

Purposeful/Purposeless

by

Ben Murray

Submitted in partial fulfilment of the requirements
for the degree of Master of Architecture

at

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DALHOUSIE UNIVERSITY
SCHOOL OF ARCHITECTURE

The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "Purposeful/Purposeless" by Ben Murray in partial fulfilment of the requirements for the degree of Master of Architecture.

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ABSTRACT

This thesis examines what makes a building valuable enough to keep regardless of what happens within it or where it is. A generic vacant lot in Dartmouth, N.S., ensures that these qualities are derived primarily from the architecture rather than its site. By housing three very different building programs, an auto body shop, small school and church, the design is challenged to become resilient to significant change. The thesis draws on ideas of building permanency - polyvalency and frame theory (Leupen), as well as adaptability - building layers and strategic over-dimensioning (Brand). Valuable permanency is achieved by creating a building that is both full of purpose and purposeless at the same time. Purposefully, it is achieved through the use and correct arrangement of common forms, spatial sizes, a diversity of spatial types, as well as a high degree of self-maintenance of climate and construction. The purposeless qualities of proportion, craft and light help give the building its enduring character.

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I would also like to thank Susan Molesky for her support and advice.

INTRODUCTION

Thesis Question: How Can a Building Admit and Inspire Reuse?



Building 20, MIT - 'Low-road' reuse. From: Brand, *How Buildings Learn*



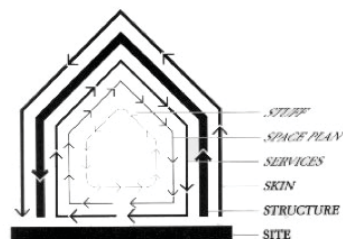
Selexyz Dominicanen Book Store - 'High-road' reuse. From: Powell. *Architecture Reborn*.

Steward Brand, in his book *How Buildings Learn*, describes two ways in which buildings achieve long patterns of reuse. 'Low-road' buildings are useful and kept because they are not precious: "no one cares what happens to them" (Brand).

Holes can be put in walls, windows changed without any care for their outward appearance and floors torn out or stacked up to the brim, and the building remains, acquiring a fondness from its occupants for its ability to accommodate them. 'High-road' buildings, in contrast, are kept because of their precious nature. Churches, such as the one above, are kept because of their attachment to memory, identity and beauty. What can also be seen above is how the distance between the new and old structure highlights how difficult it is to change or the church. This lack of adaptability is a typical problem with high-road buildings and is often a reason why they are torn down. Mies Van der Rohe believed that for a building to survive and remain useful it must have a strong architectural expression (Spaeth, 1985). Architects like Van Eyck disagreed, believing that expression was like fashion, inevitably to go out of style, and that too much flexibility produced bland buildings, leaving the building susceptible to demolition (Van Eyck, 1960). Both the high-road/low-road distinction of Brand and the expressive/functional distinction of Van der Rohe reflect the dichotomy of purposeless and purposeful that this thesis seeks to break down. By separating the building into layers of permanency it is possible to develop the more lasting layers in a 'high road' fashion and the less permanent layers in a 'low-road' way - thus maximizing both qualities and increasing the lifespan and value of the building.



Crown Hall - From: Spaeth, *Van der Rohe*



Brand's 6 building layers. From: Brand, *How Buildings Learn*



Frontispiece of *Essai sur l'Architecture* by Marc-Antoine Laugier. Laugier's primitive hut distinguishes two layers - structure and skin

Previous thoughts on Reusability and Adaptability

There are three ideas on building reusability that are considered and applied in this thesis: building as layers, building as frame and architectural polyvalence.

Layers

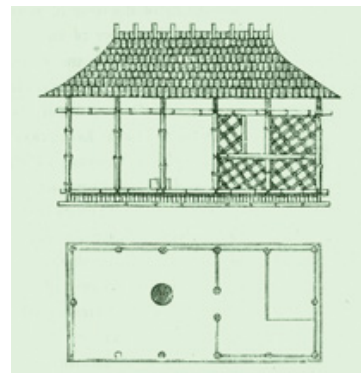
Steward Brand, building on a previous work of architect Frank Duffy, describes a building as a collection of layers which are distinguished from each other by their life-span. As shown on the previous page, these layers progress from site to 'stuff', the site being the most permanent while 'stuff', like furniture, being the most transient. The main argument of Brand, and the mechanism for design used in this thesis, is that the physical independence of these layers is crucial in creating a building that is adaptable and reusable.

Frame and Generic Space

Bernard Leupen builds on previous ideas of architectural polyvalence, including Brand's 6 layers, Laugier's primitive hut, and Semper's four elements, to develop an idea of adaptable space based on permanency. Leupen describes a building according to a modified five layers, shown here on the right. He argues that each of these layers, when made permanent, can act as a frame that can free the movement of the other layers. The first example of this is the separation of structure and skin into columns, façade and interior partitions, which frees the skin of the responsibility of holding the building up. Another example Leupen gives is the way in which the services are consolidated and fixed into a central core of a Maison Alba house to prevent their intrusion into the free subdivision of the rest of the space. Here the service layer acts as a frame within which the free movement of the other layers can be focused on.

Polyvalence

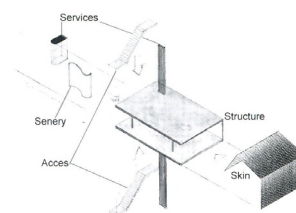
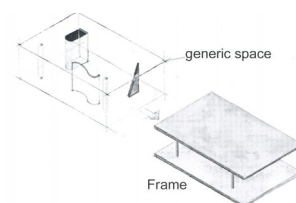
The last major relevant idea is polyvalence, a term Herman



"The Caribbean Hut"

Gottfried Semper: *Style in the technical and Tectonic Arts*.

Semper viewed architecture and the primitive hut in terms of four elements, the hearth, earthwork, roofwork (roof and structure) and covering membrane

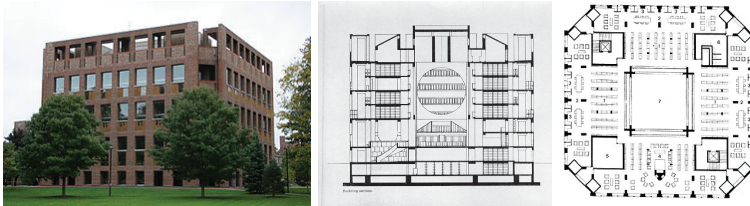


Leupen's generic space and 5 Layers. From: Bernard Leupen *Frame and Generic Space*



Montessori school stair. From: *Lessons for Students in Architecture*

Hertzberger often used to describe a space or form that can accommodate many uses with minimal structural or architectural change. A stair, correctly designed, can function in many different ways – for transportation, for seating, for gathering, or for observing.



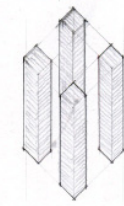
Precedent

Exeter Library

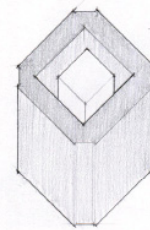
Designed by Louis Kahn, Exeter Library is an important precedent for this thesis in that it is a clear example of one of the ways that the articulation of frames can promote a freedom of use. In plan, the library is set up along two X's, one for the served and the other for the servant spaces. The corners of the building clearly articulate and separate all the vertical circulation and services from the rest of the building, which, unencumbered by these structures, have the potential to be more than a place to hold and read books. The building is durable in both purposeful and purposeless ways. It has a long practical life expectancy due to construction and high functionality is combined with a 'cultural' durability that stems from an attention to light, material, form and space that goes beyond practical purpose: purposelessness.

Maltings Building

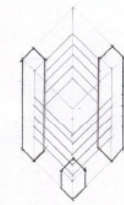
Built in the 1860's in Cambridgeshire, England, the three-floor structure was gutted to make one large multi-purpose hall for musical and theatrical performances. An addition



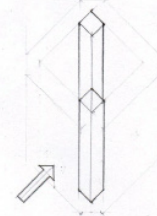
Servant Spaces



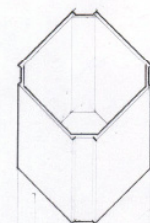
Public/Private



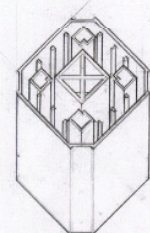
Services



Access

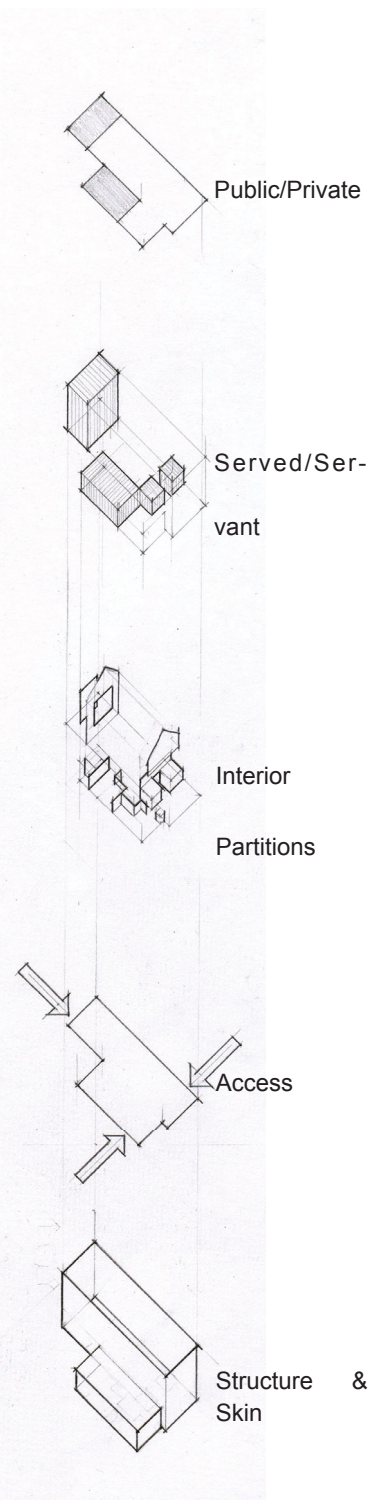
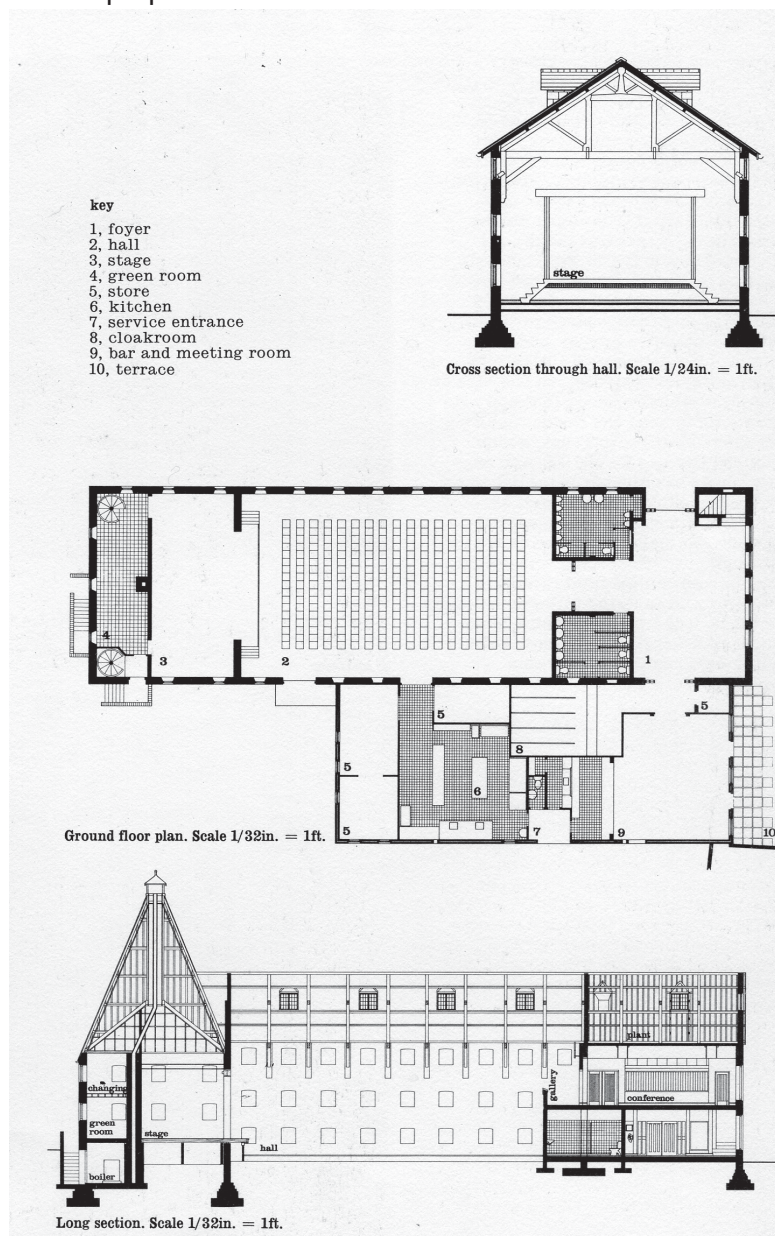


