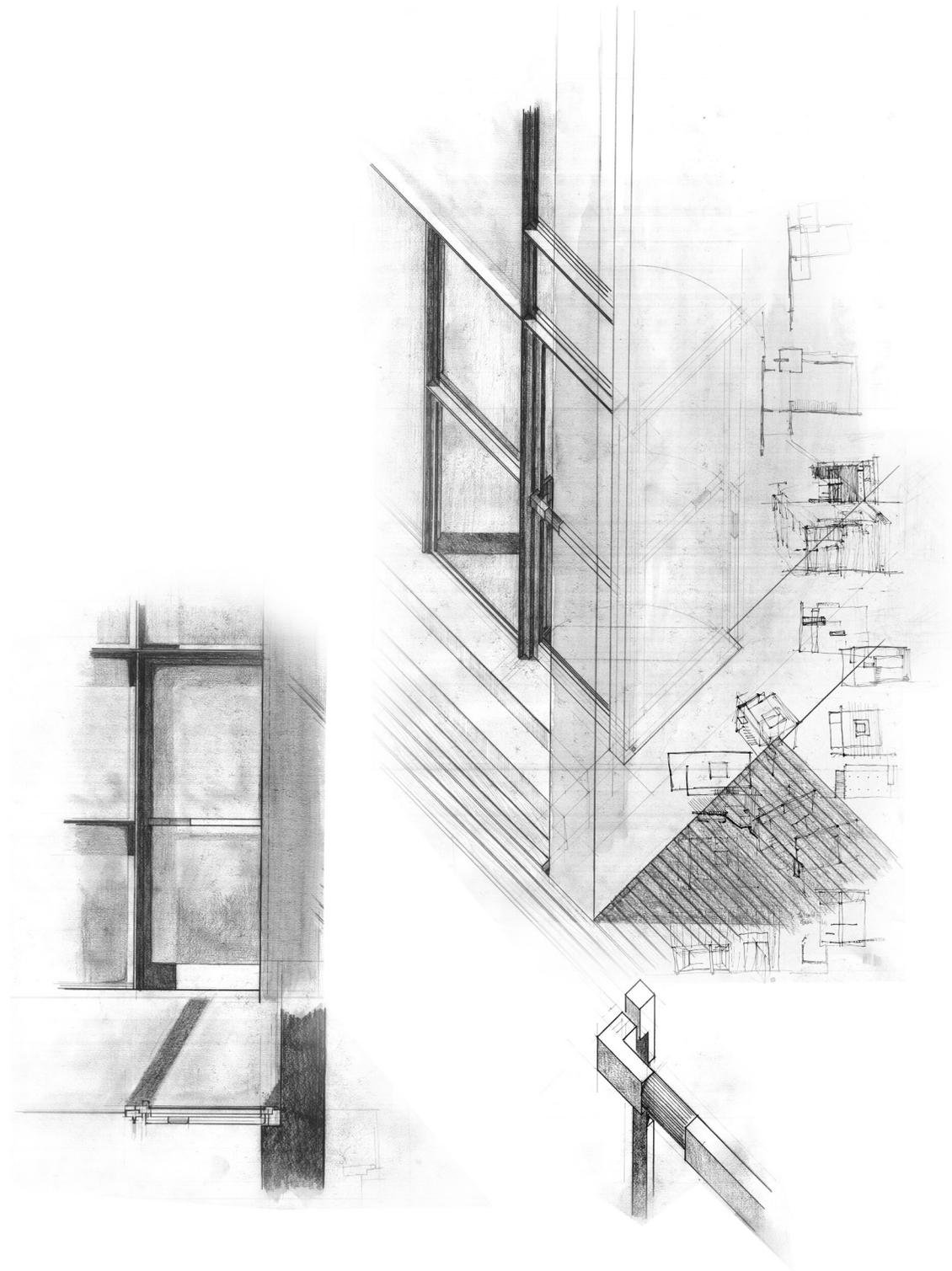
the cast-in-place concrete slab of the study area attaches to the south wall and the column on the opposite corner, which allows the space to melt into the main living area.



