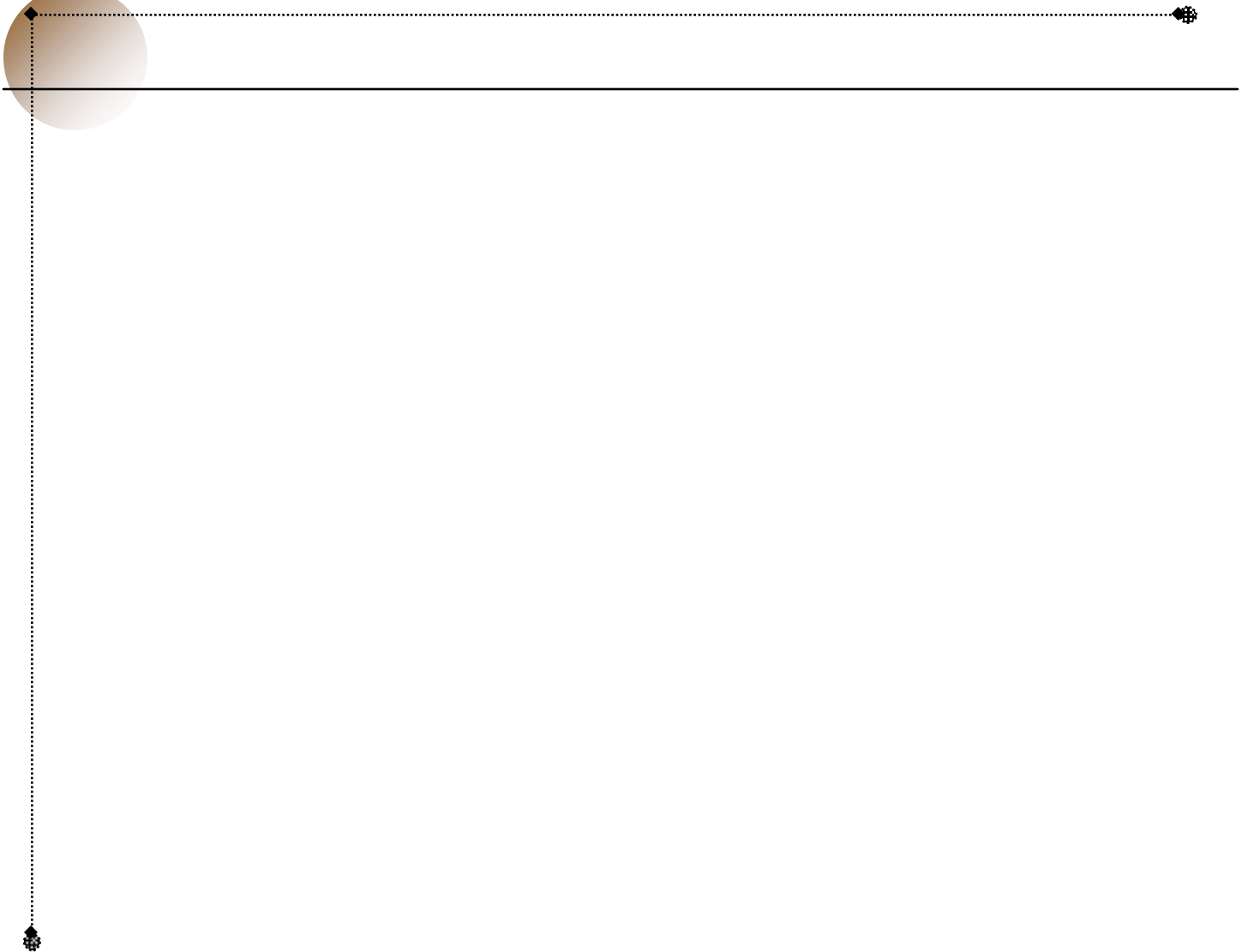
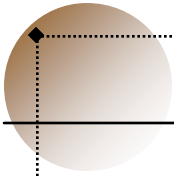




# *“Native”*

ARCHITECTURE



2

**Native Architecture:**

Sustainable design theory applied to affordable housing in a rural setting





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## Abstract:

This project will seek a holistic and sustainable solution to rural housing and community design. The community of Cannonball will be the subject of this design study. Implementation of principles of sustainability will be essential to the final design solution. Quality, meaningful design must be more than functional and beautiful, it must also be a solution *native* to its context. To achieve this end an in depth analysis of the cultural, economic, and environmental systems is essential. This project will seek to define a notion of *progress* specific for the community of Cannonball and achieve that notion through effective design.

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**Native Architecture:**  
Sustainable design theory applied to affordable housing in a rural setting



# **Project Description**

**User/Client Description**  
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# Project Description

## User/Client Description

The Standing Rock Sioux Tribe will be the client on this project. Typically, the Tribal Planning Committee acts as the building committee for all tribally funded building projects, and would be the chief contact for the architect on a project like this. Once houses are built, they are typically turned over to the Tribal housing authority for management and facilitation. The housing authority basically acts as the landlord for the residents of the houses.

The issue of funding will be a crucial consideration for this project. Where the Tribe could potentially use some of their allotted federal money to fund this project, more than likely additional means of funding would need to be found. The majority of this money would most likely have to through additional grants, since most Individual residents do not have the ability to secure a lone. The Department of Housing and Urban Development (HUD) typically grants money for these types of projects, but other grants are also available. Rural Development and Job Service of North Dakota, are just a few that might be willing to get on board if the project is set up to address their concerns.

In the case of this project, the client and the user are not necessarily the same. The houses will be designed residents of Cannonball, ND. While they are members of the tribe, they do not typically act as the client for housing projects because they do not have any assets directly invested in the funding of the project.



## Project Elements

### Affordable Housing Units —

#### **Problem:**

Currently there is a shortage of housing in Cannonball, across the Standing Rock Sioux Reservation, and in many reservations across the country. Many houses shelter two or even three families. Population is booming as typical families grow younger and younger, but while the population is increasing, job opportunities are not. The typical family lives off welfare, spending money as quick as it comes. Typically residents pay rent, never gaining equity in the property.

#### **Solution:**

This project will seek out a solution to the housing shortage that can also supply jobs to the community and jump-start the local economy, while also seeking to preserve the uniqueness of culture and ecological diversity and integrity. In short, this project will seek to provide a means to achieving a holistic notion of progress.

### Sustainable Community Master Plan —

#### **Problem:**

In addition to housing, the cannonball community lacks a good solution to many community needs. Community service buildings are spread out helter-skelter, and many are in poor condition.

## Project Description

### **Solution:**

This project will seek to place community buildings and spaces in a manner that will encourage their use and foster a better sense of community.

### **Plan for Progress –**

### **Problem:**

There is a sever lack of jobs and other economic activity. People need to take a more active role in the livelihood of themselves and their community.

### **Solution:**

This project will seek to outline a community wide strategy to harness materials and energy and to focus labor and effort to achieve a higher degree of self sufficiency and self-reliance, at the level of both the individual and the community.

### Project Emphasis

The project emphasis will be to provide a “native” design solution to the Cannonball community. I use the term “native” as described by William McDonough in his book *Cradle to Cradle*. This project will seek to abide by McDonough’s ideas about sustainability by eliminating the concept of waste, respecting diversity, drawing inspiration from nature, in order to put “eco-effectiveness” into practice.

Quality design is more than a beautiful and functional solution. A meaningful solution must first and foremost be native to the context of the problem. A designer achieves effective native design by first coming to an understanding of the context of the site, uses project specific to data to define a set of goal, and finally innovates a sustainable solution.

# Project Description

## Methodology and Documentation:

### Phase 1:

I must develop a comprehensive theoretical underpinning of the project, and apply it to create an understanding on the building typologies. This will be based on the ideas of contemporary thinkers. Through this process I will discover my “voice” for this project. A crucial element of this will be refining a more holistic definition of progress. Finally, I will draw conclusions and outline a framework for achieving effective design in the realms of housing and community planning.

Program – This document will first describe in depth my theoretical underpinning for this project. Second it will describe the housing design and community planning typologies as interpreted through my theoretical underpinning. Thirdly, It will outline an analytical framework for evaluating the appropriateness of a design solution.

### Phase 2:

I will seek out and document case studies that resonate with my theoretical underpinning and interpretation of the building typology.

Case Studies – This document will describe previous design solutions to affordable housing and sustainable community design and carefully assess their successes and failures. I will then be able to determine appropriate design solutions for this project, avoid past mistakes and capitalize on prior success.

### Phase 3:

I will take an inventory of the site. I will describe, briefly, the history the people and the land and their current conditions. Also, I will inventory the built and natural features of the site itself.

**Site Inventory** – This document will briefly describe the present characteristics and past history of the site, the ecology of the land and the culture of people. It will also give reference to sources for more in depth information.

### Phase 4:

I will employ an eco-systemic perspective in my analysis, to create a system model of the project context. I will evaluate the system in terms of the definition of “progress” described in my program. I will seek council in this analysis from experts in the field of anthropology, economics, and ecology.

**Systems Map** – This document will systematically map the current relationships existing in the project context. This document will be produced in conjunction with my honors thesis.

**Progress Assessment Report** – This document will assess the current “progress” level, as defined in the theoretical underpinning, of the cannonball community. This document will be produced in conjunction with my honors thesis.

### Phase 5:

Once an accurate and useful model is complete, I will engage the people of cannonball to come to a better understanding of their situation and their wants and needs. With their input, I will be able to outline concrete and quantifiable goals and begin to envision a solution.

**Goals** – this document will describe the wants and needs of the people of Cannonball. It will set forth concrete quantifiable goals.

### Phase 6:

I will synthesize the goals of phase 5 with the analysis of phase 4 and propose changes to the model completed in phase 4 that will be designed to meet the goals set forth in phase 5. This document will be produced, not for my architectural thesis, but for my paralleling *honors* thesis. However it will inform my architectural thesis, particularly

## Project Description

in materials selection. This document will be based on the same theoretical underpinnings as outlined in this document.

Plan for Progress – This document will describe the means to achieve “progress” and meet the goals set forth by *Progress Assessment Report*. This document will be presented in conjunction with my honors thesis.

Phase 7:

I will design a system of housing design and community planning that will be based on both my theoretical underpinning in phase 1 and assessment of the building typology in phase 2. My designs will fit into the larger plan for progress for the community outlined in phase 6.

Design Presentation – This document will describe the final design solution.

## Project Schedule:

### Spring Semester 2005

Week 1: (Jan 10-14)

**Finalize *Cultural and Economic Assessment***

**Begin *Materials Selection Justification***

**Outline *Plan for Progress***

**Begin Preliminary/Schematic Design Phase**

T 11 Jan Classes begin

Week 2: (Jan 17-21)

**Finalize *Materials Selection Justification***

**Continue Preliminary/Schematic Design Phase**

M 17 Jan Martin Luther King, Jr. Holiday

Week 3: (Jan 24-28)

**Continue Preliminary/Schematic Design Phase**

Week 4: (Jan 31- Feb 4)

**Continue Preliminary/Schematic Design Phase**

Week 5: (Feb 7-11)

**Finalize *Plan For Progress***

**Finish Preliminary/Schematic Design Phase**

Week 6: (Feb 14-18)

**Begin Design Development Phase**

Week 7: (Feb 21-25)

**Continue Design Development Phase**

M 21 Feb President's Day Holiday

Week 8: (Feb 28- Mar 4)

**Continue Design Development Phase**

Week 9: (Mar 6-11)

**Finish Design Development Phase**

# Project Description

M-F 07-11 Mar Mid-semester Thesis Reviews

Week 10: (Mar 14-18)

M-F 14-18 Mar Spring Break

Week 11: (Mar 21-25)

**Begin Presentation Phase**

F-M 25-28 Mar Easter Holiday

Week 12: (Mar 28-Apr 1)

**Continue Presentation Phase**

Week 13: (Apr 4-8)

**Continue Presentation Phase**

Week 14: (Apr 11-15)

**Continue Presentation Phase**

Week 15: (Apr 18-22)

**Finish Presentation Phase**

Week 16: (Apr 25-29)

**M 25 Apr Thesis Projects due at 4:30pm in the Memorial Union Ballroom**

**T-W 26-27 Apr Annual Thesis Exhibit in the Memorial Union Ballroom**

**R-R 28 Apr-05 May Final Thesis Reviews**

**F 29 Apr Draft of Thesis document Due to Primary Critics**

Week 17: (May 2-6)

**F 06 May Last day of classes**

**M-F 09-13 May Final examinations**

**R 12 May Final Thesis Document due at 4:30pm in the Department office**

**F 13 May Commencement at 4:00pm Fargodome**



# Theory

Redefining Progress  
Nature as a Mentor in Design

## THEORETICAL UNDERPINNING:

Imagine this metaphor:

*A frog jumps into a pot of water which is gradually being heated. As the water gets warmer, the frog adjusts its body temperature and continues to adjust to the increasing temperature until, ultimately, the frog gets boiled alive. (Saunders, 2002, p. 5)*

What lesson can be learned from this fable? Perhaps, it is this: The frog, having jumped into the pot, did not have the foresight to realize its peril; content with the status quo and not realizing the escalating danger, the frog fails to make the proper adjustments in order to ensure its survival. Ultimately the frog perishes because it could not make so radical a change as to simply jump out of the boiling pot. The inability to adjust from a strategy that *has* worked to one that *will continue* to work ultimately destroyed the frog. Let us not make the same fatal mistake, for we are sitting in a heated pot of our own: our heated pot is the consumer culture, characterized by sprawl in our community planning, and quantity over quality in our housing. Much like the ever increasing water temperature, these paradigms will not ensure our continued survival. We must adjust the way we live. We do not have the option, as the frog did, of jumping from our environment, planet earth. Instead we must work to keep the temperature from escalating to a fatal degree. We must transition from our current cradle-to-grave model of production and consumption that will only continue to ratchet up the temperature. In its place, we must adopt a cradle-to-cradle model that works as nature has for billions of years.

## ***REDEFINING PROGRESS***

We have grown farther from a holistic understanding of the universe. Similar to the frog's strategy, we've misplaced our faith in technical ingenuity to solve our problems. This is no more evident than in the typical way progress is measured in our society, namely the GDP. Our rising GDP is analogous to the rising temperature of the water in the pot. There will come a point where our economic growth, as measured by the GDP, does more harm than

good. In order that we can begin to make better economic decisions, we need a new measure of progress, one that more accurately reflects the reality that people experience. As a measure of economic health, the currently used GDP is badly flawed:

*By counting only monetary transactions as economic activity, the GDP omits much of what people value and activities that serves basic needs. It doesn't count free services – such as community volunteer work or caring for children or elderly parents in the home. . . The GDP also ignores the value of leisure time spent in recreation, relaxation, or with family or friends. The GDP omits crucial contributions of the environment, such as clean air and water, moderate climate, and protection from the sun's rays. It ignores (all these services) even though these services become expenses if they need to be bough instead. (Venetoulis, 2004, p.9)*

According to the GDP all growth in economic activity is good, but growth in the GDP does not necessarily reflect an improvement in the economic reality that people experience (Venetoulis, 2004, p.7). It is important to remember that economic activity is not an end in itself; it is a tool to address needs and enhance well-being (Venetoulis, 2004, p.9). Every activity that that provides value is part of the economy, weather it, paid for or not, be it positive or negative. An economic model that assigns appropriate values to all economic activities is needed. With such a model citizens and policymakers would be better informed, and able to make more appropriate, sustainable decisions. The Genuine Progress Indicator (GPI) is an attempt to do this. When you compare the GPI to the more standard GDP the difference is astonishing. (See figure xx)

It appears our current economic strategy in America of unbridled consumption is not enhancing our lives as much as we are made to think. “Like the frog we keep adjusting and reacting to the increasing health hazards to satisfy our demands for more comforts greater conveniences and easier living. But despite western materialism few people seem satisfied and content. (Saunders, 2002, p.5)” Decision making based on the GDP as a measure of progress is a recipe for disaster.

Our current economic system, based largely around the goal of increasing the GDP, is not sustainable and must be changed if we intend to make this planet our *home*. Our modern economic model of unbridled material consumption is not sustainable over an extended period of time. It will ultimately spell our doom. We must emphasize effectiveness over efficiency. Being less bad isn't good enough. Instead of a cradle-to-grave model that

dumps material into a landfill to be lost forever, we must switch to a cradle-to-cradle model that works more like nature does, converting waste to food in a continuous cycle, and respecting the advantages of diversity. Stretched out to eternity, it doesn't matter how efficiently we manage the limited material available to us, if we continue with a cradle-to-grave model, logically there will come an end.

The essence of this transition is changing the way we think. In essence, we must strive for effectiveness over efficiency. The key to making this transition lies with how we design. Many of our current design ideologies just aren't sustainable.

*Our current strategy is powered by brutish and artificial sources of energy that are enormously depleting. It pours waste into the water and smoke into the sky. It attempts to work by its own rules, which are contrary to those of nature. And although it may seem invincible, the fundamental flaws in design presage tragedy and disaster). . Neither the health of natural systems, nor an awareness of their delicacy, complexity, and interconnectedness, have been part of the industrial design agenda. (McDonough, 2002, p.17,26)*

In this system, nature is the enemy: "If brute force doesn't work, you're not using enough of it. (McDonough, 2002, p. 30)" In this system, one size fits all: Design solutions are universal, because that is most efficient. In this system, once a product becomes obsolete, it is thrown "away," because the system lacks any alternative. We can do better. We must design better. We must design to love "all the children, of all species, for all time. (McDonough, 2002, p. 14)" We must realize as a society that nature is not the enemy; one size does not fit all; "away" does not exist. Our designs must reflect this realization. Design cannot be "a bland, uniform structure isolated from particulars of place – from local culture, nature, energy, and material flows. (McDonough, 2002, p. 17)" Our designs must be native to its context. Since, Ultimately, our designs are shaped by our goals, our goals must change from ones based on the GDP model where material consumption is the ultimate good, to one based on GPI that takes all things into account in a holistic way of thinking.

We need to seriously reconsider our notion of progress; for what we thought was boundless has limits. Today, "progress" is doing more with less in order that we may produce even more. Efficiency is the ultimate goal. Under today's strategy, "the machines of industry would be refitted with cleaner, faster quieter engines. Industry would redeem its reputation without significantly changing its structure or compromising its drive for profit.

(McDonough, 2002, p. 51) "Reduce, Reuse, Recycle. This is the answer given to us. We are made to feel guilty for our joyous unbridled consumption. But it is this very consumption level by which we measure progress. The more we consume, the higher the GDP. But let us not forget, the more we consume, the more we degrade the environment. Must it be this way? When product equals waste we can't have it both ways.

Are we really faced with this most dire of choices? Either we halt our "progress" and our abundant consumption in the name of preserving the environment, or ultimately perish. Must we lead the most meager of lifestyle to ensure survival? Must our consumption inevitably lead to our demise? "The association of growth with negative consequences has become a major theme of environmentalism in the modern age. (McDonough, 2002, p. 49)" Perhaps, there is a better way:

*In a philosophical sense efficiency has no independent value: it depends of the value of the larger system of which it is a part. An efficient Nazi, for example is a terrifying thing. If the aims are questionable, efficiency may even make destruction more insidious. (McDonough, 2002, p. 65)*

Efficiency is not a strategy for progress, "It presents little more than an illusion of progress. (62)" Efficiency is simply "being less bad." Is this the best we can do? We can do better. "Why not be 100% good?" The ultimate failure of our current infrastructure is a failure of the imagination. (McDonough, 2002, p. 67) In the end efficiency is not only an inadequate solution; it just plain isn't much fun. Why can't we have it both ways? Isn't that what design is all about? Why not "leave aside the old model of product-and-waste, and its dour offspring 'efficiency,' and embrace the challenge of being not efficient but *effective* with respect to a rich mix of considerations and desires. (McDonough, 2002, p. 72)" Lets design a system that is 100% good, and is a delight to live in.

## ***USING NATURE AS OUR MENTOR IN DESIGN***

Resolving the conflict between natural and built systems:

We can use nature as our model in this new design paradigm. Why can't growth enrich instead of degrade the environment? Efficiency is not nature's answer. Nature is effective. It turns waste into food, eliminating the concept of waste all together. Nature's design framework is a flowering of diversity and abundance.

*If nature adhered to the human philosophy of efficiency, there would be fewer cherry blossoms. Fewer nutrients, fewer trees, less oxygen and less clean water. Fewer songbirds. Less diversity, less creativity and delight. The idea of nature being more efficient . . . is preposterous. The marvelous thing about effective system is that one wants more of them, not less. (McDonough, 2002, p. 76-77)*

Growth can be and should be a good thing. If designed properly, economic growth is not cancerous madness. The GPI shows us that past advances in industry have been offset by degradation to the environment, with no overall net gain. However, The perceived conflict between nature and industry can be reconciled. The value of one system need not be sacrificed for another. In fact, growth is an essential component to both. If only designed properly, industry and nature can even enhance each other's prosperity. If industry can be made to mimic nature's model, to use waste as food, and using locally sensitive design solutions, sustainability can be achieved, and even be delightful. Sustainability can be progressive and even fun.

What must we do to achieve McDonough's "second industrial revolution?" The working of a "second industrial revolution" is essentially this: the elimination of "monstrous hybrids." In their place should emerge a world of two metabolisms: the biological and the technical. While the two systems, when combined, tend to contaminate one another. Through careful design we can keep these worlds of material separate. Uncontaminated, we can harvest this material for another use or return it to nature. It truly would function as a metabolic process, a constant cycle of rebirth, abundance, and prosperity. This must be the new paradigm in design. Yes, let's still achieve functionality and beauty, but let's reconsider how we achieve that end. Good design must first and foremost be "native" to the problem to which it is applied. Nature can be our mentor in this method. We can tap into

natural energy flows, and use local materials to generate profitable local enterprise that will enhance the community we live in, thereby enhancing our own lives. Prosperity comes from working hard, yes, even efficiently, but most of all effectively.

Design and technology can be our savior, but it could also be our doom. For it can give us an illusion of progress while glossing over the fundamental problem more deeply rooted in our mode of adaptation. Let's, as designers, bring the cradle-to-cradle concept to reality, so that we may contribute to a planetary eco-system that sustains human life on this planet. Let's not design for the good of man or nature, but for the good of all.

### Functionality and Beauty inspired by Nature:

The imperative of the cradle-to-cradle model to create architectural solutions *native* to their context must build on the already existing imperative to create solutions that are both functional and beautiful. Nature can inform us in our designs to achieve these ends as well. We construct buildings to provide healthy and safe places in which we carry out our lives. We build these buildings not only to fulfill a basic functional need, but, ideally, we also build them in such a way that enriches our lives. A quality design meets all three of these ends. Native design strategies not only tell us how to live in harmony with nature, they also tell us how we can design functional and beautiful spaces.

When investigating the effectiveness of current practices to provide functional spaces, that is, spaces that first and foremost are healthy and safe places to occupy and secondly comfortable, one might be shocked by what they find. If we examine the health consequences of the built environment, we must conclude that our modern methods must be changed for we have acted with little regard for long term consequences. Only recently are we beginning to see our folly. "Gradually it is being acknowledged that the prevailing site conditions and the actual siting, design, construction, and maintenance, of a building can have a profound effect on the health of the occupants." (Saunders, 2002, p. 3) The health of the environments that we build must become of greater concern to architects. Material selection becomes a crucial aspect of designing a healthy building. "Twentieth-century Western industry and commerce has produced approximately 70,000 new synthetic materials and chemicals. . . less than 2 percent have been tested for their effects on human health, and more than 70 percent haven't been tested at all." (Saunders, 2002, p. 9) This increase in the manufacture and use of synthetic materials have coincided with a sharp rise in environmental ill-

ness know as 'diseases of civilization.' Cancer is one of these diseases. While, ultimately, all cancers are genetic diseases caused by damaged genes, studies suggest that the environment is the chief culprit, with radiation and pollution being prime offenders. (Saunders, 2002, p. 10) This is due in large part to the increasing use of untested synthetic materials in building. Sick building syndrome is a general malaise of the modern era (Saunders, 2002, p. 9), and its consequences may be greater than we realize. Designers of building must do all in their power to not reduce but eliminate exposure to radiation and pollution. This end is achieved in all aspects of design. When specifying materials, architects must be aware of both the safety of the final product as well as the processes that produced that product. Whenever possible, questionable synthetic material should be avoided in favor of more natural, less environmentally harmful material. We must work to improve the process of how we build in order to do a better job of providing safe, healthy spaces. We must be more innovative, and spend time and effort researching low-energy, non-hazardous, non-polluting solutions, even when an easy high technology solution is readily available. We must design with humility, respecting and working in harmony with natural energy flows in order to design more effectively. Good design begins with the selection of an appropriate site and carries through the mutual development of form and materials, resolving in a final product that enhances our lives and the lives of future generations.

While appropriate materials selection is crucial to a sustainable building design, the form that that material takes on is of no less importance. The effects of architecture are not limited to physical ailments. Perhaps the psychological aspect is of equal concern. The spaces we design should be both healthy and spiritually uplifting, for they provide the backdrop of our lives. In short they should be beautiful. Nature can inform our design toward the achievement of beauty as well. There is a divine harmony to the proportions found in nature. (Saunders, 2002, p. 186) The achievement of proportional, geometric harmony will provide a building with a spiritually and psychologically uplifting quality. "The psyche delights in pure form and line, but for any design to be fulfilling and satisfying at a level beyond merely superficial, a work of art must remind us of our bond with nature and the universe. (Saunders, 2002, p. 224)" Our psyche can see, hear, feel and resonate with these geometric pattern and harmonic ratios. (Saunders, 2002, p. 225) However, our psyche has been ignored in modern architecture. "Any building, however important or insignificant it may appear to be, will not be a work of architecture unless it has been designed according to coordinating principles where the plans, sections, elevations, and all those parts within the building have one unifying geometric proportion system." (Saunders, 2002, p. 229) The proportioning system is the



key to the building that controls its framework, but it is the architect that provides the spark of inspiration that guides the design, selecting from infinite possibilities to create a work of art. "The divine spark is within every human being; otherwise we could not recognize goodness, beauty and truth. (Saunders, 2002, p. 230)" We must discover the divine wisdom of nature in our designs. Nature can be our guide towards functionality and beauty.

### **Conclusion: THE CITIZEN'S ROLE**

Where architects can wield the expertise to provide healthy uplifting spaces in a cradle-to-cradle framework, it is the citizens that hold the key to achieving this end. Architects wield only limited power. It is the entire system society that is out of whack. If real change is to take place it must come from the citizen, the consumer. The solution lies with "re-awakening our holistic relationship with nature. (Saunders, 2002, p. 242)" We must demand this as citizens and consumers of our planners and policy makers. We must redefine our notion of "progress," for "materiality obscures the human soul. (Saunders, 2002, p. 241)" "So called progress and technical advances that continue to shape our lives have brought unforeseen disaster such as Chernobyl, Bhopal, over-intensive farming, over fishing, pollution, global warming, and weapons that can readily wipe out all life on earth within hours." (Saunders, 2002, p.240) Technical progress has created conditions that are detrimental to the well-being of the environment and humans alike. "Our faith in materialism, technology, consumerism, and market forces have not brought us (as a society) any closer to our goals of health, happiness, and prosperity (for all). (Saunders, 2002, 241)" Real progress will be achieved only when citizens demand change and take action. "it is for us to demand that the fundamental principles that created good, healthy building be understood and exercised by architects, other professionals, property developers, and indeed all those in the private and public sector who commission buildings." (Saunders, 2002, 240) In order for us to escape our death trap of modern materialism, must be willing to accept a radical change to a more sustainable way of life, lest we be boiled alive. This thesis, at its highest level, will offer a vision for change that hopes to achieve sustained vitality for the human species. On a more practical level, it will bring these goals down to a more achievable scale.



# Typological Studies

Small community planning theory  
Small housing design theory

### **TYPOLOGICAL STUDY:**

This project has two typological levels, housing design and community planning. The challenge will be to apply the cradle-to-cradle model to the specifics of the projects typology and site characteristics.

## SMALL COMMUNITY PLANNING THEORY

The planning practices of recent decades, based on modern standards for land use and transportation, have destroyed the feeling of community once felt in neighborhoods and rural villages. (Nelessen, 1994, p. xv) The American Dream has always been that of a good neighborhood and community, one's own house with a private yard. (Nelessen, 1994, p. xv) However, "This vision of the American Dream . . . faded in an attempt to accommodate sprawl. (Nelessen, 1994, p. xv)" Modern development, catering almost exclusively to the automobile, has focused development on the edge, not the core. This was all done in the name of progress, for more space and bigger yards must certainly be better. "We all thought this was good and modern. No one knew better or realized what would be lost. (Nelessen, 1994, p. xv)" But much was lost. Positive qualities of the traditional small community deteriorated. Small communities lost their walk-ability, their character, and their vitality. Through the process of modern development a typical small towns was transformed:

*Over the past forty years the village has been transformed, eroded by thoughtless and intensive application of modern standards. The widening of state highways through the village removed sidewalks, street trees, and the planted boulevard down Grand Avenue. The streetcar tracks were removed. Main Street became a highway. Soon, new retail and commercial building were built. They located along the highway outside the village, not in the traditional downtown core. Industrial parks, garden apartments, and residential sub-division tracts replaced the small farms which once formed a greenbelt surrounding the village. . Commercial strips began competing with the downtown stores, the village department store closed; the grocery store closed and moved to the strip; the movie theatre closed; the post office moved; several of the local gas stations closed; the local high school moved out of downtown; the railroad station was worn down; and the grain elevator and lumberyard disappeared. In an attempt to compete with the strip malls, the buildings that remained downtown were rehabilitated and new buildings were constructed in the strip mall style with their requisite parking lots. These were built to a scale that was completely unsympathetic to the traditional downtown. (Nelessen, 1994, p. xv)*

This typical story describes the sprawl paradigm in action.

## Typological studies

Sprawl is characterized by decentralization and separation of land uses. (Nelessen, 1994, p. xii) When sprawl concepts are central in the planning of a community an automobile is necessary to move from one zone to another. Owning an automobile becomes a necessity. The negative consequences of consequences of sprawl are many:

*The sprawl pattern discourages a sense of community, it encourages land speculation. It requires high infrastructure investments. It requires high energy consumption and is a major source of air and water pollution. Sprawl is the ultimate pattern of secular consumerism.* (Nelessen, 1994, p. xii)

Sprawl has done nothing but destroyed the health and vitality of small communities.

Where a community suffers from the effects of sprawl, individuals also are affected on a psychological and economic level. The lifestyle of the sprawl pattern of development is becoming increasingly costly. The financing of home and car ownership is getting more difficult for most wage earners. (Nelessen, 1994, p. xiii) Also, the public cost of mobility are high, approximately \$4,000 to \$9,400 per car per year depending on how many miles are driven. (Nelessen, 1994, p. xiii) So much time is spent to earn enough money to pay for these commodities, commodities that our sold to us by promises of a better life, that we hardly have the leisure time to enjoy the luxurious life for which we are paying so much. This means less time with the family and in the community. The one who really suffer are children. () So many children do not get to spend enough time with their parents, and are instead raised into the consumer culture by television and other media outlets, and the vicious cycle continues.

A new paradigm is necessary. Why not design communities to reduce reliance on the automobile. Eliminate it as a necessity. The effects would resonate through the lives of the residents of such a community. The financial burden on the average family would be reduced. With work, school, and community amenities within walking distance, less time would be spent in transit and more time spent doing things people really want to do. More family time would mean stronger families. With the street filled with people, walking instead of driving, the sense of community would improve. An accidental meeting on the street or a casual waive to the neighbors as you walk by would create a stronger community fabric. Positive health benefits would also be achieved, as people walk more, getting exercise and improving health. With so much to be gained through eliminating sprawl as a pattern of development and design, a new era of design must emerge and with it lifestyles that more effec-

tively utilize time, energy, and materials in a way that enhances the quality of life. To this end the pattern of sprawl has failed.

### SMALL HOUSING DESIGN THEORY:

On a smaller scale, the modern paradigm in housing design suffers from the same theoretical problems as community planning. The answer to satisfying people's wants and needs is simply *more*, not a solution catered to people's specific needs. In the lower income brackets, a person has little if any control over the design of their house. They are limited to whatever they can find to meet their budget requirements. Often, what's available is a cookie cutter design in a cookie cutter neighborhood, void of any personal character. If you have a little more money, you may have enough money to build your house on a site of your choosing. Even then, the typical process is to pick out a pre-designed plan from a limited number of options. Both of these solutions do not involve an architect. The typical housing solution offered to people today gives little consideration to the specifics of user or site. If you have a little more money you get the one with a little more square feet, with the extra bedroom or bathroom. Only the wealthiest can afford to hire a design professional. This should not be the case:

*People should be able to participate in decisions that shape their lives. And the design of the built environment is one of these decisions. As the technical nature of the built world requires the expertise of architects, and planners, it is they who must help people to be involved in these decisions. Architects' greatest contributions can be as the form-givers for others, shaping lives in the most fundamental and personal way. (Bell, 2004, p. 13)*

There is an underserved group of people out there. Their wants and needs are not being met by the current paradigm in housing. Serving all people should be one of the essential parameters of the new paradigm.

Why not design housing that favors the quality of space over the quantity? "This kind of house satisfies people with big dreams and not so big budgets far more so than a house with those characteristics in reverse. (Susanka, 1998, p.5)" The square footage of a house tells us nothing of the quality of the space. Houses can and should be designed to more effectively utilize square footage. "The current pattern of building big to allow for quantities of furniture with still more room to spare is more akin to wearing a sack than a tailored suit. It may offer capacity, but at the cost of comfort and charm." (Susanka, 1998, p.15) One reason that houses have grown so big is that there needs to be a separate room for every activity. (Susanka, 1998,



p.32) A better, more effective solution is to design adaptable spaces, each designed to share various functions, each in everyday use. (Susanka, 1998, p.33) Each space should be defined by the activity that takes place there. A house should be a sequence of spaces, with a hierarchy accommodating various functions and moods. There should be a balance between open and closed, public and private. (Susanka, 1998, p.43) Design of a home should accommodate the continual change and adaptability of a space to fit the specific needs of the user. As users and their wants and needs change, so too must the house be able to change. Not just a house but any building should be more like a living organism. Also like a living organism, a house should harvest local energy and material sources, and utilize natural energy flows to streamline energy use. If we build houses of durable materials, to be places of beauty, and to be easily and inexpensively adaptable we can go a long way toward achieving a sustainable future. The key is emphasizing livability. Quality of space translates to quality of life. A house should be an expression, not of society, but of the people who live in it. With houses lasting generations, the result is not only sustainability, but a better sense of past, identity, and soul. It is these elements that enhance our lives.



# Case Studies

#1

#2

#3

### CASE STUDIES

#### Case study #1:

Crisswicks, NJ.  
A case study in community planning.  
From the pages of Nelessen (2004)

#### Case study #2:

Olwick, NJ.  
A case study in community planning.  
From the pages of Nelessen (2004)

#### Case study #3:

Minnesota.  
A case study in housing design examining the critical differences in two very similar houses.  
From the pages of Susanka (2002)

**Native Architecture:** Sustainable design theory applied to affordable housing in a rural setting

### Case Study #1

## Crosswicks, Burlington Co., NJ



## Case Study #1



## Crosswicks

### Location

Crosswicks is located in Chesterfield Township in Burlington County, New Jersey within a rural agricultural area. Several county regional roads intersect at the village. It is located close to the New Jersey Turnpike and State Highway 130, although access is not direct.

### Development History

Crosswicks was the site of a Lenni-Lenape Indian settlement called "Crossweeksung." In 1677 a group of Quakers settled along the creek near the Lenni-Lenape settlement. The Quakers built their first meeting house in Crosswicks in 1692. The village developed along the Assinpink Trail both where it crossed the creek and on the hill above the creek where the present village is located. Much of the initial development in Crosswicks occurred in the early 1700s with the Friends Meeting House, whose present structure was built in 1773, acting as the focal point of the community. The village became a way station containing an inn and tavern along the Trail. The original structures along the curving Main Street were built prior to 1750. A brick schoolhouse was erected next to the Meeting House in 1784. The primary commerce in Crosswicks was agricultural trade, and in the mid 19th century it contained wheelwrights, blacksmiths, and saw and flour mills (located below the village along the creek).

## Case Study #1

### Crosswicks



#### VITAL STATISTICS

STUDY AREA:	160 Acres
OPEN:	105 Acres(65%)
DEVELOPED:	55 Acres
DU:	110
GROSS DENSITY:	0.7 DU/Acre
NET DENSITY:	2.9 TO 14.5 DU/Acre

#### DESIGN CHARACTERISTICS

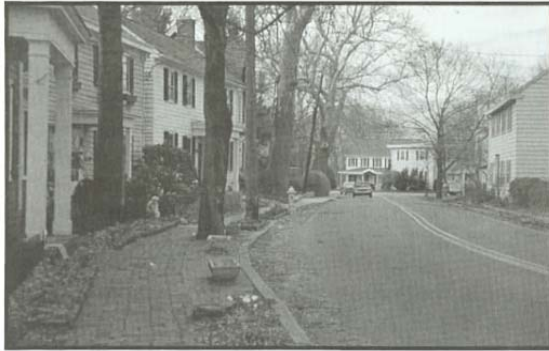
LOT SIZE:	3,000 - 15,000 Sq. Ft.
LOT WIDTH:	30 - 80 Ft.
LOT DEPTH:	75 - 235 Ft.
SETBACK:	8 - 40 Ft.
SIDEYARD:	5 - 15 Ft.
FOOTPRINT:	600 - 1,750 Sq. Ft.
BLDG. HEIGHT:	2 - 2 1/2 Stories
PARKING:	On-Street & Rearyard Garages

VITAL STATISTICS ARE APPROXIMATIONS  
DESIGN CHARACTERISTICS INDICATE TYPICAL CONDITIONS IN STUDY  
AREA  
SETBACK IS MEASURED FROM CURB OR EDGE OF ROADWAY





## Case Study #1



### Community Character

Crosswicks provides a sense of urbanity within a predominantly rural setting. Physically it is a very tight community. Streets are well defined by closely spaced houses set close to the street. A community green defines the center of the village; it is bounded by homes and community facilities such as the library and community center. The green also brings another dimension to this community, suggesting that it is tight-knit socially as well as physically. The neighborhood-like feel of the community is strong, with the community park serving as the focus.



### Design Elements

The social character of Crosswicks is evident in the architecture of the village. The importance of social interaction in the community is seen in the relationship of homes to the street. Many houses, particularly along Main street, are built within four feet of the sidewalk. Porches extend toward the public domain on houses with larger setbacks. A notable design element is the closely spaced row of single family houses along the bend in Main street. The placement of these structures defines the street at a critical location.



### Land Uses

Crosswicks is primarily residential, yet there are a small number of retail and a variety of community uses. The public library (located in the old firehouse), post office, and community center are located at the northern edge of the community green. Along Main Street there are two antique shops, a general store, and a restaurant with apartments on the second floor. There are also two day-care centers within the village, each located within residential areas at the village periphery.

## Case Study #1

### Community Focus

Crosswick's community center is not commercial in nature. Rather, it is composed mainly of community services and facilities. The community green provides the physical and social focus of the community. Retail and community facilities are located on the northern edge of the green along Main street. Within this 6.5 acre community park stands the historic Friends Meeting House.



### Walking Distances

The entire village of Crosswicks is within 1,500 feet of the community focus. Most of the village is, in fact, within 500 feet of the edge of the community park.



### Open Spaces

The land surrounding Crosswicks has for the most part remained undeveloped beyond agricultural uses. The most notable peripheral open space lies between the village and Crosswicks Creek to the north. This area is characterized by a steep slope, and the lack of development provides scenic vistas from the village. The community park is the major internal open space, and contains a playground and sports courts for active recreation. A cemetery is located adjacent to the eastern edge of the village.

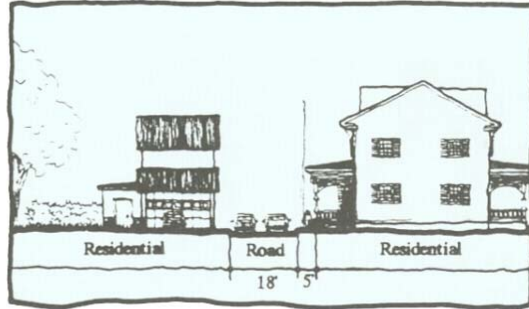


# Case Studies

## Case Study #1



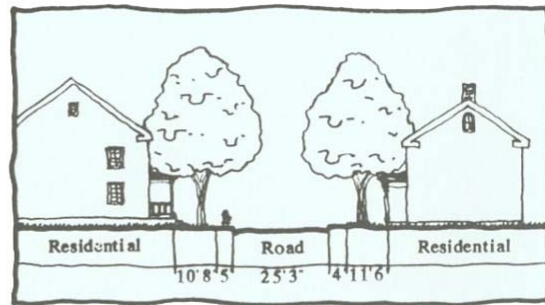
Section C - C  
Small Street connecting Front Street and the Main Street.



Section C - C'



Section D - D'  
Button Wood Street

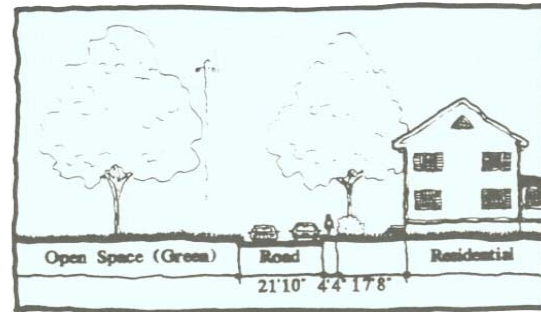


Section D - D'

## Case Study #1



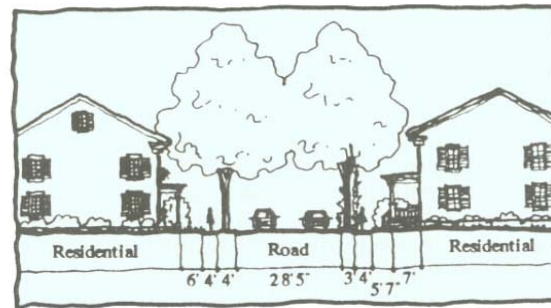
Section A - A',  
Front Street  
Low ADT



Section A - A'



Section B - B',  
"Main Street"  
Moderate to High ADT with low speed for this character of street.



Section B - B'

### Case Study #2

## Oldwick, Hunterton Co., NJ



## Case Study #2



## Oldwick

### Location

Oldwick is located in a relatively rural area of Tewksbury Township, Hunterdon County, NJ. The village is bisected by a fairly heavily traveled county road (Route 723) which provides access from nearby Interstate 78. The topography of the surrounding region is characterized by rolling to steep hills.

### Development History

Oldwick was first settled as New Germantown early in the 18th century, and town meeting records date back to 1735. Like many small settlements of the time, Oldwick prospered as a center for agricultural commerce. Most of the village's development occurred in the early 1800s. By the 1880s, Oldwick boasted 55 dwellings, two churches, an academy, four stores, and numerous services such as cobblers, tailors, blacksmiths, saddlers, a tannery and a cooper. The village itself has seen very little development in the 20th century, and its development pattern closely resembles that of the late 19th century.

## Case Study #2

### Oldwick



#### VITAL STATISTICS

STUDY AREA:	230 Acres
OPEN:	175 Acres(76%)
DEVELOPED:	55 Acres
DU:	60
GROSS DENSITY:	0.3 DU/Acre
NET DENSITY:	2.9 TO 8.7 DU/Acre

#### DESIGN CHARACTERISTICS

LOT SIZE:	5,000 - 15,000 Sq. Ft.
LOT WIDTH:	40 - 80 Ft.
LOT DEPTH:	135 - 200 Ft.
SETBACK:	6 - 24 Ft.
SIDEYARD:	5 - 20 Ft.
FOOTPRINT:	600 - 1,200 Sq. Ft.
BLDG. HEIGHT:	2 1/2 - 3 Stories
PARKING:	On Street & Rear yard Garages/Lots

VITAL STATISTICS ARE APPROXIMATIONS  
DESIGN CHARACTERISTICS INDICATE TYPICAL CONDITIONS IN STUDY  
AREA  
SETBACK IS MEASURED FROM CURB OR EDGE OF ROADWAY



## Case Study #2



### LEGEND

RESIDENTIAL	
COMMERCIAL/PUBLIC	
MIXED USE CORE	
STUDY AREA - 1,500 ft. FROM THE CORE	
ILLUSTRATIVE STREET SECTION	

**Native Architecture:**  
Sustainable design theory applied to affordable housing in a rural setting

## Case Study #2



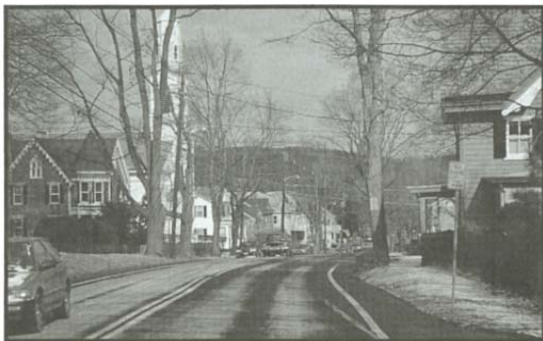
### Community Character

Oldwick is a mixed use village. This character of the village is largely defined by the area along High Street, the main thoroughfare in the village which leads to Interstate 78 and to other communities in the Township. The commercial activity along High Street gives Oldwick a rich vitality for a relatively small village. The residential areas of the village, outside the central core, are almost rural in character.