Skin



Structure

was added to accommodate ancillary functions such as a bar, store and cloakrooms. The building was kept because it represented only two-thirds the cost of a new building. The massive drying vent that gives the maltings its characteristic roofline, was adapted to help ventilate the building. It is important to note that the vent was kept both for its ventilation purposes as well as a form of identity. This distinction represents to some degree the difference between purposeful and purposeless.



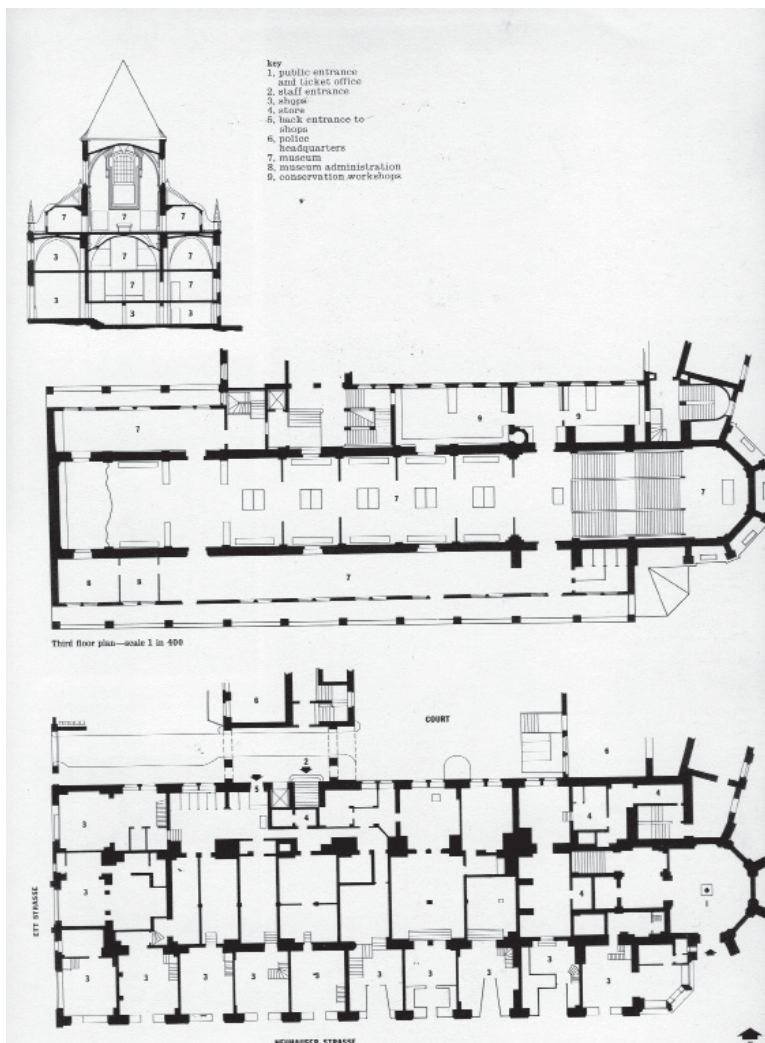
Source: Powell. *Architecture Reborn*.

Augustiner Kirche

This is a good example of the continual reuse and multi-functionality that church buildings often exhibit. Built in 1290, in Munich, Germany it was secularized in the 1800's with the south side ambulatory being used for a series of shops while the interior became a large police headquarters. It has been subsequently turned into a museum for hunting and shooting. As mentioned in the beginning paragraph, churches are often kept for their 'highroad' - purposeless qualities. What is demonstrated here, however, is how their form can accept new purposes.



South Side of Church. From: Powell. *Architecture Reborn*.



Source: Powell. *Architecture Reborn*.

Purposeful

Analogy



A farmer's jackknife. Used to cut rope and twine, prod cattle, dig dirt out of crevices as well as carving insects out of apples, the stout blade is made of durable but non-precious steel. Its retractable form and modest size ensure that it is always at hand without being a danger. The tool is simple, general and effective - much like the barn that accompanies it.



Old Barn - Western Manitoba.
From: thelens.ca

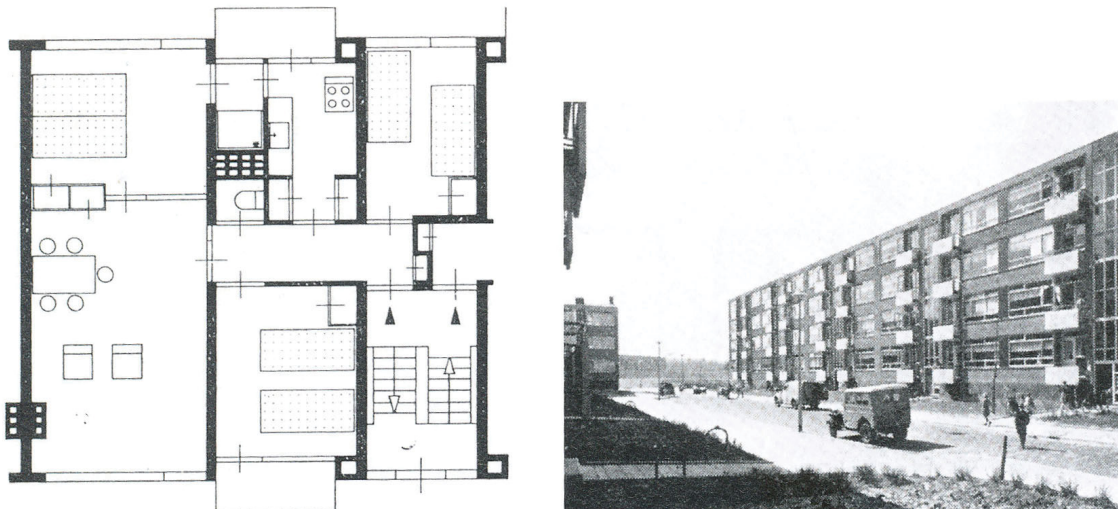
Specialty knives, like a lighthouse, offer a different value. They are particularly suited to a specific task and do the job better than a generalized tool would. The flip side of this development is that the more able they are to do this specific job, the less able they are to do others. Difficulty arises when a farmer is given a carver's knife or the carver becomes a farmer but is forced to keep his old knife. This difficulty is seen in the 1950's flats in the Netherlands. Built to a very specific set of minimal standards for living, the static concrete walls that represented this thinking were soon torn down with the rest of the building.



Western Lighthouse, Westport NS. From: Scotiapuzzles.com

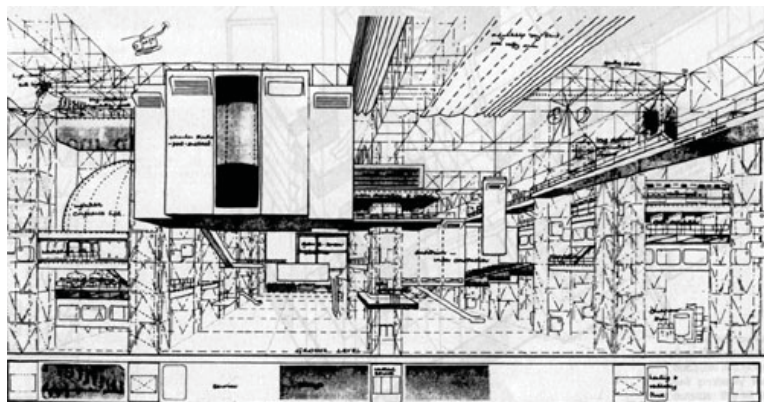


Chip Carving Knives. From: chippingaway.com



Typical Plan of a 1950's flat shown in photo on right. From: *Frame and Generic Space*

The complex Swiss army knife is a combination of them both. Like the fun palace by Cedric Price, the tool attempts to anticipate all the ways it could be put to use and to accommodate them as specifically as possible. The downfall of this approach is in its specificity - there will always be



Cedric Price, *Fun Palace*, section, circa 1964. Cedric Price Archives, Canadian Centre for Architecture, Montreal.

more functions than are anticipated, and the more tools included in the jackknife the more cumbersome, inefficient and cost prohibitive the tool becomes. This thesis takes the approach of the first jackknife - it will be simple and adaptable in its generality.



The Complex Swiss Army Knife. From: armyknife.com



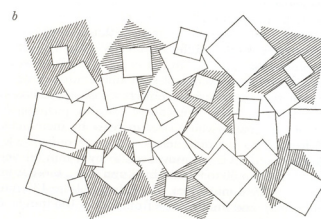
Peeler & kitchen drawer. From: foodideas.eu

Autonomy, Community and Specialization

Three themes that might be extracted from this story are autonomy, community and specialization. The general tool implies a certain amount of completeness. Many jobs can be done moderately well by a jackknife. A potato peeler, on the other hand performs one job very well but is rarely used for anything else - the chef needs a community of cutting tools for supper to be made. Likewise, the lighthouse, at its most specific, needs the actual liveable house below, or, as seen in the image on the right, a community of buildings for it to be complete. The relationship between the three is complex, important and beyond the scope of this thesis, but it should be noted that the building designed here will have an autonomous core, the ability to specialize and the capacity to be part of a greater community.



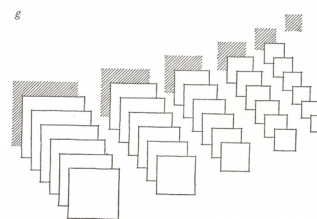
Peggy's cove lighthouse and community. From: *RobHuntley.ca*



Hans Van der Laan - Initial group of squares chosen for similarity of size.