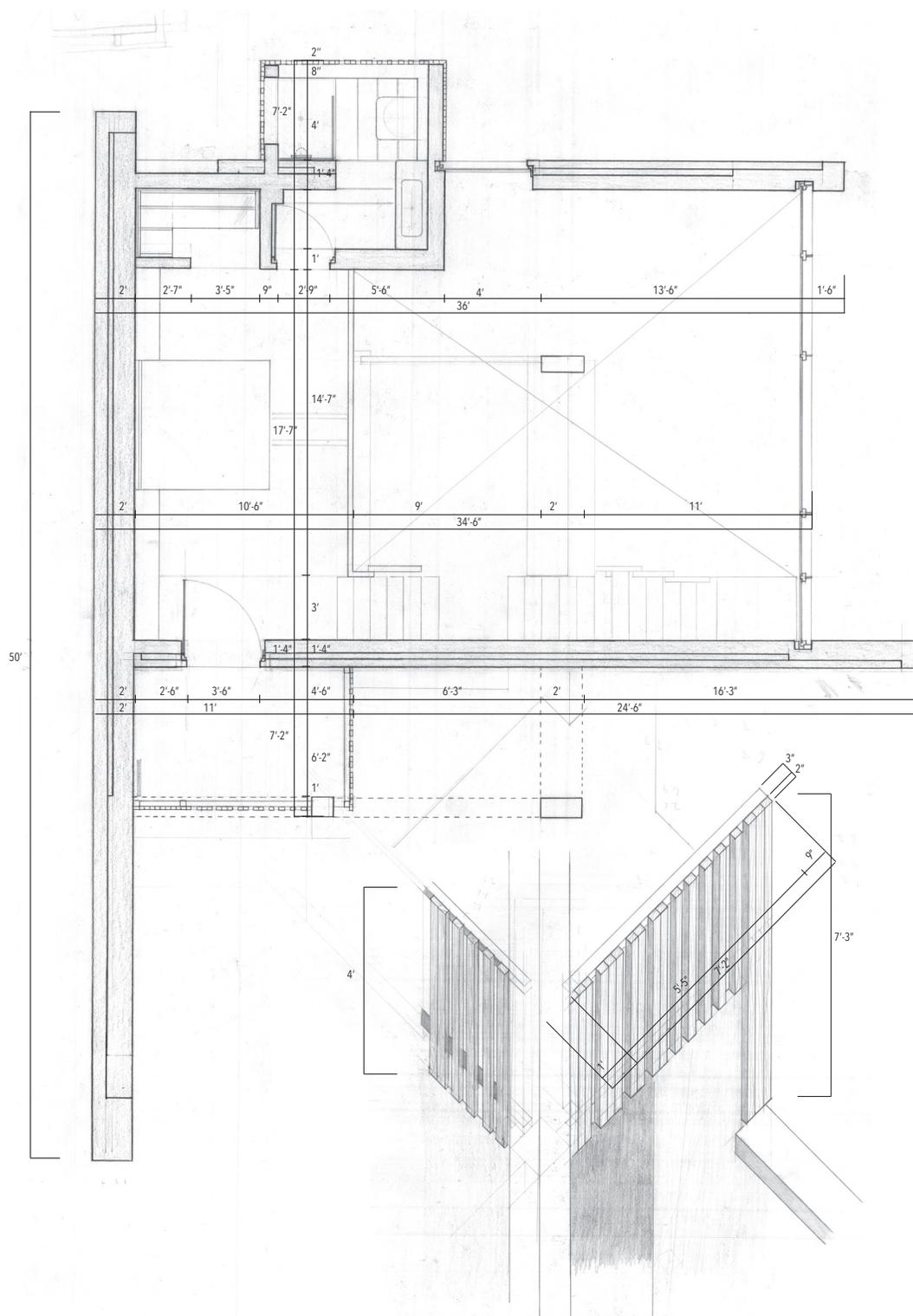
4.12 the section looking through the study area