### Design Elements

The most notable design element in Oldwick is the placement of buildings in relation to the street. Throughout the residential areas of the village, buildings are set back 15 to 20 feet from the road edge. Although houses in some areas are spaced quite far apart, the placement of buildings close to the street maintains a pleasant streetscape. At the center of the village, buildings are not only placed closer to the street, about six feet from the curb, but they are much more closely spaced. Lot sizes, and thus the space between structures, increases with distance from the center of Oldwick. Lots at the periphery of the village are quite large, and the community blends with the surrounding agricultural land.



### Community Focus

The center of community life in Oldwick lies along High Street, particularly at its intersection with Church Street. Most commercial activity in the village is focused at, or near, this crossroads. A church, general store/deli, restaurant (former inn), several stores, and professional services are located within the community focus. Oldwick continues to serve as the center of activity for the surrounding area much as it did when the village was a center of agricultural commerce in the past. The population of the village alone cannot support the level of economic activity in Oldwick, but it functions as a center for the region.

## Case Study #2

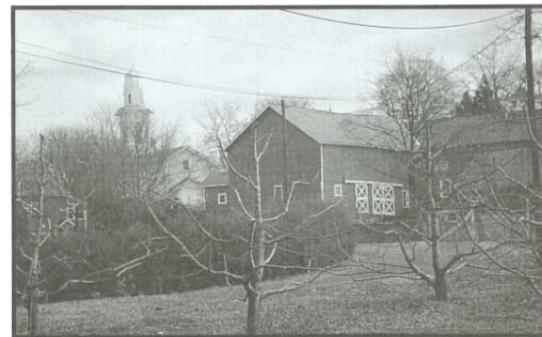
### Walking Distances

All residents of the village of Oldwick are well within 1,500 feet of the community focus. A network of sidewalks parallels the main roads, those with higher ADTs. The buildings along these roads are located close to each other with narrow front yards. As roads decrease in ADT the buildings are spaced farther apart, the sidewalks disappear, and people walk on the road surface.



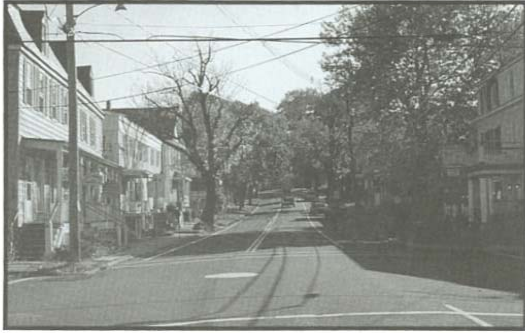
### Open Spaces

Oldwick's boundaries are well defined by peripheral open space. Most of the surrounding land is used for agricultural purposes or contains residences in former farmhouses on very large lots. There are two cemeteries in the village, one of which is located within the community focus. This cemetery, in conjunction with the yard of the former schoolhouse, creates internal open space. The other cemetery is located at the edge of the village, and functions as peripheral open space.

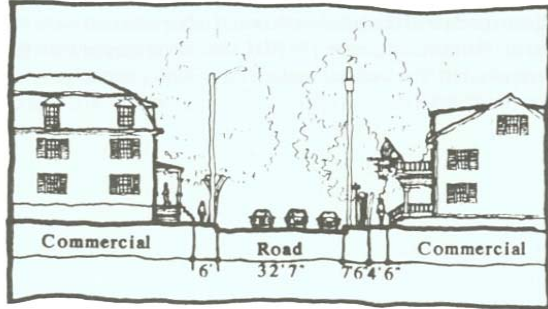


# Case Studies

## Case Study #2



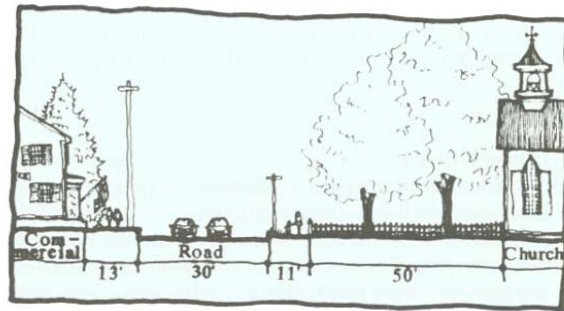
Section A - A',  
Old Turnpike Road at Church Street, the Main Street of Oldwick.  
Very high peak hour traffic, speed limit is too high.



Section A - A'

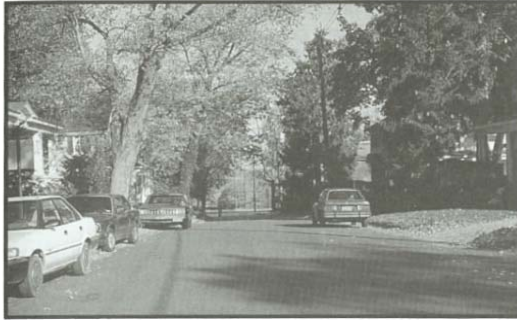


Section B - B',  
Old Turnpike Road at Church Street.

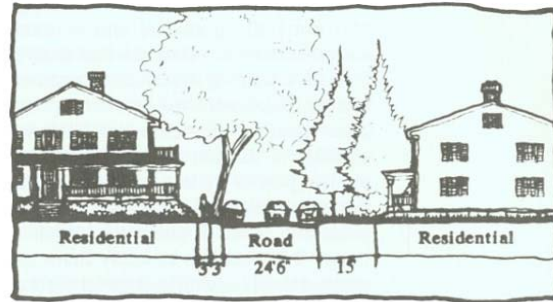


Section B - B'

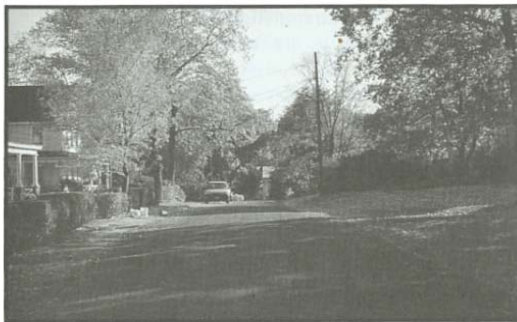
## Case Study #2



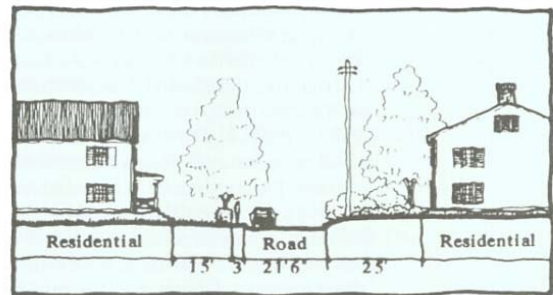
Section C - C  
Church Street, moderate to low ADT



Section C - C



Section D - D'  
Willcom Street.  
Very low ADT  
Residents can safely walk on the edge of the road.



Section D - D'

## Case Studies

The "Back to Basics" House



The "Whole Nine Yards" House

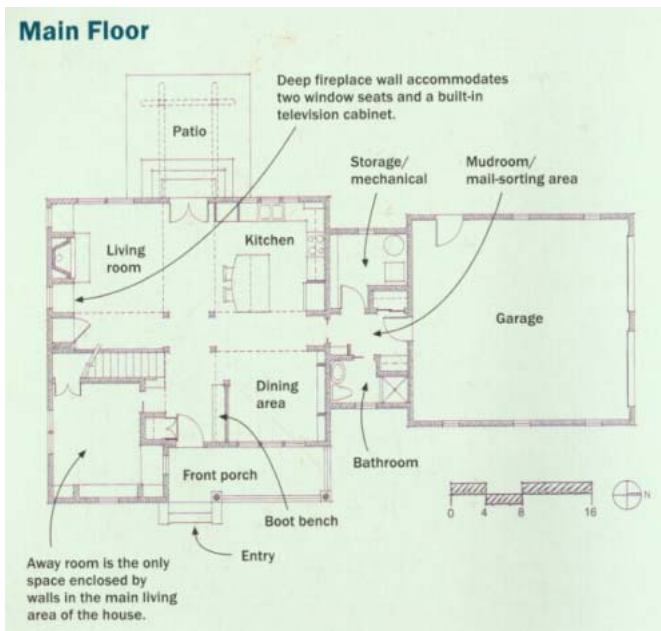
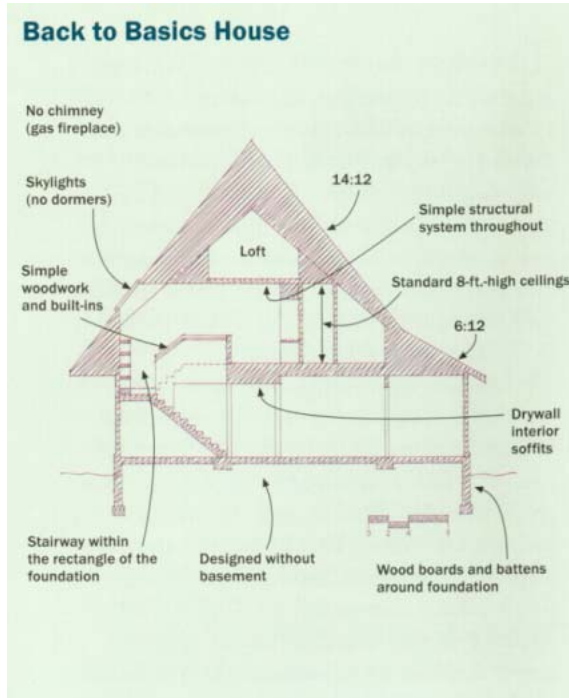
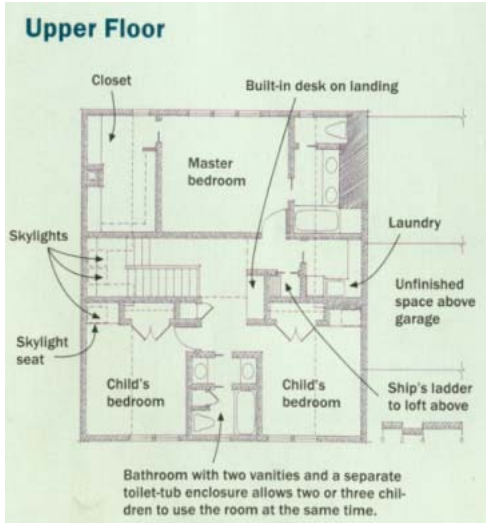


Though Similar in size the "Whole nine yards house" costs nearly twice as much, due largely to differences in finishing materials, both interior and exterior. Where paint is the primary finish in the "Back to basics" version, more expensive wood and stone is predominant in the alternative.



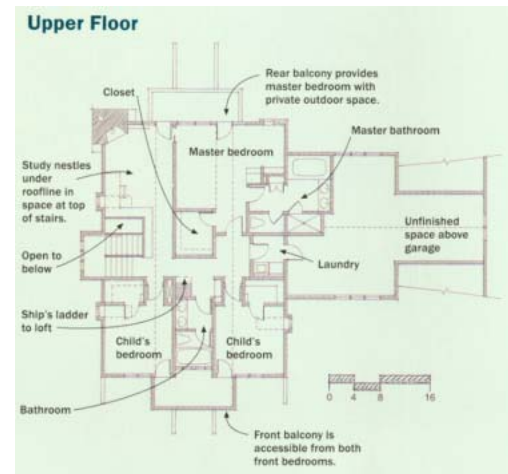
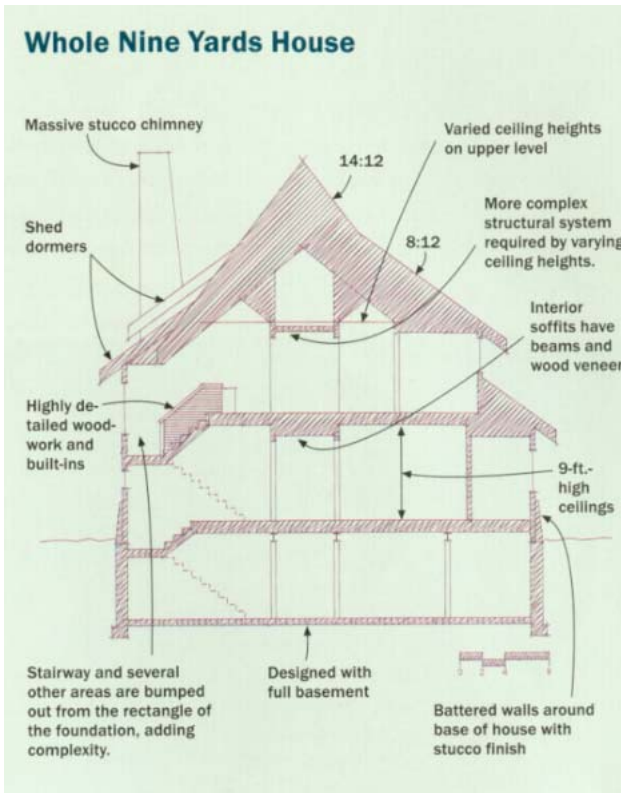
**Native Architecture:**  
Sustainable design theory applied to affordable housing in a rural setting

# Case Studies

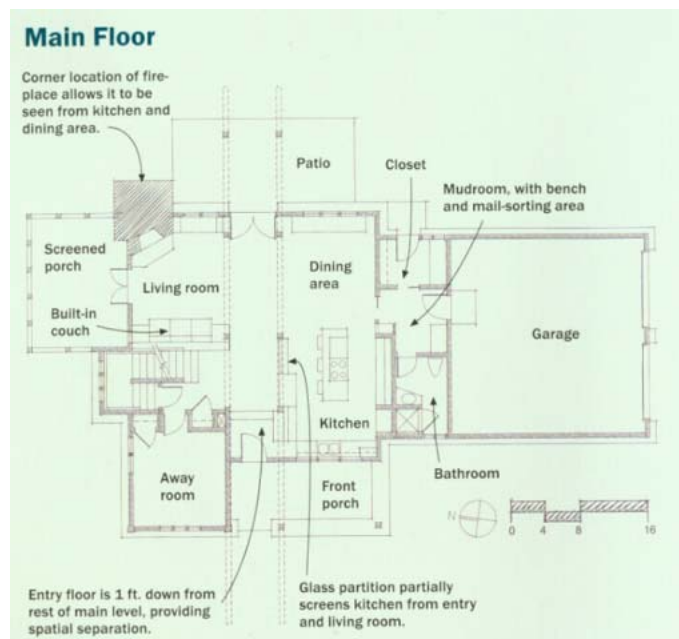


Simplicity rules in the "Back to basics" house.





The "Whole nine yards" version boast more elaborate forms and more space. Note the presence of a basement level.





# Goals and Principles

**Hannover Principles**

**Principles for Small community planning**

**Spatial program for community planning**

**Principles for small housing design**

**Spatial program for housing design**

### **GOALS AND PRINCIPLES: A FRAMEWORK FOR A SOLUTION:**

(NOTE: At this point in time, it is not possible to describe quantitative goals and guidelines. A more in-depth analysis of existing ecological, economic, socio-cultural, and political systems as well as built and natural physical features will be required to do so. And so, only a more qualitative description of the goals can be presented at this time.)

### **In general. . .**

The ultimate goal of this thesis is to offer a vision for a sustainable future. This vision will be based on a holistic, systemic understanding of the problem typology and context, in order to achieve an appropriate solution. This solution first and foremost must be native to its context, behaving as a natural organism, tapping into local sources of material and energy that enhance the ecosystem in which it exists, never producing waste that cannot be reused in another process. Constrained by this imperative, the solution must also provide spaces, at both the community and individual scale, that are functional and beautiful, thereby providing a healthy, safe, and delightful environment that enhances the quality for life for its users. With such an overarching goal, it is useful to break it down into smaller, more manageable goals, or principles. The “Hannover Principles” authored by William McDonough provide an excellent guideline to achieving to ultimate goal of sustainable design.

### The Hannover Principles

- Insist on rights of humanity and nature to co-exist** in a healthy, supportive, diverse and sustainable condition.
- Recognize interdependence.** The elements of human design interact with and depend upon the natural world, with broad and diverse implications at every scale. Expand design considerations to recognizing even distant effects.
- Respect relationships between spirit and matter.** Consider all aspects of human settlement including community, dwelling, industry and trade in terms of existing and evolving connections between spiritual and material consciousness.
- Accept responsibility for the consequences of design** decisions upon human well-being, the viability of natural systems, and their right to co-exist.
- Create safe objects of long-term value.** Do not burden future generations with requirements for maintenance of vigilant administration of potential danger due to the careless creation of products, processes or standards.
- Eliminate the concept of waste.** Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems, in which there is no waste.
- Rely on natural energy flows.** Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate the energy efficiently and safely for responsible use.
- Understand the limitations of design.** No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not and inconvenience to be evaded or controlled.
- Seek constant improvement by the sharing of knowledge.** Encourage direct and open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility, and re-establish the integral relationship between natural processes and human activity.

### Specifically. . .

This is not a typical architectural thesis in that it is not a specific building on a specific site. Rather, the solution offered by this thesis will be a system of creating housing and community that will adapt a building and a community to the site's specific physical and social conditions. On account of this uniqueness, a spatial program, in the typical quantitative sense, is useless. Both the housing and the community will be designed to be a vibrant and ever-changing. Instead of specific quantitative guidelines, more general strategies for creating functional beautiful spaces, based on proportional relationships are provided in the following compilation.

At both levels of scale of this thesis, the goal is to plan/design to accommodate healthy lifestyles, with a utility and aesthetic that promotes both physical and psychological well being.

### Principles For community planning. . .

**Design for the human scale.** Design for the human scale and perceptions, creating a sense of neighborhood and community.

**Ecological responsibility.** Design in harmony with nature, not against it.

**Pedestrianism.** Define the primary community by walking distance.

**Open Spaces.** Design for internal and peripheral open spaces.

**Community Focus.** Design for a neighborhood or community center that offers a sense of identity and place.

**Streetscapes.** Design for streets internal to the community and highways on the periphery.

**Variation.** Design for buildings of smaller scale in a pattern of various footprints. (figure ground)

**Mixed Use.** Design for mixed use and multiple land uses, also include a mix of housing types, income, and a horizontal and vertical mix of uses.

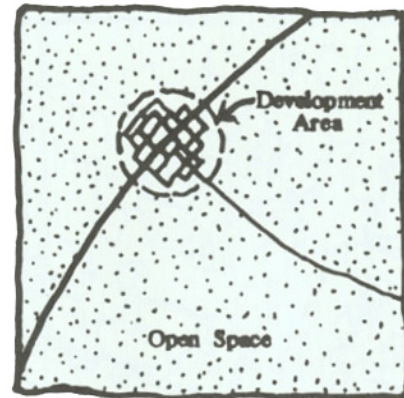
**Design Vocabulary.** Specify an architectural style or styles for the community including façade treatments, walls, and fences, streetscapes, materials, and colors.

**Maintenance.** Design community materials, and organizations that facilitate short-term and long term maintenance and security.

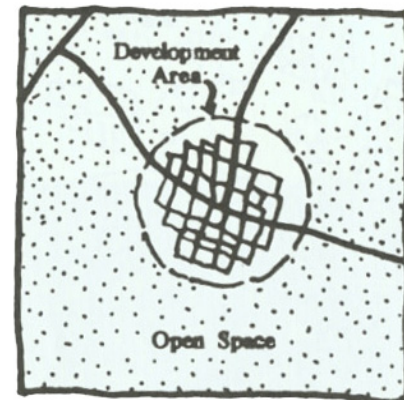
(more detailed descriptions of these strategies can be found in Nelessen, chapter 7)



Spatial program for incorporating these principles:



The Hamlet in a rural setting.



The Village in an exurban setting.



The Neighborhood in a town.

# Goals and Principles

**TABLE OF COMBINED  
RECOMMENDED PROGRAM CHARACTERISTICS FOR SMALL COMMUNITIES**

	HAMLET	VILLAGE	NEIGHBORHOOD
AREA (acres)	10- 100	100 - 500	175 - 300
DWELLING UNITS	4 - 100	100 - 600	400 - 2,100
NET D.U./ACRE (lot size)	1.0 - 6.0	1.0 - 8.0	4.0 - 15.0*
POPULATION	12 - 300	200 - 1,800	1,000 - 6,000
JOBS: HOUSING RATIO 150 to 350 sq. ft. of building space per job	0.25:1.0 - 1.0:1.0	0.5:1.0 - 1.0:1.0	0.5:1.0 - 1.0:1.0
OPEN SPACE RATIO	.50 - .75	.45 - .70	.10 - .25
PUBLIC OPEN SPACE RATIO	.03 - .08	.03 - .08	.03 - .08
LOCAL RETAIL*	26 - 52 S.F./D.U.	26 - 52 S.F./D.U.	26 -52 S.F./D.U.
CIVIC SPACE** (minimum)	300 S.F./D.U.	300 S.F./D.U.	300 S.F./D.U.
GREEN/COMMON SPACE (minimum)***	200 S.F./D.U.	200 S.F./D.U.	200 S.F./D.U.
MODAL SPLIT (auto: all other)	90:10 - 60:40	70:30 - 50:50	40:60 - 20:80
WATER	Private/Community Wells	Community Well Regional Supply	Regional Supply
SEWAGE	Septic or Community Treatment	Community or Regional Treatment	Regional Treatment

\* Additional retail required as it becomes more of a regional center

\*\* Land area required for Churches, Municipal Buildings, Library, Day Care, etc.

\*\*\* This is included in the total public open space

1. The design should be unique to the user. When the house is initially built various options of Kitchen, living and dining space layout and relationships should be provided to the user/client.
2. Each room should be customizable to accommodate a wide assortment of budget, tastes, and lifestyles.
3. Unique customizable detailing options should be provided to give a room a sense or character, and the user a sense of ownership and individuality.
4. Make spaces as effective as possible. The spaces within the house are more than just square footage. They should be designed to accommodate the activities that will happen within them.
5. A Hierarchy of qualitative space should be provided. This means both public and private spaces, open and enclosed, high and low key.
6. The unit should be designed to be easily modified, expanded, and adapted to the requirements of the user.
7. Adding additional public space or private rooms (i.e. bedrooms, bathrooms) should be considered up front so that it may be easily achievable in the future.
8. The siting of the building and its design should be appropriately influenced by ecological and environmental factors including solar orientation, prevailing winds, topology, in order to most effectively tap into natural energy flows.
9. The individual building should fit into the planning parameters of the community.
10. The design should utilize patterns found in nature to fit the human scale and resonate with the human psyche.

(more detailed descriptions of these strategies can be found in Susanka (2000))

### **Spatial program for incorporating these principles:**

#### Public (open) Spaces:

Living room  
Dining room

## Goals and Principles

Kitchen  
Foyer/Entry  
Public W/C (optional)  
Back patio (optional)  
Front porch

### Private (enclosed) Spaces:

Bedrooms  
Master Bedroom (optional)  
Bathroom (s)  
Master bathroom (optional)  
Walk-in closet (optional)  
“Away” room (optional)  
Home office (optional)

### Service Spaces:

Laundry (location varies)  
Garage (optional)  
Mud room (if garage)  
Storage pantry (optional)  
General storage  
Mechanical room

### NOTES:

For quantitative information regarding these spaces see

For qualitative information regarding the design of these spaces see Susanka (2004)

## Goals Tree:

- Offer a vision for a sustainable future
  - Based on holistic understanding of typology and context
  - A native solution
    - + Behave as a natural organism
    - + Abide by “The Hannover Principles”
      - + Function and beauty
      - + Healthy
      - + Delightful

Abide by outlined community and housing principles and guidelines



# Site Inventory

Site Description

Site Data

History of the Land and its People

Cannonball Today

## Site Inventory:

### Site Description:

The Cannonball Community is located approximately 30 miles south of Mandan, ND. About a mile after crossing the Cannonball River and entering the reservation, Cannonball is located approximately a mile east of the highway. There are over 10,000 residents of the Standing Rock Sioux Reservation. Approximately 1,500 people live in Cannonball and the surrounding country.

The name of the town and river comes from the cannonball-shaped chunks of limestone that periodically fall out of the banks of the river as it cuts into its banks exposing and releasing the stones previously embedded in the nearby soil.

The land surrounding Cannonball is gently rolling hills. The land to the east gradually descends toward the Missouri River. A steep bluff exists to the north along the Cannonball River. To the West, the tribe leases out the flat to the west to a potato growing operation. Rolling hills continue to front the Missouri to the south. Vegetation consists primarily of prairie grasses. The occasional cottonwood tree springs up in lower lying areas. In town, barren earth is most common.

People first settled in the Cannonball area in 1863 when five bands of the Sioux tribe forded the Missouri River near the outlet of the Cannonball River. The bands were fleeing in the aftermath of the Minnesota uprising, and crossed the river after the Battle of White Stone. The reservation was started in 1934 followed closely by the Reorganization Act in 1936. In 1968 the whole town was transplanted further inland from the river, and in 1969 a dam was completed upstream on the Missouri creating the Lake Oahe.

An annual community celebration, also referred to as a Pau-wau, is held June 14<sup>th</sup> called Around-the-Flag Day. The Celebration Grounds lie on the east side of town, as near to the river as it can safely be put. Other significant landmarks include an old cemetery where



many famous chiefs are buried, and a memorial to local soldiers who died in combat in service of the U.S. Armed forces.

The roads in Cannonball have recently been repaired and paved, and are in excellent condition. Water is piped in from Fort Yates, 23 miles to the south. Electricity is purchased from off reservation, and brought in on power lines.

In addition to the occasional trailer house, there are three typical house designs. The ones on the north end of town are the newest, and all seem to be in equally good condition. They are basic units, rectangular shaped, set back about 100 feet from the street, and spaced about 100 feet on center. The south end of town has the oldest and the largest units. The quality of these units upkeep varies, as some have recently been renovated while others lie in severe disrepair. On the east end of town nearest the river, are the nicest housing units. Not as new as the ones to the north, or as old as the ones to the south, they have garages, and break the rectilinear theme. These appear to be in the best kept condition.

Existing non-residential structures include a post office, community rec-center (gymnasium), a convenience store, a tavern, a clinic, a school, a day care center, and 6 churches. The post office is located at the center of town, and appears to be an older wood framed building. The Gymnasium is a metal building recently built that attaches on to the post office. A large parking lot exists next to the gymnasium. The convenience store is located out of town along the highway. The tavern is located toward the north-east edge of town. The school, going up through grade six, is a brick building on the east end of town. The Day care center is just north of the school and across the street. Finally, the six churches are sporadically spread out around town.

Aerial Photo of the existing Cannonball Community



Existing topology of surrounding area



## History of the Land and People:

### The Land: From Abundance to Tragedy

(NOTE: the following is a summary of a chapter from Licht: "the Land")

The story of the Great Plains prairie ecosystem, the ecosystem in which the Cannonball community sits, is one of great abundance and life, followed by tragic degradation and loss. Too dry to be forest, too wet to be desert, the great plains are characterized by a east to west gradient in habitat, from tall grass to short, that is for the most part a consequence of rainfall. (Licht, 19997, p. 2)

The pre-Columbian grassland ecosystem of the Great Plains was perhaps one of the richest ecosystems to ever grace the earth. (Licht, 1997, p. 2) Perhaps the best indication of the scale of life and vitality that once existed on the Plains is the legendary size of the great buffalo herds that once roamed the prairie ecosystem. These herds were awe inspiring, like nothing seen before by western men.

Every single herd was mind boggling. Witness this reflection by William Street in 1904: 'Many times has the question come to my mind, How many buffaloes were in that herd? And the answer, no one could tell. The herd was not less than 20 miles in width – we never saw the other side – at least 60 miles in length, maybe much longer; two counties of buffaloes! There might have been 100,000, or 1,000,000, or 100,000,000. I don't know. In the cowboy days in in Western Kansas, we saw 7,000 herd of cattle in one round-up. After gazing at them a few moments, our thoughts turned to that buffalo herd. For a comparison, imagine a large pail of water; take from it or add to it a drop, and there you have it. Seven thousand head of cattle was not a drop in the bucket as compared with that herd of buffalo.' (Licht, 1997, p 6)

Accompanying the buffalo on the plains was other big game of bears, wolves, antelope, deer, elk and bighorn sheep. The prairies was bursting with life big and small. The abundance of buffalo indicated the abundance of all life on the Plains. The scale of the abundance of wildlife on the plains has rarely been equaled anywhere on earth. (Licht, 1997, p.8)

The abundance of life on the Plains was only paralleled by its resiliency. The climate of the Plains was often harsh, as typical of continental temperate climates. Given to temperature extremes, especially in the north, summers were characterized by intense heat, and winters by chilling cold. In

addition, drought and flood was a common occurrence. Yet, through it all life persisted and thrived. This resilience can be traced to the unique characteristics of the prairie soil.

The real richness and vitality of the prairie ecosystem was belowground. . Roughly 85% of the prairies vegetative biomass, both living and dead, and 60% of net plant productivity occurred beneath the surface. (Licht, 1997, 5)

Everything changed with the arrival of western man. At first, "The Great American Desert" was a term coined to describe the landscape. It was deemed a region unfit for cultivation. Never the less, the region was purchased by the United States and the process of the settlement of the Great Plains by western man began.

The first settlers began turning the tough prairie sod in the early 1800's. Once the rich, dark soil of the tallgrass prairie provided some of the best farmland the world has ever seen. In leapfrogging spurts pioneers began swarming over the tallgrass region, quickly dividing up the once vast grassland. . By 1890 the tallgrass prairie was essentially gone, replaced by the plowed field, the shelterbelt, and the rock pile. (Licht, 1997, p. 12)

With the tallgrass prairie conquered, the focus was shifted toward the bison homeland, the short and mixed grass prairies.

Even before the bison were eliminated, the settling of the mixed grass and short grass regions had begun. Eager for expansion, Washington politician urged people westward with little thought for the consequences of dense human settlement of the landscape. The premise, and promise, was that there was enough human demand in the eastern states, in terms of food and fiber, to warrant the homesteading and exploration of the entire grassland biome. . how large that surplus would be, or how much was needed was never scientifically asked. (Licht, 1997, p. 12)

Overzealousness and ignorance characterized the settling of the Great Plains. Where farming characterized the settlement of the eastern plains, ranching dominated the western plains. Techniques used in settlement were incompatible with the existing ecosystem. Eventually these techniques led to breakdown.

Confined within small pastures and maintained at unnaturally high numbers, the introduced livestock affected the native vegetation in ways it was not adapted to withstand. Whereas the eradicated bison had grazed an area and then moved on, the fenced cattle did not give the

vegetation a rest. The constant grazing and trampling soon denude and desertified the arid landscape. In some cases heavy grazing during drought years reduced ground cover by up to 95%... By the early 1900's poor farming practices along with widespread overgrazing, had made the Great Plains ripe for disaster of apocalyptic proportions. (Licht, 1997, p. 14)

When drought hit in the 1930's disaster insured.

The drought of the 1930's, and the legendary dust bowl that accompanied it, was widely viewed as a great natural catastrophe. In retrospect, however, the drought was not the catastrophe; removing and denuding the natural vegetation that protected the fragile soil was the catastrophe. ... When the settlers started removing and reducing the protective grasses and forbs, the fine material started blowing again. The Drought of the 1930's was no different from countless others since the last ice age; the difference was the shielding vegetation had been ravaged. ... The only sites that weathered the period relatively intact were the ungrazed lands. (Licht, 1997, p. 15)

The degradation of the Great Plains prairie ecosystem has been due entirely to the settlement practices of western man.

In all the devastation has been complete and tragic.

Nowhere in the Great Plains does there exist a vestige of naturally functioning grassland ecosystem, or even a close simulacrum, because the prairie ecosystem has not only lost grass, but also wildlife. The extermination of the Great Plains wildlife was probably the largest human-caused elimination of fauna in terms of biomass, the world has ever seen. ... The swiftness and extent of the loss of grassland wildlife are unparalleled in human history. Many have accepted the passing without remorse or second thoughts. For others, however, the loss was tragic and sad. ... In retrospect it appears that the gravest misjudgment in settling the grassland biome was that the nation saw the Great Plains not for what they were but as what it imagined, hoped, and prayed they could be. The full story is not one of great victories and clear successes. It is a story of economic boom and financial bust, of natural resources exploited for distant markets, and of agriculture expansion established with great human cost. The great human cost, as well as the ecological cost, continues to this day. (Licht, 1997, p. 16-18)

This project will seek to remedy, in a small way, the mistakes of the past.

### Notes:

A more general scientific description of the grassland ecosystem can be found in Coupland (1992). Chapters 1-8 cover a general description. Chapters 9-11 detail the specifics of Short, mixed, and tallgrass prairies respectively.

Licht (1997) characterizes the modern Great Plains ecology in the chapter titled "The Ecology of a Degraded Ecosystem."

THE PEOPLE: Modern History of the Lakota People:

## **Citizenship and Reorganization**

The Indian Reorganization Act was passed by Congress on June 18, 1934 as part of the New Deal reform policy in America. It marked the beginning of the modern history of the Lakota people, and for many other Native American tribes. (DeMallie, 2001, p. 821) Another important event occurred a couple of years earlier. In recognition of the volunteer efforts of many Native Americans during World War I (they were not yet citizens) Congress granted citizenship to all American Indians in 1924.

## **World War II**

Thousands of Sioux left reservations for the first time to join the military or work in the war effort upon America's entry into World War II. When they returned they were profoundly changed (DeMallie, 2001, p.821) On the home front, "off reservation jobs provided real economic opportunities . . . for Indian people, and encouraged others to seek similar employment." (DeMallie, 2001, p.821) In military service, as a reflection of their warrior society roots, the Sioux volunteered enthusiastically and many distinguished themselves in the infantry, often on hazardous reconnaissance missions. (Demallie, 2001, p. 821) in all, the war effort was the first taste many Sioux had of mainstream American culture.

## **The Pick-Sloan Project**

The 1944 Flood control Act called for 5 flood control dams to be constructed along the Missouri River, and also called for reservation and irrigation projects along its tributaries. This project directly effected 5 Sioux reservations, including the Standing Rock Reservation, in which Cannonball is located. However, the tribes were not informed of the plan until 1947, too late to have any meaningful input. The dams had a devastating effect on reservation land holdings. In Standing Rock 56,000 acres of primarily fertile bottomland that constituted the vast majority of the reservations timberland, wild game, and plant supply. The community of Cannonball itself was relocated on account of this project, from a riverside to a safe elevation further up the hill. The resources of the bottomland has sustained a social and cultural way of life impossible on the drier uplands. To make matters worse, few of the promised irrigation programs were completed, none on Indian land. Rehabilitation efforts focusing on livestock, tourism, and recreation met with little success. The effects on the economic prosperity of Indian reservation of these projects resonate to this day.

## **Termination, Relocation, and Urbanization**

Another costly policy to Indians in general and Sioux in particular was "termination." Termination revoked the access of tribes and its members to benefits they had previously enjoyed. One ma-



major consequence was that farmers and ranchers had to rely on state systems of loan application that was geared more toward large-scale agriculture. Few qualified. Coupled with the increasing need for capital in agricultural systems, many small individual and tribal operations were forced out of business.

Also at about this time, the BIA instituted a Voluntary Relocation Program. This option was attractive to many because living conditions on the reservation were so poor and many faced the loss of their homes due to flooding. In 1950 the annual income on Standing Rock was under \$800. However, the return rate of this policy was high, 45% returned within a year or two. The jobs and housing available off reservation just weren't that much better.

# Site Inventory

## Cannonball Today

(2000 Census Data)

**Total Population: 963**

Living in owner occupied units: 426

Living in renter occupied units: 530

On farm: 92

Non-farm: 871

**Total Housing units: 238**

Owner occupied: 122

Renter occupied: 116

Single family units:     91 owned with 335 residents  
                                  99 rented with 471 residents

Duplex:                 4 owned with 15 residents  
                                  11 rented with 17 residents

Mobile:                 27 owned with 68 residents  
                                  6 rented with 25 residents

**Total Households: 233**

**Average (median) income**

31 single residents

2 person: 26 family and 5 non-family     17,868

3 person: 37 family and 2 non-family     12,500

## Demographic Data:

### Age Chart

(See appendix A)

### Income Chart

(See appendix A)

### Occupation Chart

(See appendix A)

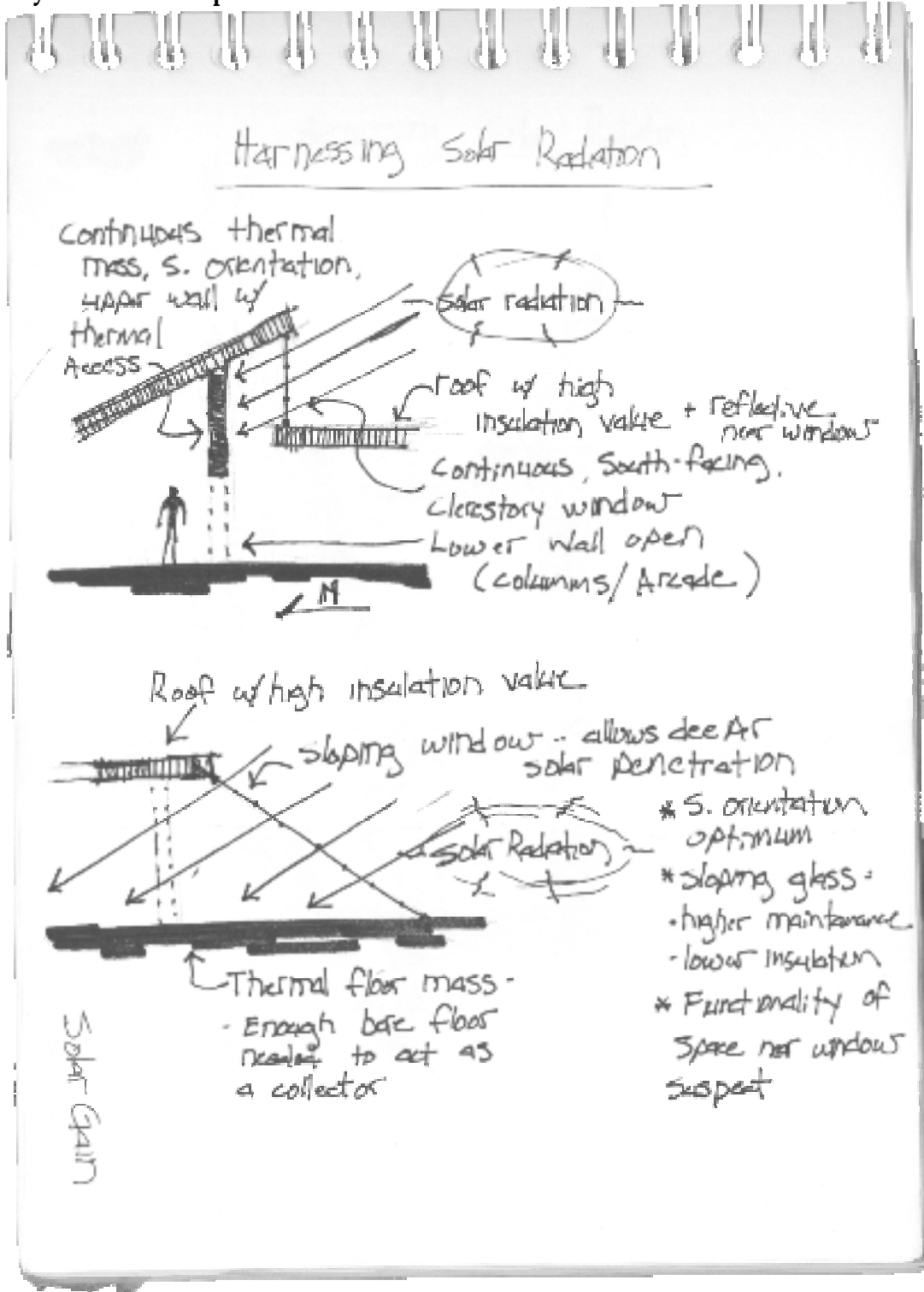
### Education Chart

(See appendix A)