Purposeless

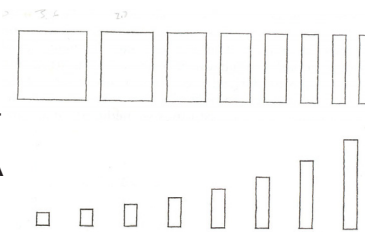
There are three aspects of the building that will be focused on to give the building its 'high-road' quality - proportion, craft and light.



Groupings of similar sizes

Proportion

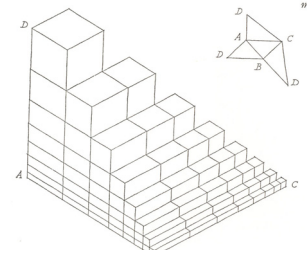
One of the oldest topics in architectural thought, proportion usually consists of three basic relationships. The relationship between parts – how does the dimensions of column A relate to column B, the relationship between the parts and the whole – how does column A relate to the building, and the relationship between the part or whole to the inhabitant – how does the person relate to the column/building. The third is much more complex than, and often the generator of the first two, being that it involves subjective and objective



Difference in size separated into length and width

From: Van der Laan, *Architectonic Space*: .

components. Dom Hans Van der Laan, a Dutch architect and monk, developed a system of proportioning based on perceivable differences. Using squares of card, he would ask someone to separate them based on similar sizes, after enough experiments he made a conclusion on what minimum difference was needed for a person to tell one size from another. This became the basis for his proportioning system, the conclusions of which have been incorporated into the design.

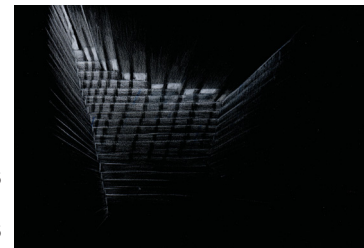


Proportional system in three dimensions. Any two touching blocks have a difference of 0.75

From: Van der Laan, *Architectonic Space*: .

Craftsmanship

Craft becomes purposeless when it is done for its own sake, which is often an indication of how much the builder enjoys their work. The more respectful the design of the building is towards the builder's capabilities, the more the building will embody the joy that comes from making something well. To this end, the design attempts to carry the momentum of creation into work that is done for no other reason than itself – this is the basic principle of purposelessness.



Study 1



Study 2

Light

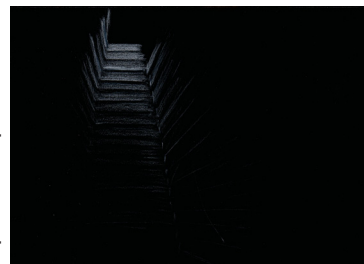
The awareness of this architectural quality is the strongest purposeless goal in this thesis - the testing will be developed through a process of drawing and modeling, imagining and making. The drawings on the right show some preliminary studies of light and space.



Study 3

Method

There are four main methodological moves made to examine the architectural influence on the making of a valuable, reusable building. First, by choosing an architecturally generic site, the important influence of the location is removed.

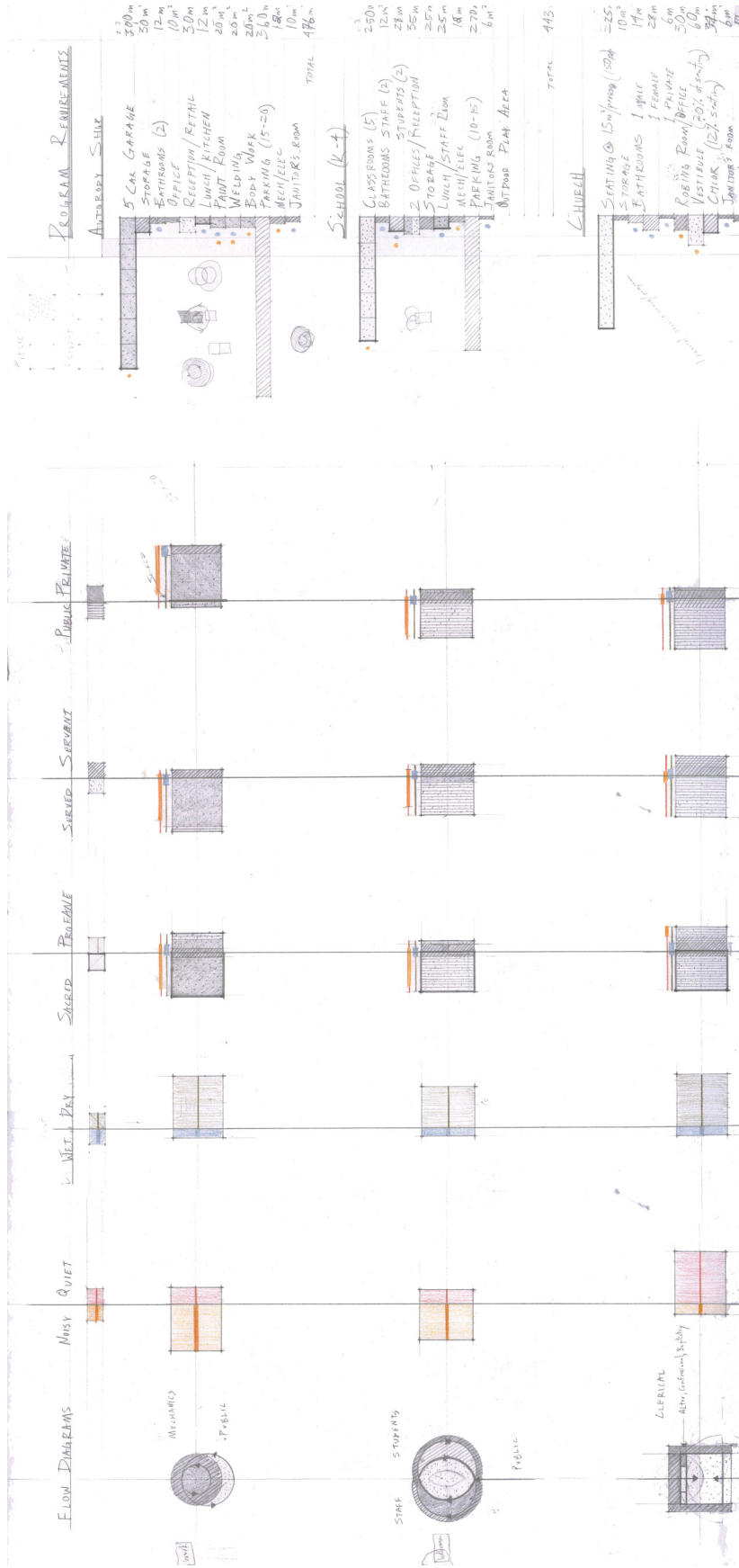


Study 4

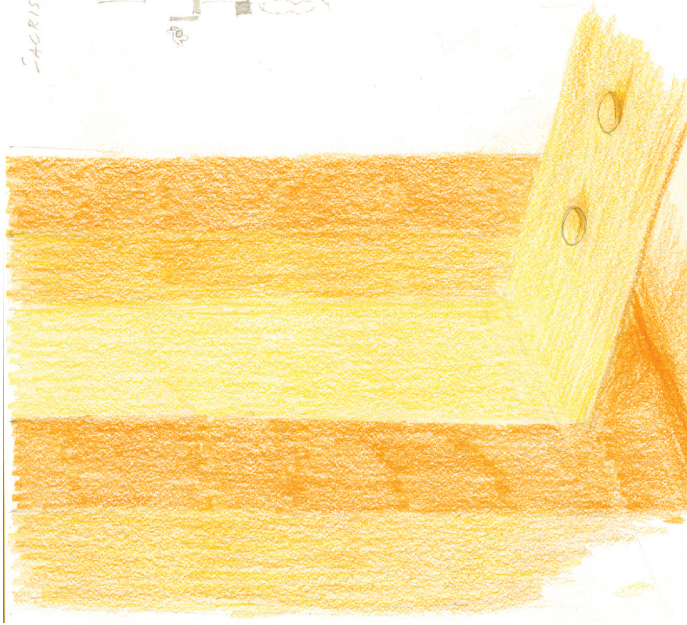
Second, by anticipating three different ways the building could be used (school, body shop and church), the building will accommodate these and the variations in-between. The third is by designing the building on the basis of layers, starting with the most permanent and moving to the impermanent. Their independence will ensure that each can be modified without disturbing another. The last, is that each architectural move satisfy both a purposeful and purposeless function.

Program

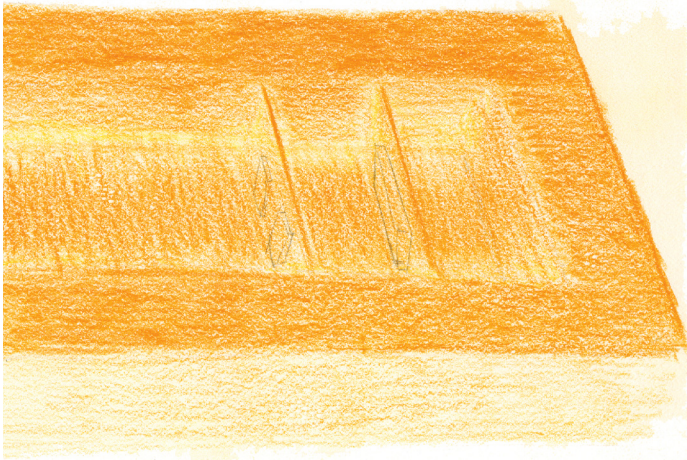
The terms use and reuse needs to be described more specifically: how will the building be used and for what? Most buildings are designed for a client with a particular purpose in mind, but purposes are always changing and if the building does not anticipate this, it will fall. Trying to predict the specific future uses of the building could have some value but this quickly falls off the farther ahead one tries to look. Instead, a way to test the success of a building's ability to accommodate unknown purposes is to design for three very different programs and let their commonalities determine its generalized form. To this end, a grade school, a church and an auto body shop have been used to test the idea. The following are two descriptions of each of the programs. The first is centered around important architectural dichotomies as well as the flow of materials and people. The second identifies analogous structures in each of the programs and looks at the design of each.



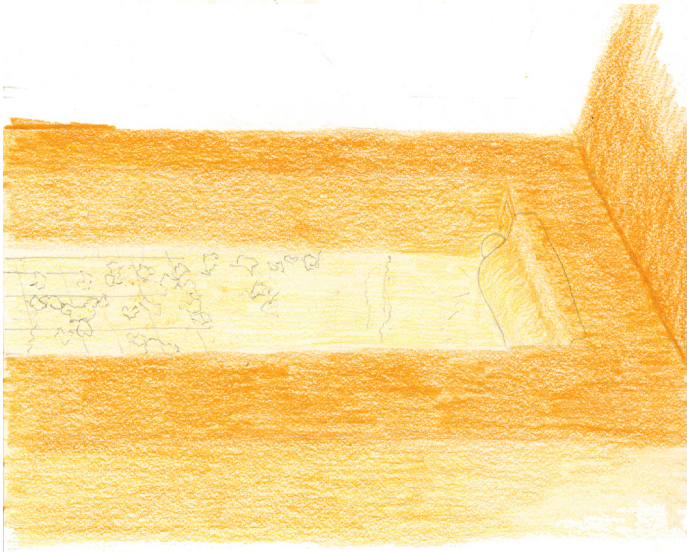
Diagrams of important architectural distinctions, and floor space areas for each of the three programs. From top to bottom: auto body, school, church.