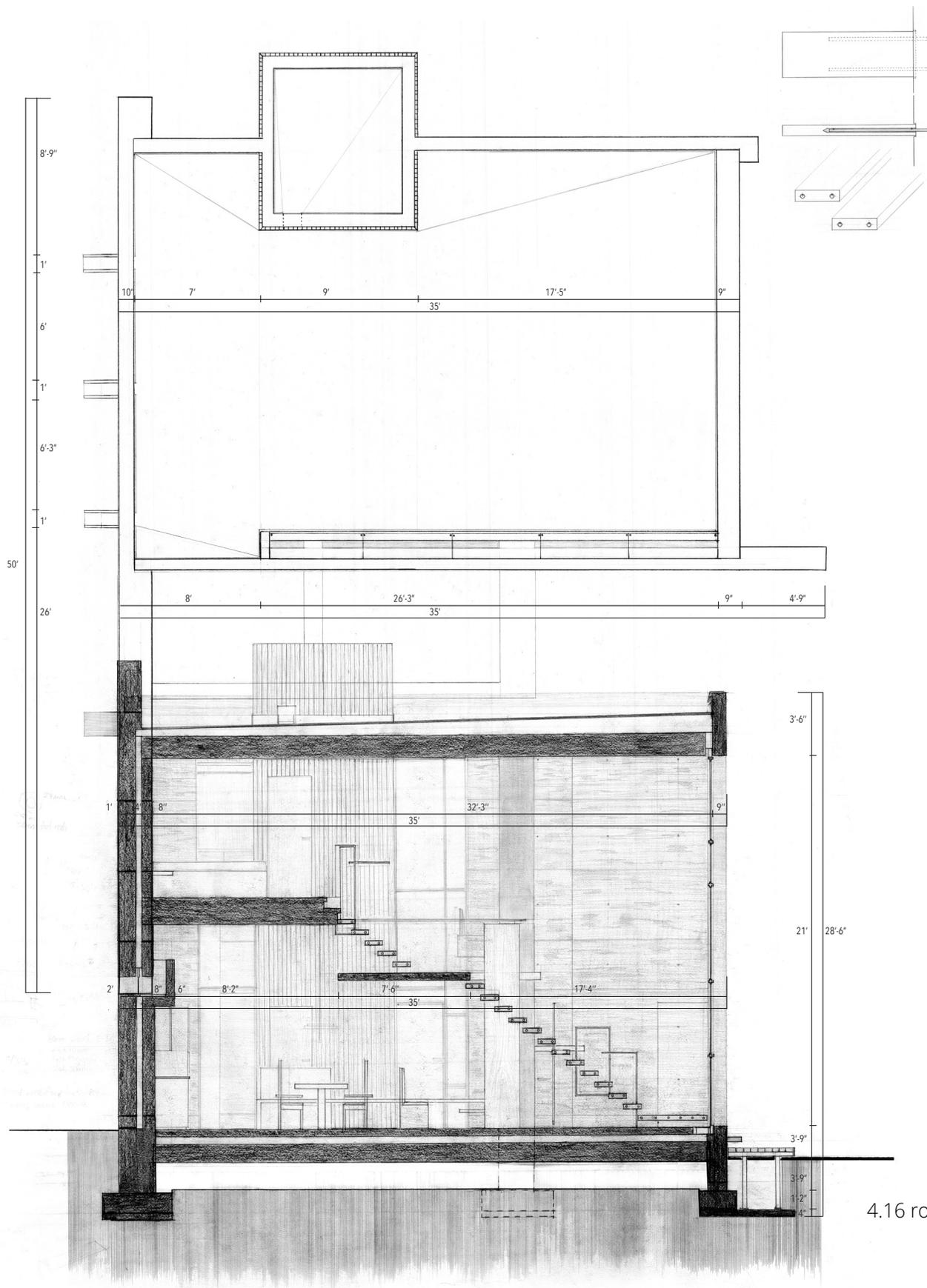
4.13 the structure continues after the facade facing south to frame the inner garden