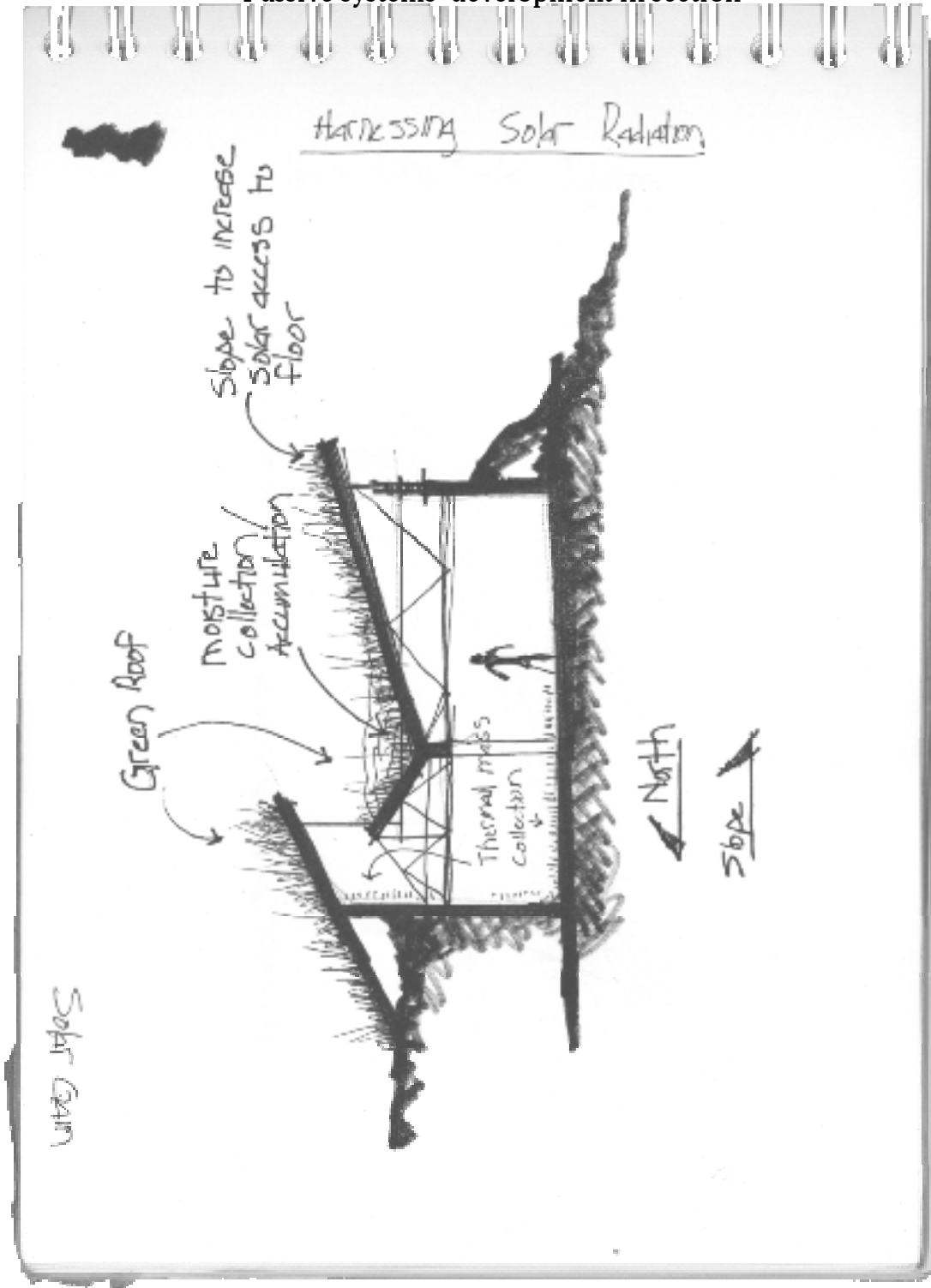


# Process Sketches

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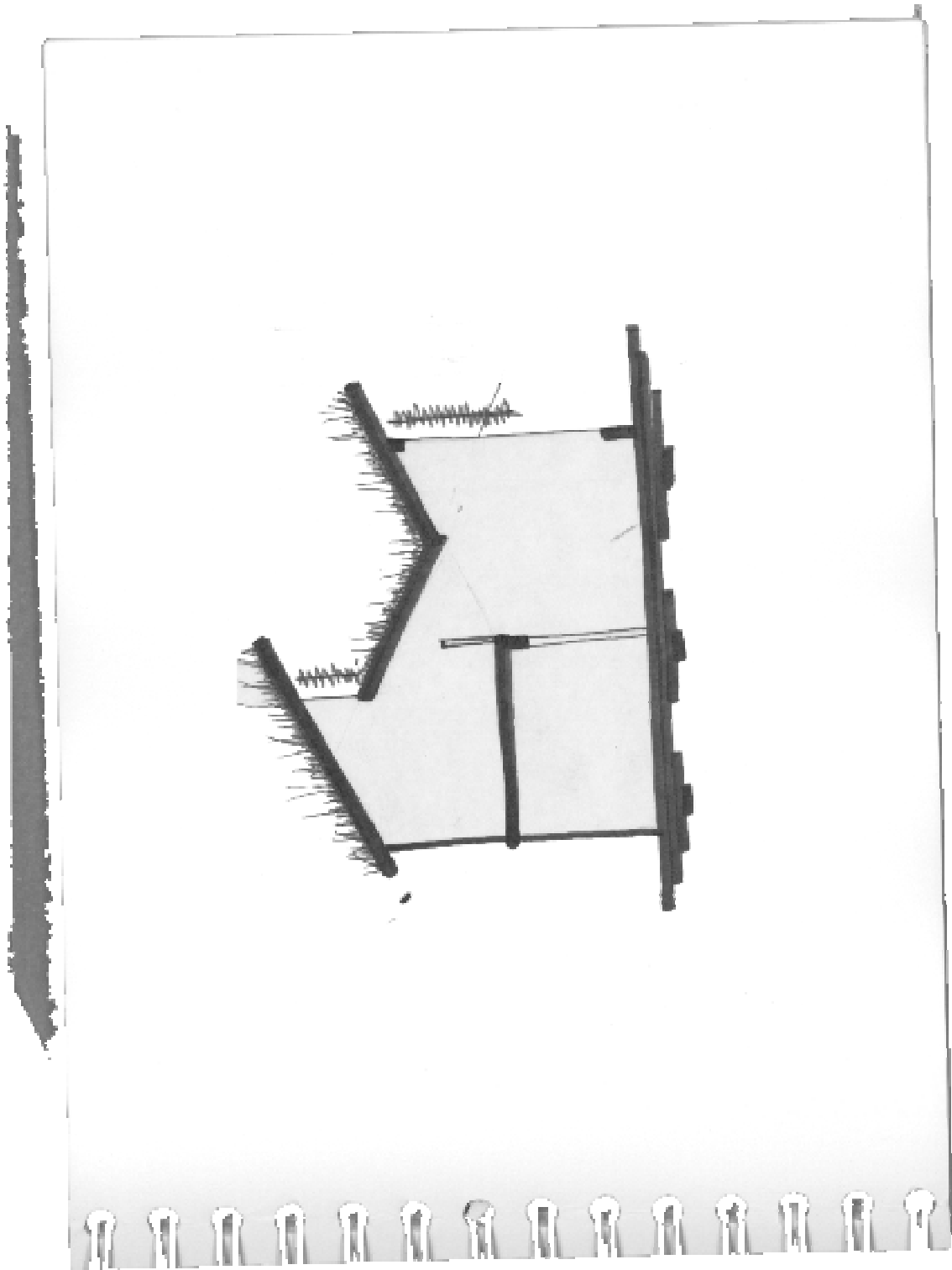


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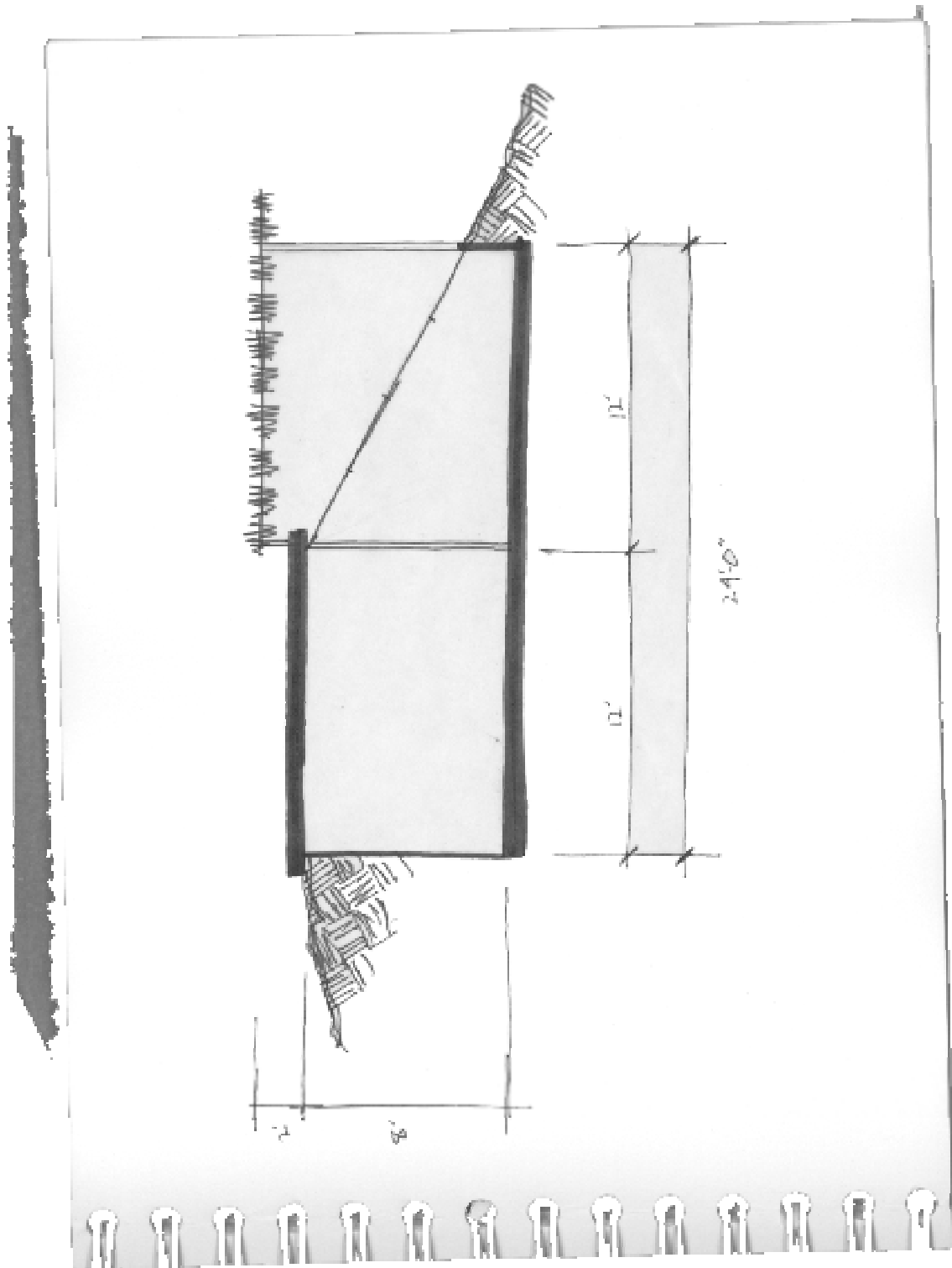
## Process Sketches

Passive systems development in section





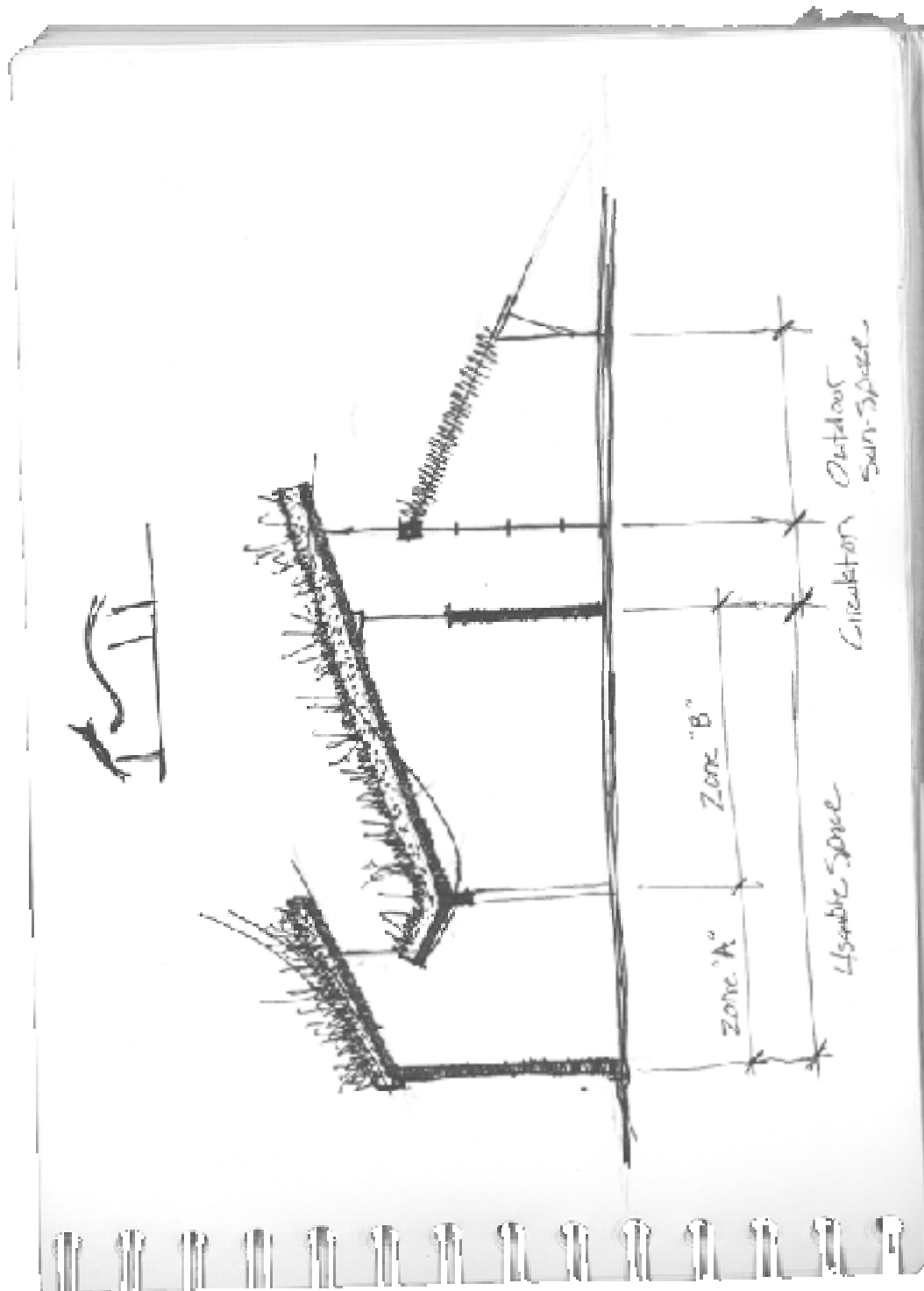
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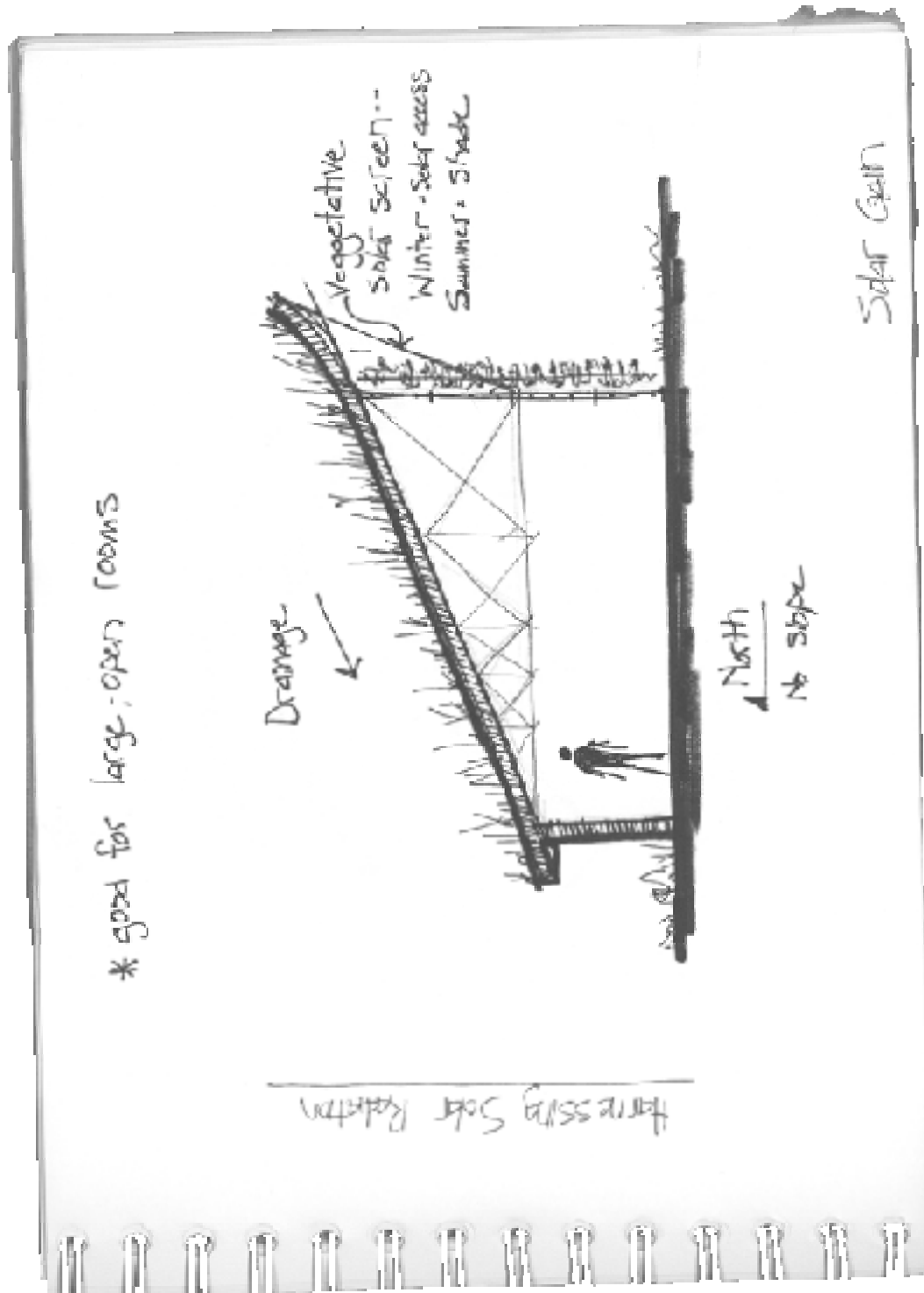
**Native Architecture:** Sustainable design theory applied to affordable housing in a rural setting

## Process Sketches

Passive systems development in section

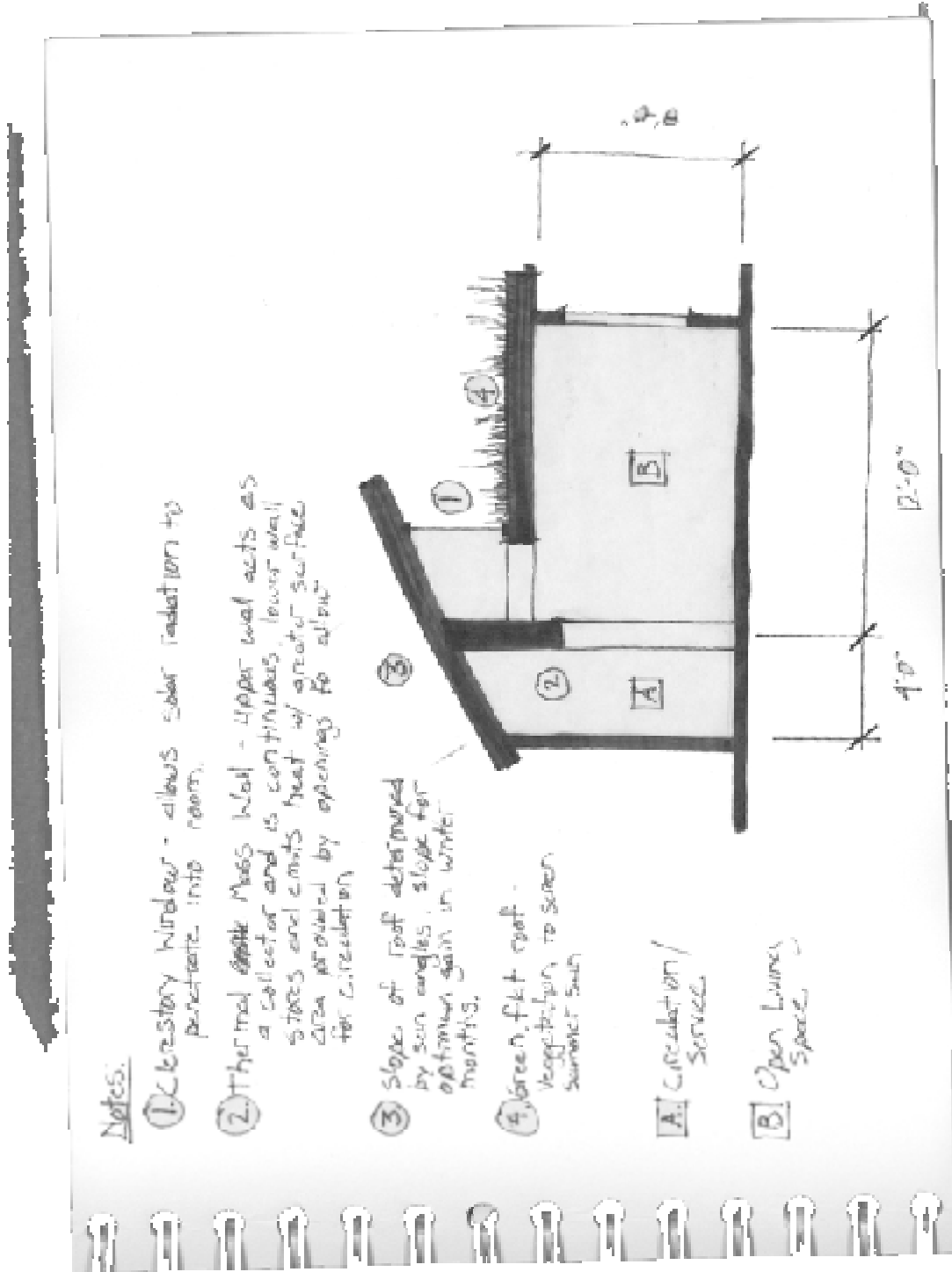


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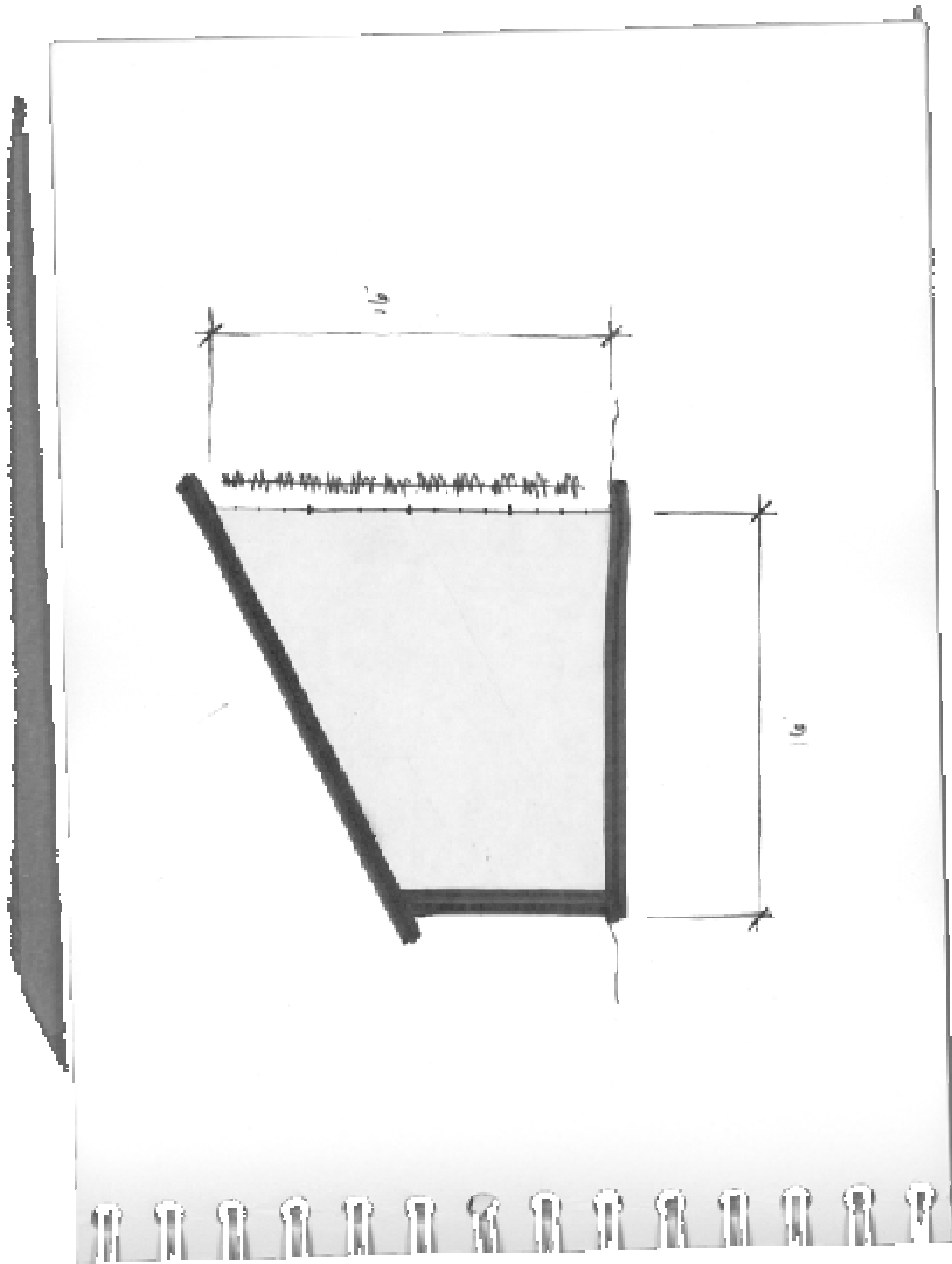


# Process Sketches

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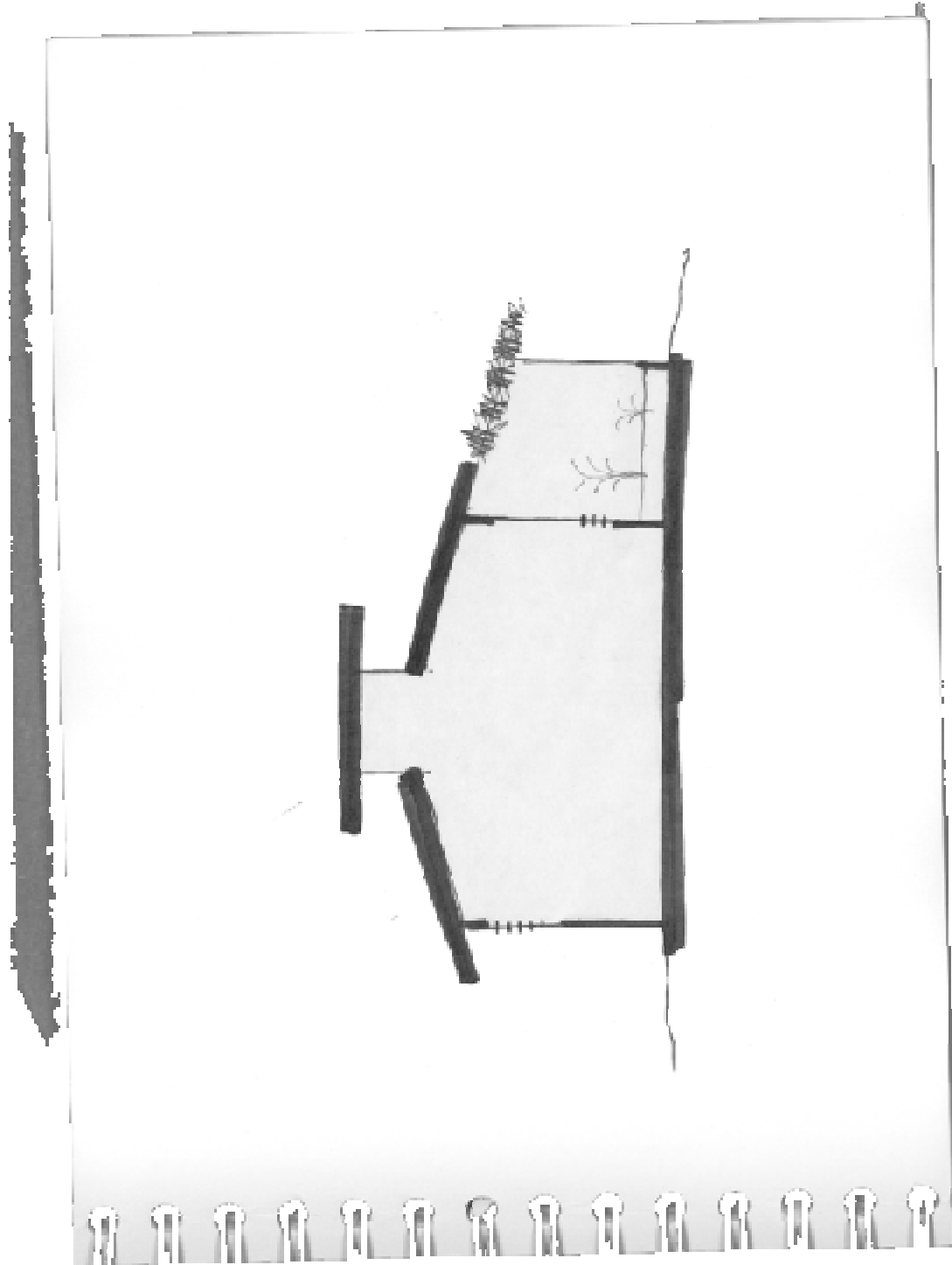


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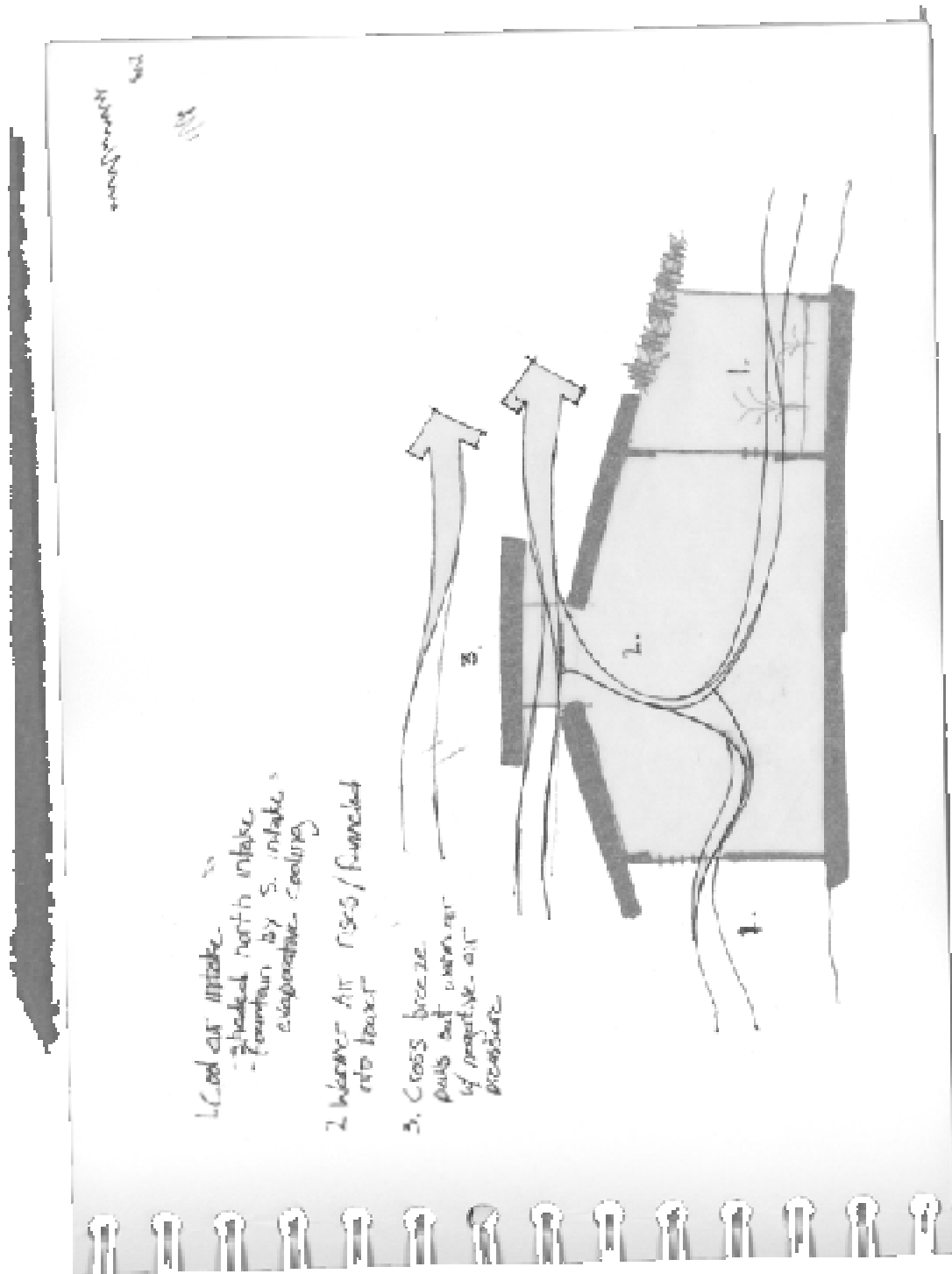


## Process Sketches

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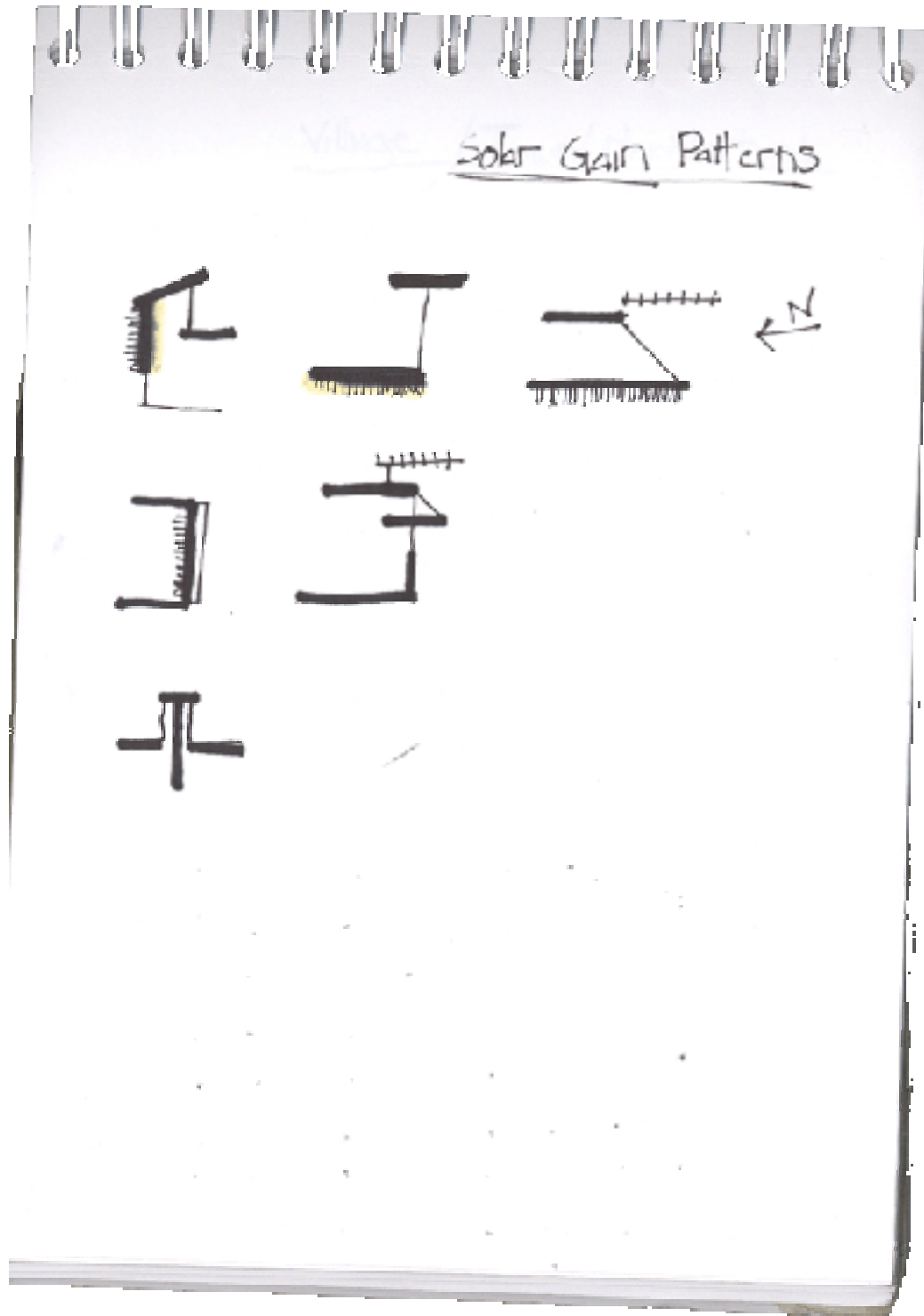


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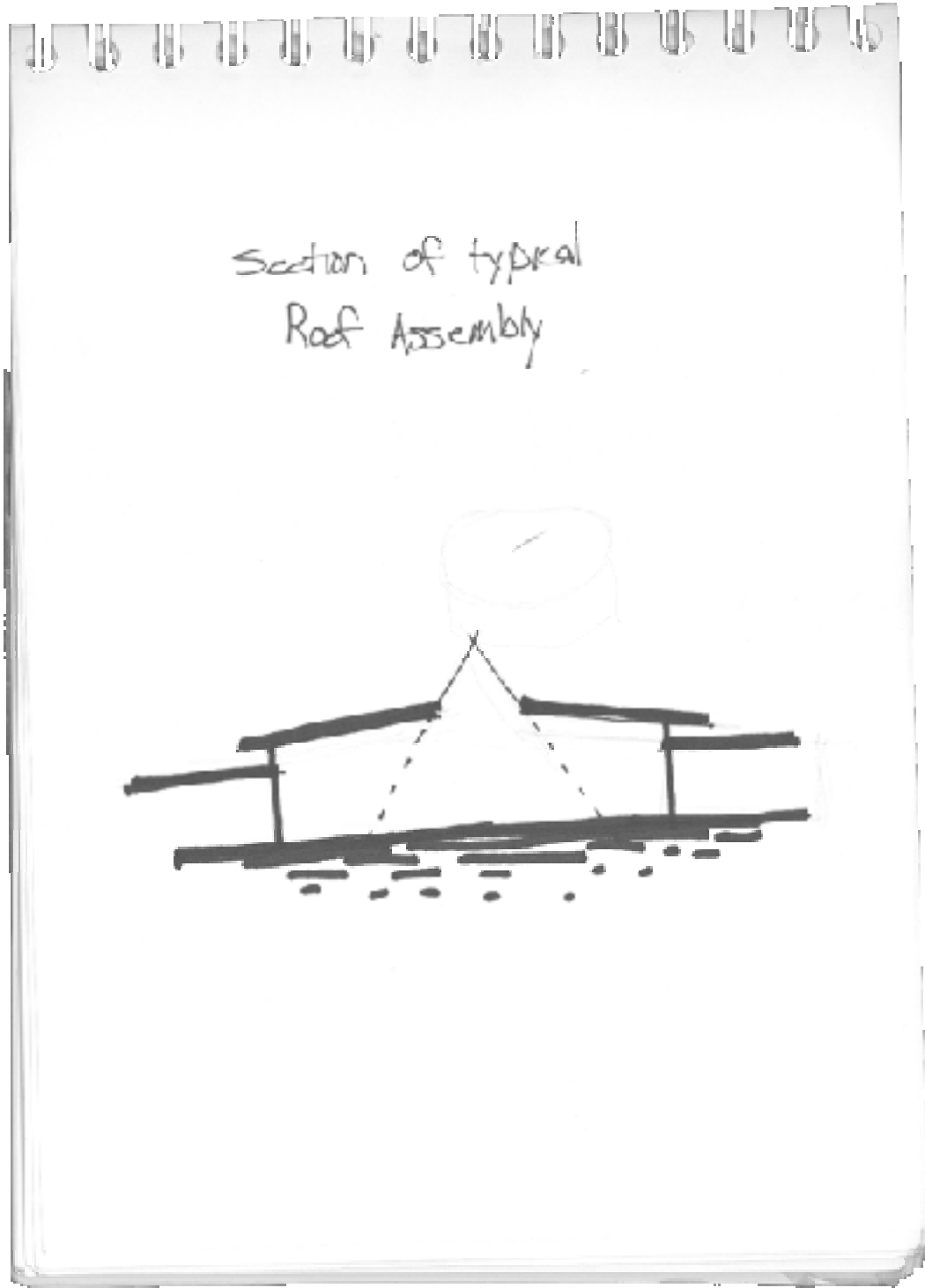
## Process Sketches

Passive systems development in section



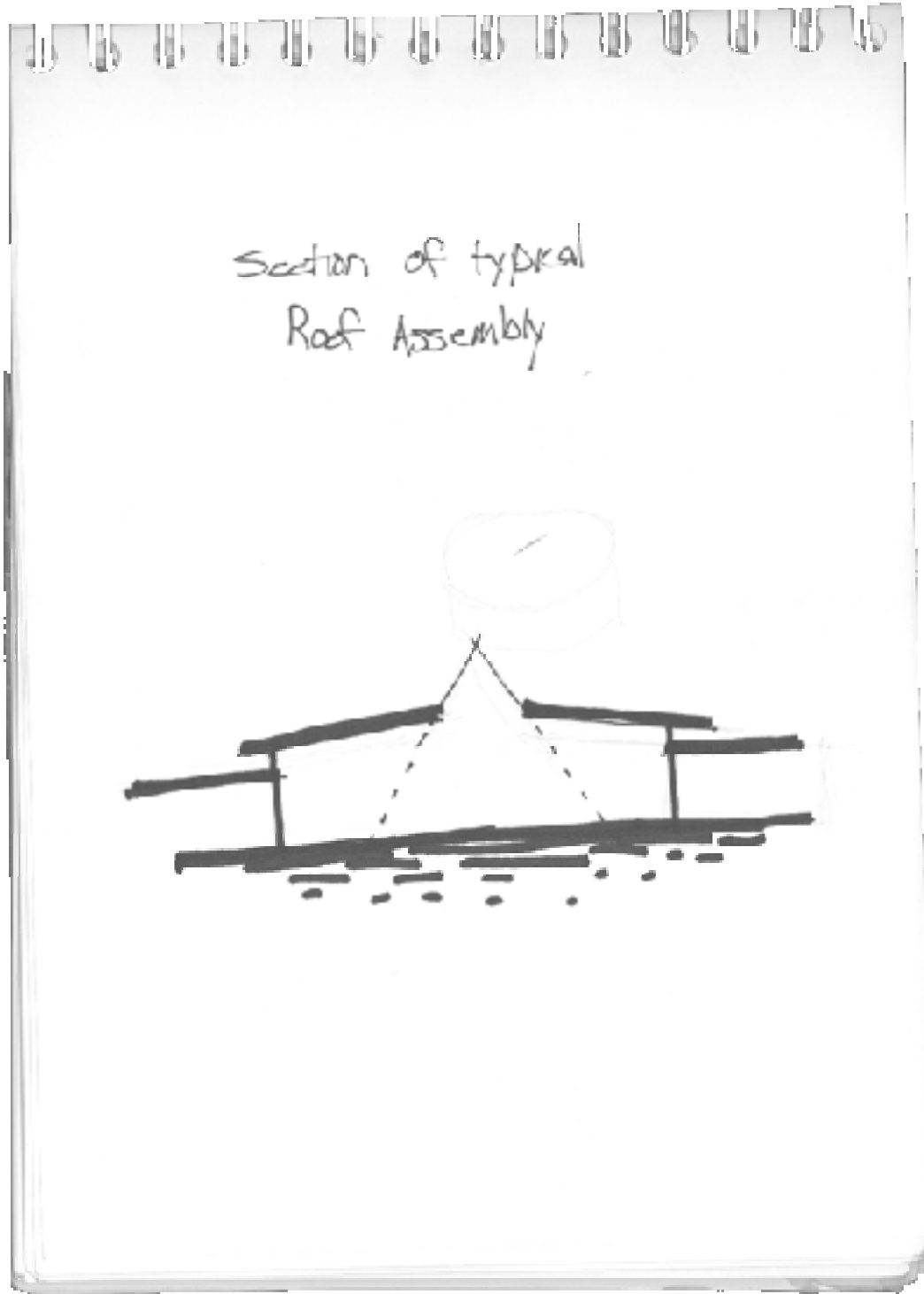


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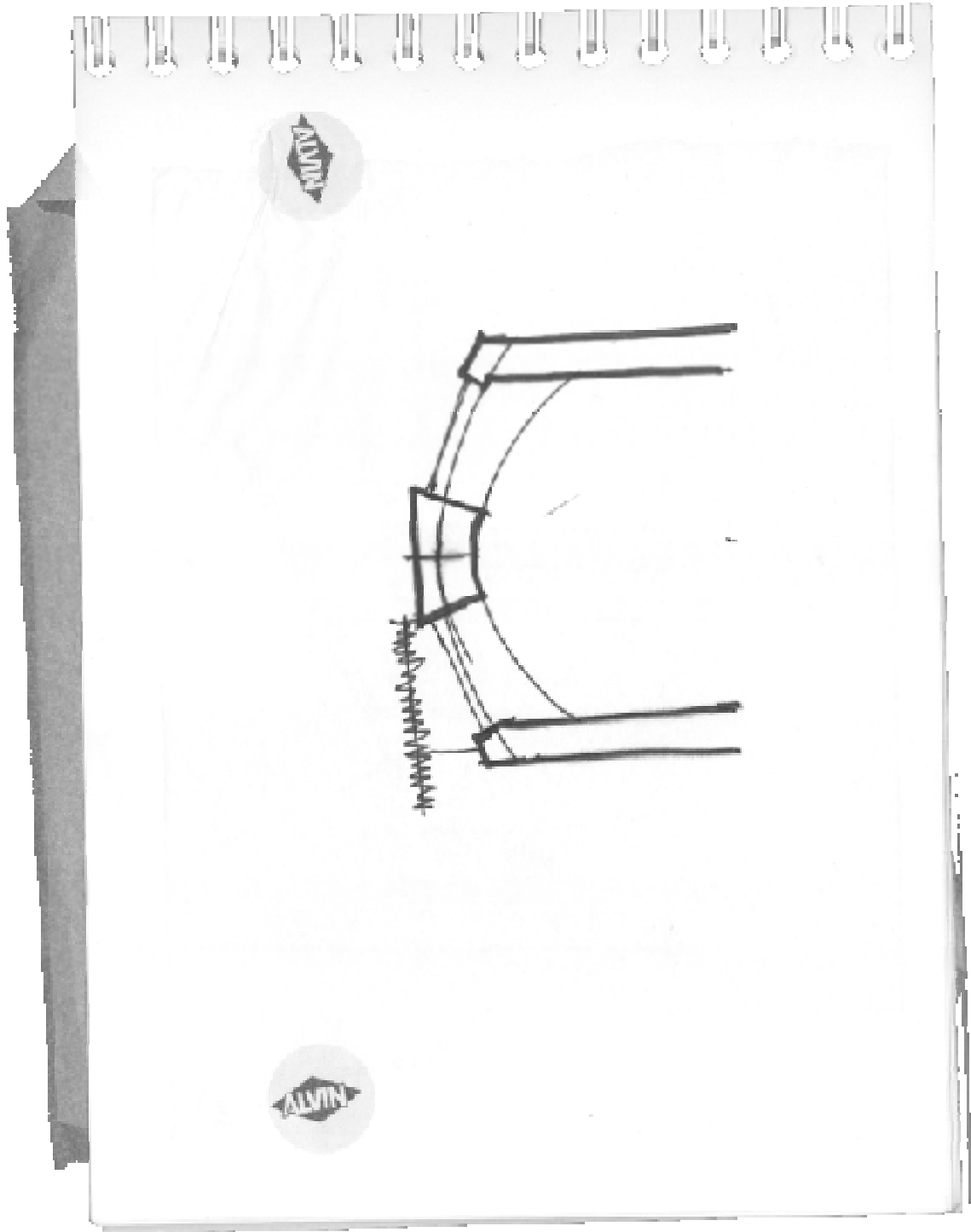