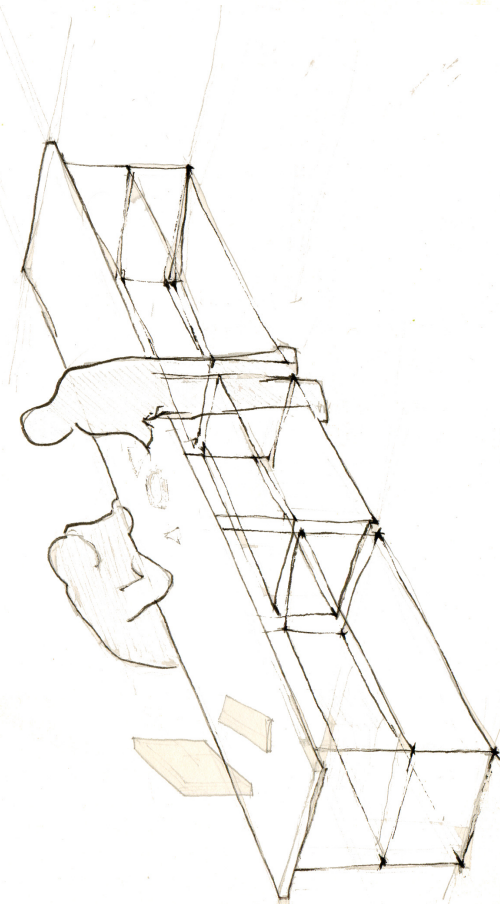
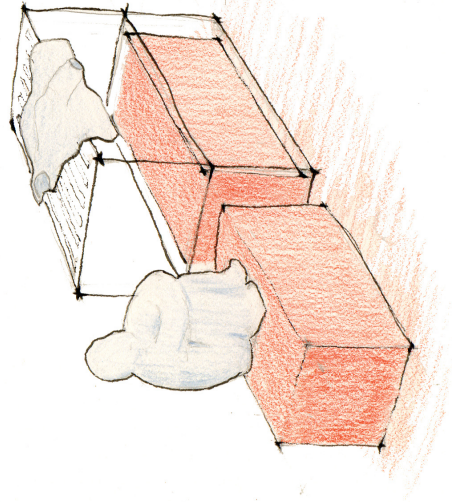
Sacristy



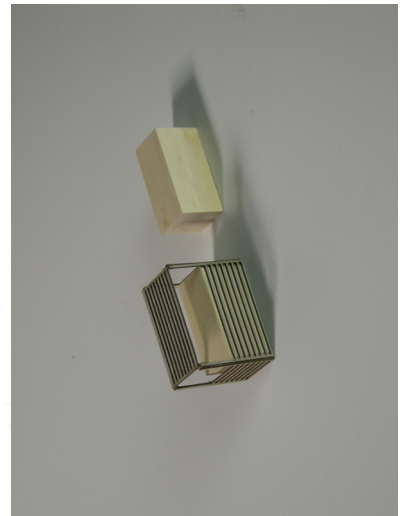
Tool Vault

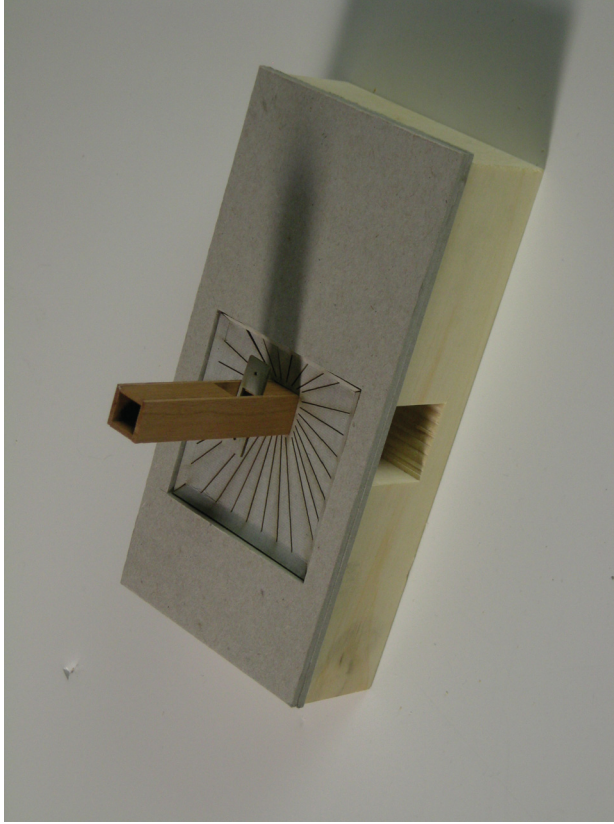
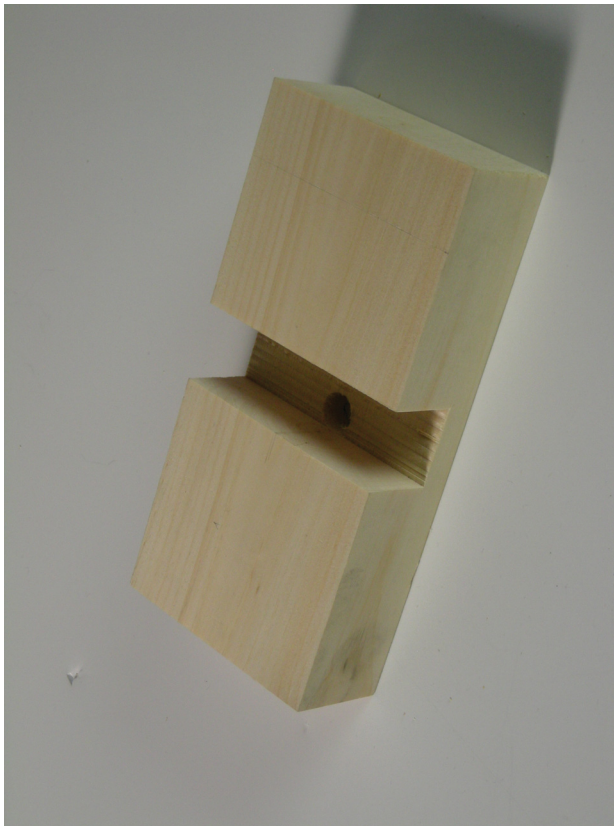


Nurse's Room

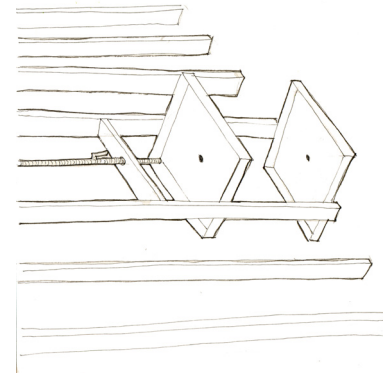


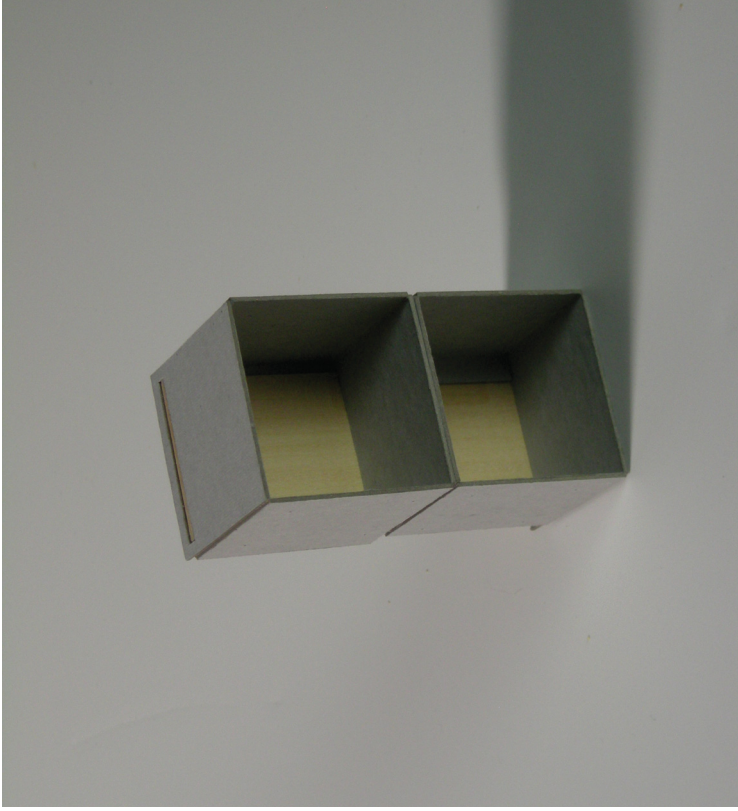
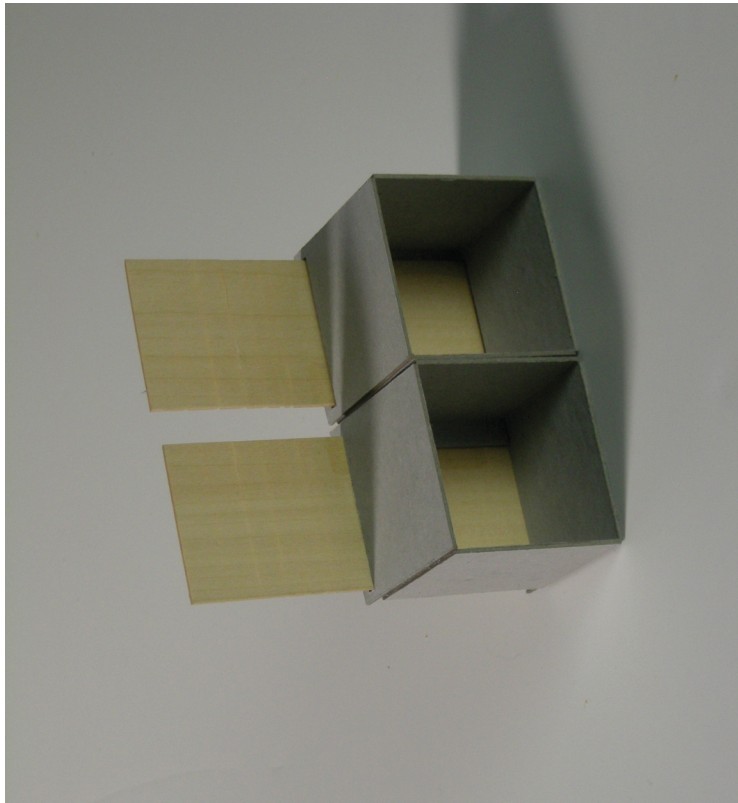
Block and Rack. Block of concrete is warmed by geothermal energy and placed in the entrance and in the water bay. At 40" high the rack can double as a stand desk to be used with a stool counter or table top with the possibility of shelving underneath.