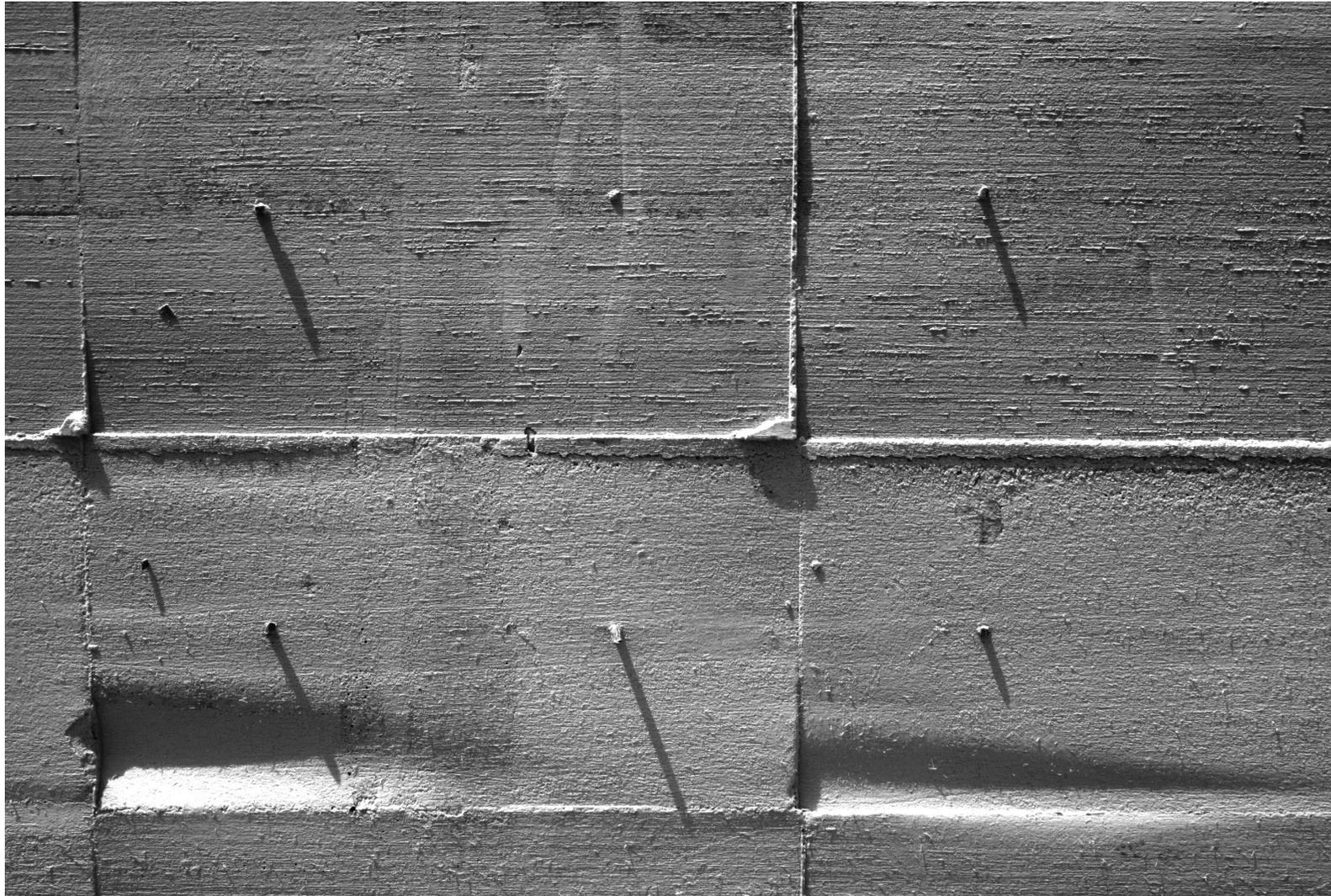
4.14 door and door handle details



4.15 sleeping area



4.16 roof plan and section through the stair



4.17 memory as an extension of the experience

(bibliography)

Bachelard, G. and M. Jolas (1994). The poetics of space. Boston, Beacon Press.

Bloomer, K. C. and C. W. Moore (1977). Body, memory, and architecture. New Haven, Yale University Press.

Fascari, Marco. "The Tell-the-Tale Detail." In Theorizing a New Agenda for Architecture, an Anthology of Architectural Theory 1965-1995, edited by Kate Nesbitt, 498-513. New York: Princeton Architectural Press, 1996.

Frampton, K., et al. (1995). Studies in tectonic culture : the poetics of construction in nineteenth and twentieth century architecture. Cambridge, Mass., MIT Press.

Holl, S., et al. (2006). Questions of perception : phenomenology of architecture. San Francisco, CA, William Stout.

Leatherbarrow, D. and M. Mostafavi (2002). Surface architecture. Cambridge, Mass., MIT Press.

Malnar, J. M. and F. Vodvarka (2004). Sensory design. Minneapolis, University of Minnesota Press.

Pallasmaa, J. (2012). The eyes of the skin : architecture and the senses. Chichester

Scarpa, C., et al. (2007). Carlo Scarpa : architecture and design. New York, Rizzoli.

Tanizaki, J. (1977). In praise of shadows. New Haven, Conn., Leete's Island Books.

Talarico, W. and Smith Maran Architects. (2005). Graphic standards details : openings. Hoboken, N.J., J. Wiley & Sons.

Walter, E. V. (1988). Placeways : a theory of the human environment. Chapel Hill, University of North Carolina Press.