## Process Sketches

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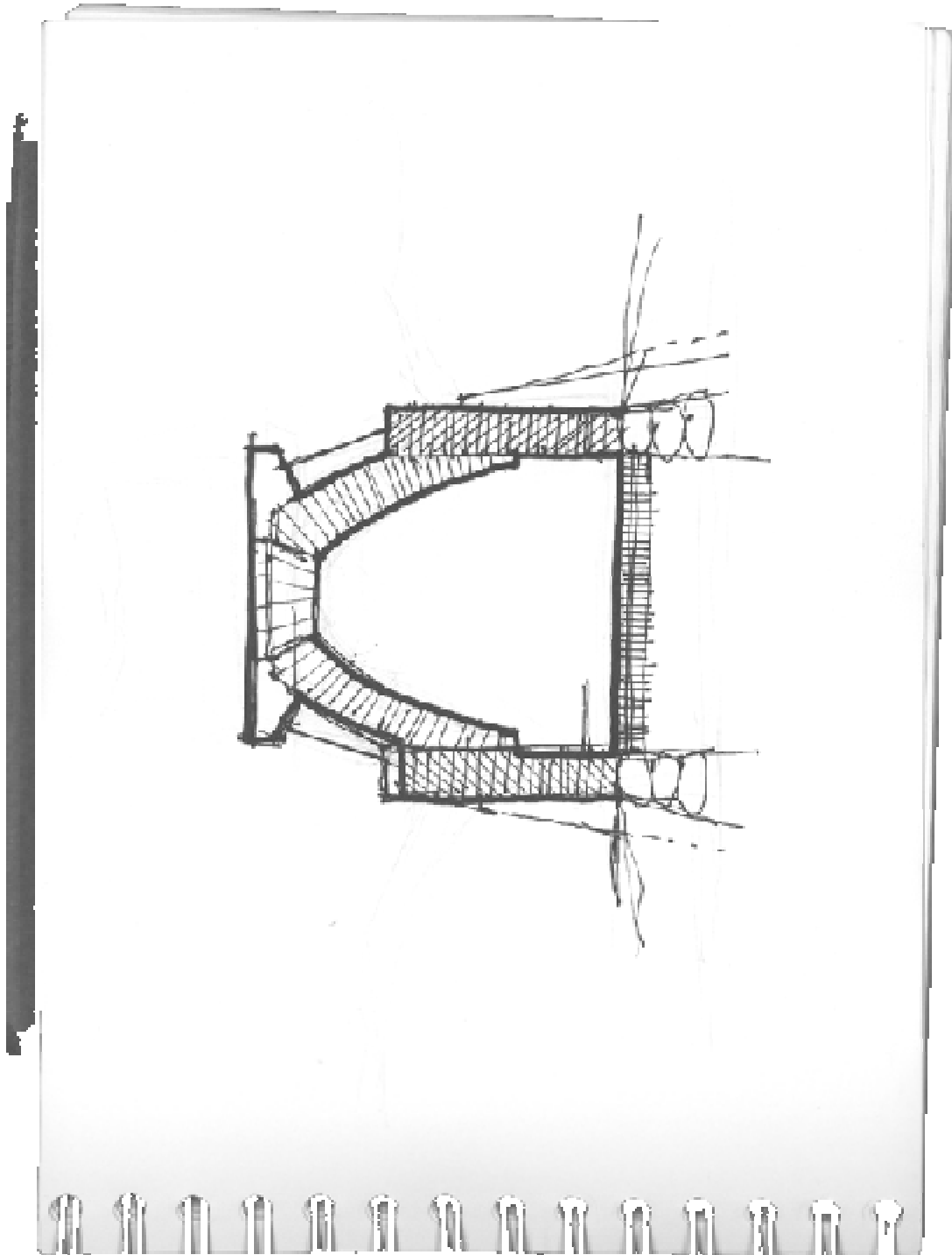


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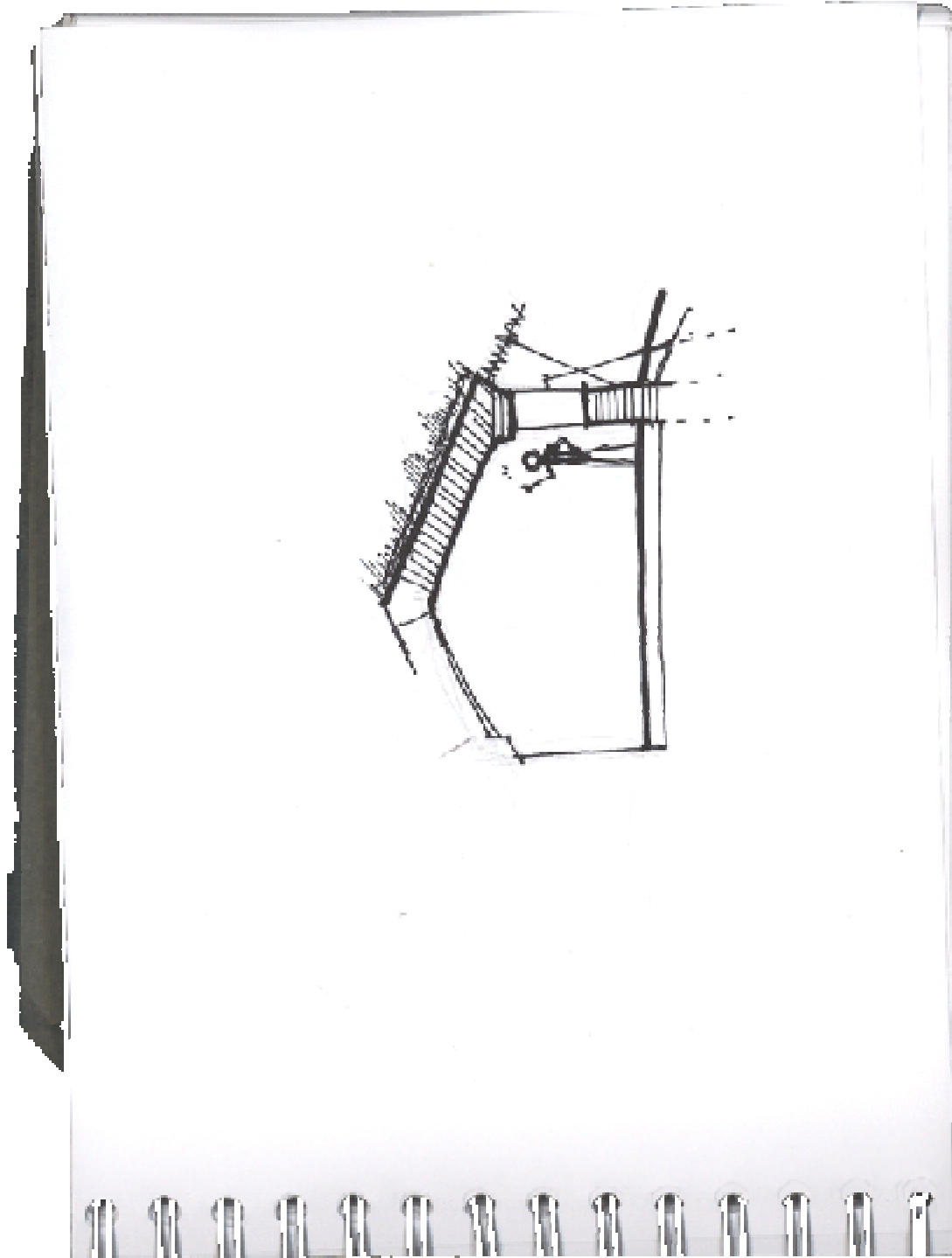


## Process Sketches

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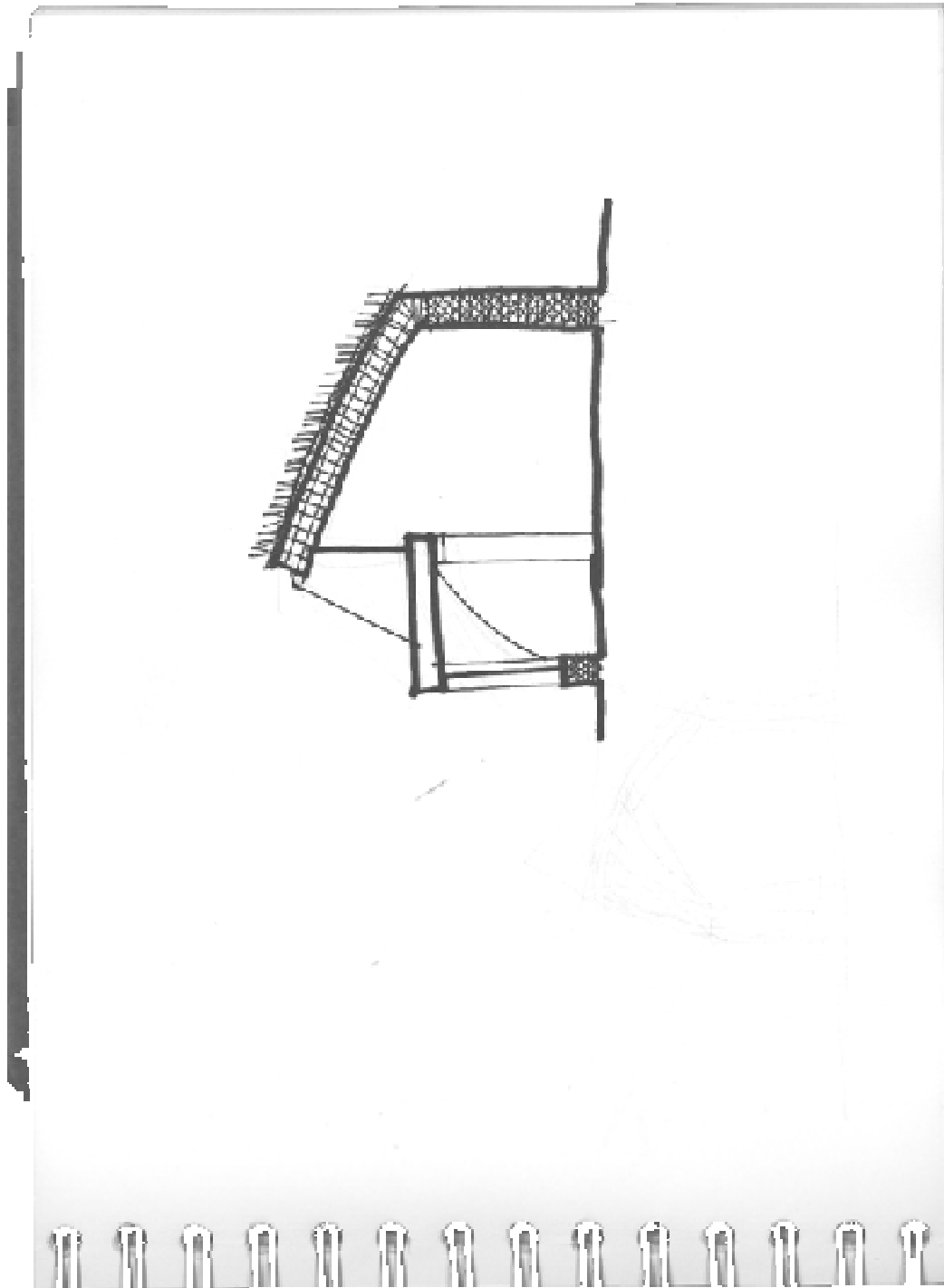
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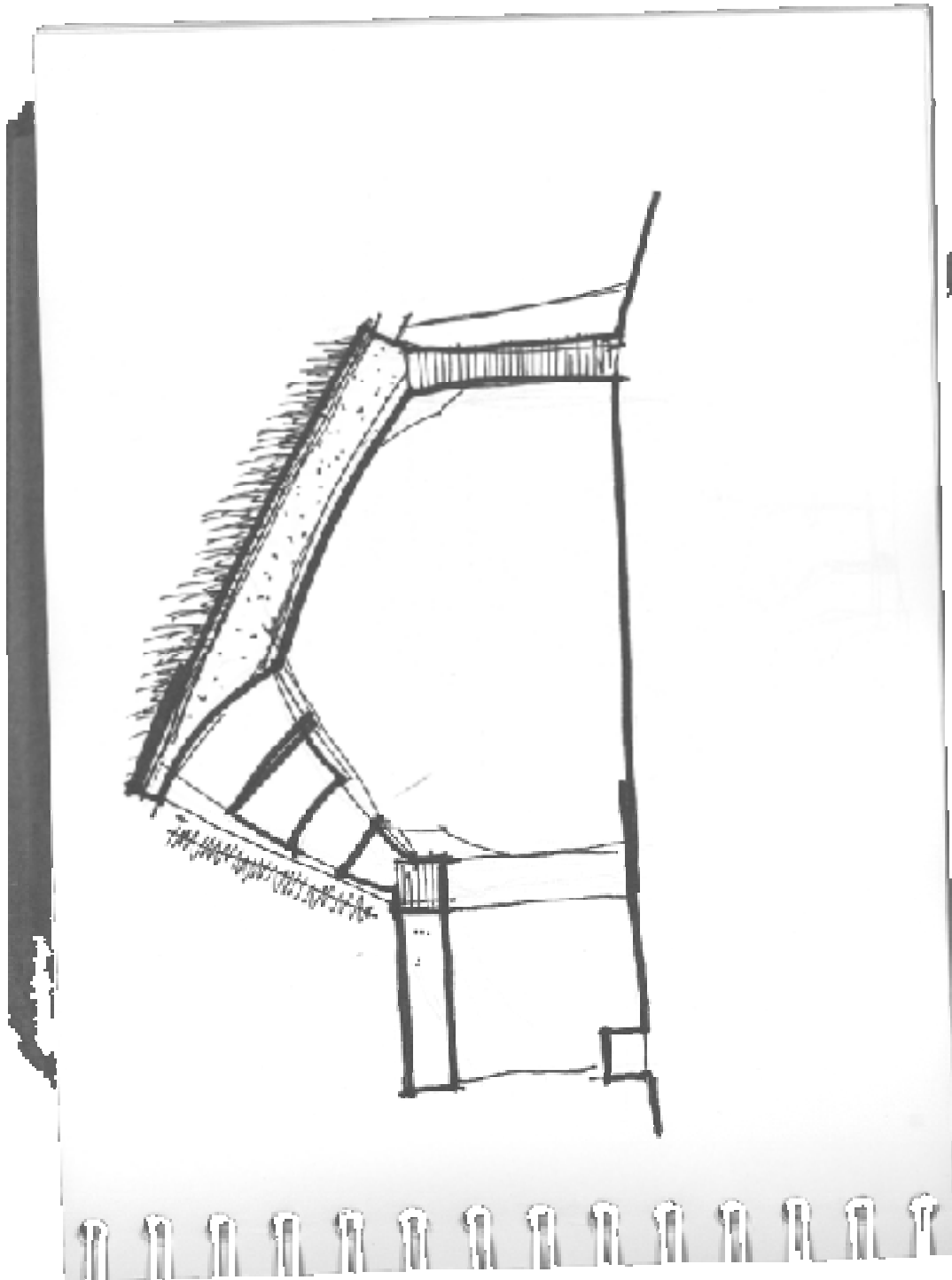
**Native Architecture:** Sustainable design theory applied to affordable housing in a rural setting

## Process Sketches

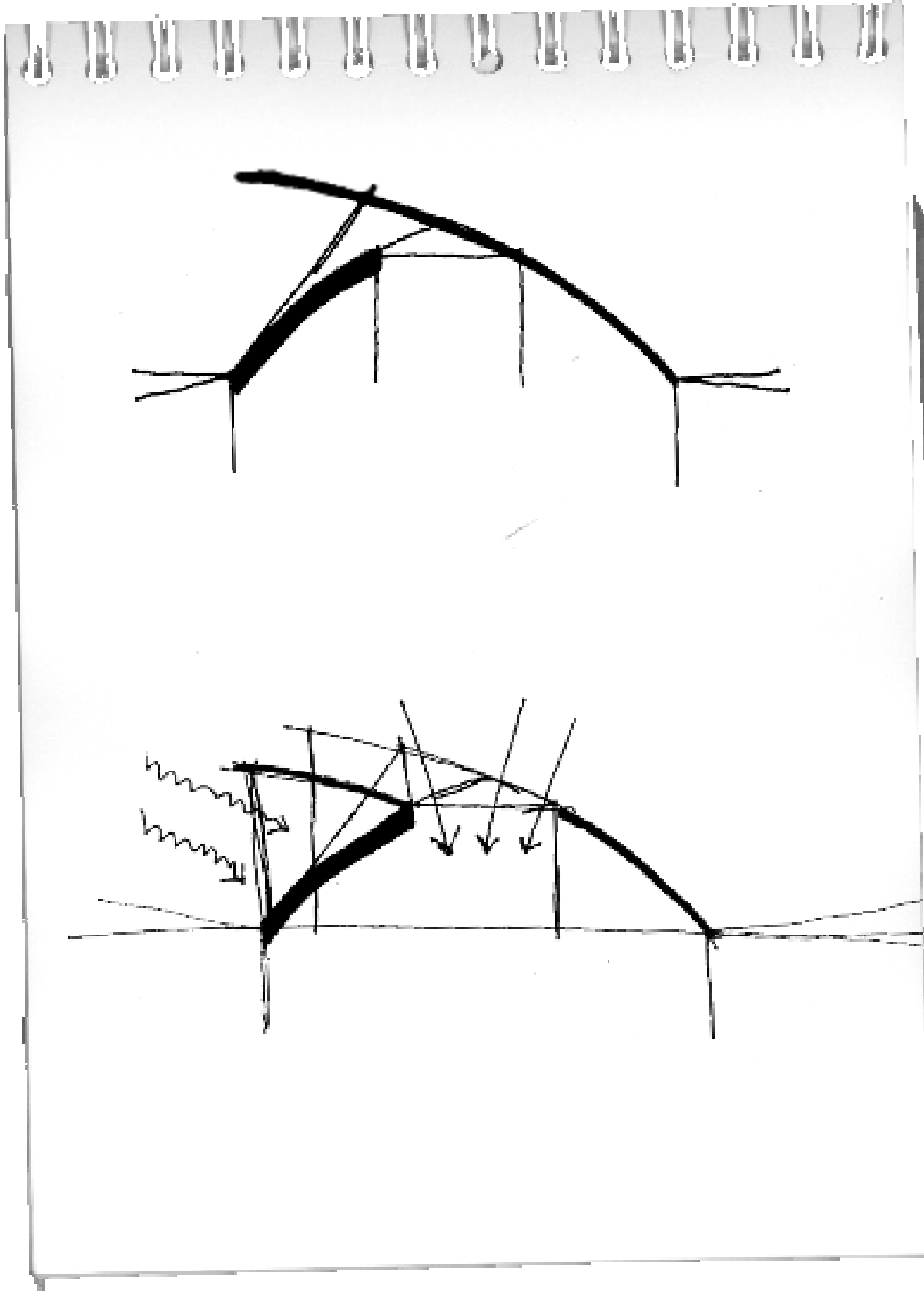
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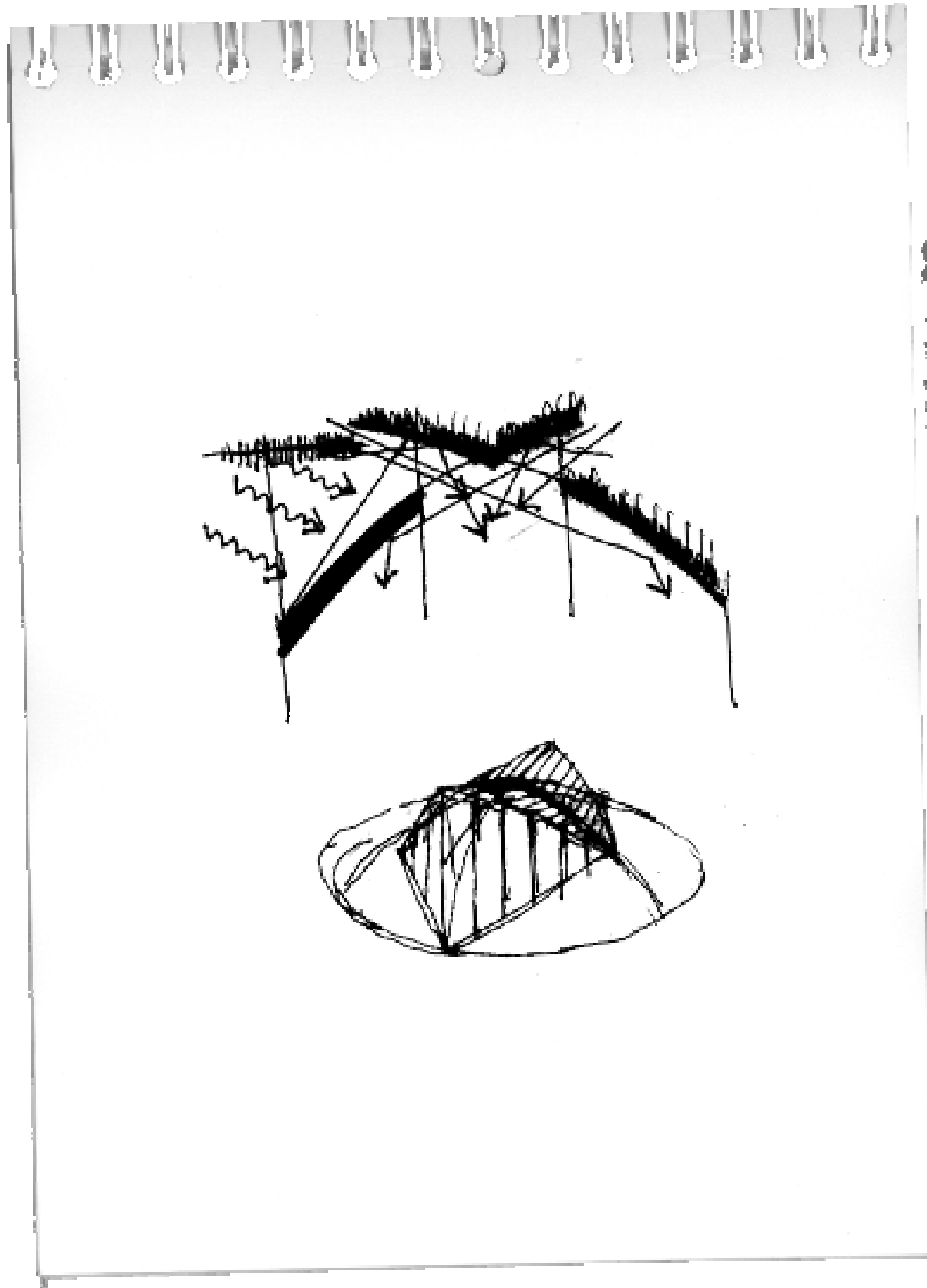


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Passive systems development in section

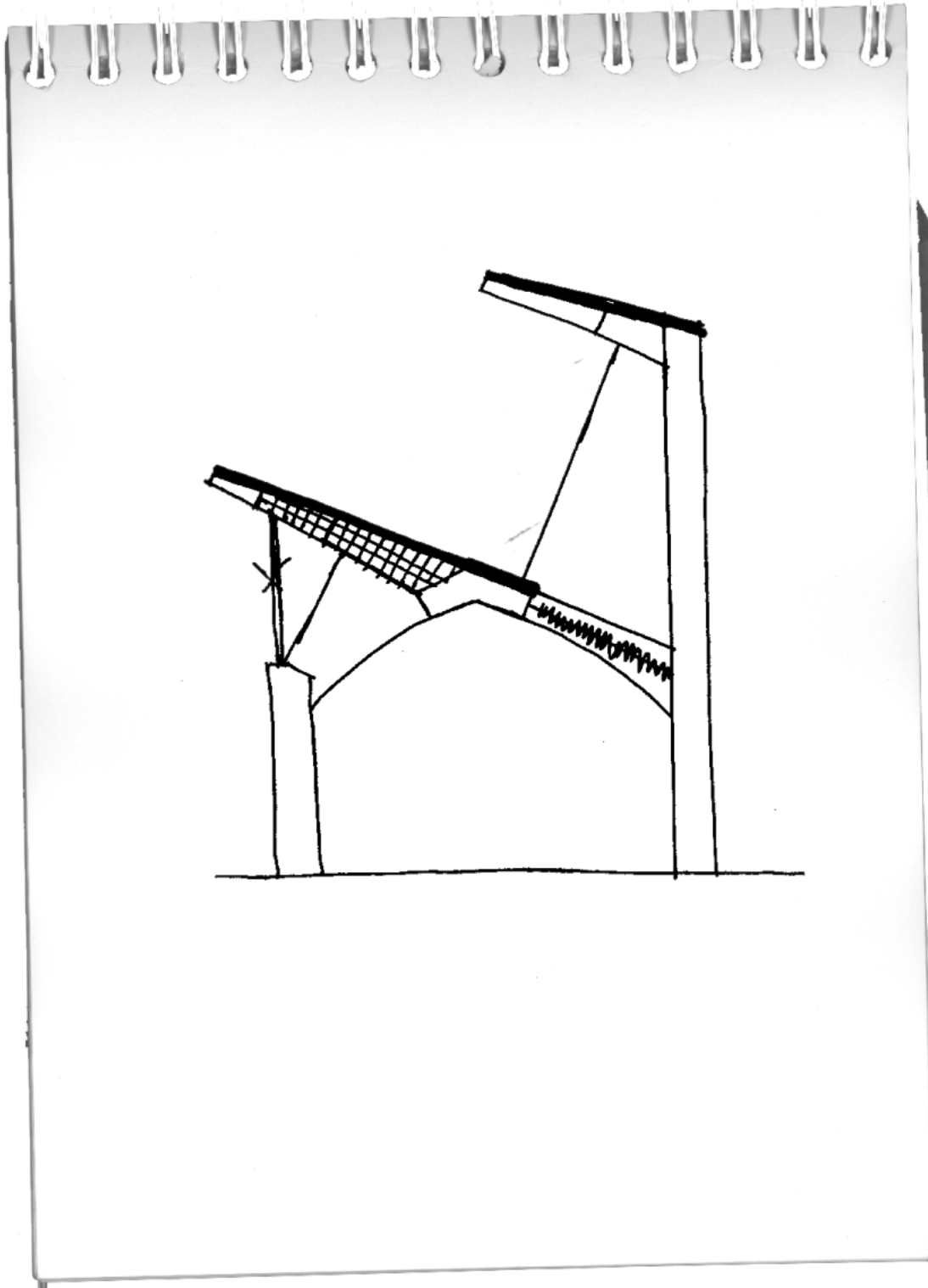


Sustainable design theory applied to affordable housing in a rural setting

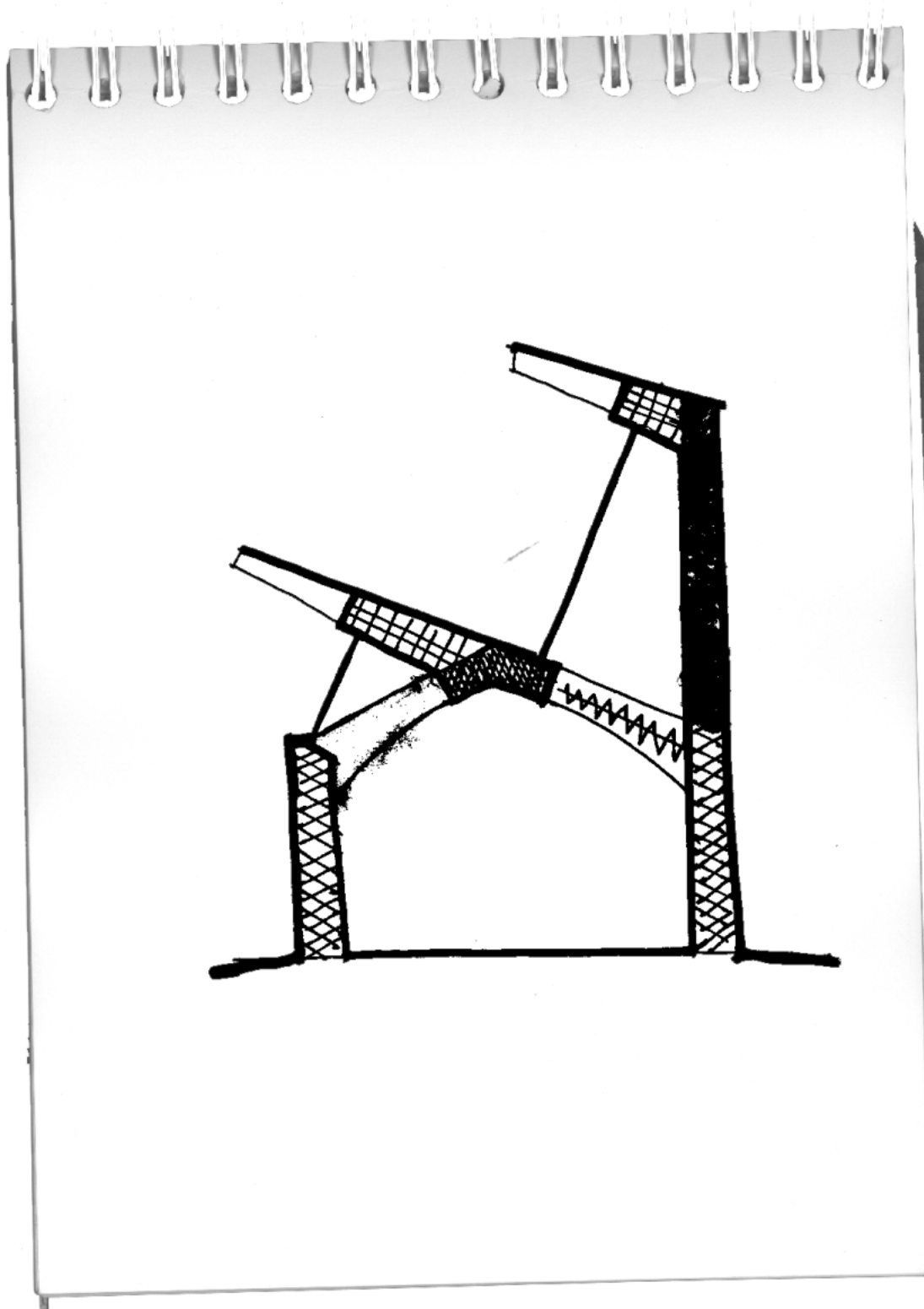
**Native Architecture:**

## Process Sketches

Passive systems development in section



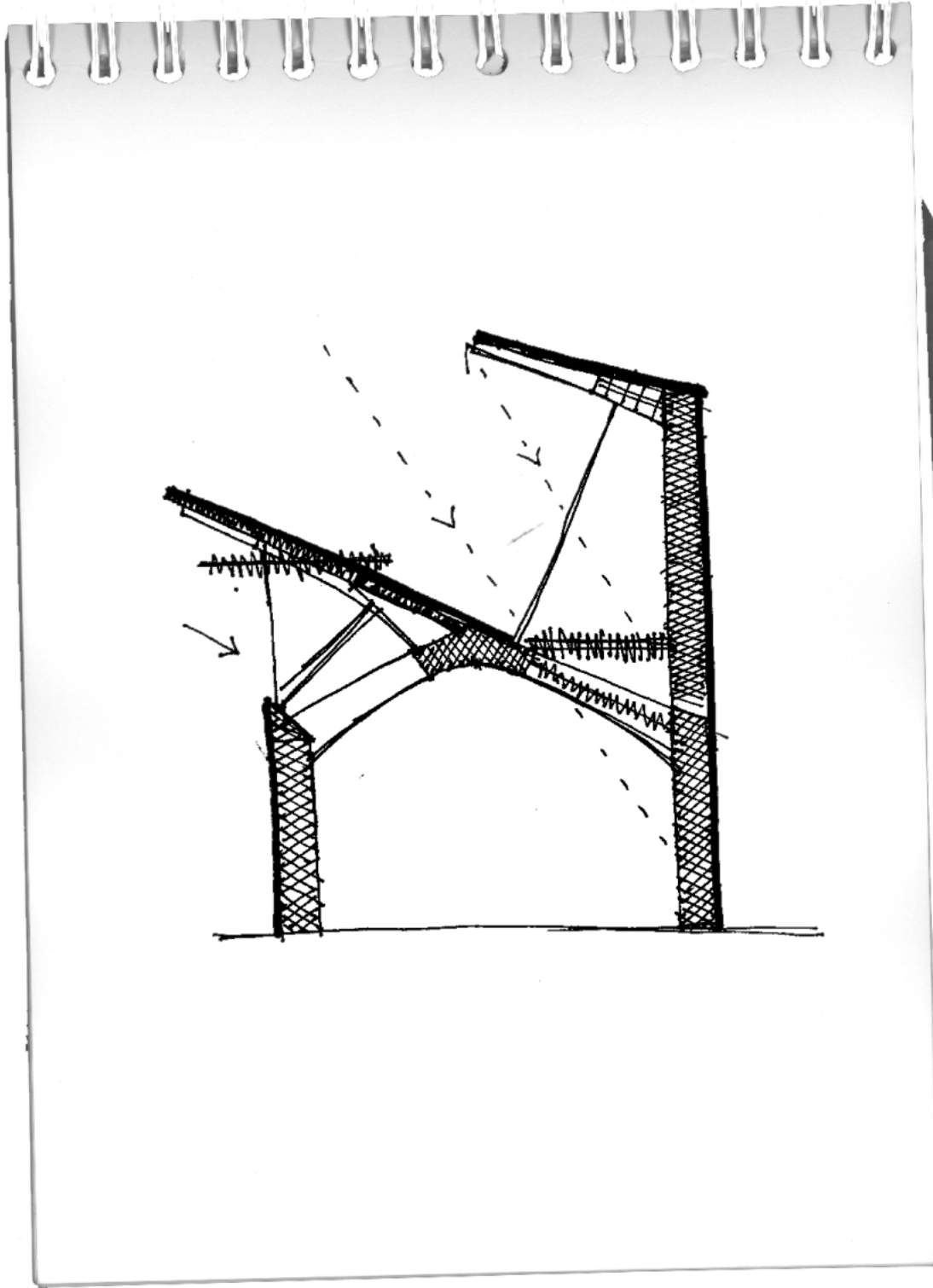
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**Native Architecture:** Sustainable design theory applied to affordable housing in a rural setting

## Process Sketches

Passive systems development in section

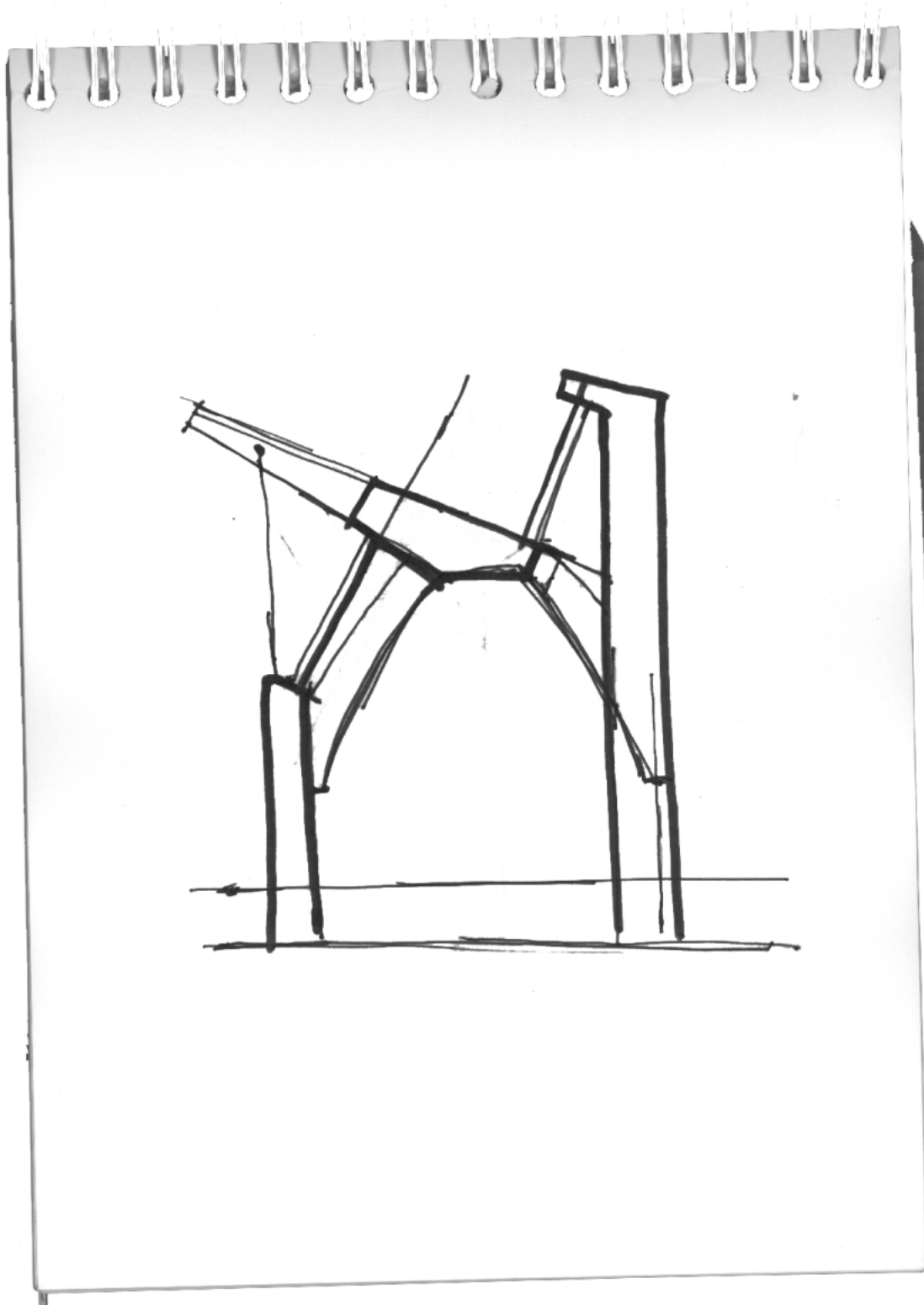


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### **Native Architecture:**

Sustainable design theory applied to affordable housing in a rural setting

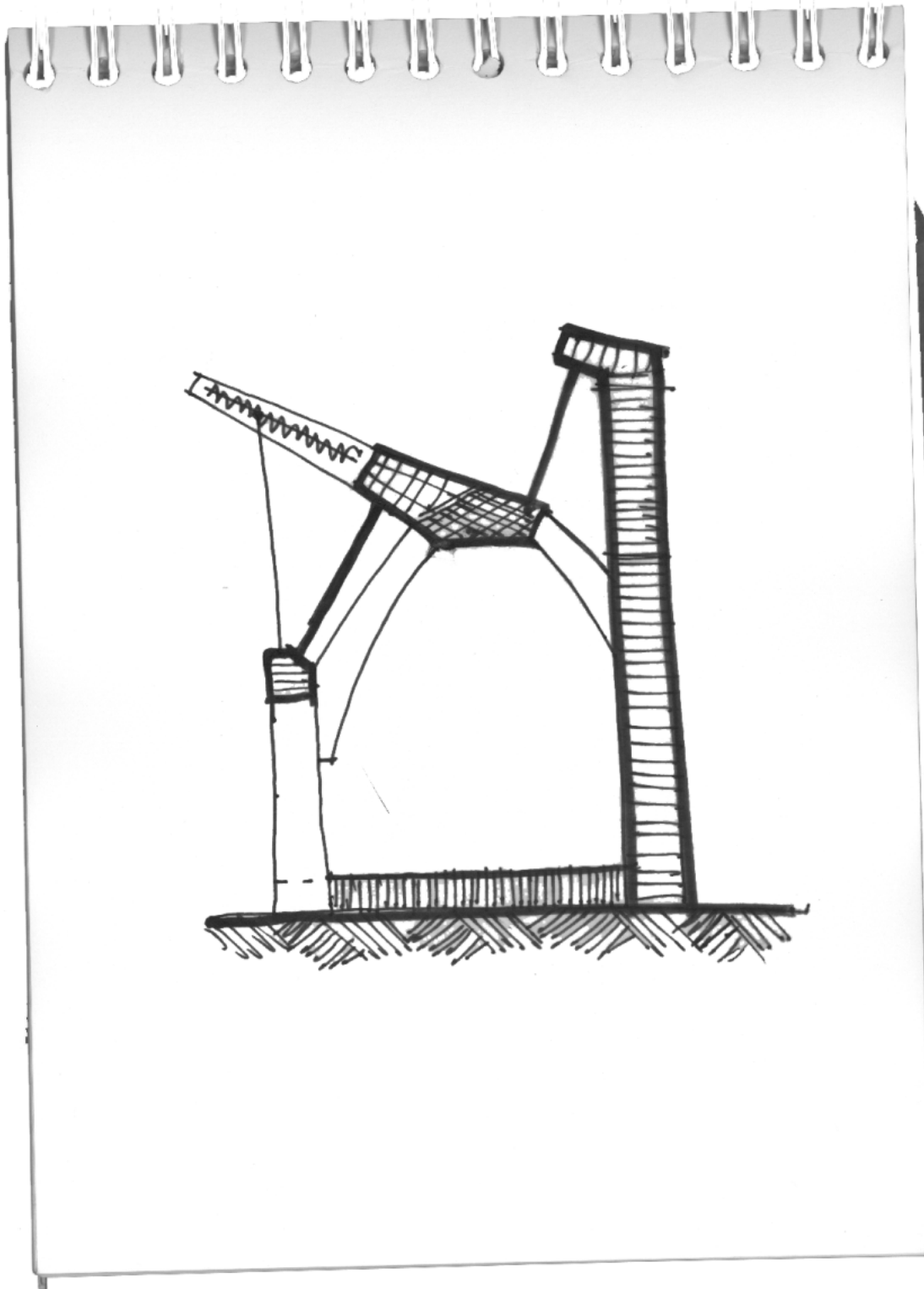
Design systems development in section



**Native Architecture:** Sustainable design theory applied to affordable housing in a rural setting

## Process Sketches

Passive systems development in section

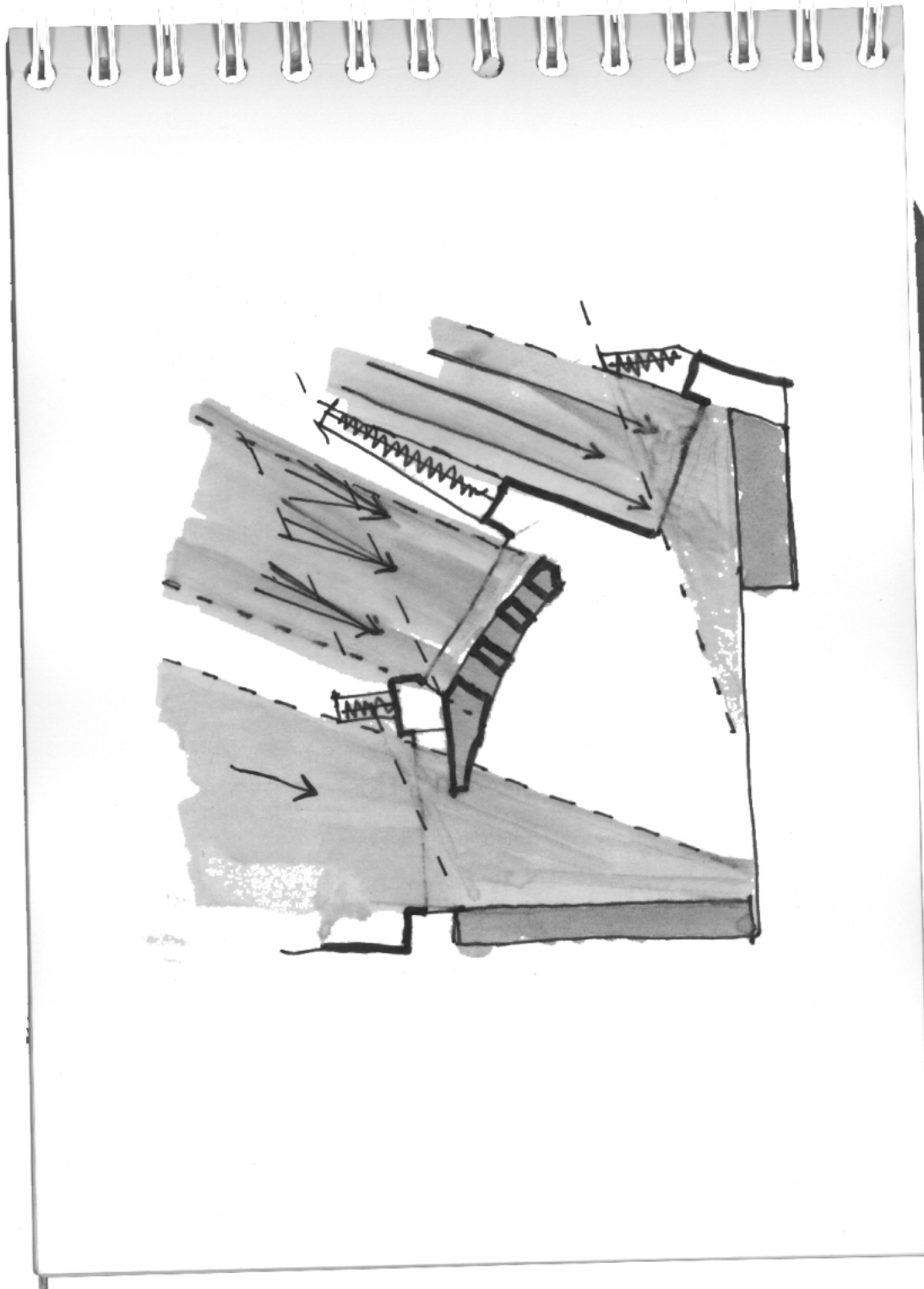


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### **Native Architecture:**