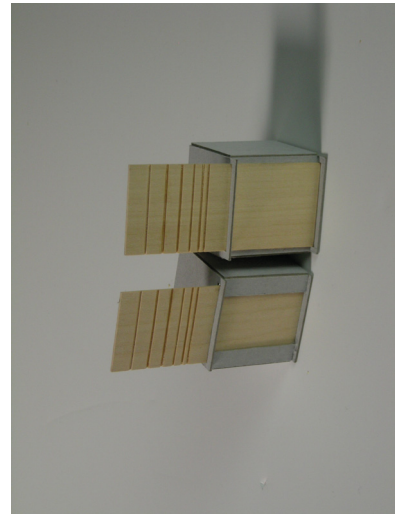


Models above show a preliminary design for the entry of the water services into the building from both the cistern and the street. Upon or exiting the building all three programs require a place to wash themselves clean of the previous place -either ceremoniously or actually. The drain in the floor is large to accept many different uses, from a janitors mop to the mess of a paint booth to children playing.





Designed for the storage of people or objects, these pews/chairs are made of light folded steel and wood and can be combined to form open cabinetry. These pews can be stacked together to archive parts that mechanics hold on to for as long as thirty or forty years, or distributed around a classroom to differentiate space. The cuts along the back allow the wood to bend to accept a churchgoer's natural lean.

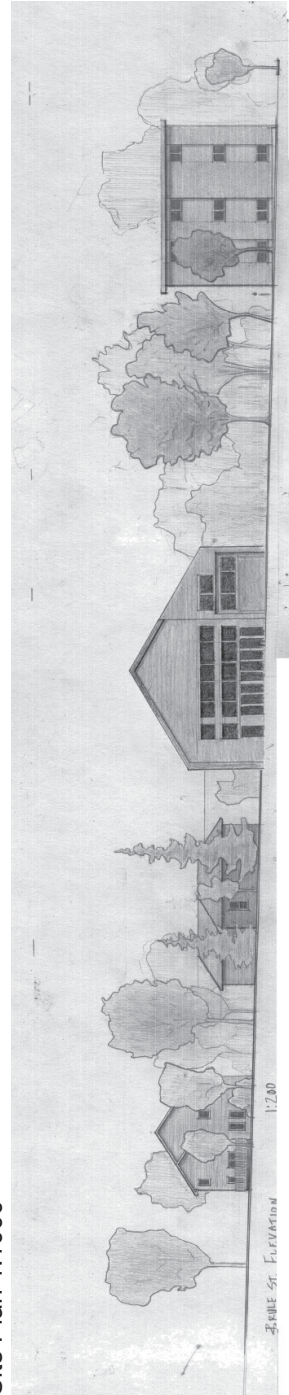


Site

Located in an area of Dartmouth, N.S. that has a lot of low-income housing, the site was chosen for its generic nature. With the exception of a high school, a little west of the site, there is a very uniform distribution of simple one and two story houses as well as two to five story apartment buildings which vary little from the one immediately south of the site (see elevation). The purpose for choosing such a generic site was to eliminate it as a significant variable in the design process. Although the building will respond to the site, it will not derive its architectural quality from it.



Site Plan 1:1000



Elevation 1:200

DESIGN

Purposeful

Formal Strategies

Three formal strategies were considered – scattered, centralized and linear.

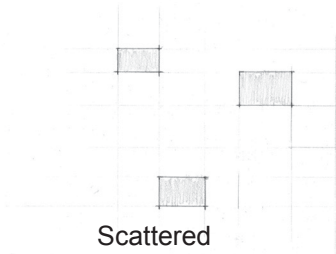
Scattered

The scattered organization was the least suitable. Schools as we know them have spaces that are fairly independent; each classroom has enough autonomy and need for separation to drive a series of forms rather than one form. These forms could respond to subtle differences in the site and program or be infused with different architectural characteristics – the wooden classroom, the brick and glass classroom, the steel and soft wool classroom – etc. The main space(s) of the church and autobody are continuous and do not like these separations.

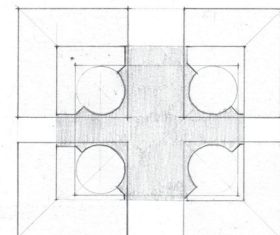
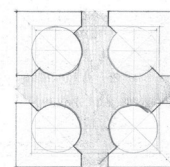
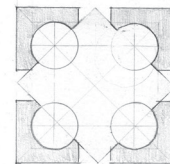
Centralized

The first two diagrams shown on right show a centralized organization that switches between four private spaces with circulation through the middle and one central space with circulation around the outside. Four semi-circular walls that pivot between two positions achieve the two different configurations. The church and auto body shop would occupy the first pattern, while the school the second. The third diagram shows a more developed version. The interior square is moved towards the south to allow more light into the main space and more room for services in the north - blocking off the north wind at the same time. In the first two diagrams four cars would access the central space from four sides of

SCATTERED



Scattered

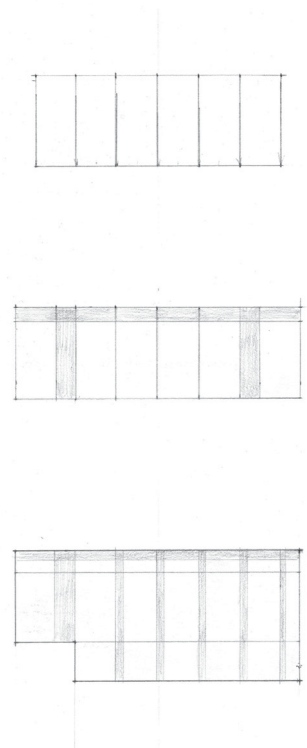


Centralized

the building; the thickened middle section in the third, allows four car access on two sides. There are three inherent difficulties to this form and strategy, one is access - highlighted by the autobody shop that requires a full, one-sided access. The second is the difficulty in resolving the circular and rectilinear geometry, fitting a desk or adding shelves against a circular wall is a difficult thing to do without wasting space, time and energy. The third was expansion/contraction. A radial pattern discouraged the easy movement of light, air, people and materials into the center of the building. Expanding linearly was a possibility but was more suited a basically linear pattern.

Linear

A linear strategy was chosen because of its ability to expand, shrink and differentiate. The bays are first differentiated based on served and servant spaces. One bay at 8' to contain the services needed for every 24' bay. Eight feet is enough space for an elevator, a switchback stair, an office, a private handicap bathroom, or a side loaded kitchen. In combination with the 12' for each car in an autobody shop - each mechanic has 16' of space to work on a vehicle. The north and south sides of the building are differentiated next to take advantage of the sun's heat, create more private, darker spaces in the north as well as providing structure to deal with the prevailing northern winter winds. The perimeter of the building is shifted to provide a larger public space at the street end of the building while simultaneously providing a smaller more private space at the eastern end.



Linear

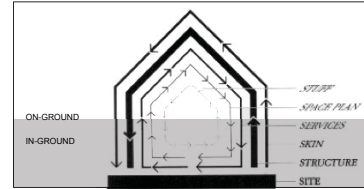
In-Ground/On-Ground: Modified Layers

The diagram on the right shows a modification of Steward

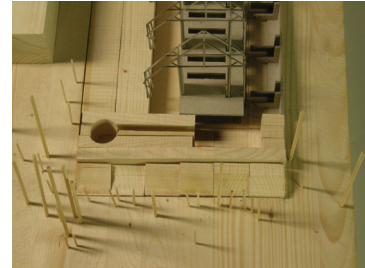
Brand's layers, it adds the distinction Semper makes between 'earthwork' and 'roofwork'. The area of any layer that lies beneath the ground is significantly more permanent than those above. This is an old architectural distinction of elements, often called stereotomic and tectonic, that divides the voluminous mass of the groundwork from the lighter framework above.

'In-Ground'

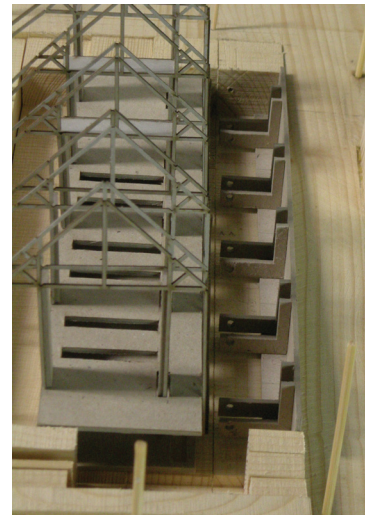
In preliminary designs seen in the photo on the right, the circle in plan was used below ground, reflecting the different forces that exist there. The building plans in the following pages show two different axes for the two different conditions. This earlier 'in-ground' design was different in other ways, it had full basement as a secondary gathering space for the school and church, while cuts in the floor created access for mechanics to work on the undersides of cars. The need for light was solved by a large light well on the north side, which, as it bled into the circulation space became space for services. This is represented as a drilled hole in the card model on right. The design developed away from a full basement because the cost of construction, heating and maintenance was a concern, particularly for the autobody shop. The two stories above the basement that were required for the church were not being well used. Secondly, the secondary gathering space was not completely required for a church or a school, church-goers could informally gather in the 20' wide south-facing space while the school's need for it was simply less pressing. As shown on the right, this left a mechanical room, geothermal well, service trenches and a cistern.



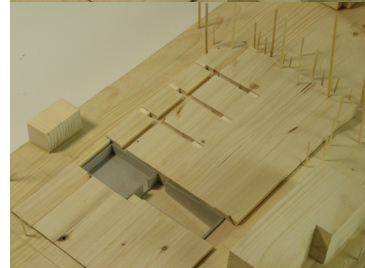
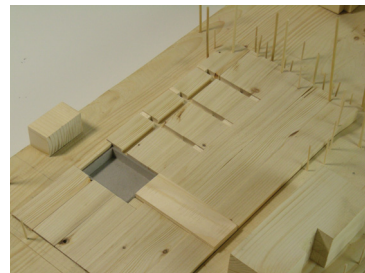
Modified Layers



Peliminary cistern design



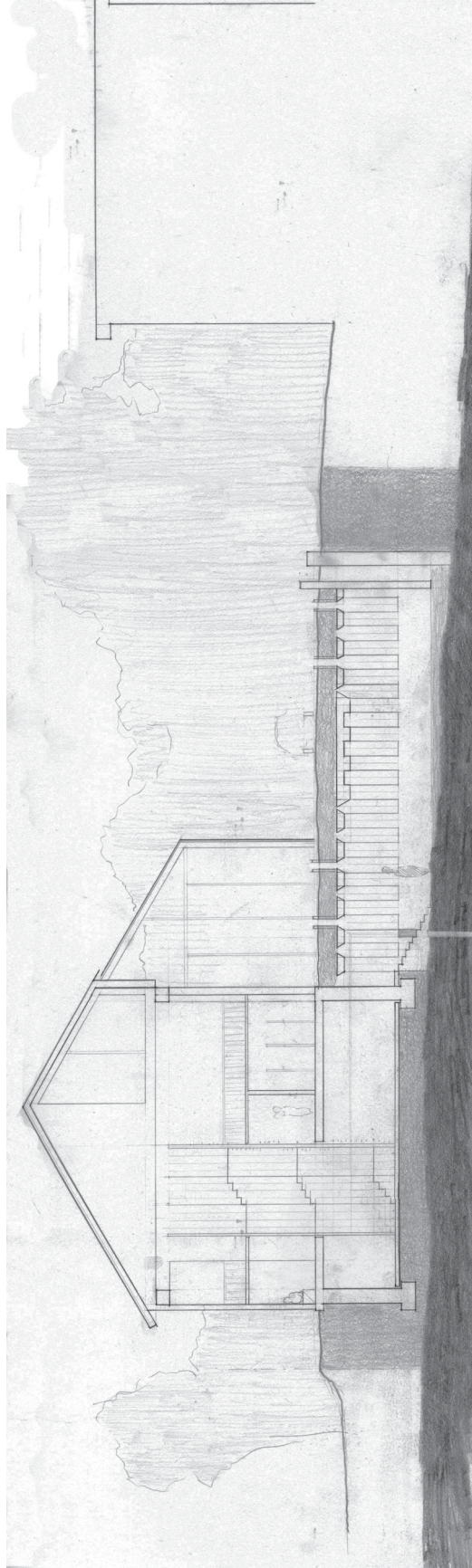
Peliminary design showing light well on right side



In-ground services, basement and cistern



'In-Ground' Plan

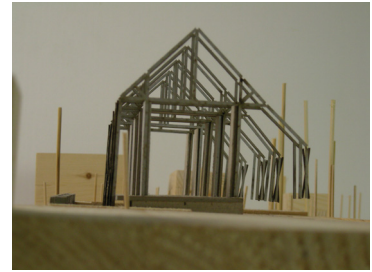


Cross Section

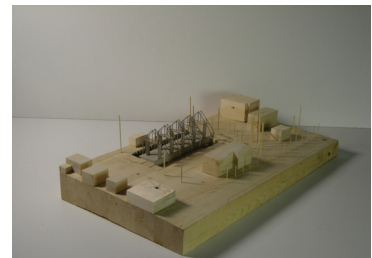
'On-Ground'

The building material in-ground is primarily high in compressive strength and low in tensile, while the building material above is potentially the opposite or generally high in both. The lightness of the on-ground construction was looked at in one of the preliminary models at right and developed into the white model below.

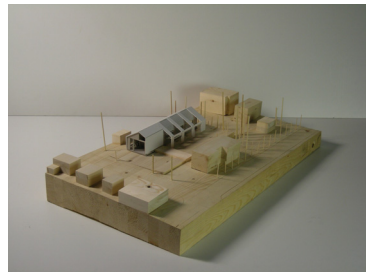
The 'on-ground' plan and longitudinal section show each program occupying one of the middle bays. The only layer to receive significant change is the scenery layer, made up of interior partitions and furniture. The longitudinal section looking north-east shows the presence of the in-ground services for each 8' bay. The following axonometric shows four layers in the ground and on the ground.