Sustainable design theory applied to affordable housing in a rural setting

Passive systems development in section

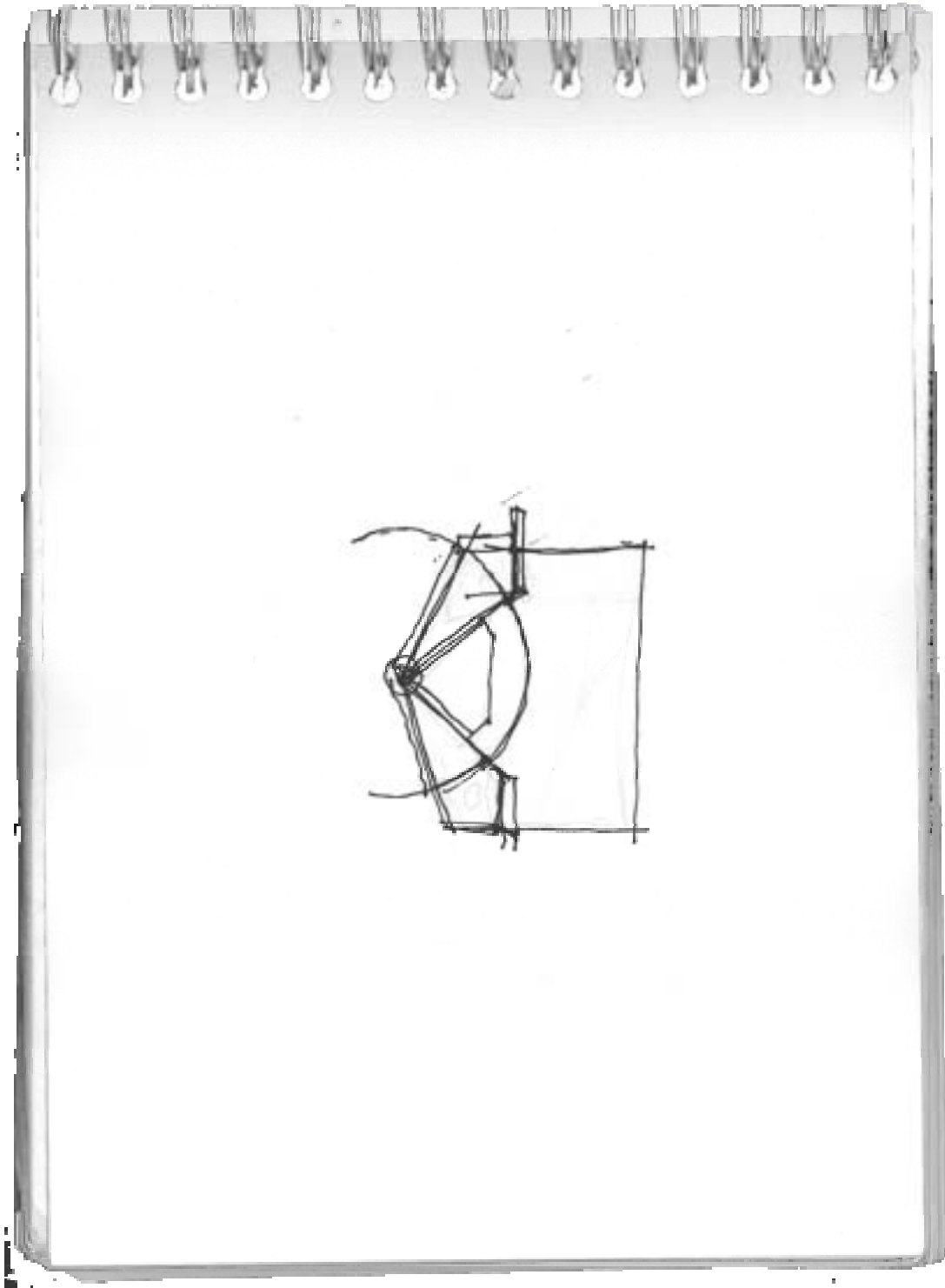


Sustainable design theory applied to affordable housing in a rural setting

**Native Architecture:**

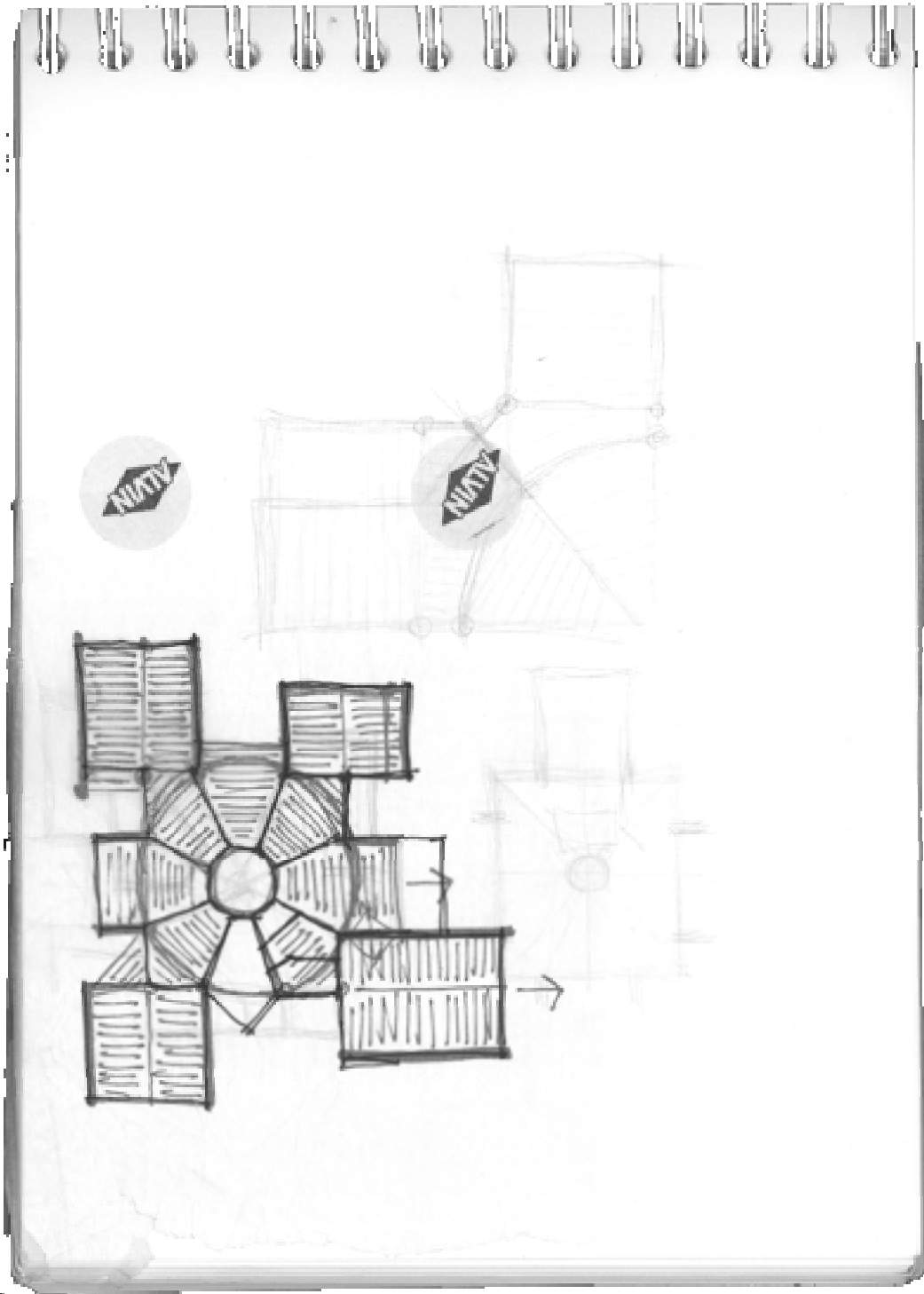
## Process Sketches

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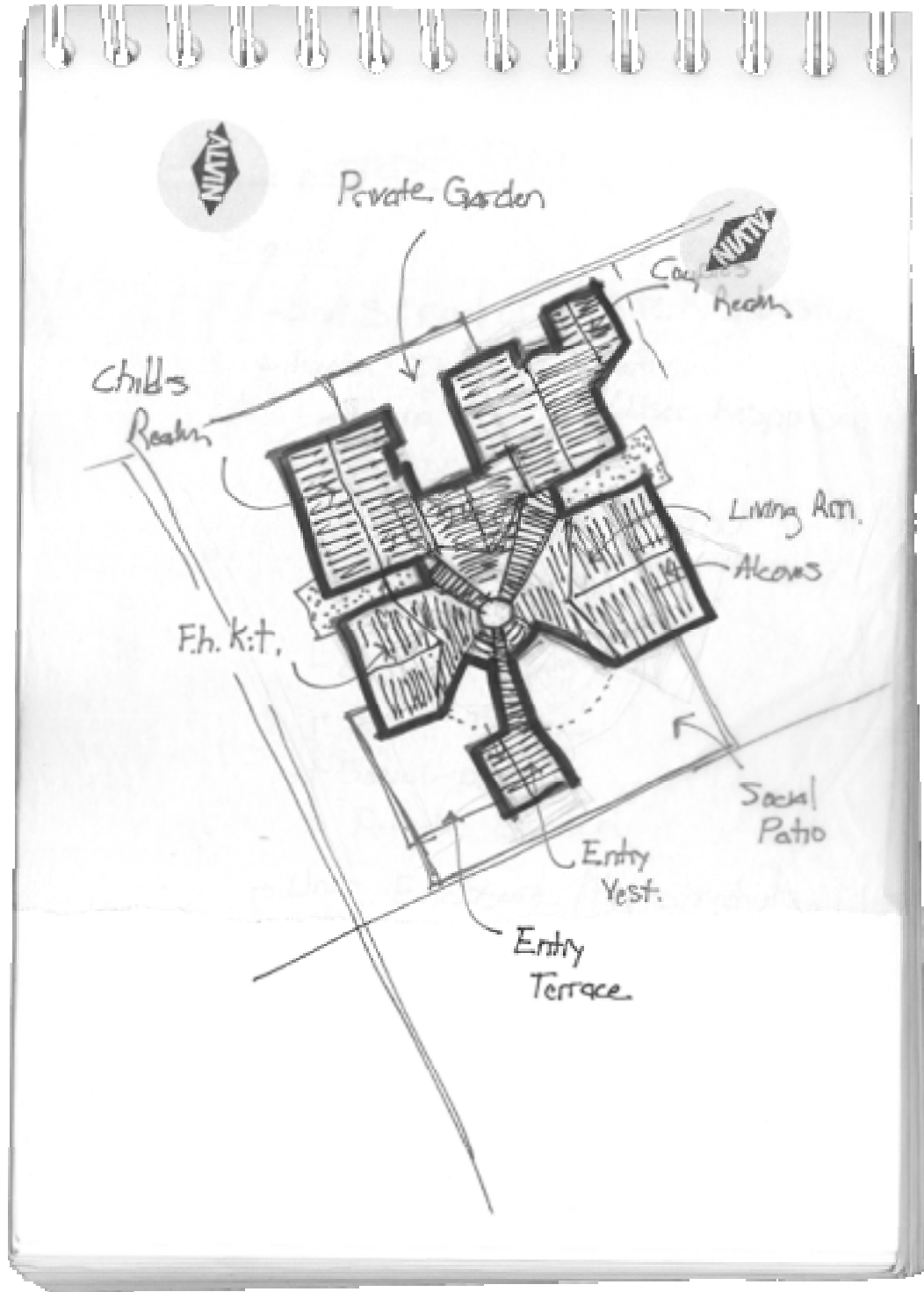




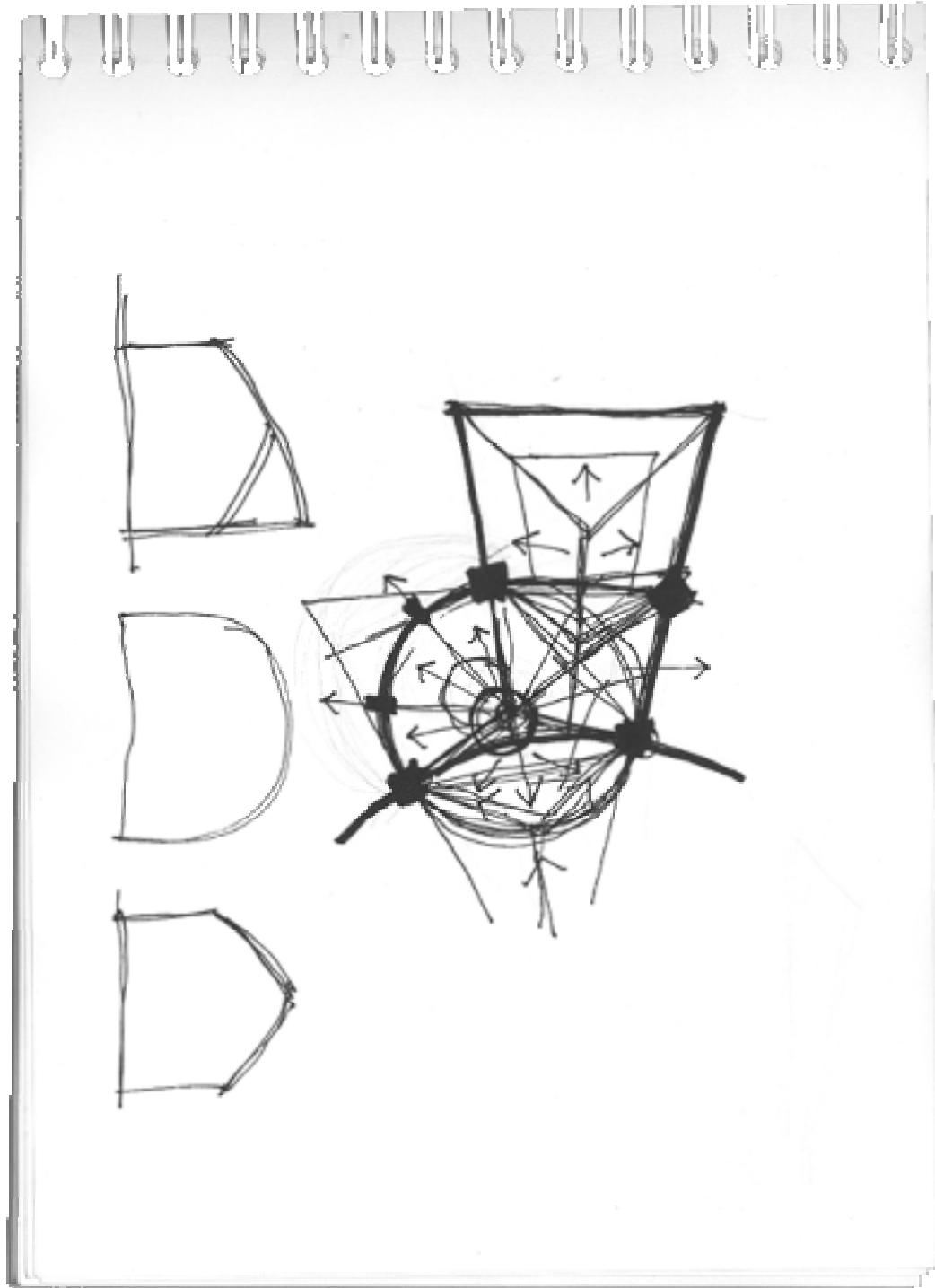
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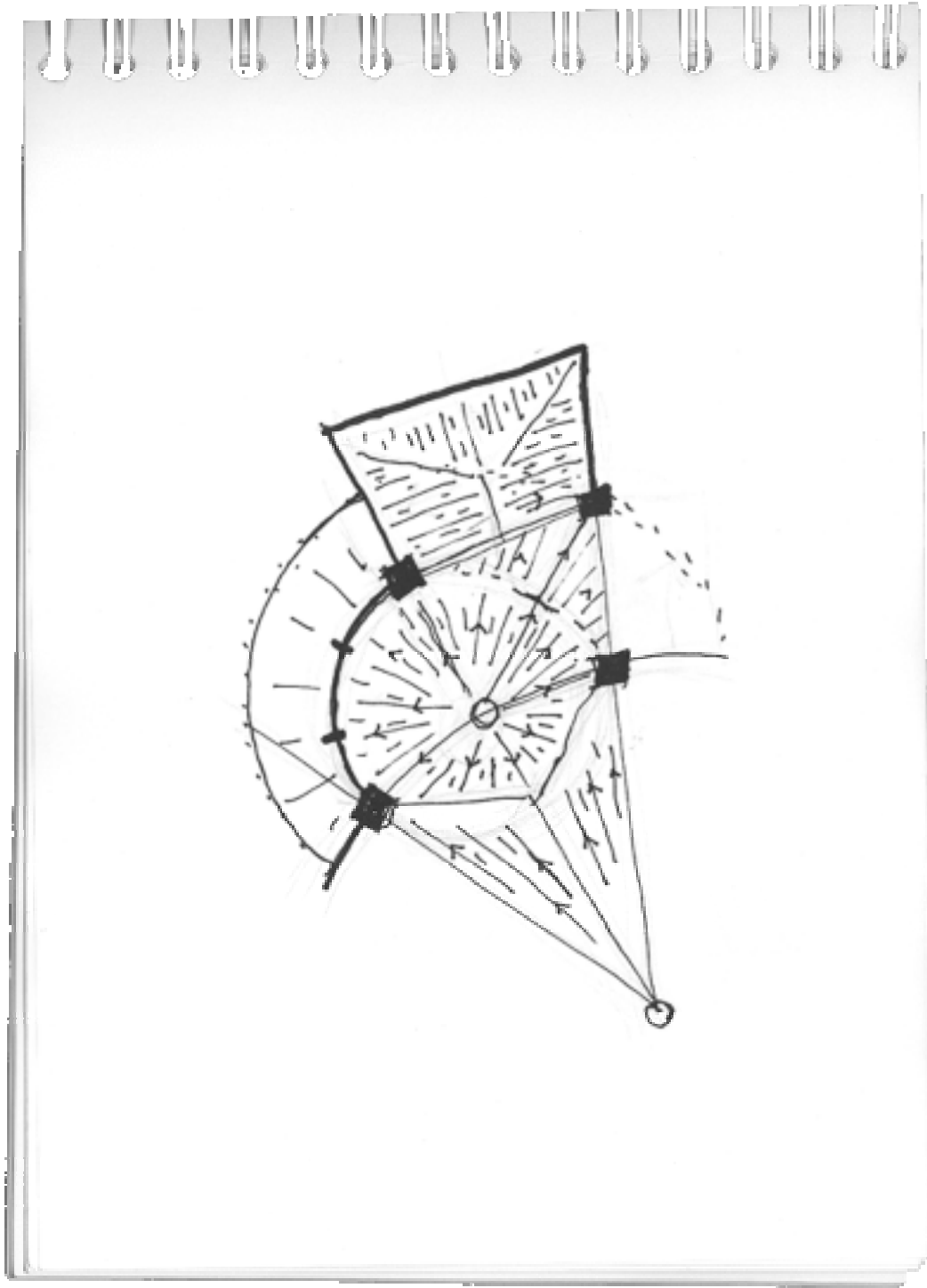
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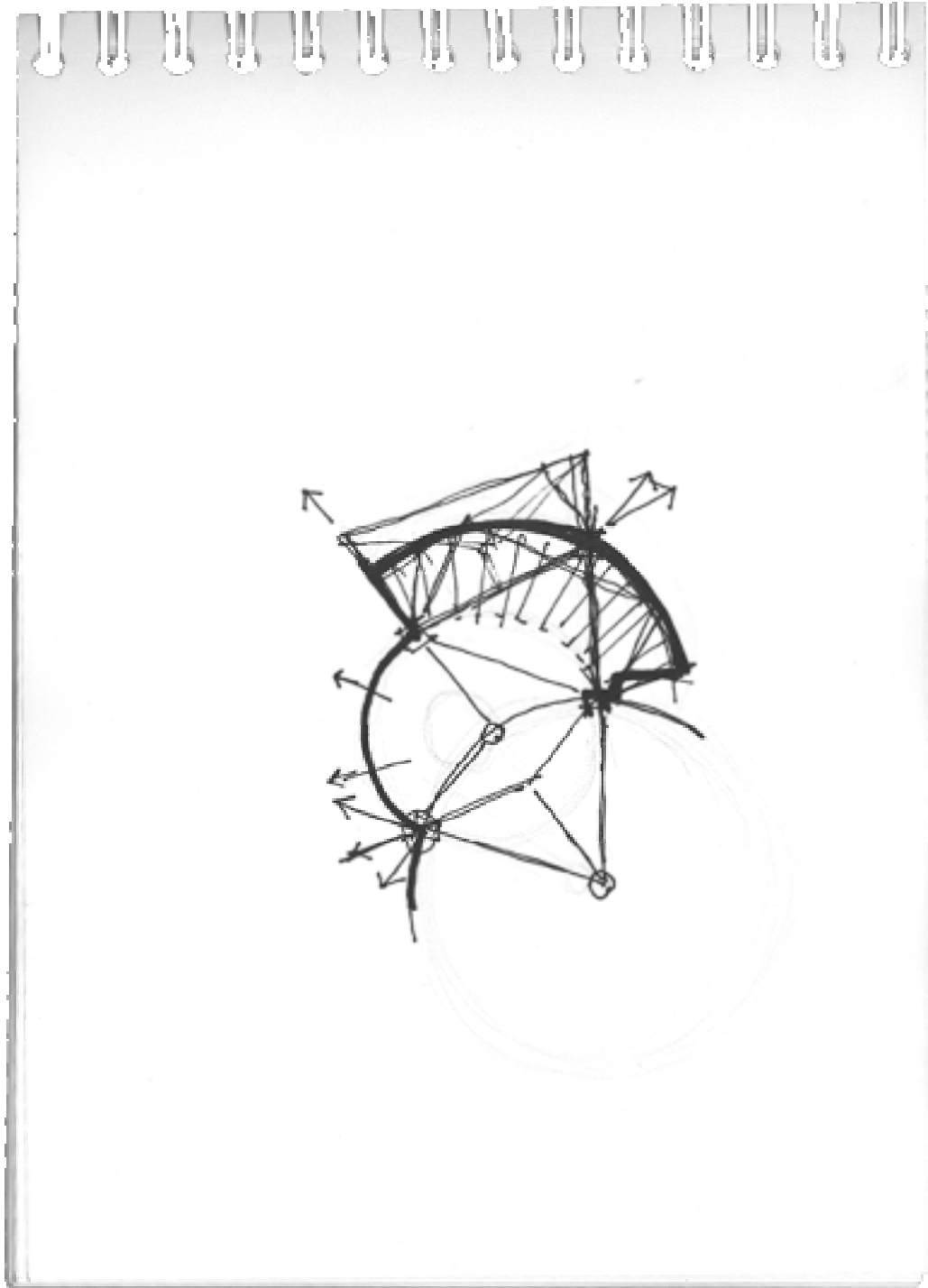
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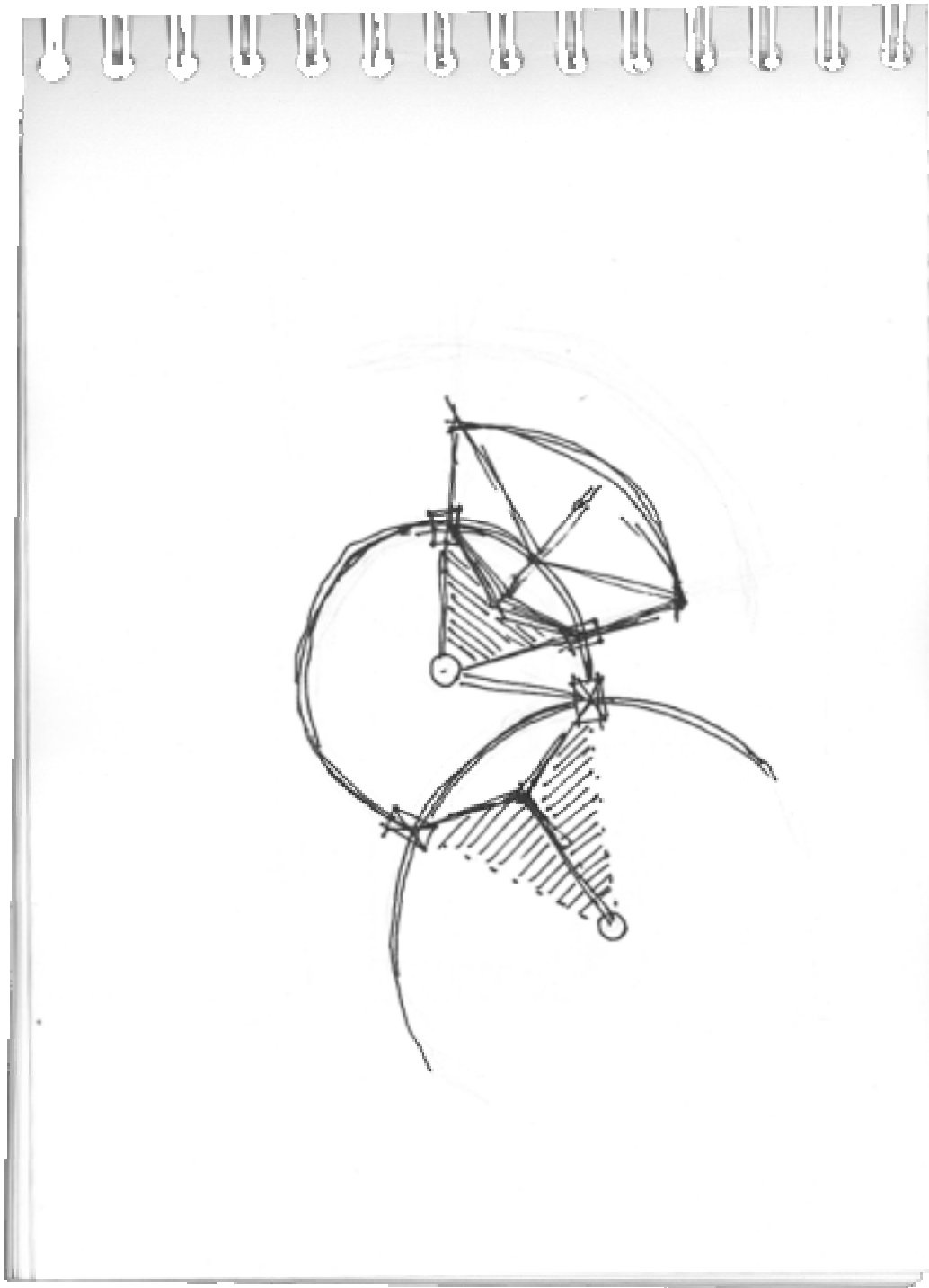
### Structure development in plan



Structure development in plan



Structure development in plan

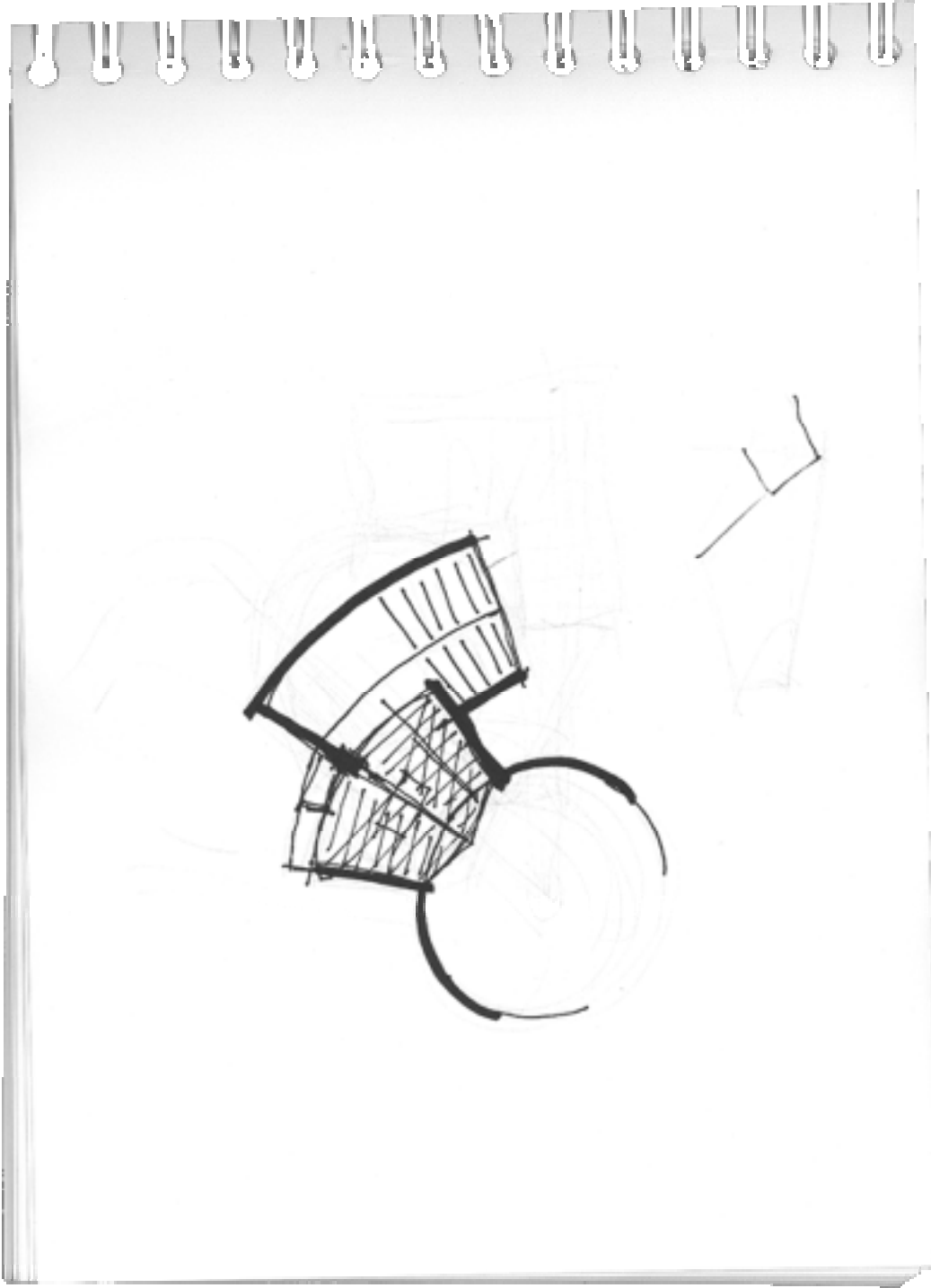


Structure development in plan



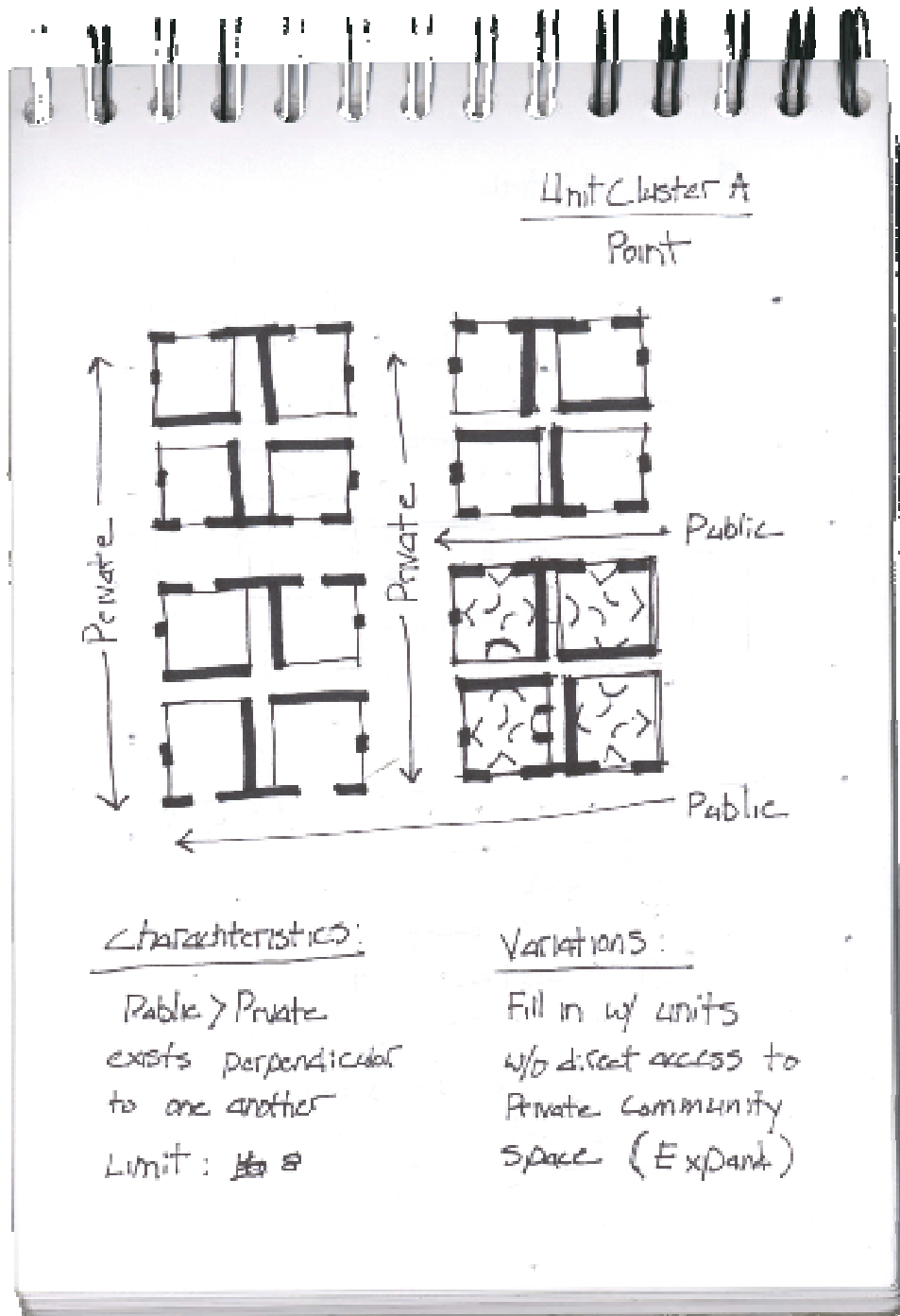
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Structure development in plan