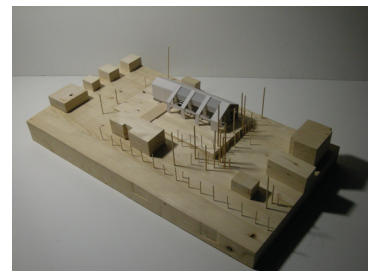
Preliminary design street view



Preliminary design west view



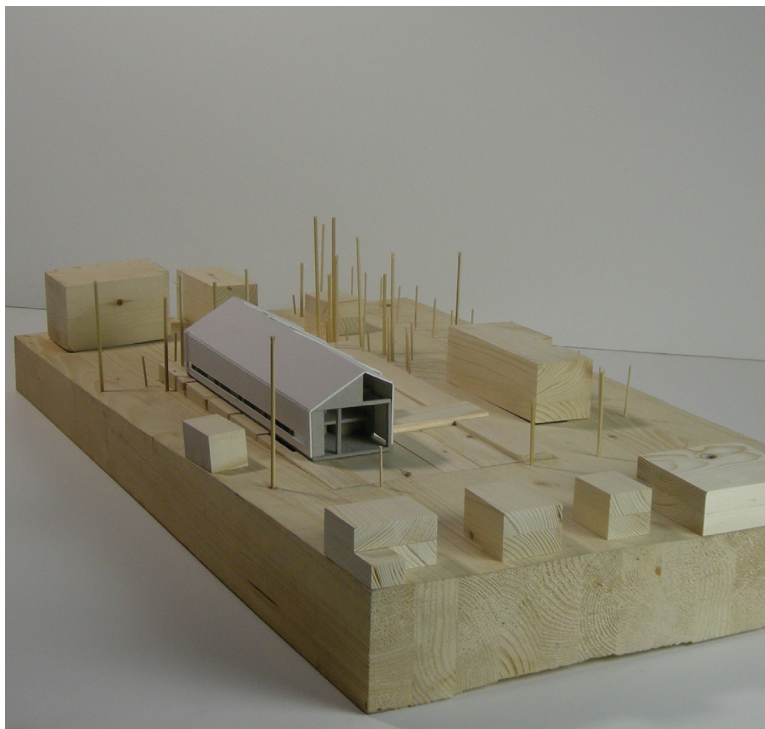
West view



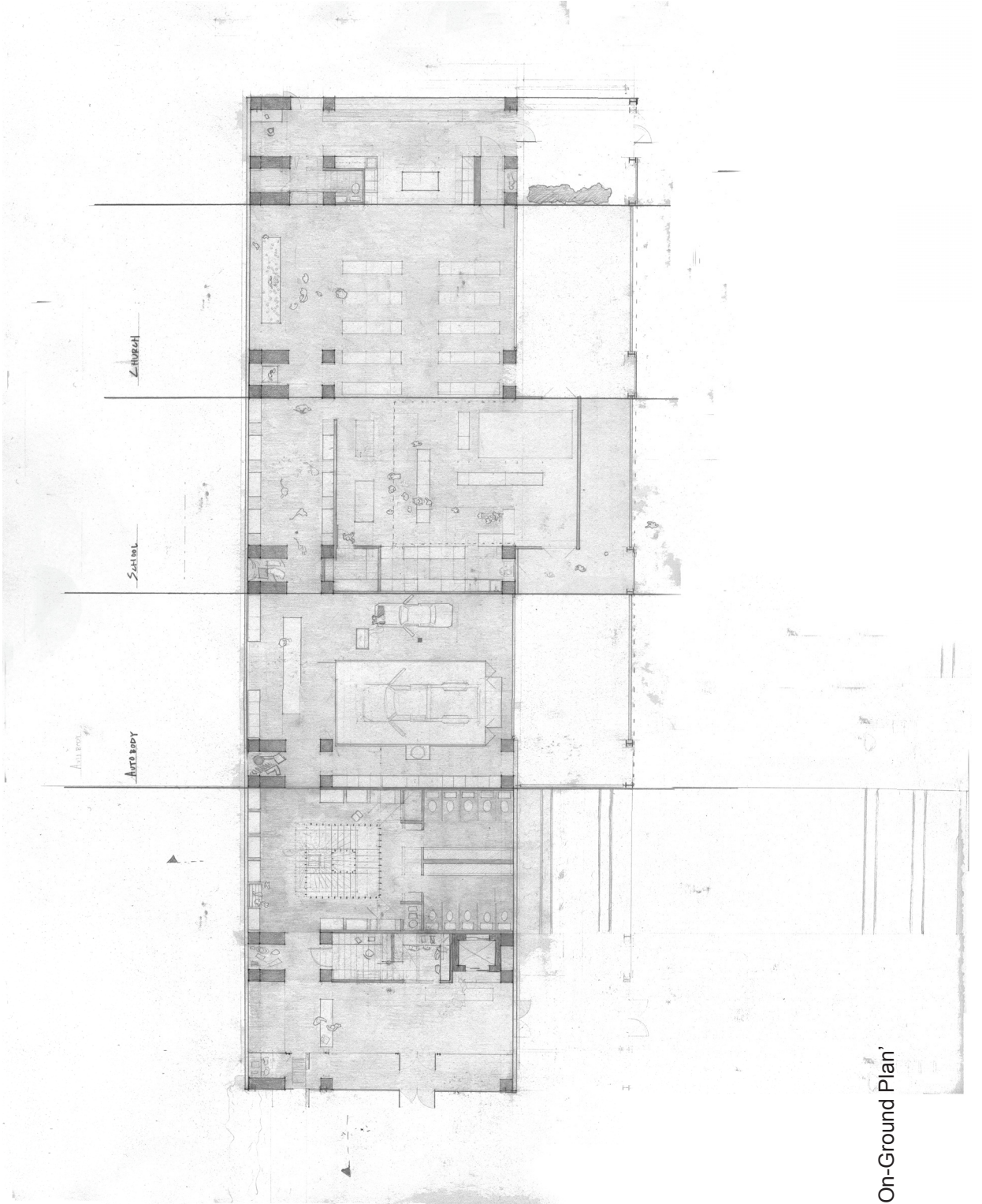
South view



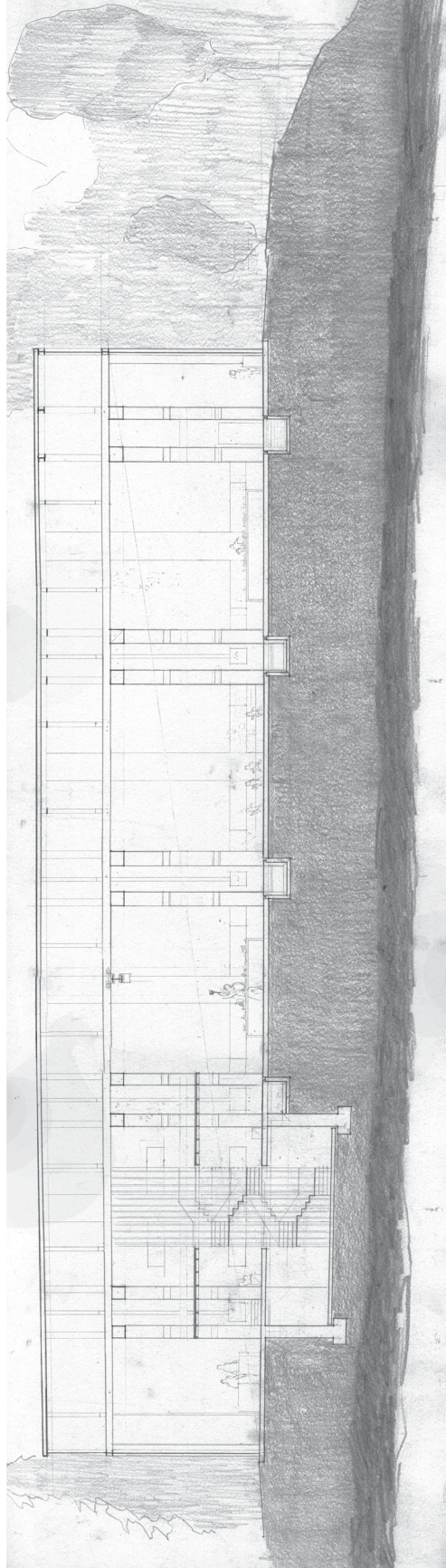
Street view



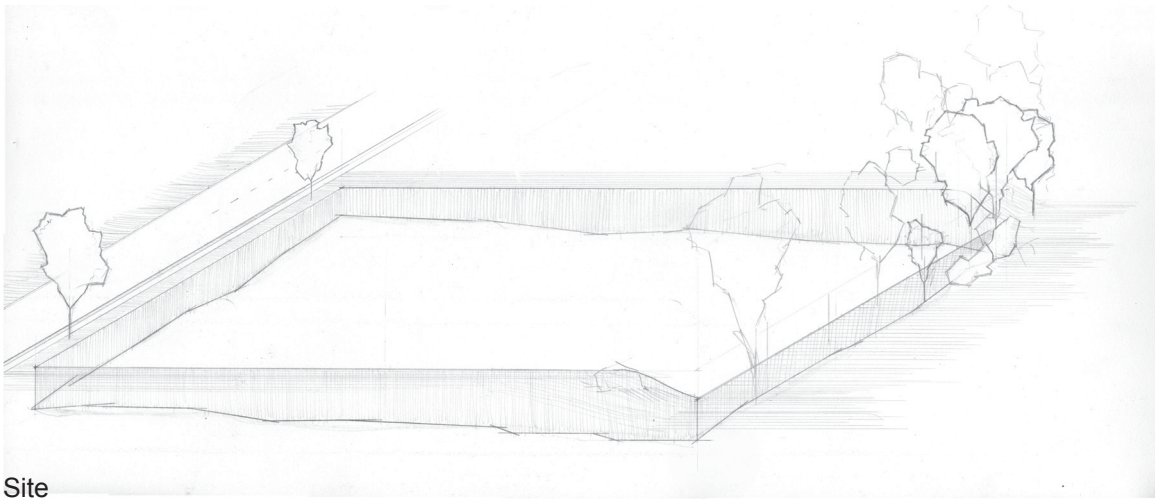
North-west view



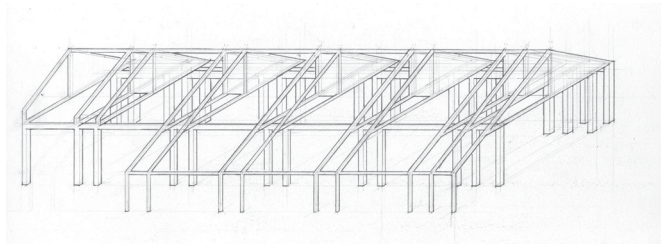
'On-Ground Plan'



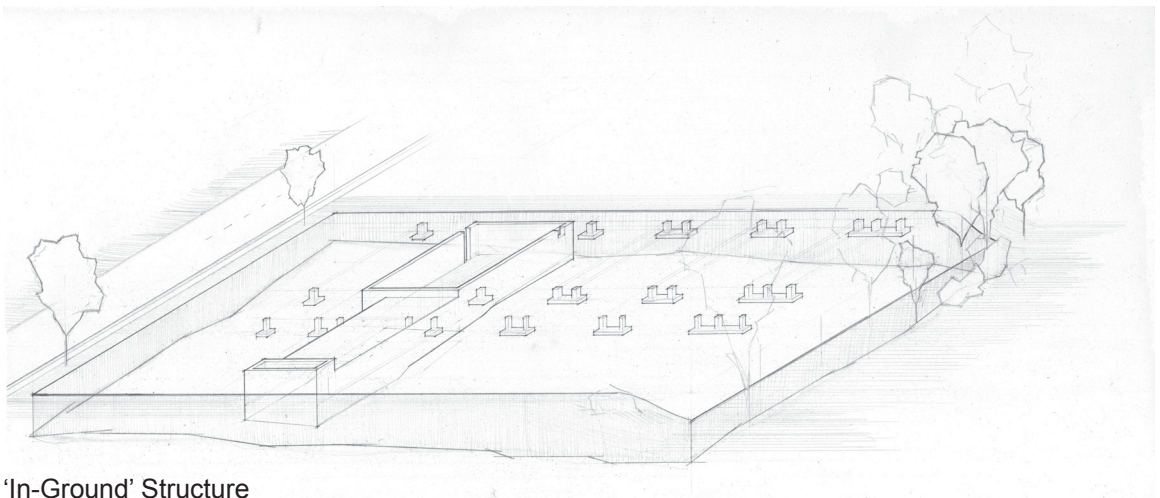
Longitudinal Section



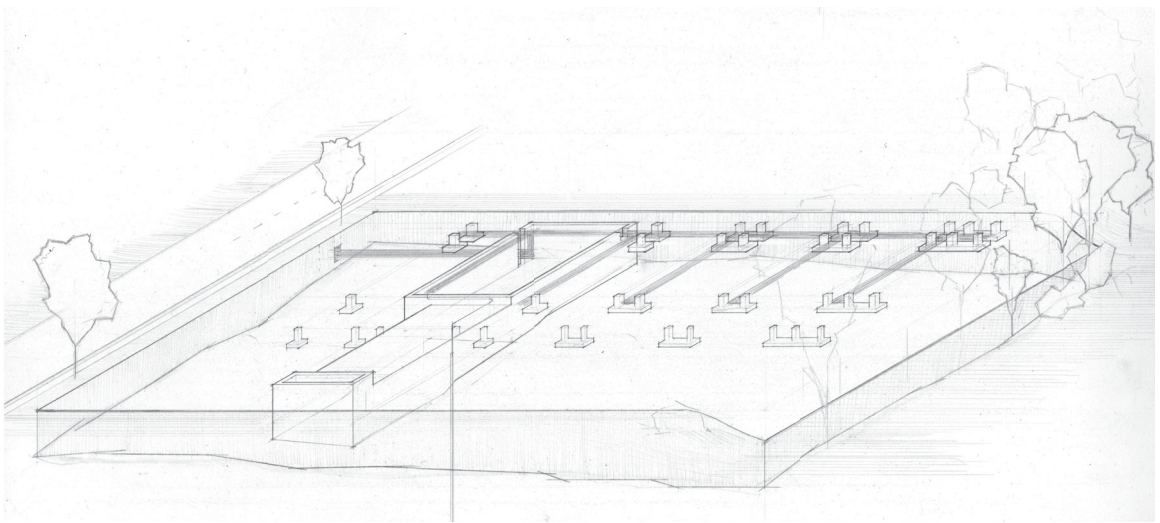
Site



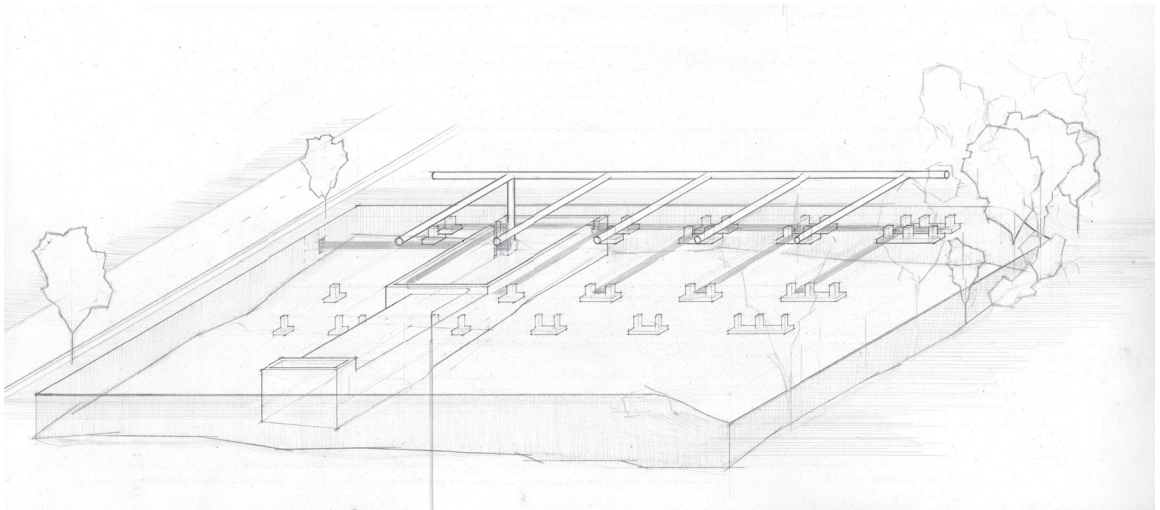
'On-Ground' Structure



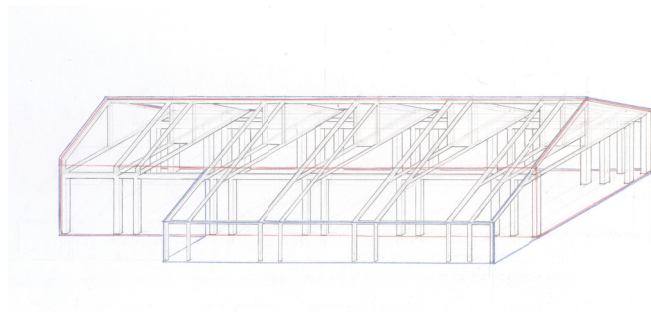
'In-Ground' Structure



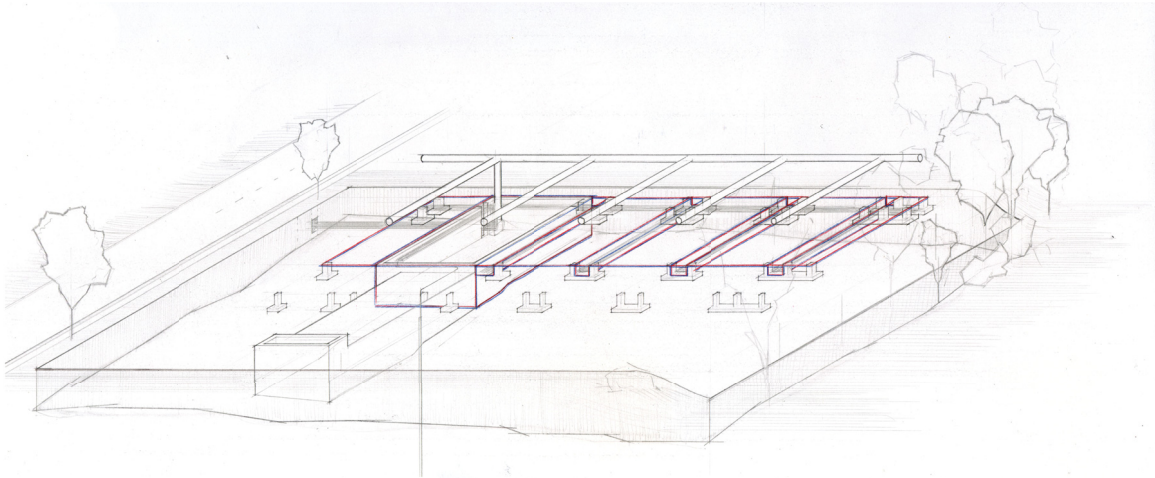
'In-Ground' Services



'On-Ground' Services

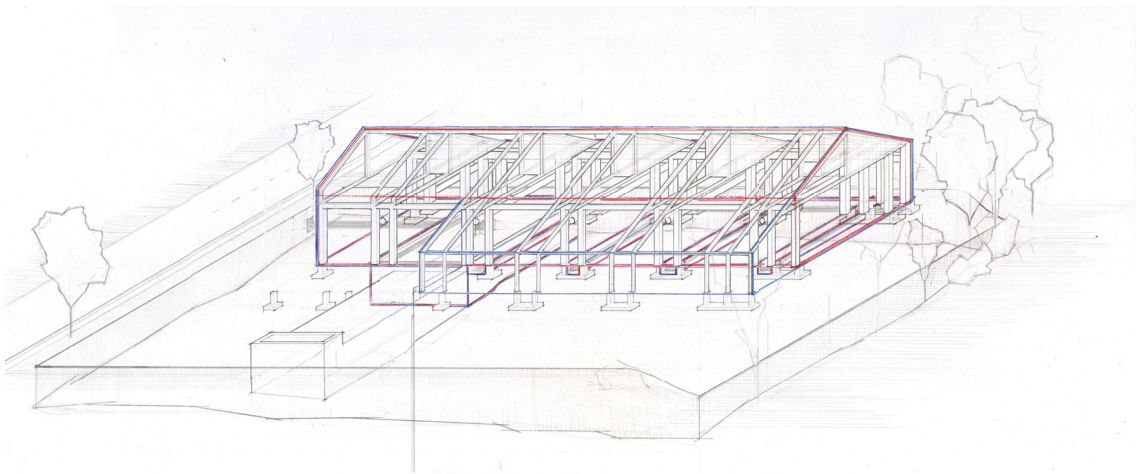


'On-Ground' Skin



'In-Ground' Skin

— Thermal layer
— Water barrier -
vapour, rainscreen, bulk water

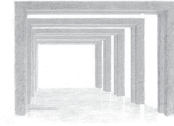


Composite

Purposeless

Proportion

The bays were divided into the 8' and 24' with a secondary division of the 24' bays into two 12' bays. This halving of the large bay creates a $2/3, 1, 1, 2/3$ rhythm. As mentioned in the introduction, the Van der Laan proportioning system is complex but two major ratios of division that repeat themselves are thirds and quarters. Both 12 and 24 are evenly divisible into thirds and quarters.