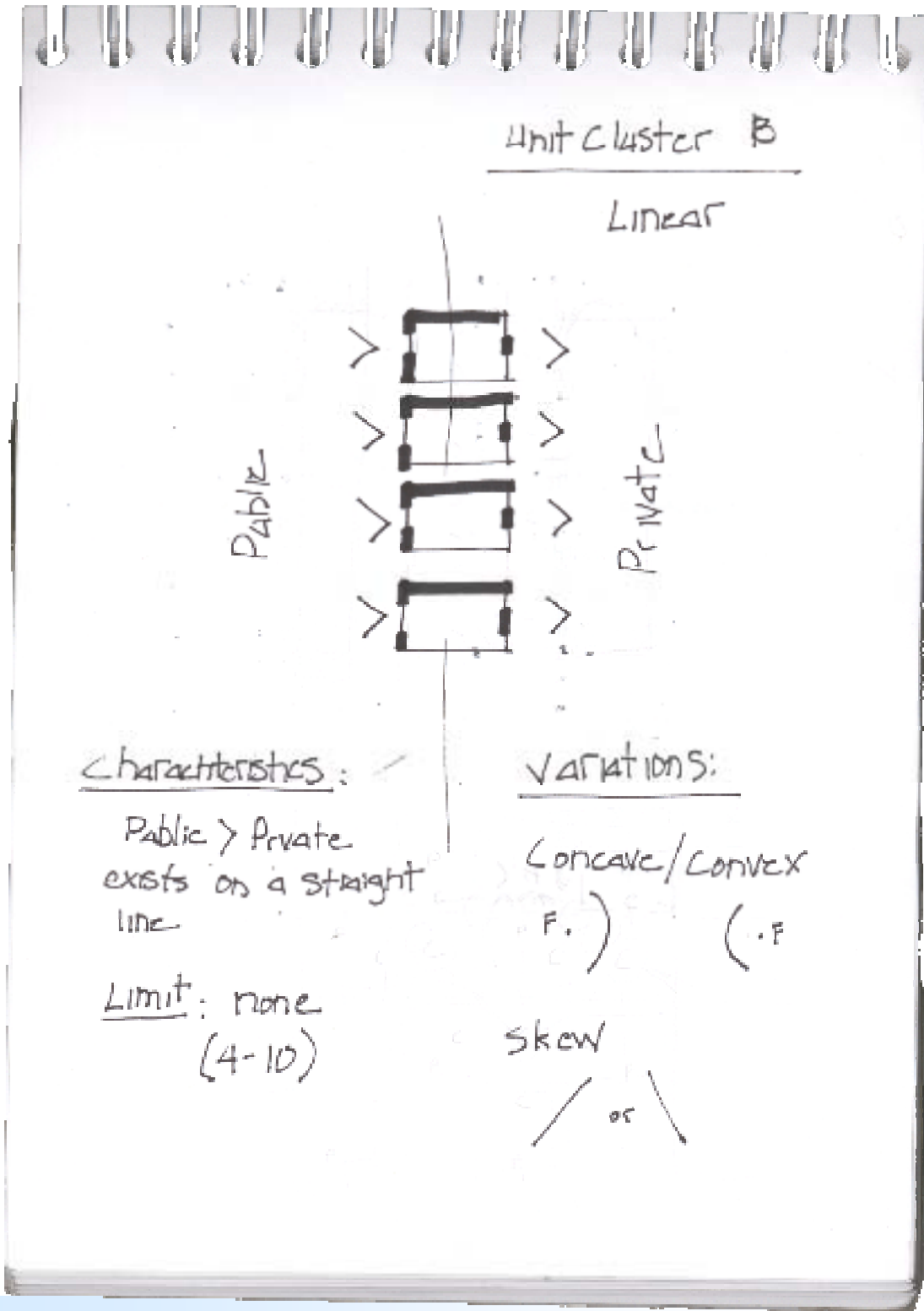




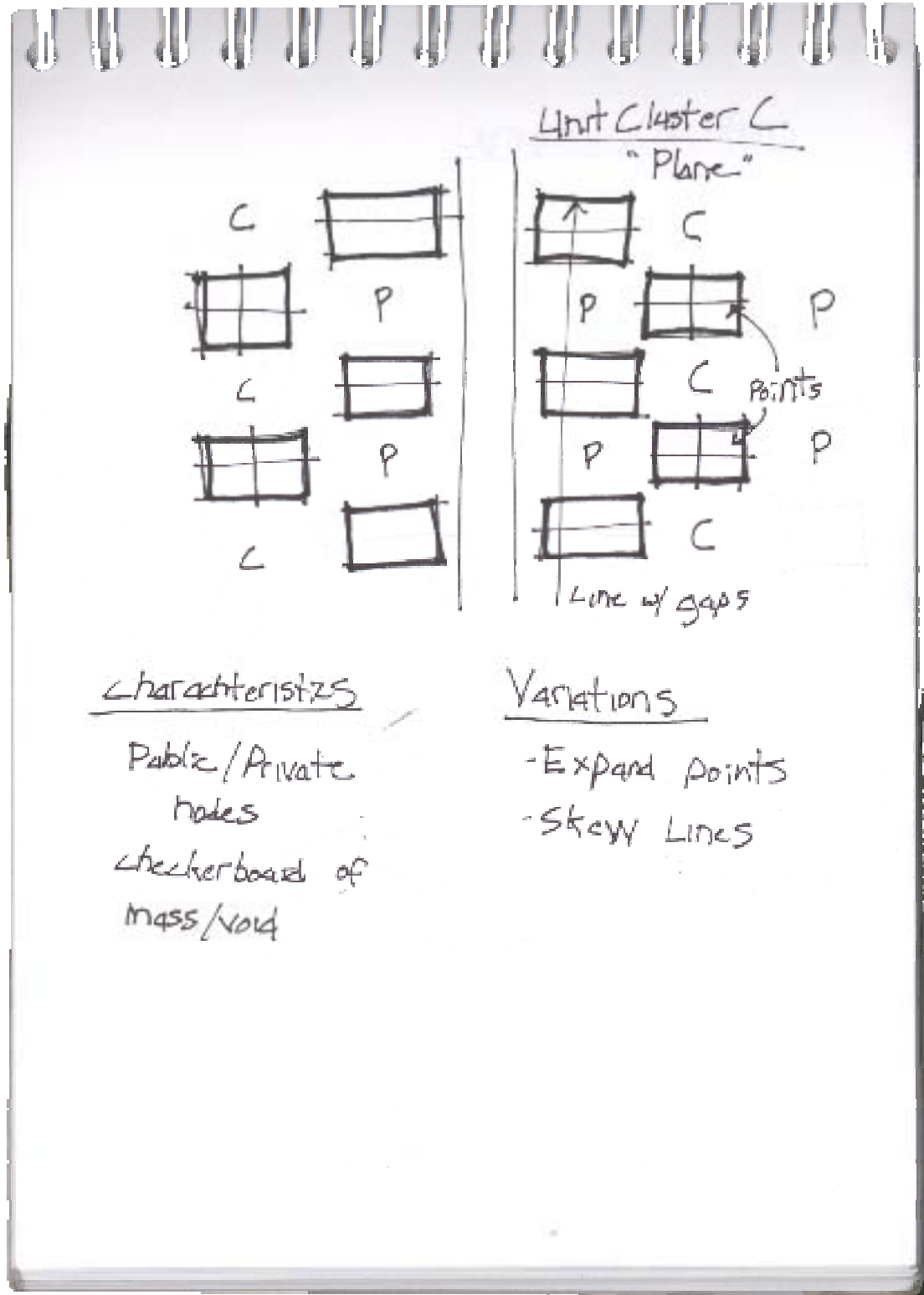
Customization System development



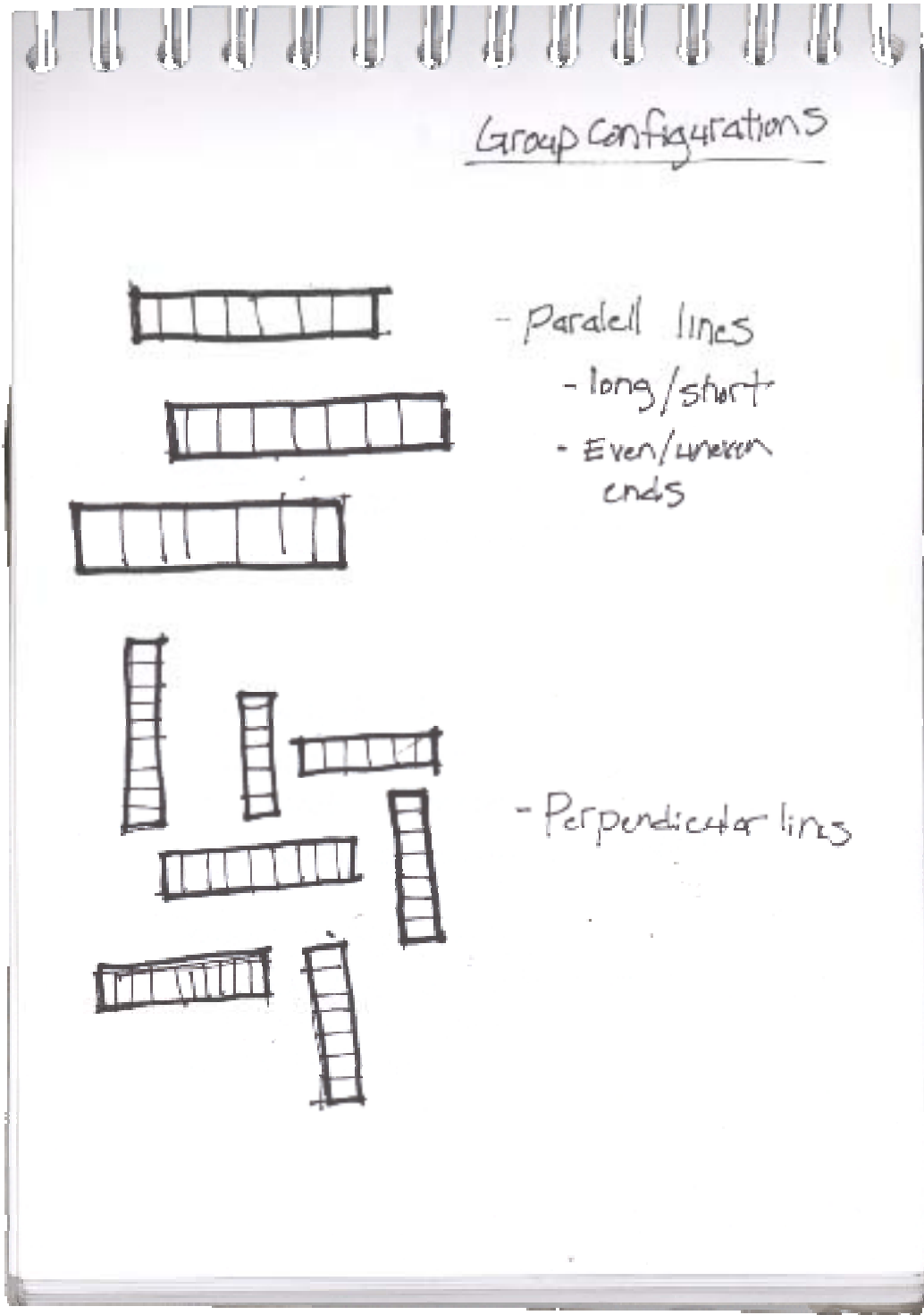
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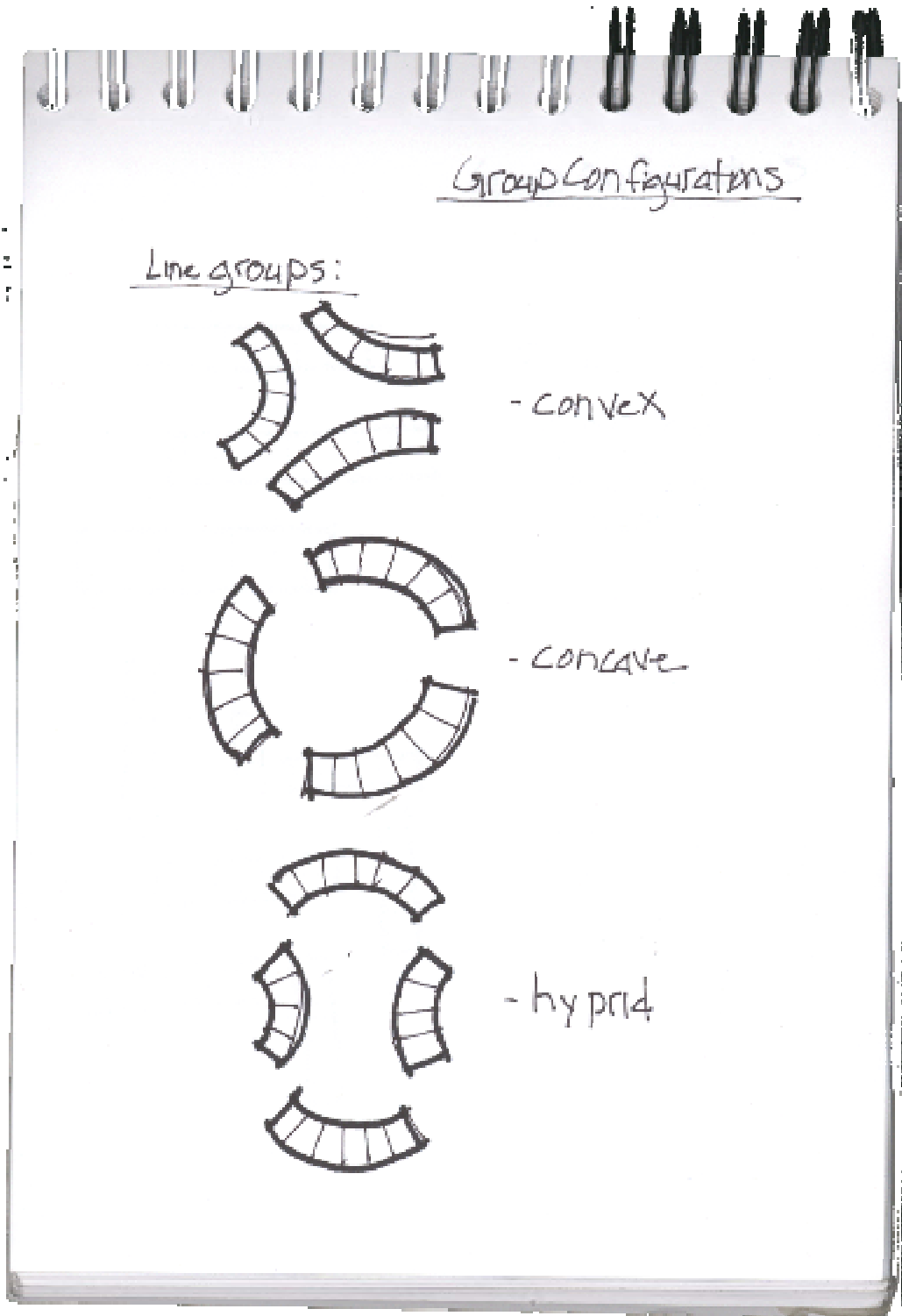
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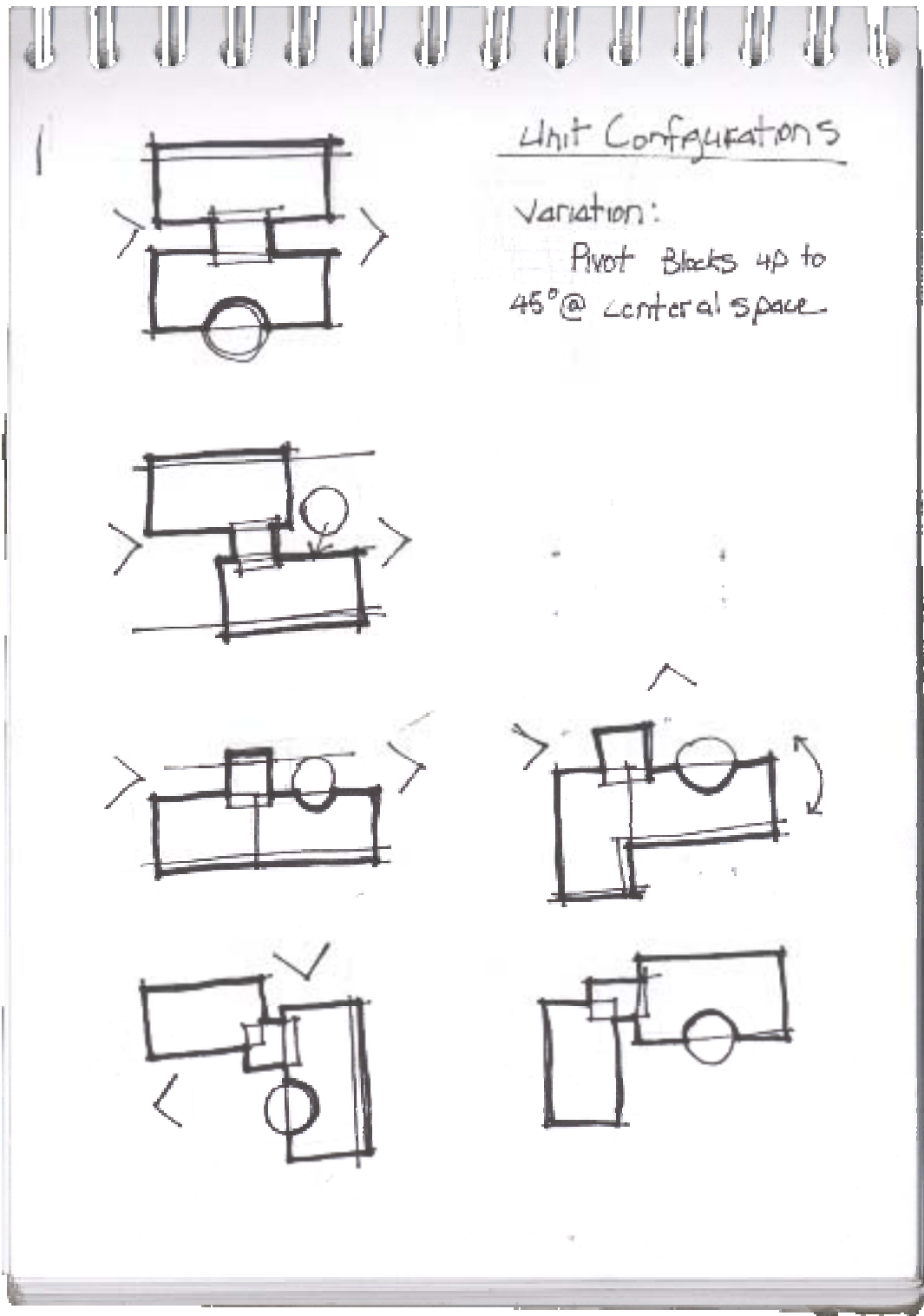
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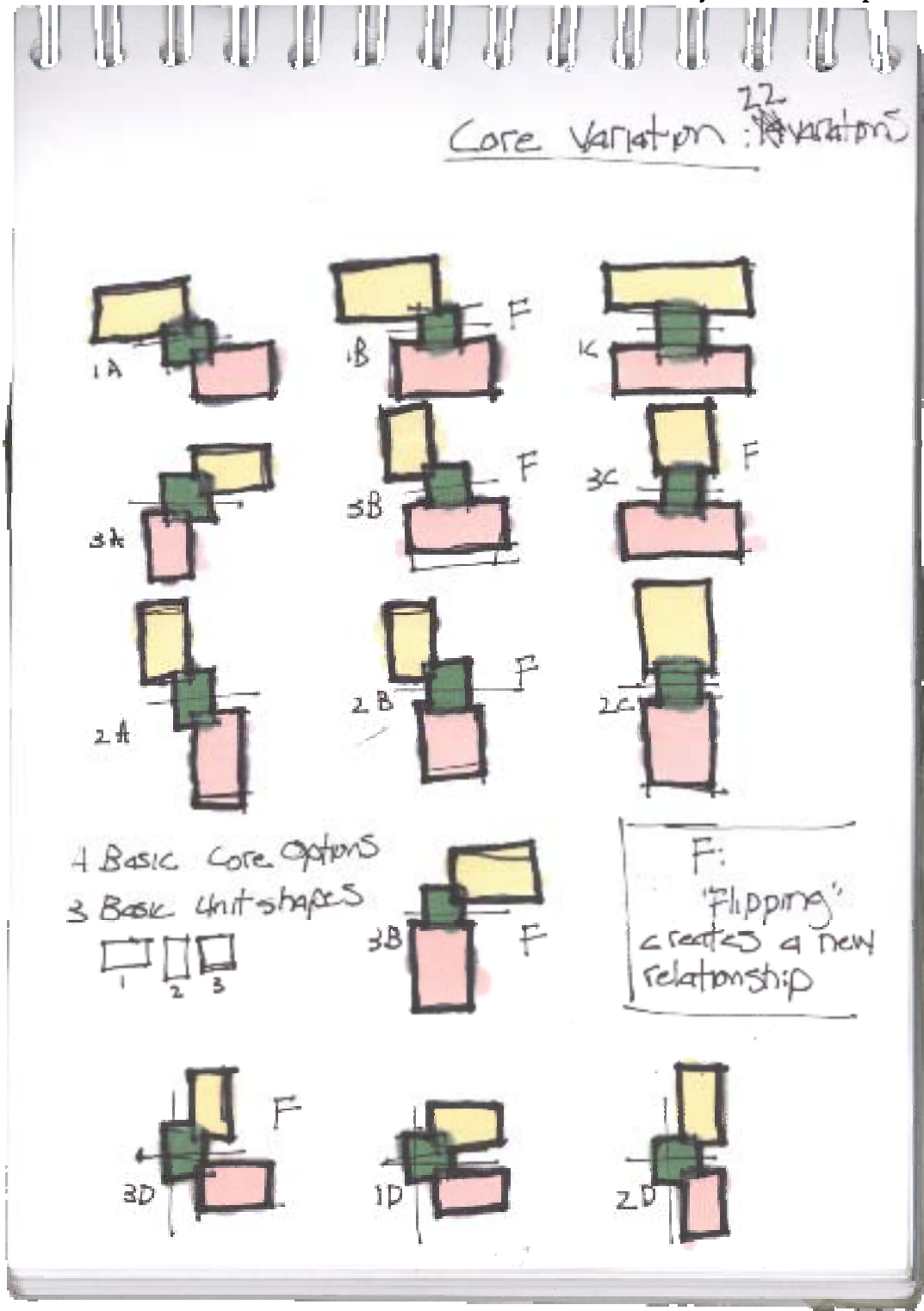
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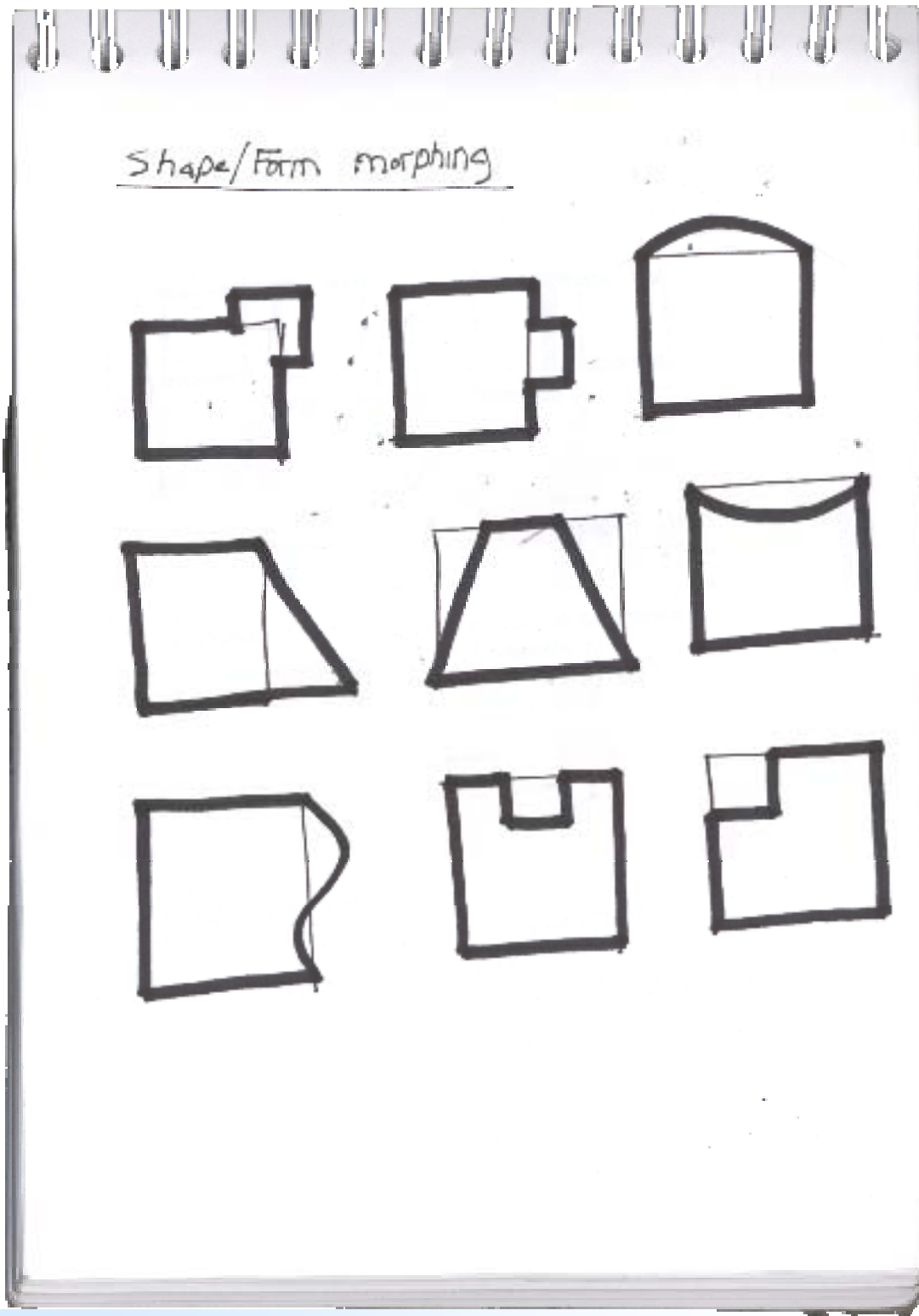
## Customization System development



Customization system development

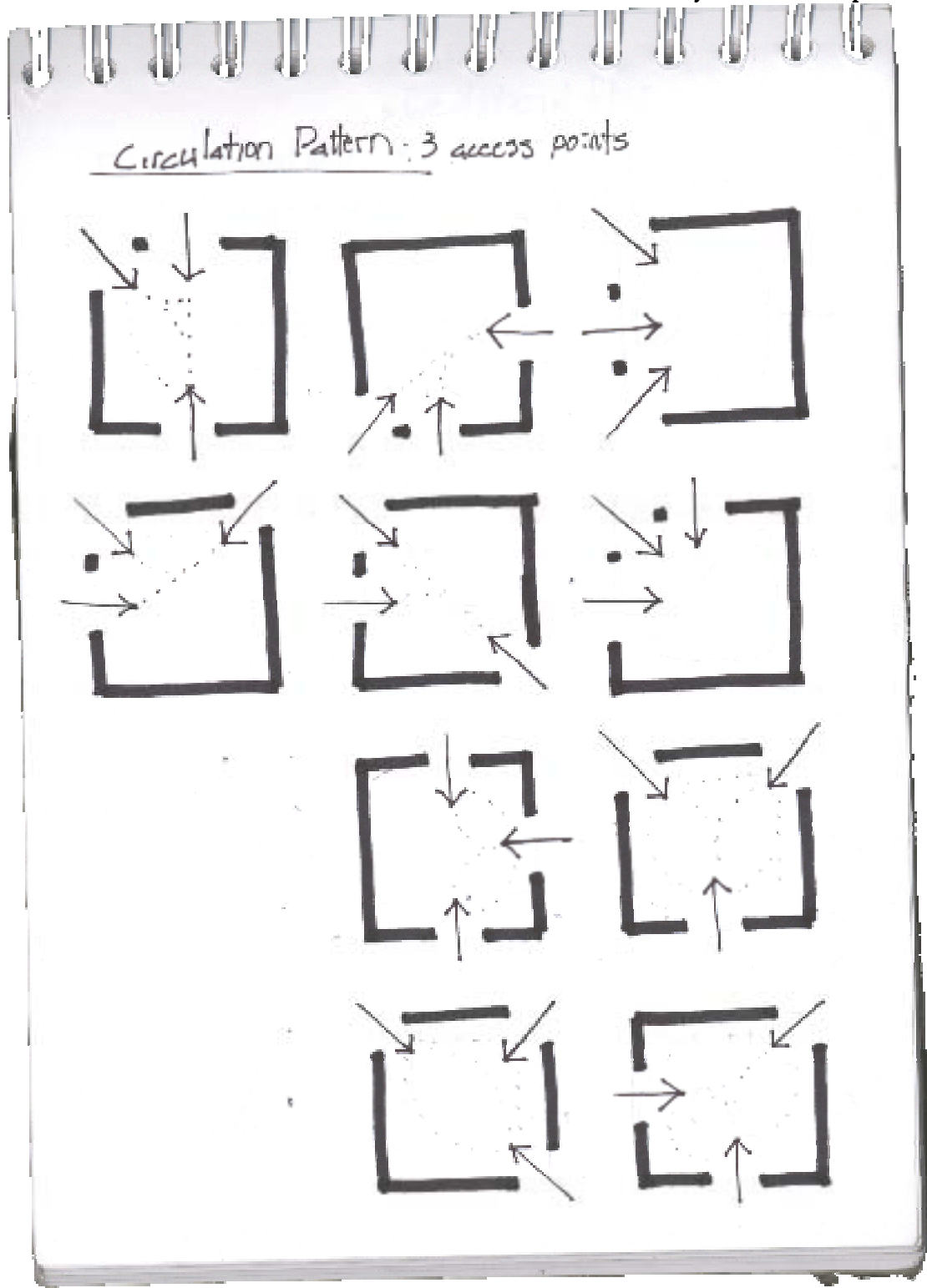


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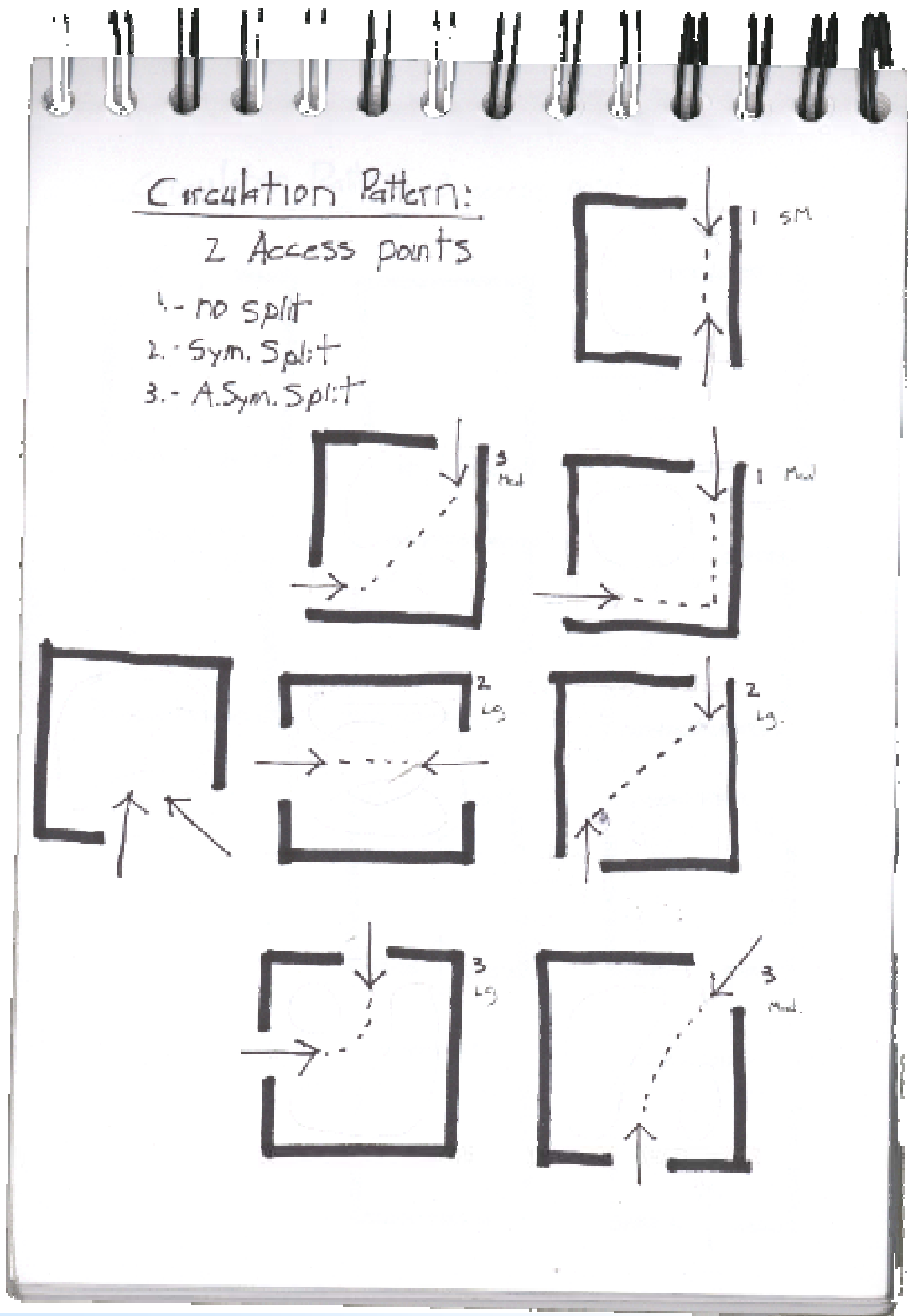




Customization system development



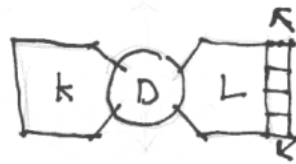
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Customization system development

Variation in Commons.

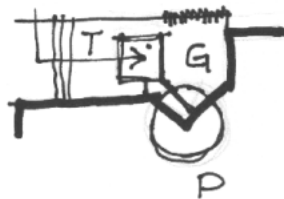
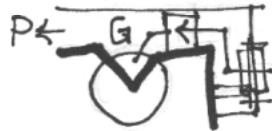
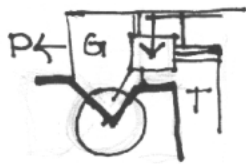
- SIZE
- Shape/ ~~orientation~~
- ~~orientation~~ orientation



## Customization System development

### Variation in Entry/Exterior

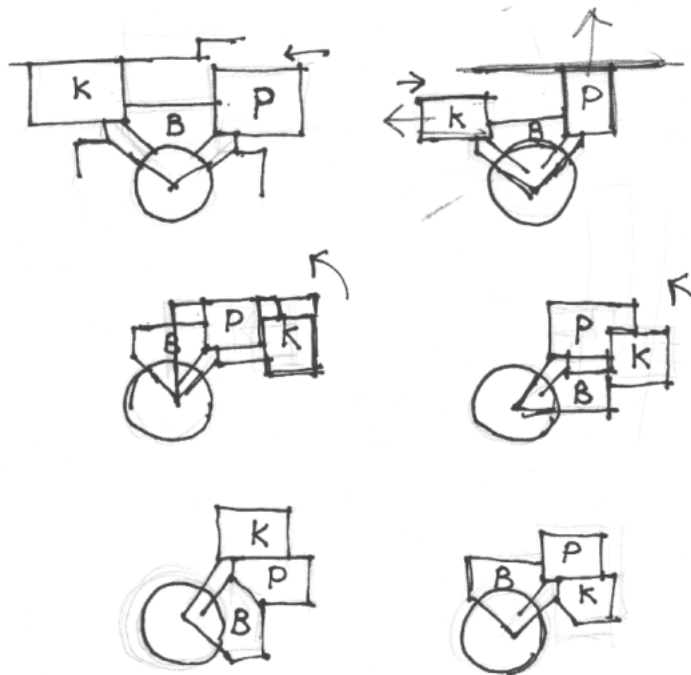
- Location
  - Orientation
  - Features (Sala etc.)
- } Entry/Door



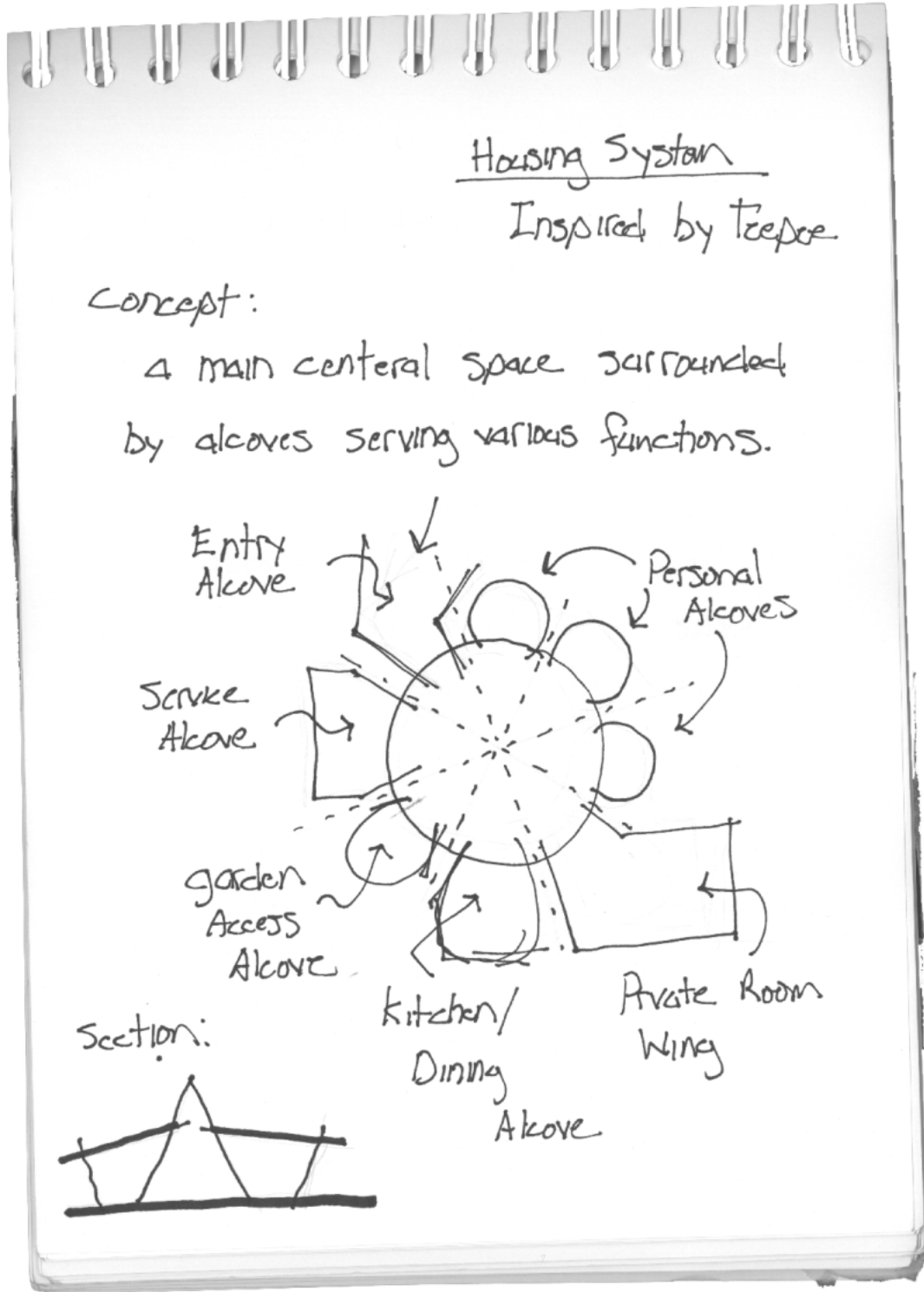
Customization system development

Variation in Private Wings:

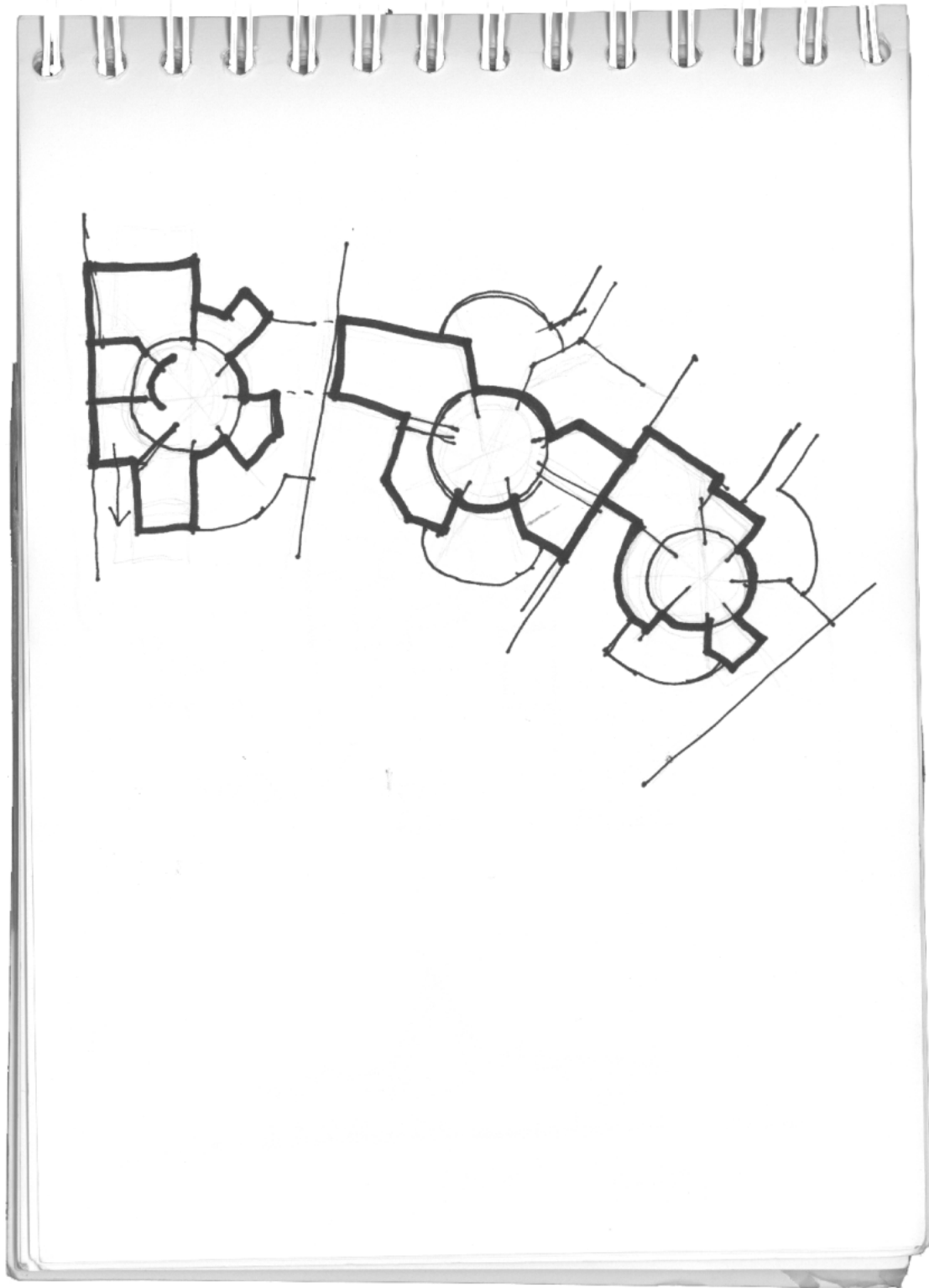
- Front/Back ~~orientation~~ Location
- Side-wall orientation



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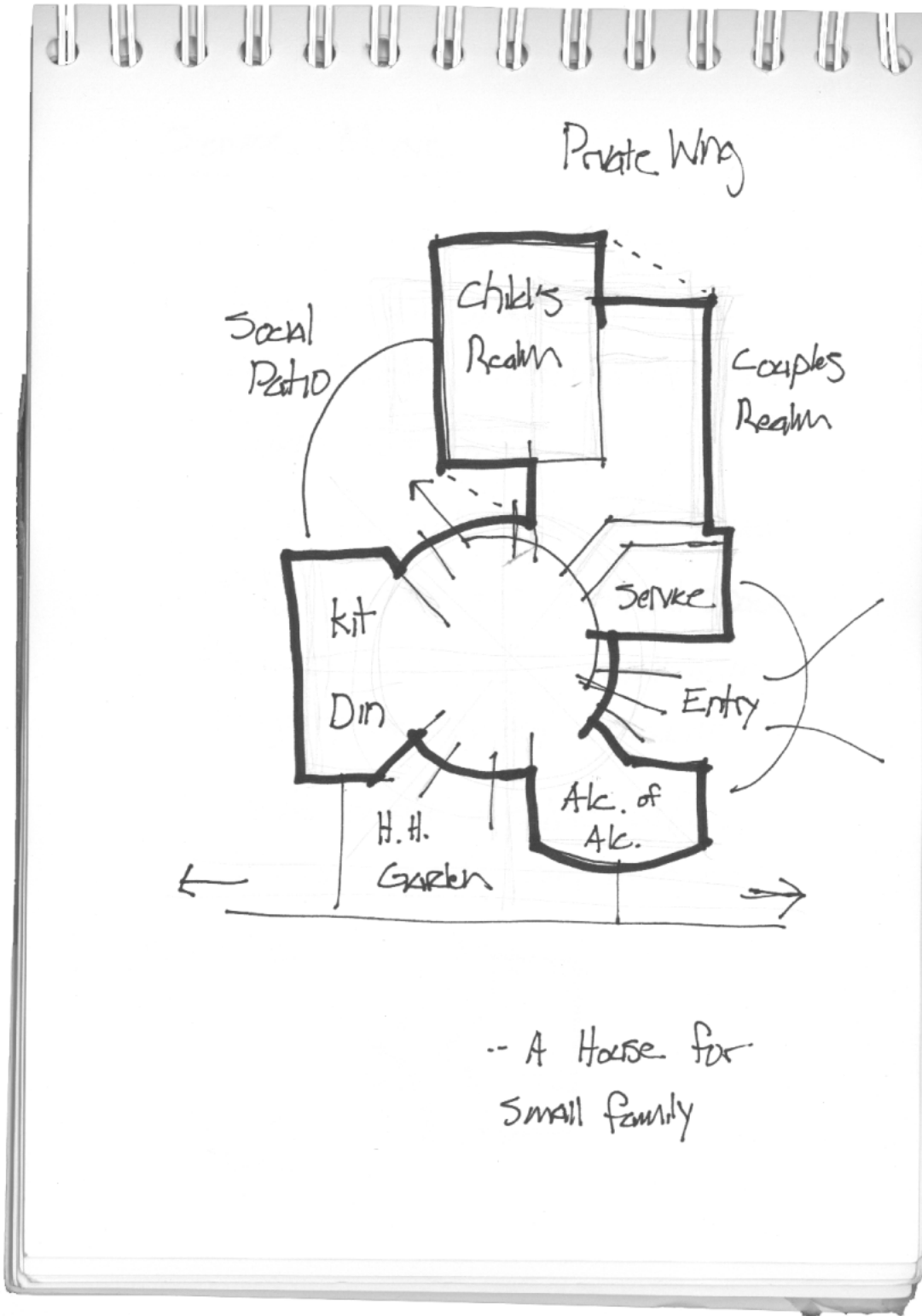


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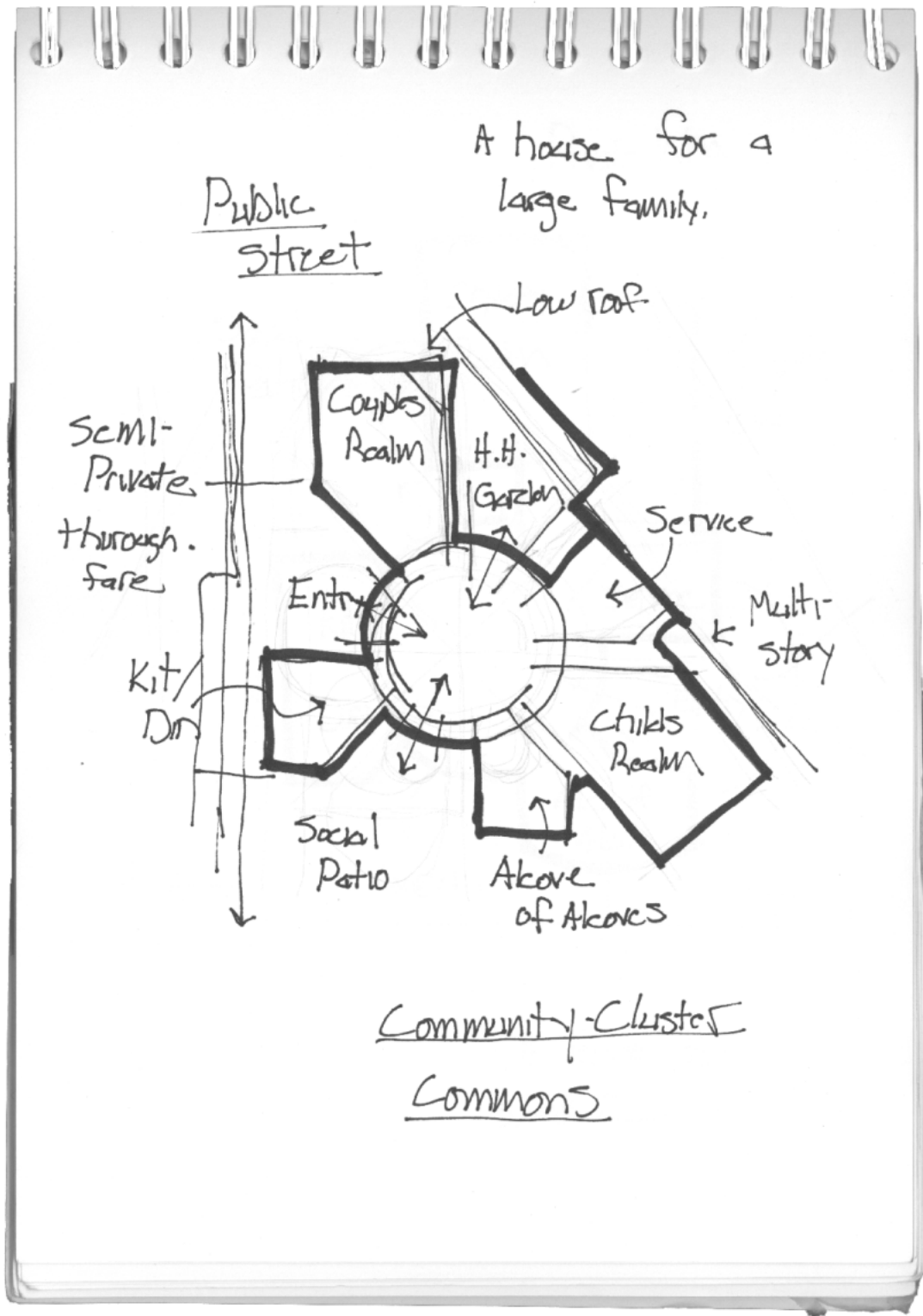
**Native Architecture:** Sustainable design theory applied to affordable housing in a rural setting

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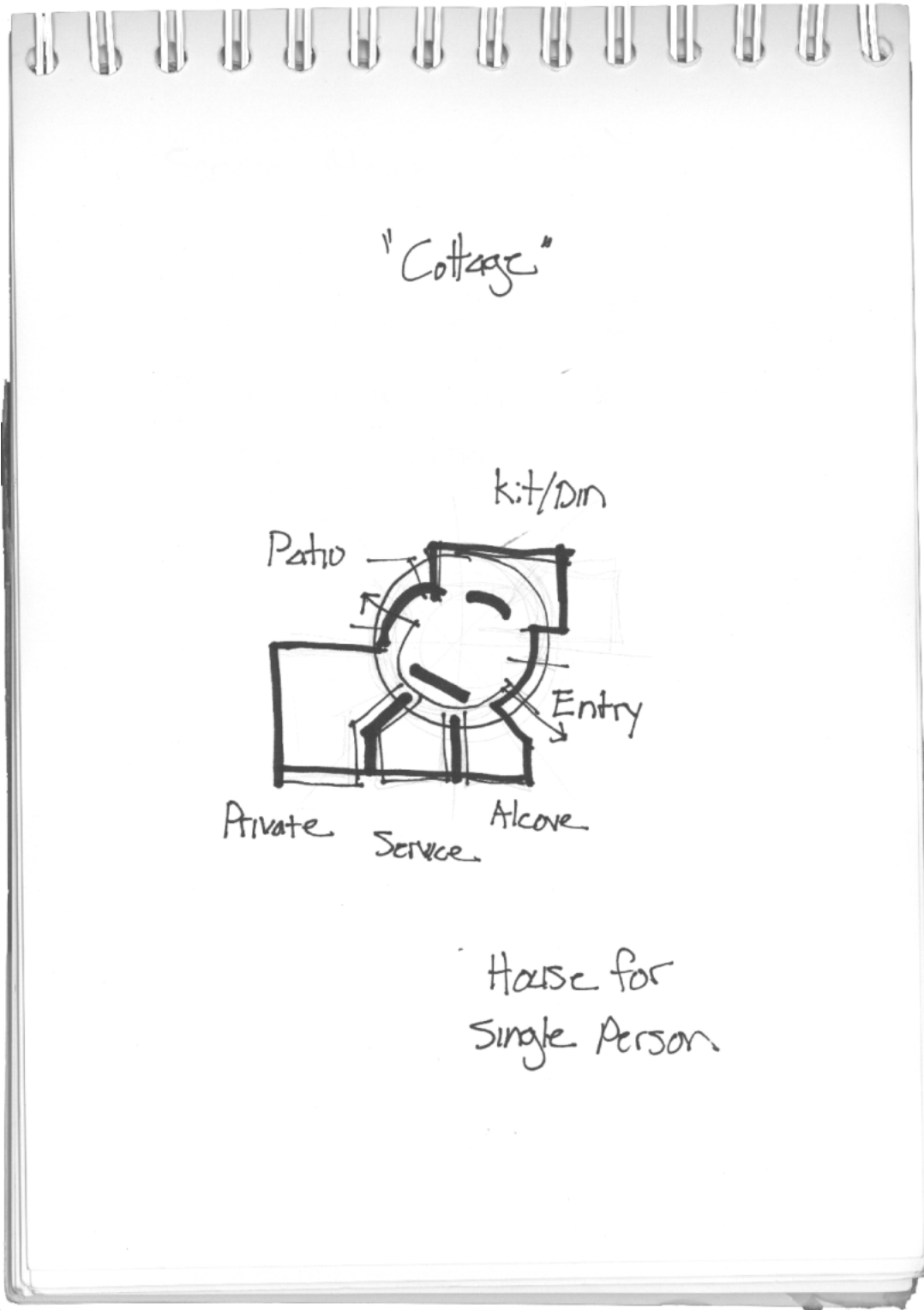




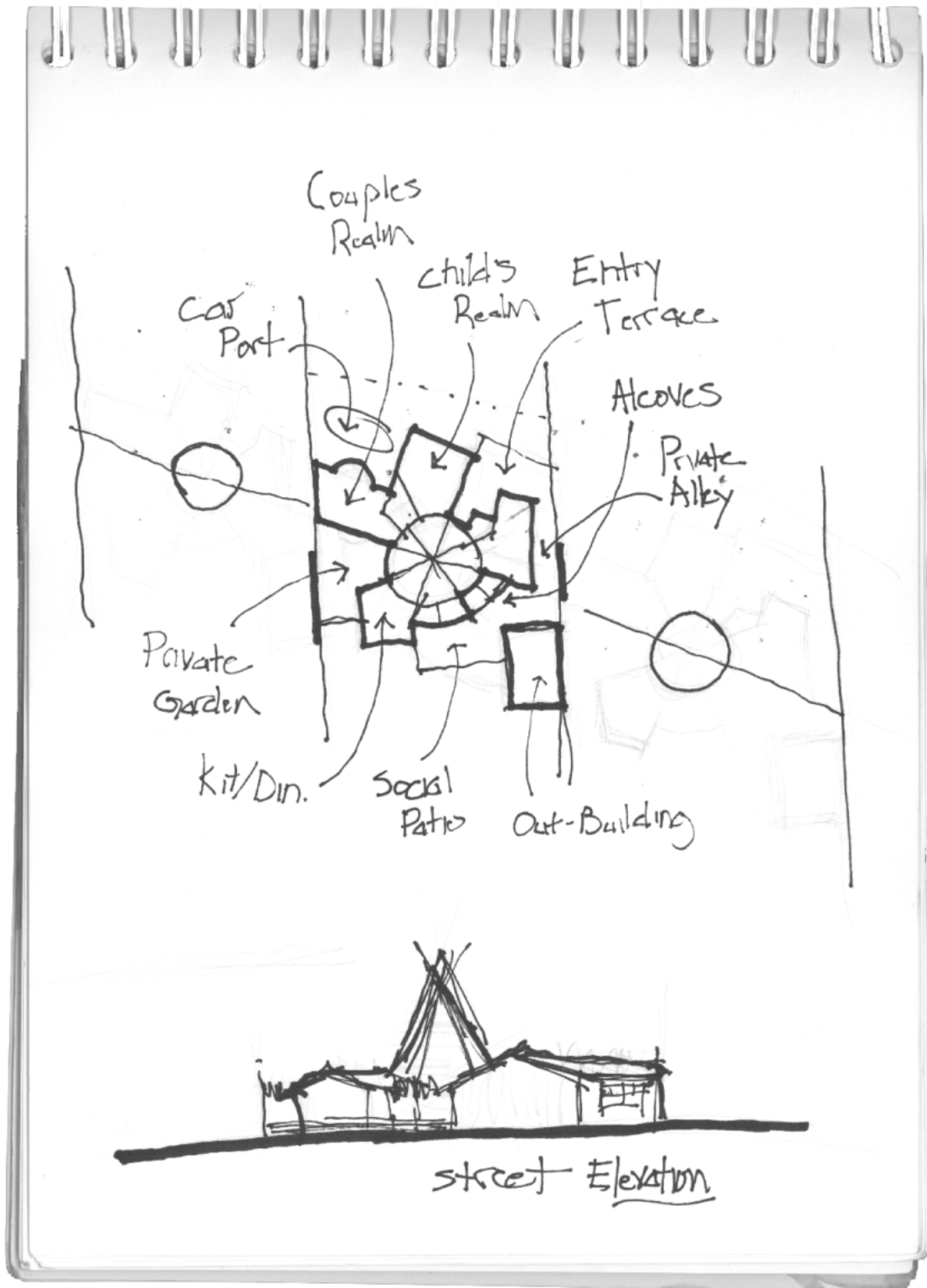
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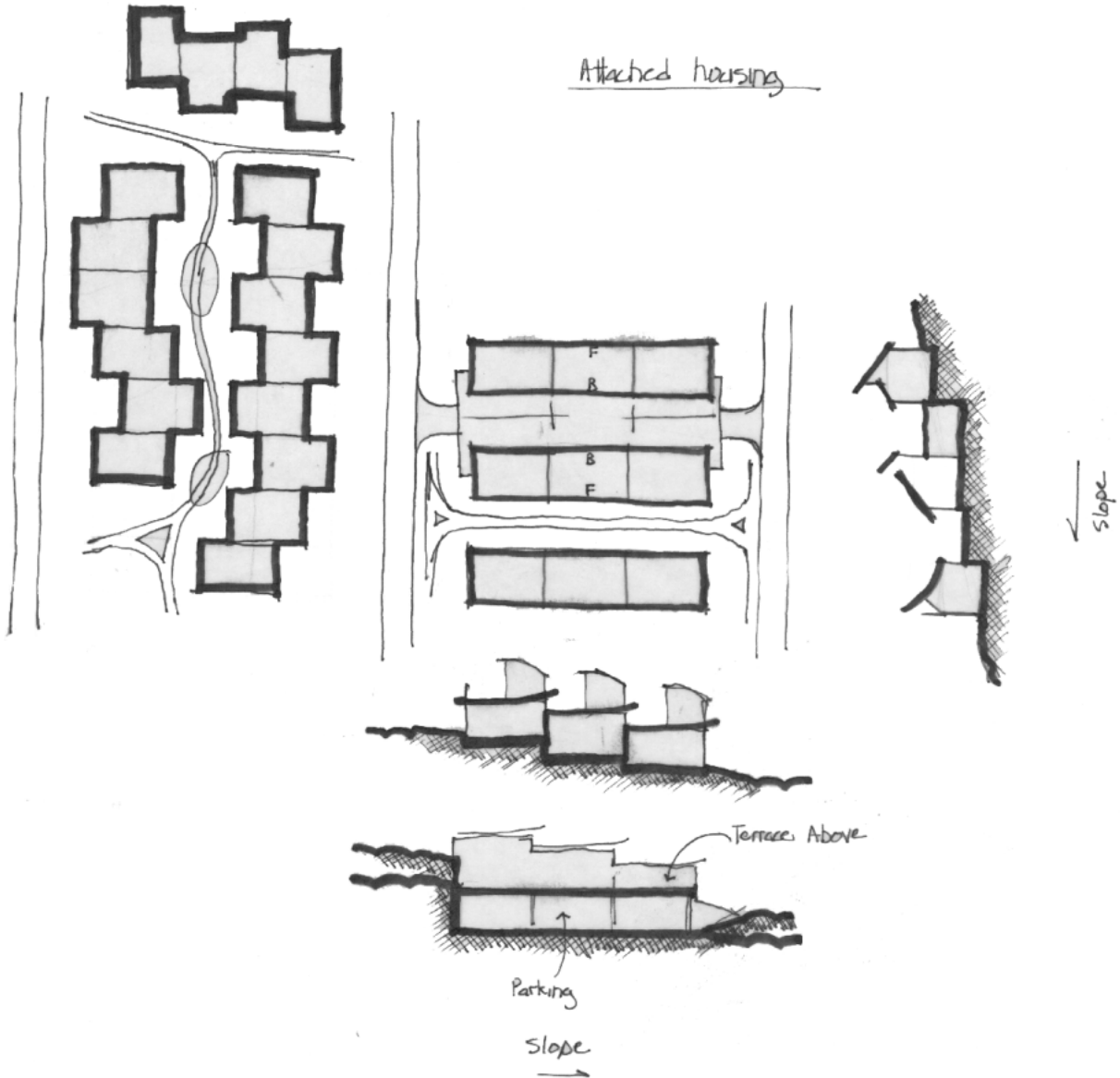


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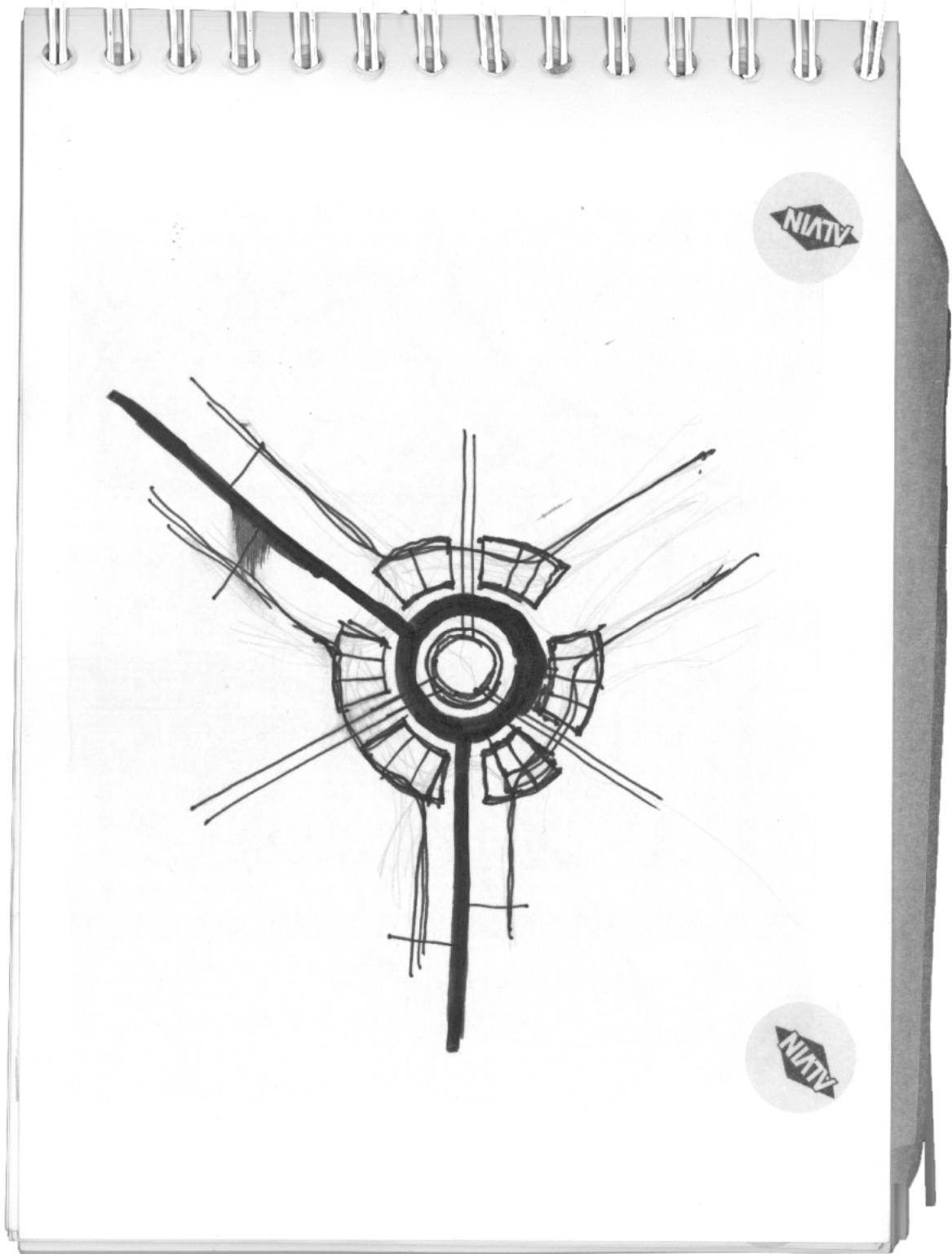


# Process Sketches

## Customization System development

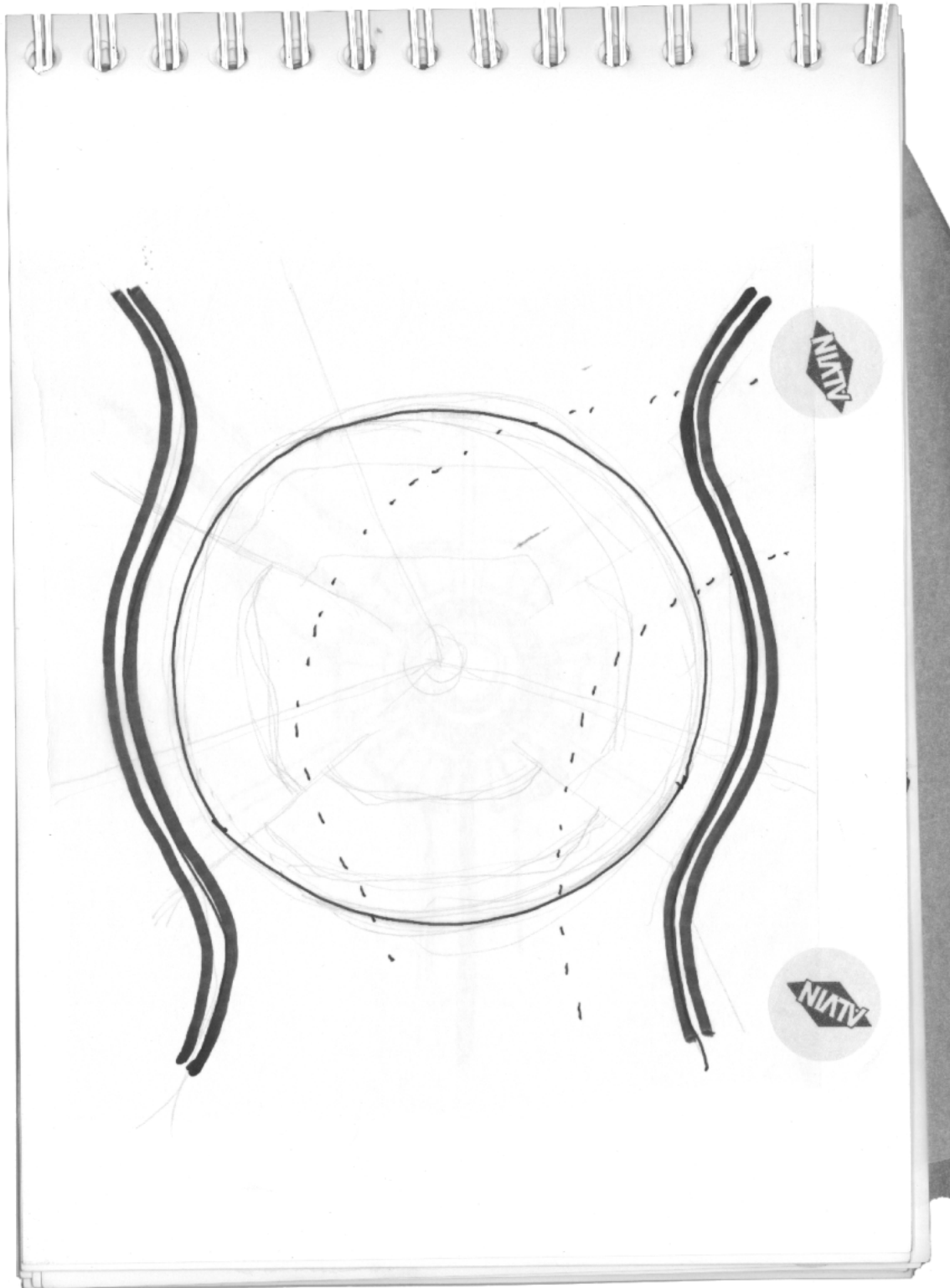


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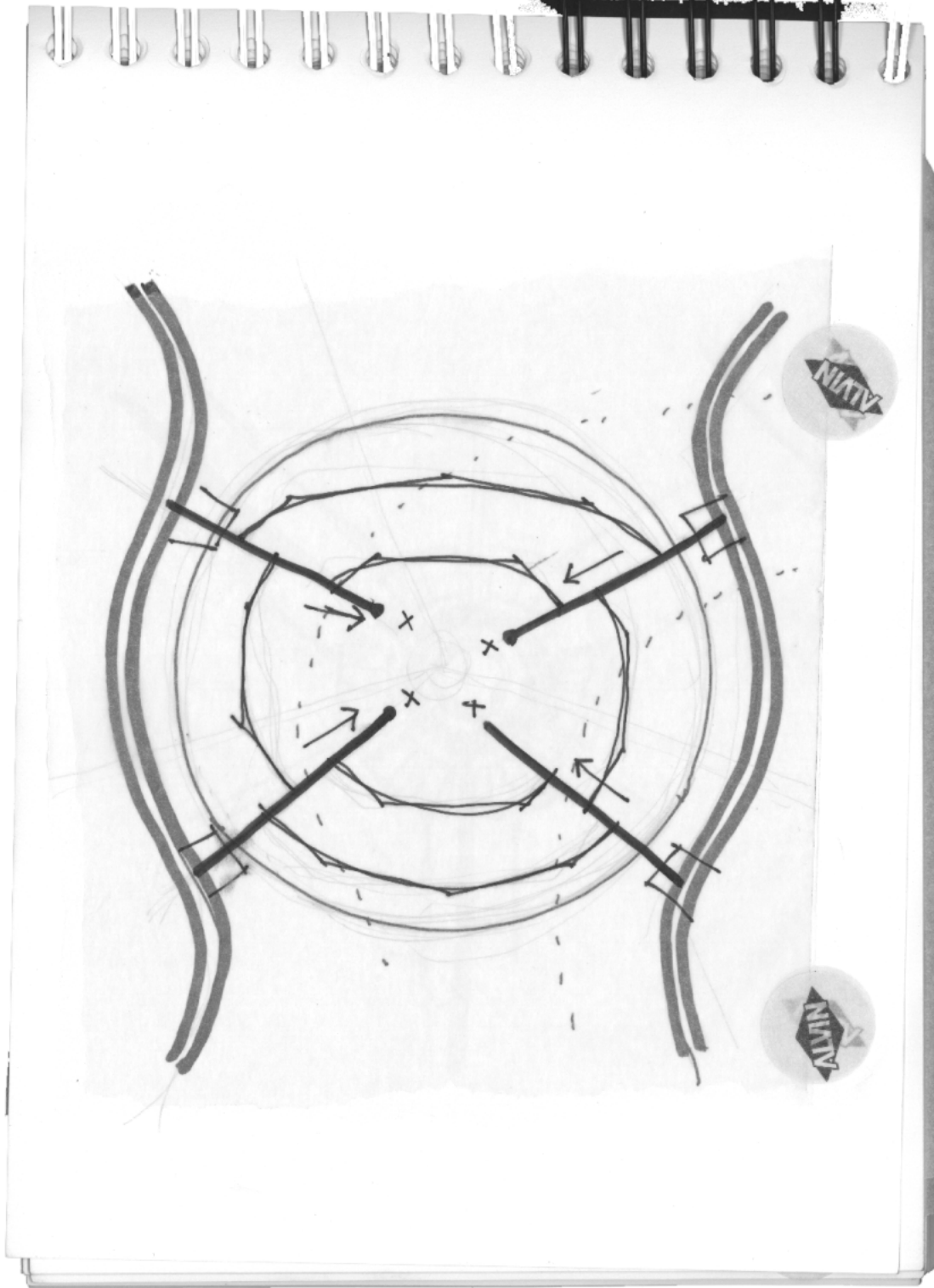


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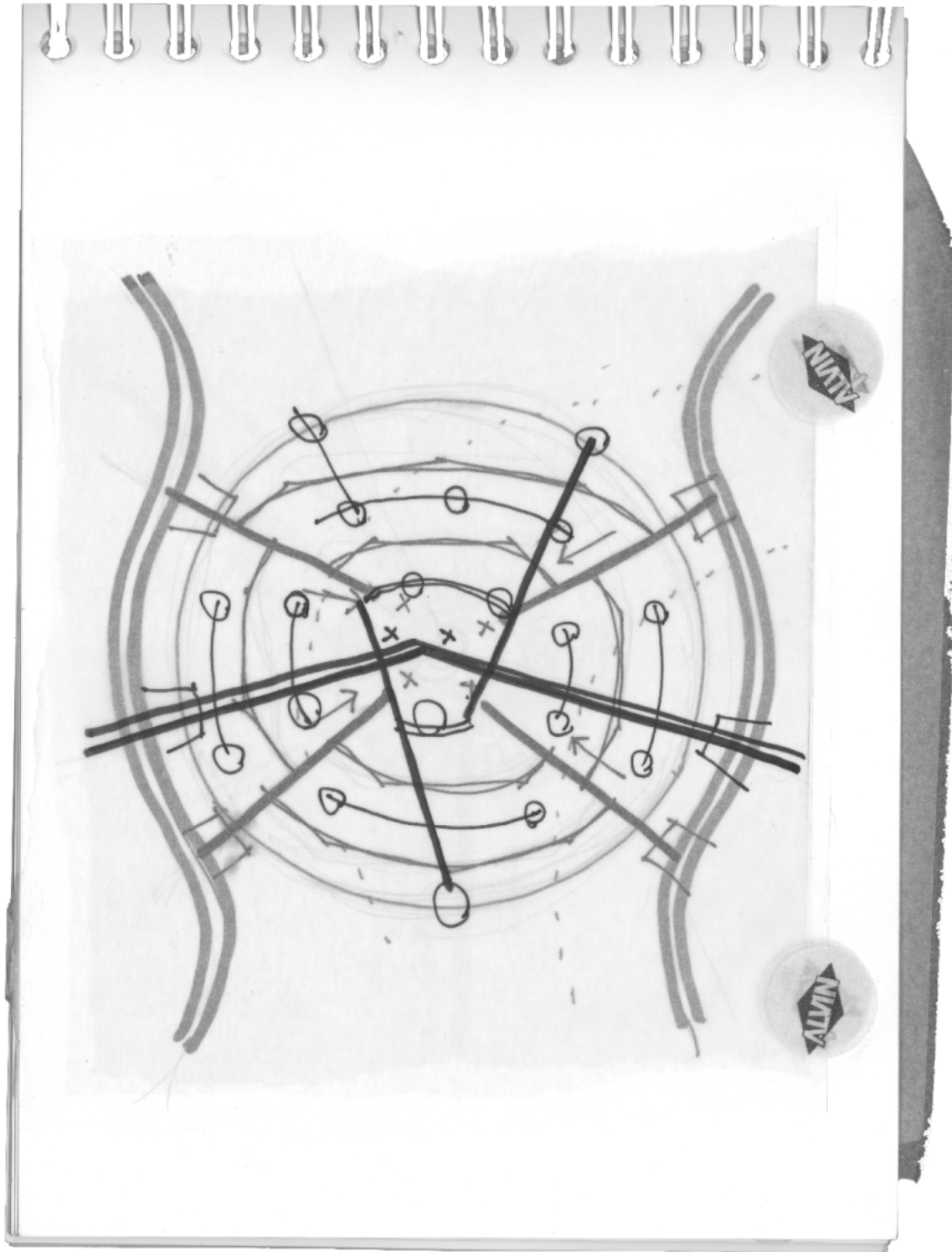


Generic neighborhood development



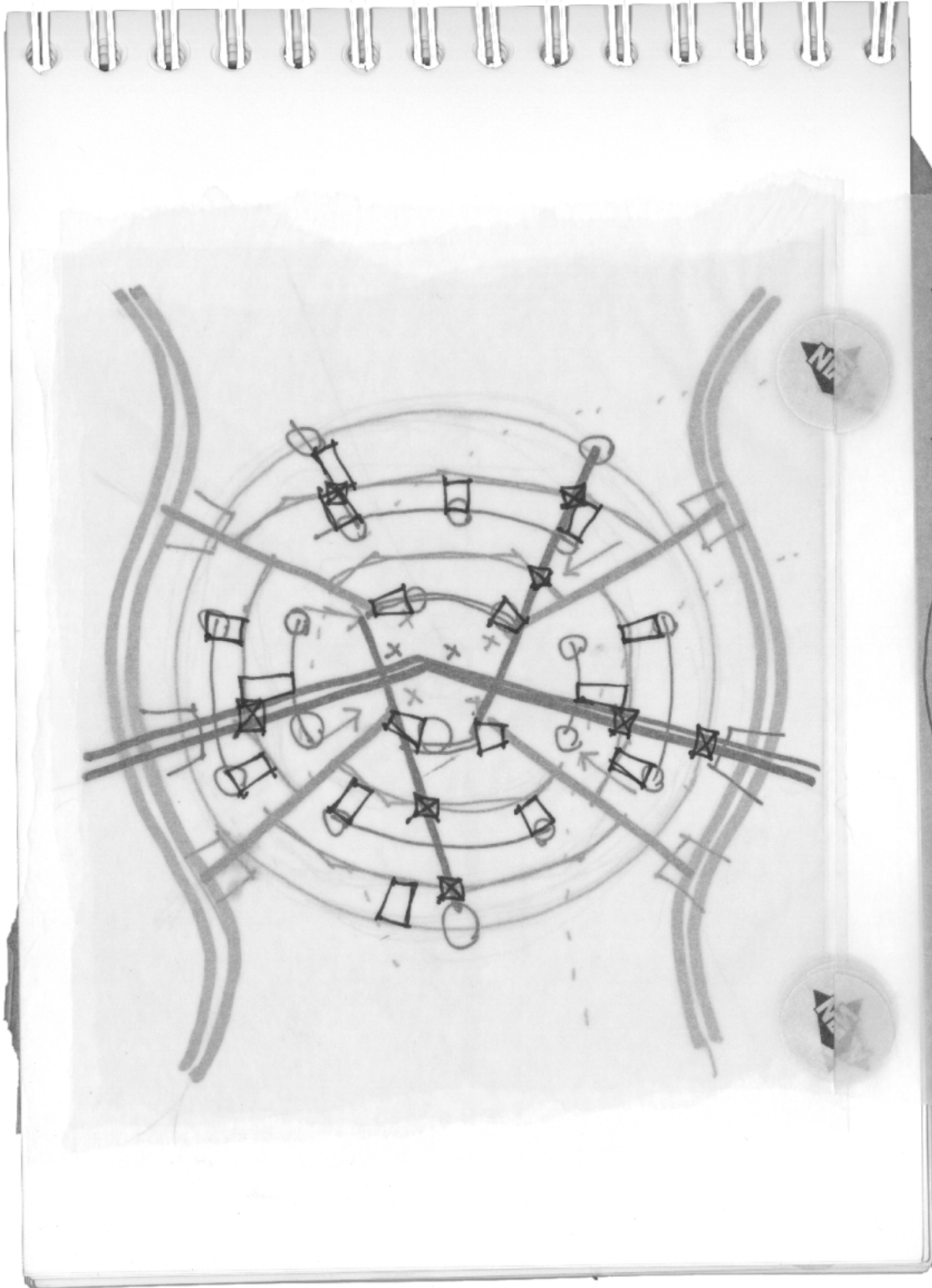
## Process Sketches

### Generic neighborhood development





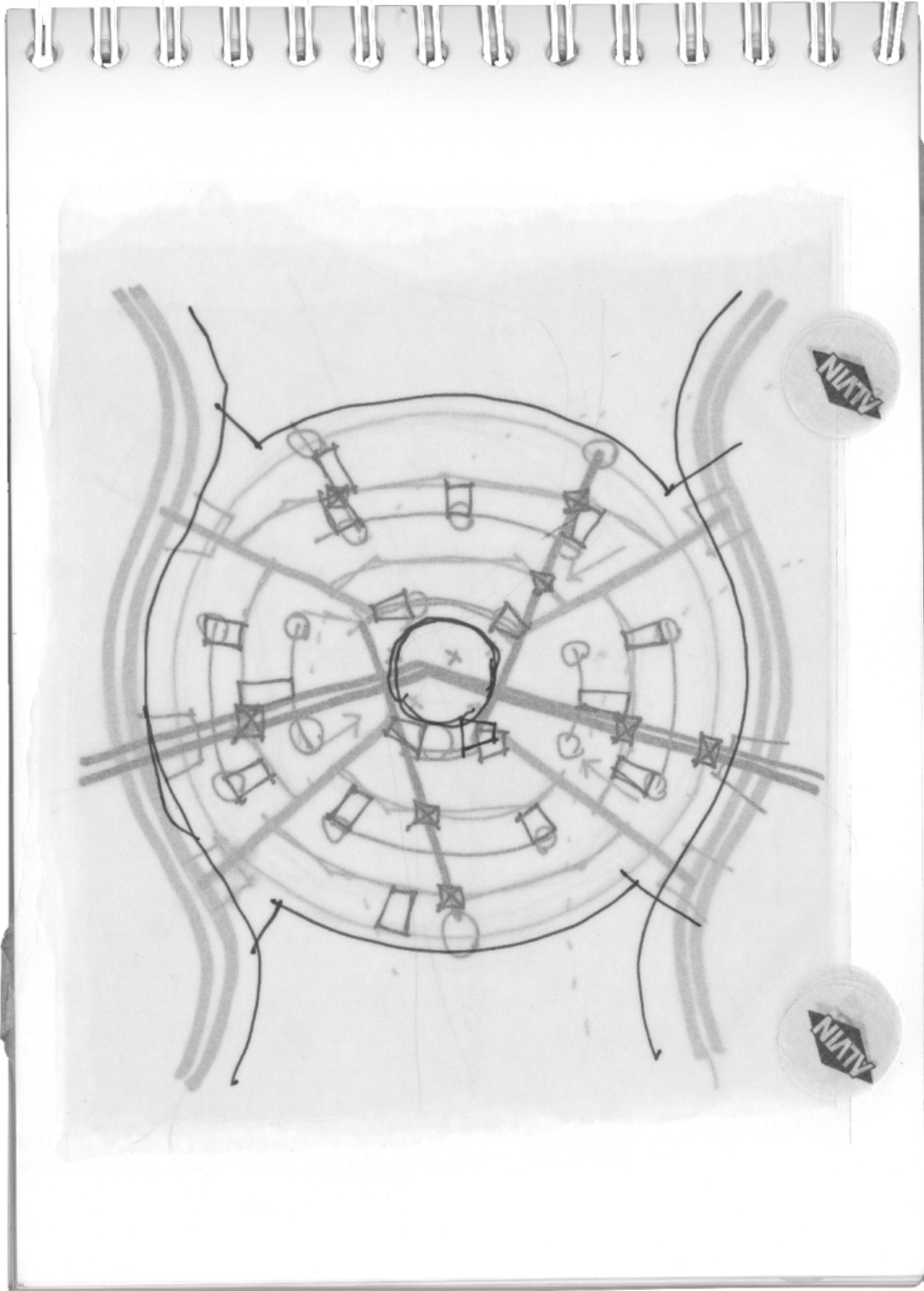
Generic neighborhood development



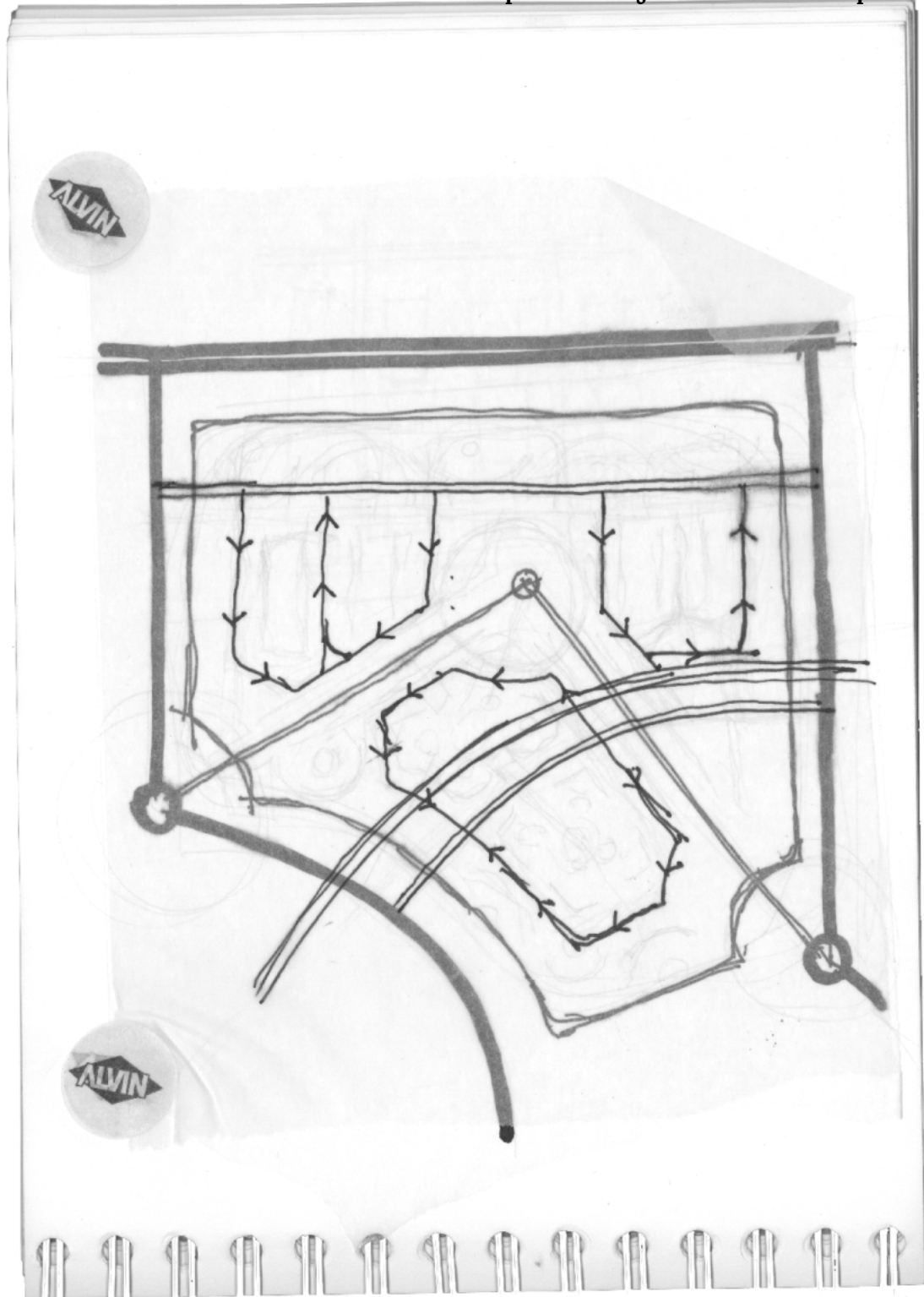
**Native Architecture:** Sustainable design theory applied to affordable housing in a rural setting