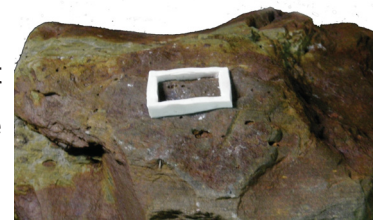


Preliminary drawing showing bay rhythm

In-Ground/On-Ground: Modified Layers

'In-Ground'

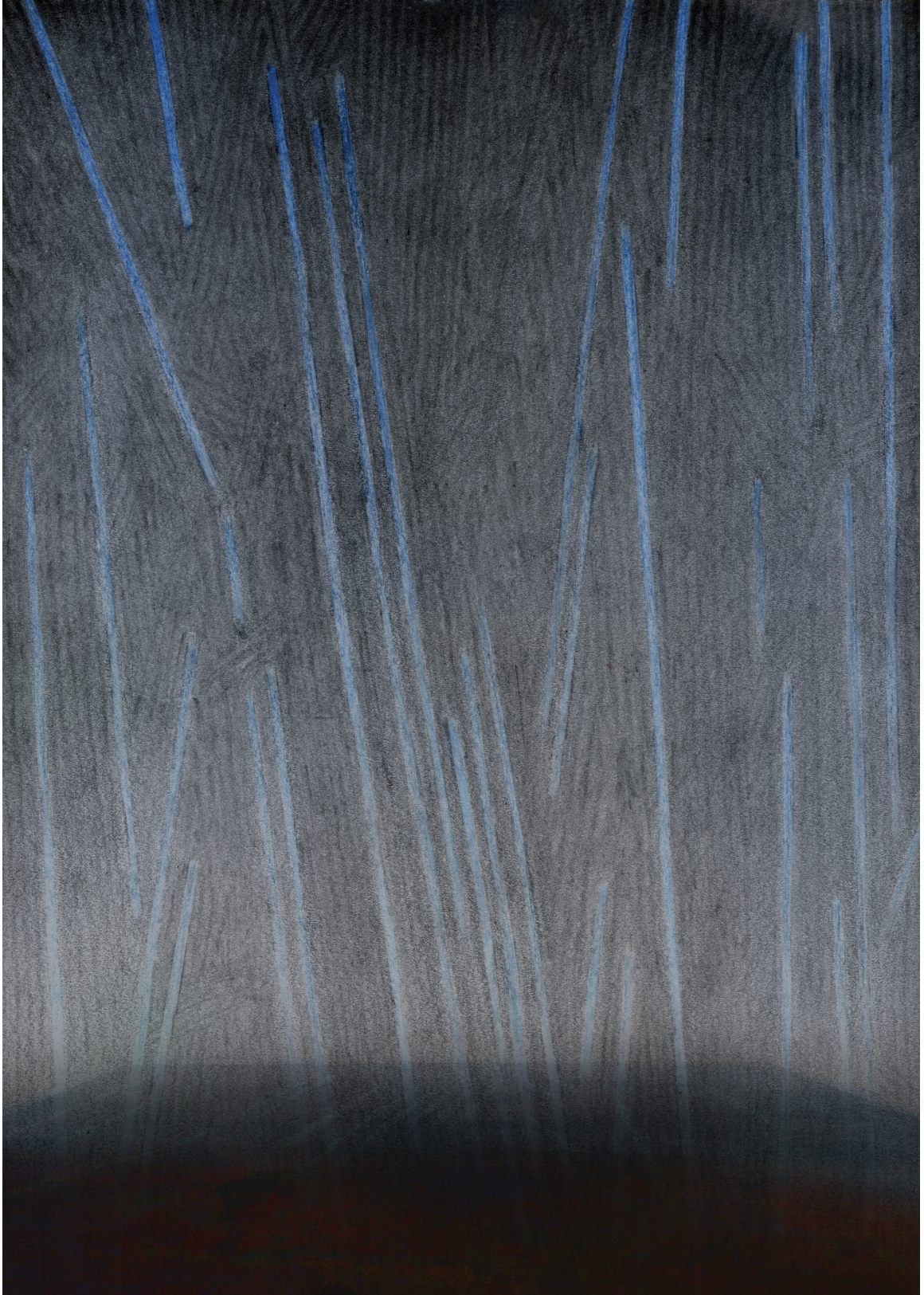
A parti model for the cistern shown on the right distinguishes sharply between the natural stone and the concrete frame. The space of the cistern is made through a ring of concrete frames holding the earth back while letting the water through. The contrast between what is made and what is found is heightened by the fact that one has to pass through the mechanical room to reach the cistern. The drawing on the next page represents a feeling for the way in which light would enter the back of the cistern, bouncing up from the water's reflective surface, blue light, red stone, dark above, light below.



Parti model

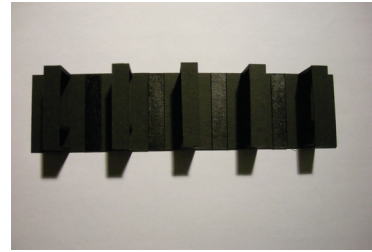
'On-Ground'

The gradient from light to dark, south to north and the meshing of diffuse light with direct light help to create different atmospheres in different spaces. The windows above are thermal insulating glass, their core is made up of a honeycomb of insulative material that allows in only diffuse light, while the openings below this let in direct light. The mixture

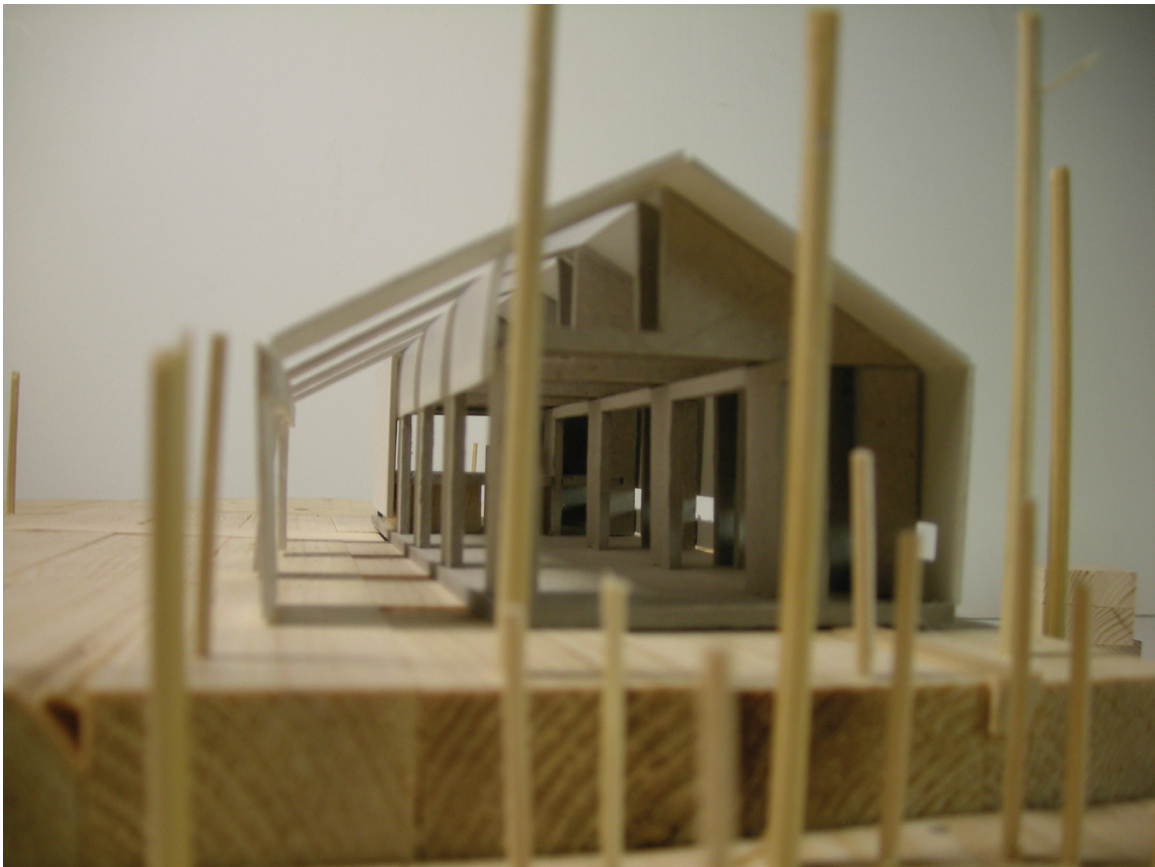


Cistern Light

of the two different types of light work with Van der Laan's idea of distinguishable differences. The shadows from the direct light become less sharp, and when combined with an 8' light/dark or polished/unpolished floor treatment rhythm, the space begins to develop a lasting richness. It should be noted that the concrete is darkened in a purposeful way to increase its ability to absorb heat from the sun.



8' rhythm of polished, unpolished floor.



Dark and light spaces

CONCLUSION

This is very much an open-ended thesis, something that will never be finished. The above represents one iteration. The degree of resolution of the purposeful is higher than the resolution of the purposeless. This shows in the development of the skin, which, along with the structure define the way in which light enters the building. In addition to this shortcoming, a layer that could have received more attention was the circulation/access layer included in Leupen's formulation. Although the 8' bays are meant to accommodate a switchback stair, the design needed more separation between this layer and the rest of the building. Finally, a deceptively important question that was struggled with and shows strongly in the work, is the question of which comes first: purposeful or purposeless? It could be argued that they are the two sides of the same coin and it does not matter as long as both in the end are dealt with. The author is unsure how much this hindsight, or out-of-process-sight actually helps during designing. Most of the work here comes from a purposeful beginning, the solutions to which are fairly convincing but it is unclear how a more purposeless beginning might have affected the outcome.

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