## Process Sketches

### Generic neighborhood development

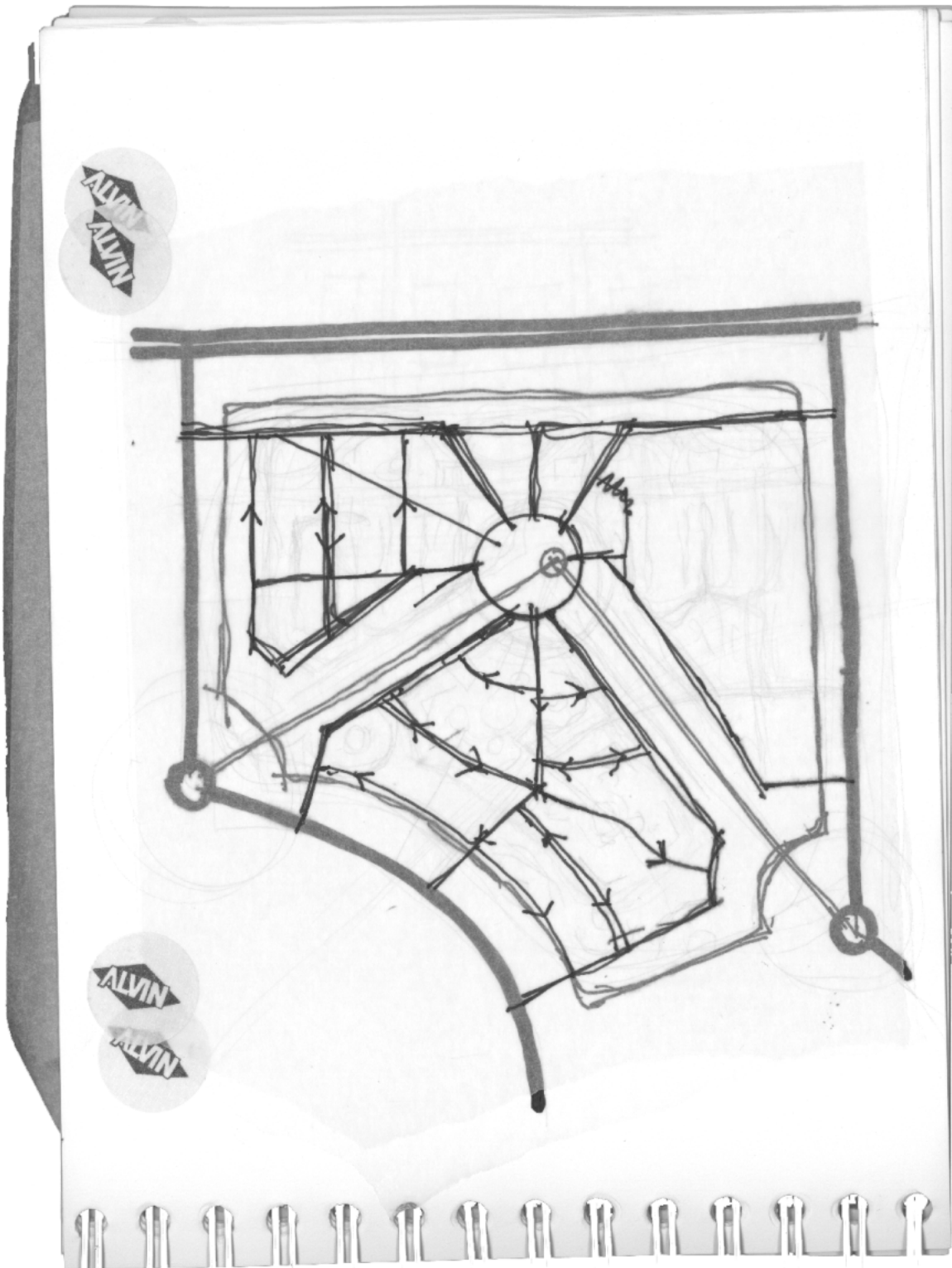


specific neighborhood development

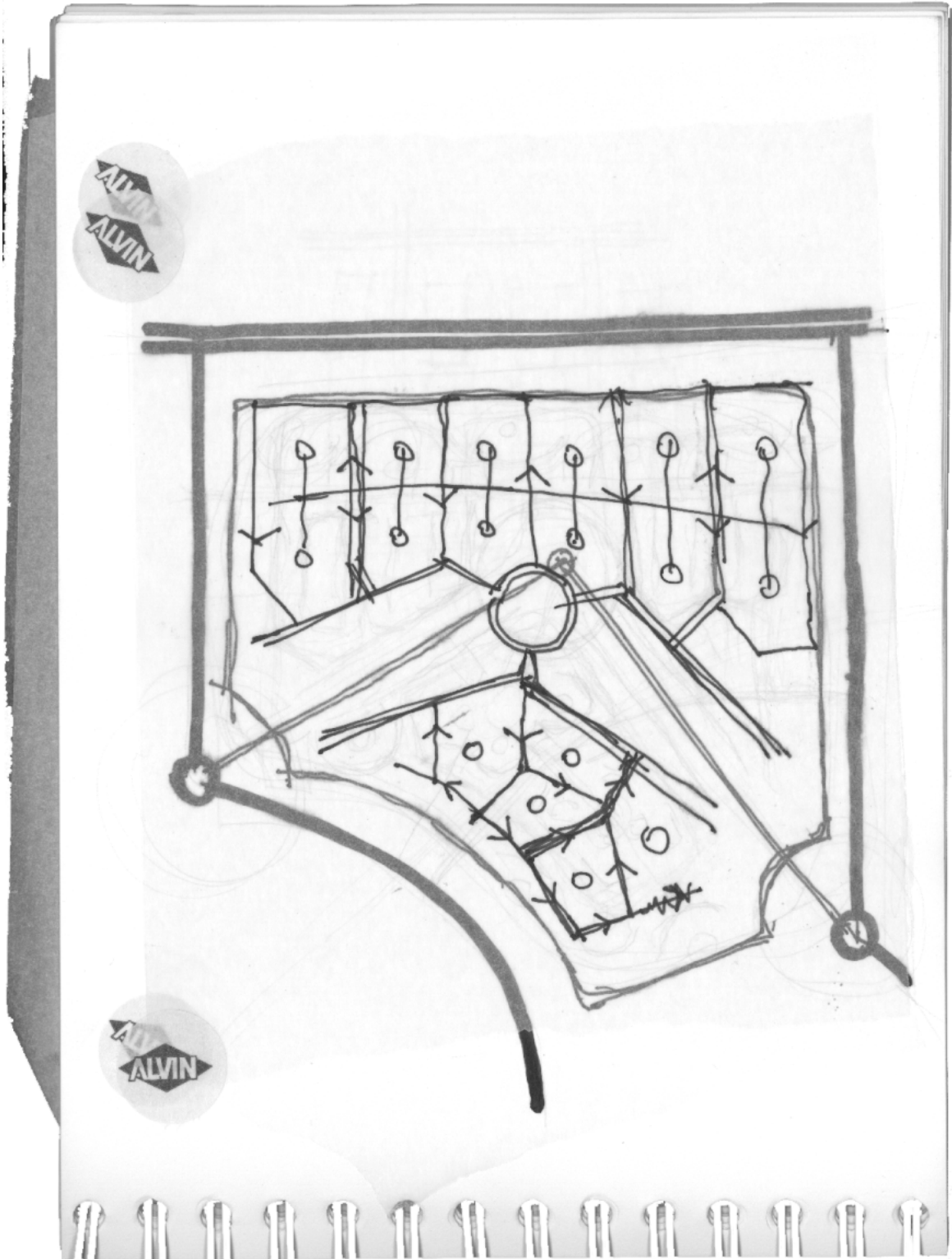


## Process Sketches

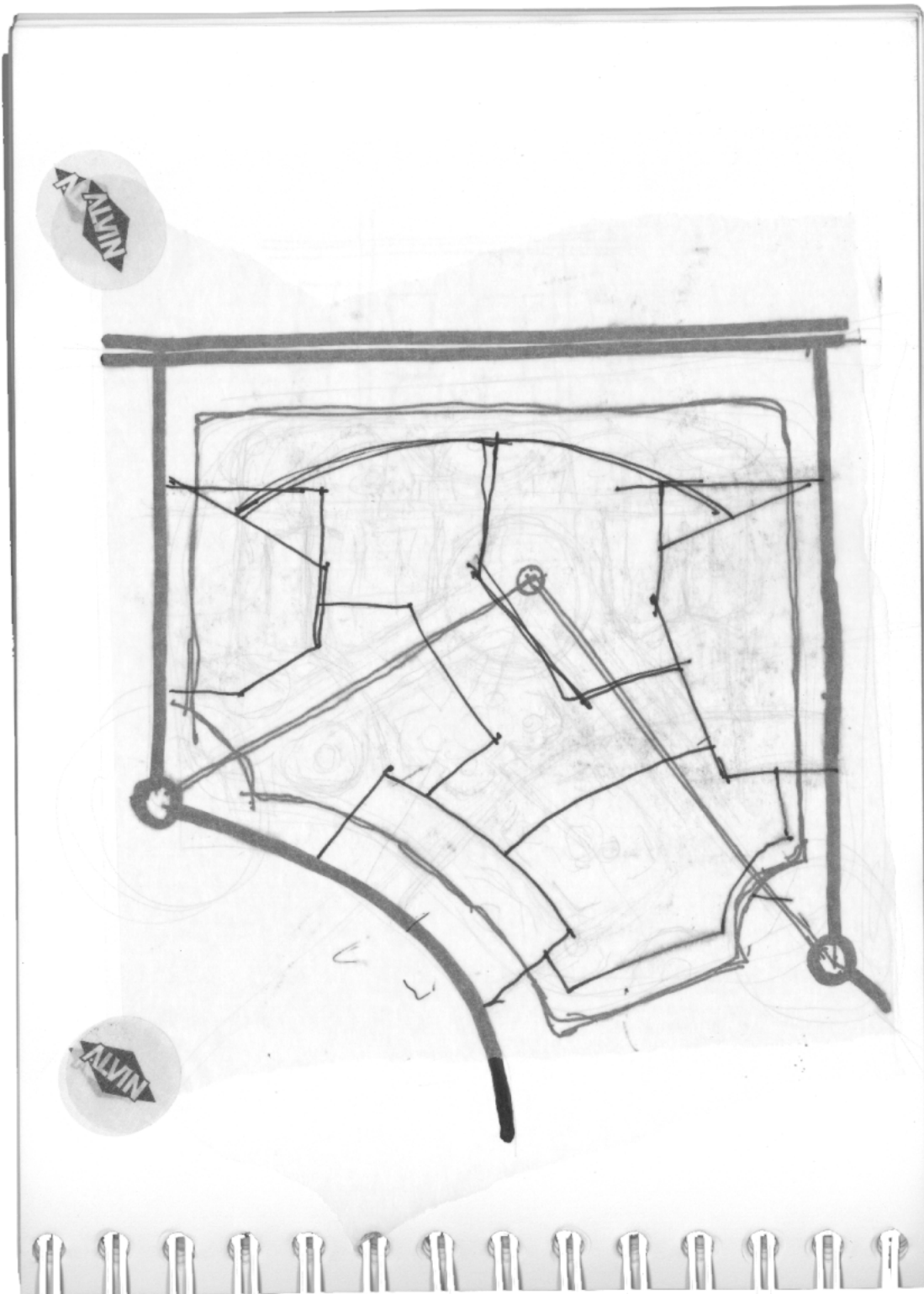
specific neighborhood development



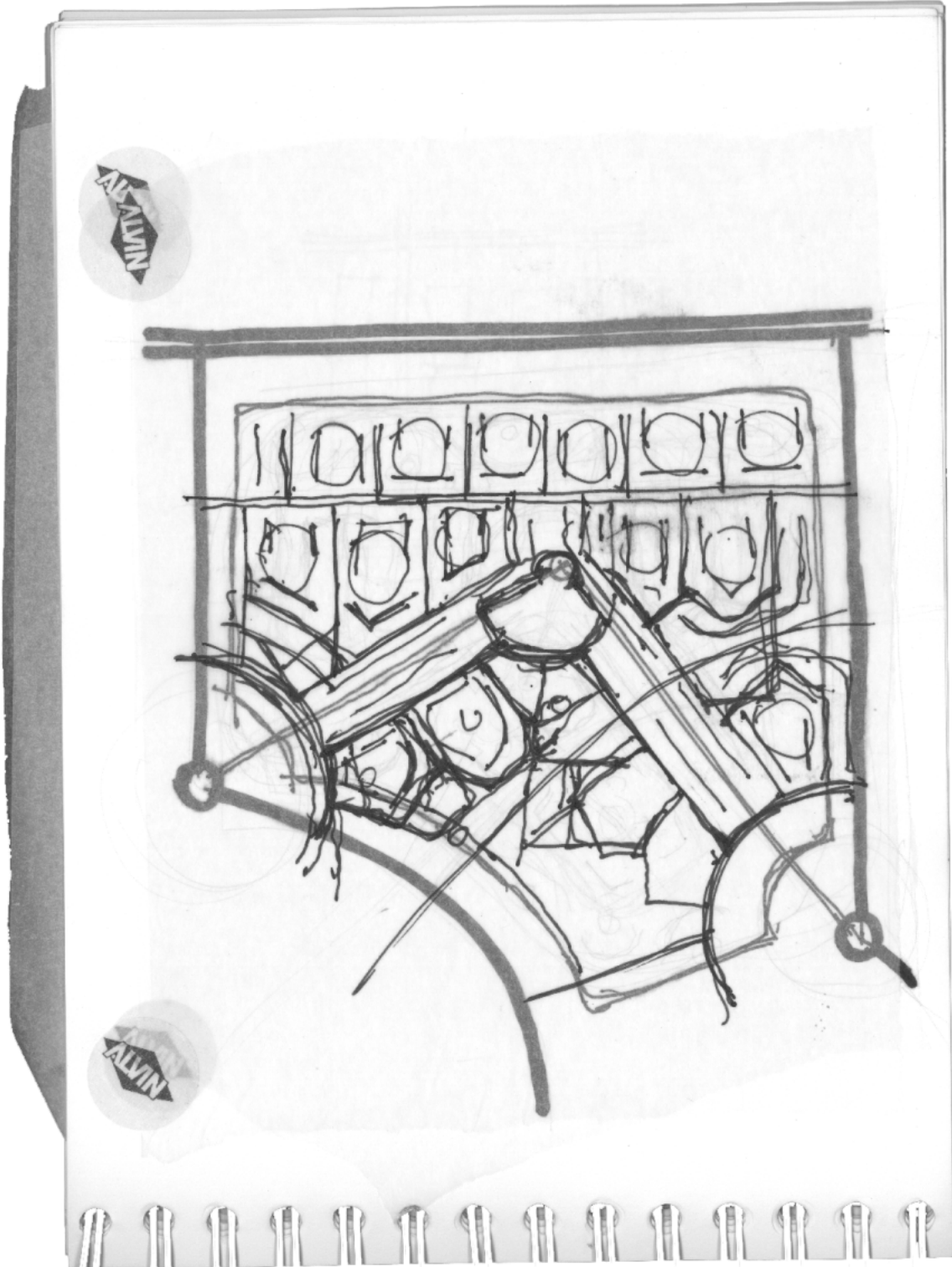
Specific neighborhood development



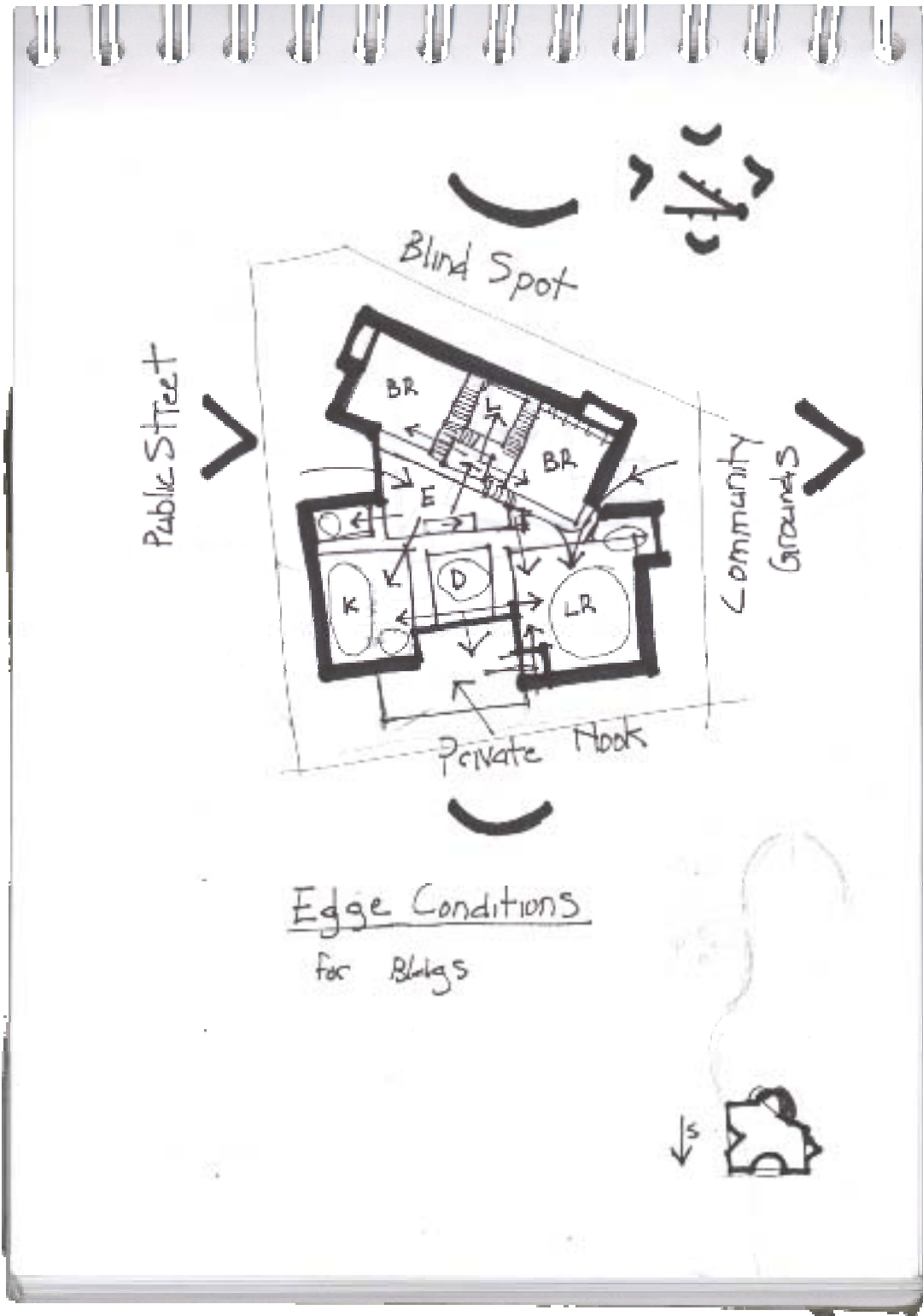
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Specific neighborhood development

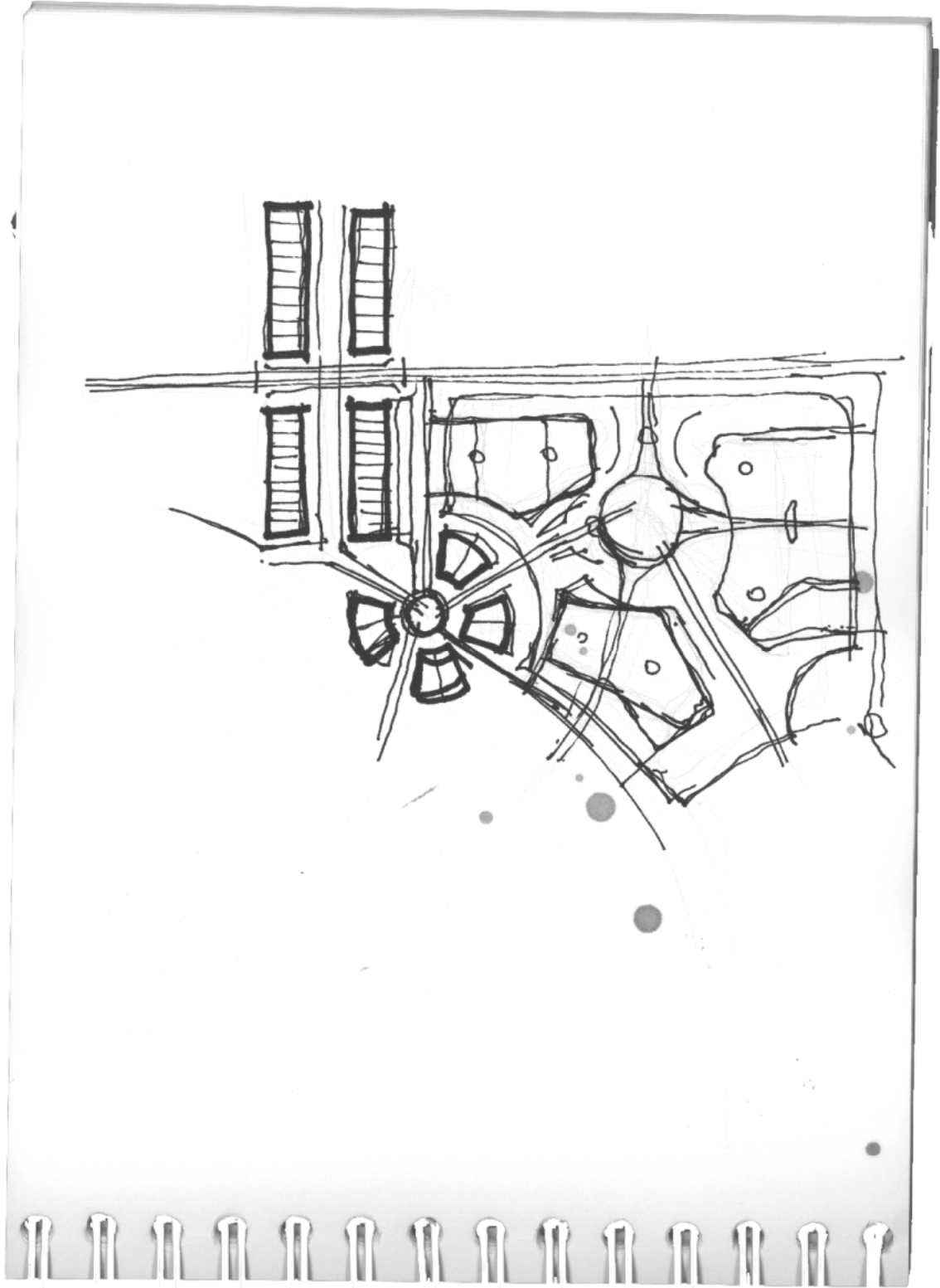


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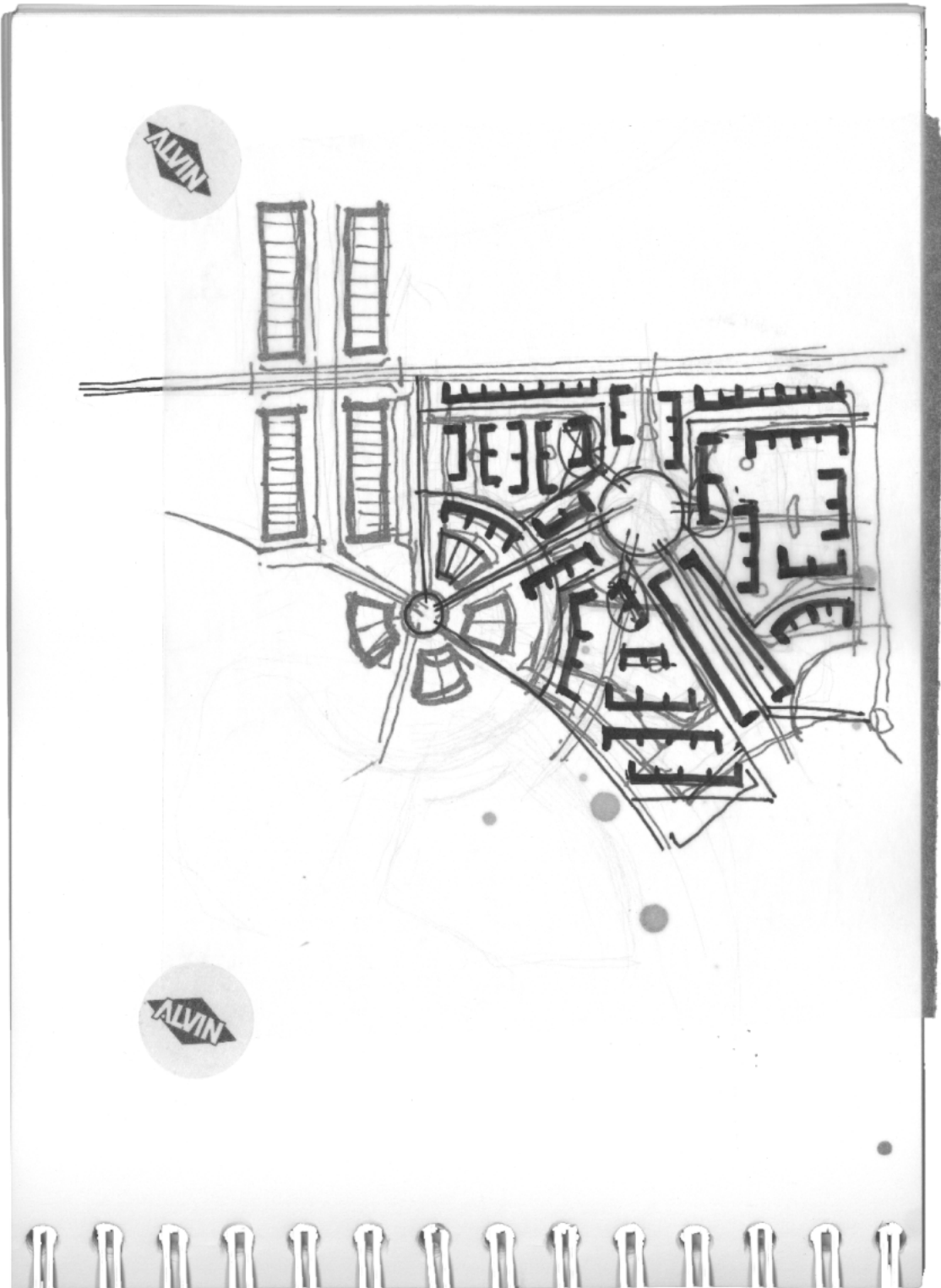
Specific neighborhood development



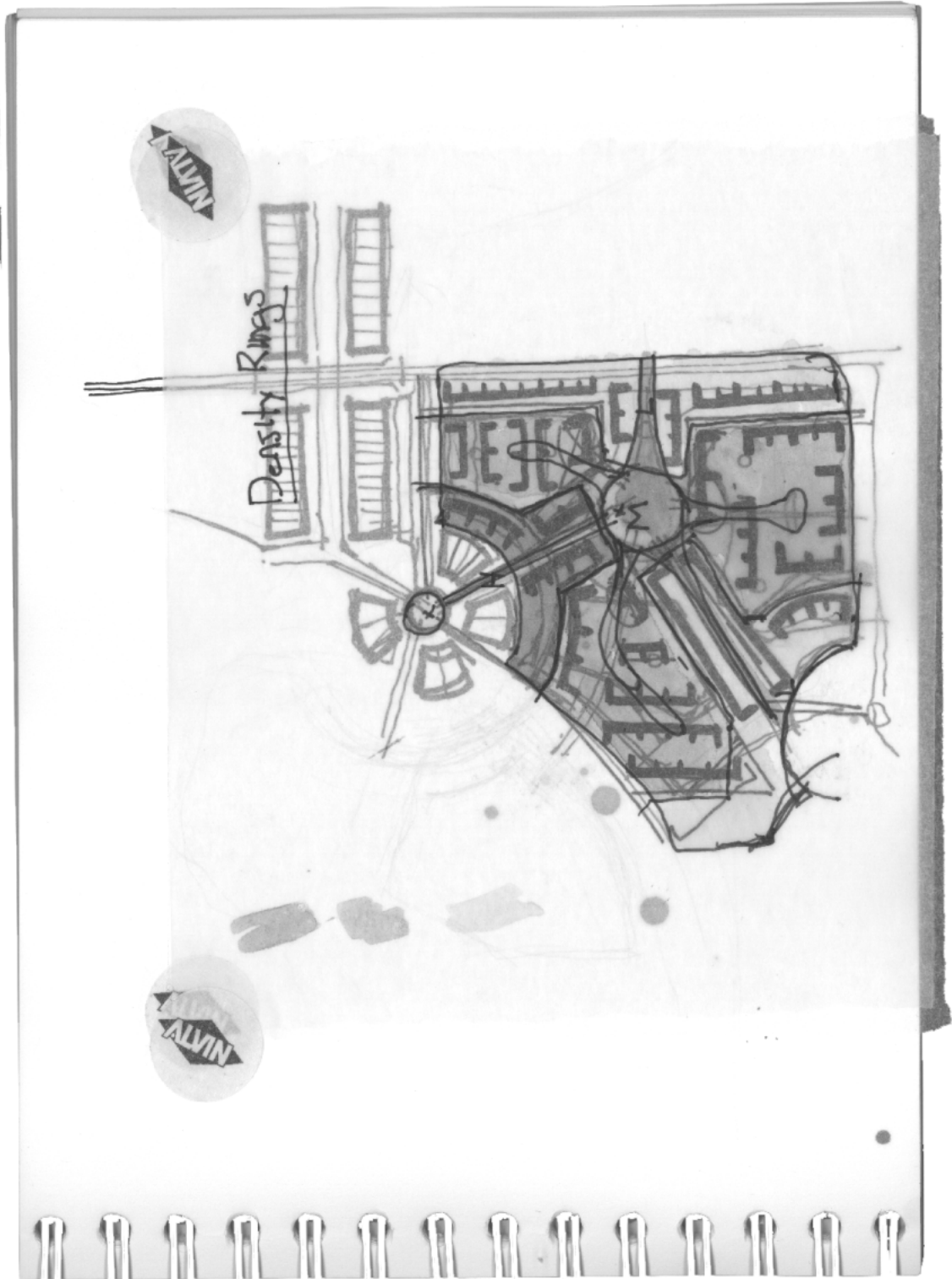
**Native Architecture:**  
Sustainable design theory applied to affordable housing in a rural setting

## Process Sketches

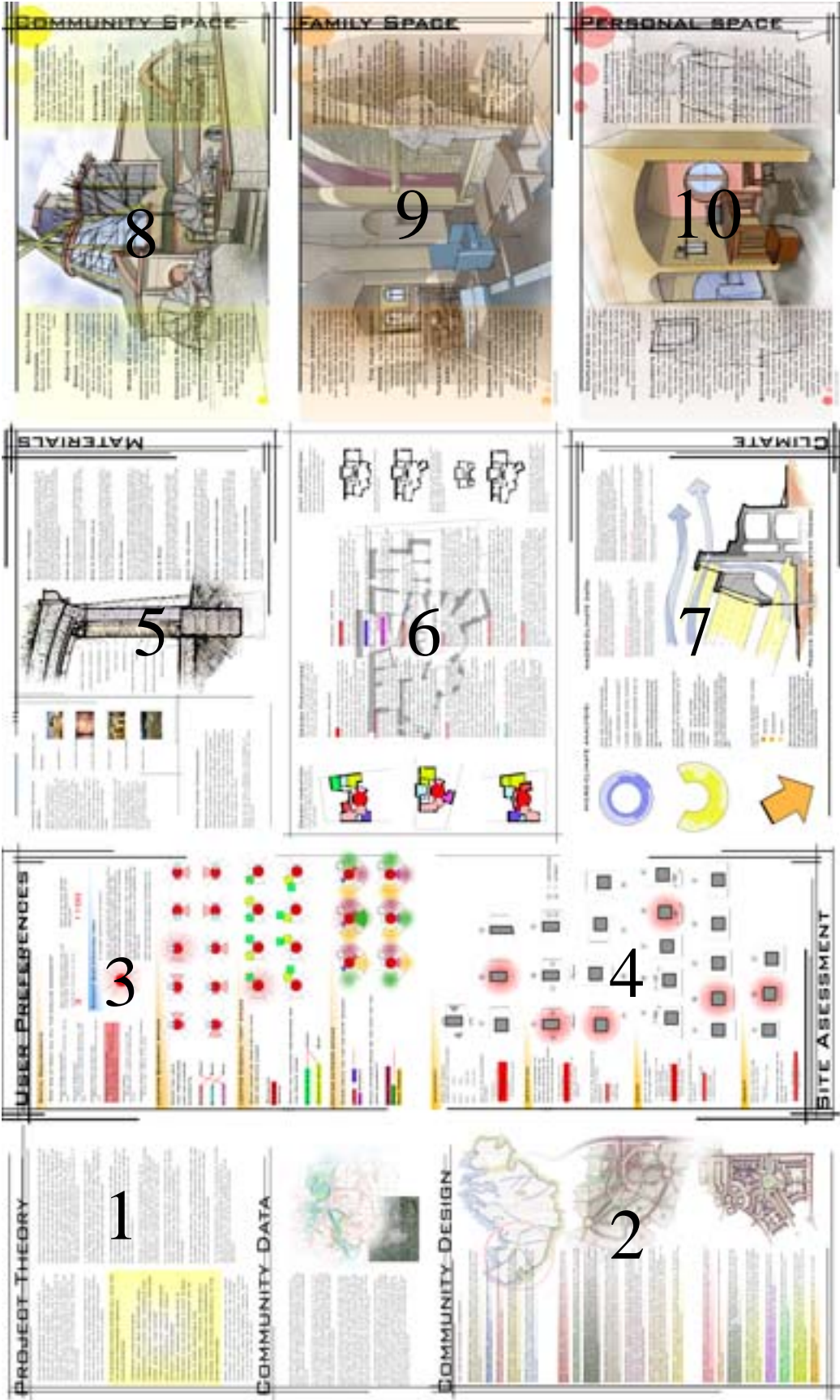
specific neighborhood development



Specific neighborhood development



**Native Architecture:** Sustainable design theory applied to affordable housing in a rural setting



# Design Result

Full Set  
Board 1  
Board 2  
Board 3  
Board 4  
Board 5  
Board 6  
Board 7  
Board 8  
Board 9  
Board 10

## PROJECT THEORY

THE UGLY CONSEQUENCE OF THE MODERN ERA IS AN INDUSTRIALIZED SAMENESS, THE LOSS OF A SENSE OF PLACE, CULTURE, AND INDIVIDUAL PERSONALITY. THIS HAS BEEN PARTICULARLY TRUE IN THE THIRD WORLD, AND IN THIS COUNTRY, INDIAN RESERVATIONS. INSTEAD WE ARE DRIVEN TO BE CONSUMERS, ALL BE THE SAME COG IN THE MACHINE OF ECONOMY, MEANING A MEDIUM THROUGH WHICH MATERIAL AND ENERGY FLOW IN ONE DIRECTION ENDING IN A LANDFILL OR WASTED, AND MONEY IN THE OTHER DIRECTION, ACCUMULATING IN THE WEALTHIEST.

WHERE THE INDUSTRIALIZED PARADIGM ASSUMES AN INFINITE WEALTH OF NATURAL CAPITAL MARGINALIZES HUMAN CAPITAL WHILE PUTTING A PREMIUM ON MANUFACTURED AND FINANCIAL CAPITAL. IN FACT, IN TRADITIONAL ECONOMIC RECKONING, NATURAL AND HUMAN CAPITAL IS IGNORED.

**A SUSTAINABLE HUMAN SYSTEM WILL HAVE THE FOLLOWING INESCAPABLE ESSENTIAL CHARACTERISTICS:**

- SIMPLER LIVING STANDARDS
- SMALL, HIGHLY SELF SUFFICIENT LOCAL ECONOMIES UTILIZING LOCAL MATERIALS AND LABOR TO PRODUCE LIFE ESSENTIAL SERVICES: FOOD, SHELTER. (LIKE NATURE)
- TECHNOLOGIES THAT MINIMIZE RESOURCE AND ENVIRONMENTAL IMPACTS. (HIGHLY EFFICIENT TECHNOLOGIES)
- A SERVICE ECONOMY, WHERE WHAT IS PRODUCED AND DEVELOPED IS WHAT IS BEST FOR PEOPLE AND THE ENVIRONMENT NOT BY WHAT IS MOST PROFITABLE FOR CORPORATIONS. (TECHNICAL METABOLISM.)
- HIGHLY PARTICIPATORY AND COOPERATIVE SYSTEMS THAT OPTIMIZE SPECIFICALLY TO THE GIVEN CONDITIONS.

GOOD, "QUALITY" ARCHITECTURAL DESIGN, AND ALL DESIGN IN GENERAL, FOR THAT MATTER, MUST FIRST AND FOREMOST BE "NATIVE" OR "NATURAL" TO ITS CONTEXT, OR IN OTHER WORDS, SUSTAINABLE. IF A BUILDING DESIGN, OR ANY OTHER DESIGNED ENTITY, DOES NOT POSSESS A "NATURAL" QUALITY, IF IT IS NOT SUSTAINABLE, WE OUGHT TO CONSIDER IT OF LITTLE VALUE -- USELESS AND UGLY.

TYPICALLY WE EVALUATE A DESIGN BASED EITHER ON ITS UTILITY OR ITS BEAUTY, AND OFTEN BOTH AT THE SAME TIME, AS IS CERTAINLY THE CASE WITH EVALUATING ARCHITECTURE. IT HAS BEEN UTILITY AND BEAUTY THAT HAVE HELPED TO DEFINE QUALITY DESIGN IN THE MODERN, INDUSTRIALIZED ERA. HOWEVER, THAT THE USEFULNESS AND BEAUTY OF A DESIGN IS MEANINGLESS UNTIL THE DESIGN IN QUESTION FIRST PASSES A MORE RIGOROUS ETHICAL TEST OF SUSTAINABILITY, WHERE NOTHING IS BEAUTIFUL, IF IT IS NOT UNIQUE TO ITS PARTICULAR CIRCUMSTANCES NOTHING IS USEFUL IF IT FIRST REQUIRES US TO SURRENDER OUR SOUL.

IF WE CONSIDER DESIGN AS NOTHING MORE THAN A DECISION MAKING PROCESS, THROUGH WHICH A SINGLE APPROPRIATE DECISION, OR SET OF DECISIONS, IS DERIVED FROM A MULTITUDE OF MANY POSSIBILITIES, THEN WE ARE ALL, IN A SENSE, DESIGNERS, IF OF NOTHING MORE THAN OUR OWN LIFESTYLES.

AS A CONSEQUENCE OF THIS DISTINCTION, THE PREVIOUS EVALUATION OF "QUALITY" DESIGN BECOMES MEANINGFUL NOT ONLY TO PROFESSIONAL DESIGNERS, LIKE ARCHITECTS, BUT TO US ALL. WHAT THIS ESSENTIALLY MEANS FOR ALL OF US IS THIS: BEFORE WE CAN JUDGE SOMETHING AESTHETICALLY, OR FUNCTIONALLY, WE MUST JUDGE IT ETHICALLY.

THE GOAL OF THIS PROJECT IS TO DEMONSTRATE A WAY OF ACCOMPLISHING A SUSTAINABLE COMMUNITY. THIS PROJECT DIVIDES SUSTAINABILITY AT 3 LEVELS: COMMUNITY PLANNING, BUILDING FORM DESIGN, BUILDING MATERIAL SELECTION. THIS PROJECT DEMONSTRATES A SUSTAINABLE WAY AT ALL THREE LEVELS.

AT THE COMMUNITY PLANNING LEVEL, IT DEMONSTRATES A WAY TO DESIGN A COMMUNITY NOT AROUND THE AUTOMOBILE, BUT AROUND PEOPLE. THIS HAS NOT ONLY POSITIVE ENVIRONMENTAL CONSEQUENCES, BUT ALSO POSITIVE SOCIAL AND HEALTH IMPLICATIONS.

AT THE BUILDING FORM LEVEL, IT FOCUSES ON HOUSING, AND A WAY TO DESIGN A HOUSE THAT, GIVEN AN UNDERLYING STRUCTURE, BEST FITS THE NEEDS OF THE USER, AND THE DEMANDS OF THE SITE. IT SHOWS THIS SYSTEM OF HOUSE GENERATION IN DEPTH AND GOES ON TO DETAIL OUT AN EXAMPLE HOUSE.

AT THE BUILDING MATERIALS LEVEL, A LIST OF MATERIALS THAT MEET THE BEFORE MENTIONED SUSTAINABILITY REQUIREMENTS IS PROVIDED AS WELL AS A METHOD OF ASSEMBLY THAT CAN BE ACCOMPLISHED WITH LITTLE OR NO HEAVY MECHANIZED EQUIPMENT.

## COMMUNITY DATA

THE CANNONBALL COMMUNITY IS LOCATED APPROXIMATELY 30 MILES SOUTH OF MANDAN, ND. ABOUT A MILE AFTER CROSSING THE CANNONBALL RIVER AND ENTERING THE RESERVATION, CANNONBALL IS LOCATED APPROXIMATELY A MILE EAST OF THE HIGHWAY. THERE ARE OVER 10,000 RESIDENTS OF THE STANDING ROCK SIOUX RESERVATION. APPROXIMATELY 1,500 PEOPLE LIVE IN CANNONBALL AND THE SURROUNDING COUNTRY.

THE LAND SURROUNDING CANNONBALL IS GENTLY ROLLING HILLS. THE LAND TO THE EAST GRADUALLY DESCENDS TOWARD THE MISSOURI RIVER. A STEEP BLUFF EXISTS TO THE NORTH ALONG THE CANNONBALL RIVER. TO THE WEST, THE TRIBE LEASES OUT THE FLAT TO THE WEST TO A POTATO BRIDGING OPERATION. ROLLING HILLS CONTINUE TO FRONT THE MISSOURI TO THE SOUTH. VEGETATION CONSISTS PRIMARILY OF PRAIRIE GRASSES. THE OCCASIONAL COTTONWOOD TREE SPRINGS UP IN LOWER LYING AREAS. IN TOWN, BARREN EARTH IS MOST COMMON.

IN ADDITION TO THE OCCASIONAL TRAILER HOUSE, THERE ARE THREE TYPICAL HOUSE DESIGNS. THE ONES ON THE NORTH END OF TOWN ARE THE NEWEST, AND ALL SEEM TO BE IN EQUALLY GOOD CONDITION. THEY ARE RABBIT UNITS, RECTANGULAR SHAPED, SET BACK ABOUT 100 FEET FROM THE STREET, AND GRADED ABOUT 100 FEET ON CENTER. THE SOUTH END OF TOWN HAS THE OLDEST AND THE LARGEST UNITS. THE QUALITY OF THESE UNITS LIKEWISE VARIES, AS SOME HAVE RECENTLY BEEN RENOVATED WHILE OTHERS ARE IN SEVERE DISREPAIR. ON THE EAST END OF TOWN NEAREST THE RIVER, ARE THE NICEST HOUSING UNITS. NOT AS NEW AS THE ONES TO THE NORTH, OR AS OLD AS THE ONES TO THE SOUTH, THEY HAVE BARABARS, OR BREAK THE RECTILINEAR THEM. THESE APPEAR TO BE IN THE BEST KEPT CONDITION.

EXISTING NON-RESIDENTIAL STRUCTURES INCLUDE A POST OFFICE, COMMUNITY RECREATION (GYMNASIUM), A CONVENIENCE STORE, A TAVERN, A CLINIC, A SCHOOL, A DAY CARE CENTER, AND 6 CHURCHES. THE POST OFFICE IS LOCATED AT THE CENTER OF TOWN, AND APPEARS TO BE AN OLDER WOOD FRAMED BUILDING. THE GYMNASIUM IS A METAL BUILDING RECENTLY BUILT THAT ATTACHES ON TO THE POST OFFICE. A LARGE PARKING LOT EXISTS NEXT TO THE GYMNASIUM. THE CONVENIENCE STORE IS LOCATED OUT OF TOWN ALONG THE HIGHWAY. THE TAVERN IS LOCATED TOWARD THE NORTHWEST EDGE OF TOWN. THE SCHOOL, GOING UP THROUGH GRADE SIX, IS A BRICK BUILDING ON THE EAST END OF TOWN. THE DAY CARE CENTER IS JUST NORTH OF THE SCHOOL AND ACROSS THE STREET. FINALLY, THE SIX CHURCHES ARE SPORADICALLY SPREAD OUT AROUND TOWN.



# COMMUNITY DESIGN

## ON MASTER PLANNING A COMMUNITY ....

**AGRICULTURAL VALLEYS** - PRESERVE ALL AGRICULTURAL VALLEYS AS FARMLAND AND PROTECT THIS LAND FROM ANY DEVELOPMENT WHICH WOULD DESTROY OR LOCK UP THE UNIQUE FERTILITY OF THE SOIL. EVEN WHEN VALLEYS ARE NOT CULTIVATED NOW, PROTECT THEM! KEEP THEM FOR FARMS, PARKS AND WILDS.

**POOLS AND STREAMS** - PRESERVE NATURAL POOLS, STREAMS, AND DRAINAGE SWALES, ALLOW THEM TO FORM NATURAL BARRIERS IN THE CITY.

**HIGH PLACES** - BUILD OCCASIONAL HIGH PLACES AS LANDMARKS THROUGHOUT THE CITY, A PLACE TO CLIMB UP TO, LOOK DOWN AND SURVEY THE WORLD.

**SACRED SITES** - WHETHER THE SACRED SITES ARE LARGE OR SMALL, WHETHER THEY ARE THE CENTER OF TOWNS, IN NEIGHBORHOODS, OR IN THE DEEPEST COUNTRYSIDE, ESTABLISH ORDINANCES THAT WILL PROTECT THEM ABSOLUTELY, SO THAT OUT ROOTS IN THE VISIBLE SURROUNDINGS CANNOT BE VIOLATED.

**ACCESS TO WATER** - WHEN NATURAL BODIES OF WATER OCCUR NEAR HUMAN SETTLEMENTS, TREAT THEM WITH GREAT RESPECT. ALWAYS PRESERVE A BELT OF COMMON LAND IMMEDIATELY BESIDE THE WATER. ALLOW DENSE SETTLEMENTS TO COME DOWN TO THE WATER ONLY AT INFREQUENT INTERVALS ALONG THE EDGE.

**PARALLEL ROADS** - AVOID INTERESTING MAJOR ROADS, INSTEAD BUILD A SYSTEM OF PARALLEL ROADS. KEEP PARALLEL ROADS AT LEAST 100 YARDS APART, AND NO MORE THAN 300-400 YARDS APART.

**IDENTIFIABLE NEIGHBORHOOD** - DEFINE NEIGHBORHOODS NO MORE THAN 300 YARD ACROSS, WITH NO MORE THAN 400 TO 500 INHABITANTS. KEEP MAJOR ROADS OUTSIDE THE NEIGHBORHOODS.

**NEIGHBORHOOD BOUNDARY** - ENCOURAGE THE FORMATION OF A BOUNDARY AROUND EACH NEIGHBORHOOD. LIMIT THE NUMBER OF ROADS CROSSING THE NEIGHBORHOOD, AND PLACE BATEWAYS AT THE PLACES WHERE THE ACCESS PATHS CROSS THE NEIGHBORHOOD BOUNDARY. MAKE THE BOUNDARY ZONE WIDE ENOUGH TO CONTAIN MEETING PLACES FOR THE COMMON FUNCTIONS SHARED BY SEVERAL NEIGHBORHOODS.

**DENSITY GRADIENT** - ENCOURAGE GROWTH AND ACCUMULATION OF DENSITY TO FORM CLEAR CONFIGURATIONS OF PLAZAS AND VALLEYS, CENTERED ON THE COMMUNITY NUCLEUS. DEFINE RIBBONS OR DECREASING DENSITY THAT WILL ALLOW PEOPLE TO CHOOSE A SITE THAT WILL MATCH THEIR PERSONAL PREFERENCE TOWARD EITHER EXCITEMENT AND CONVENIENCE, OR QUIET/TRANQUILITY AND ACCESS TO NATURE.

**SHOPPING STREET** - SHOPPING STREETS CAN FORM THE CENTRAL NUCLEUS TO A COMMUNITY, AND MUST BE MUTUALLY ACCESSIBLE BY CARS AND PEDESTRIANS. ENCOURAGE LOCAL SHOPPING CENTERS TO GROW IN THE FORM OF SHORT PEDESTRIAN STREETS AT RIGHT ANGLES TO MAJOR ROADS, OPENING OFF THEM. PROVIDE PARKING ON SECONDARY ROADS BEHIND THE SHOPS.

**INDUSTRIAL RIBBON** - PLACE INDUSTRY IN RIBBONS BETWEEN 200 AND 500 FEET WIDE, WHICH FORM THE BOUNDARIES BETWEEN COMMUNITIES.

**ACTIVITY NODES** - CREATE NODES OF ACTIVITY THROUGHOUT THE COMMUNITY, SPREAD OUT ABOUT 300 YARDS APART. AT THE CENTER OF EACH NODE, MAKE A SMALL PUBLIC SQUARE AND SURROUND IT WITH A COMBINATION OF COMMUNITY FACILITIES AND SHOPS THAT ARE MUTUALLY SUPPORTIVE.

**ACCESSIBLE GREEN** - BUILD ONE OPEN PUBLIC GREEN WITHIN 3 MINUTES WALK - ABOUT 750 FEET - OF EVERY HOUSE AND WORKPLACE. MAKE THE GREENS 150 FEET ACROSS AND AT LEAST 60,000 SQUARE FEET IN AREA.

**PROMENADE** - ENCOURAGE THE FORMATION OF A PROMENADE AT THE HEART OF THE COMMUNITY, LINKING THE MAIN ACTIVITY NODES, AND PLACED CENTRALLY. PUT MAIN POINTS OF ATTRACTION AT TWO ENDS, TO KEEP CONSTANT MOVEMENT UP AND DOWN.

**LOOPED LOCAL ROADS** - LAY OUT LOCAL ROADS SO THAT THEY FORM LOOPS. A LOOP BEING ANY PATH THAT IS IMPOSSIBLE TO USE AS A SHORT-CUT. KEEP THE ROADS NARROW - NO MORE THAN 20 FEET WIDE.

**T-JUNCTION** - TO REDUCE FREQUENCY OF TRAFFIC ACCIDENTS, AVOID 4 WAY INTERSECTIONS AND CROSSING MOVEMENTS.

**NETWORK OF PATHS AND CARB** - EXCEPT WHERE TRAFFIC DENSITIES ARE VERY HIGH OR LOW, LAY OUT PEDESTRIAN PATHS AND ROADS FOR CARS AT RIGHT ANGLES TO EACH OTHER, CREATING TWO DISTINCT NETWORKS. MAKE THE INTERSECTIONS BETWEEN THE NETWORKS AT POINTS AWAY FROM INTERSECTION WITHIN THE NETWORK THEMSELVES.

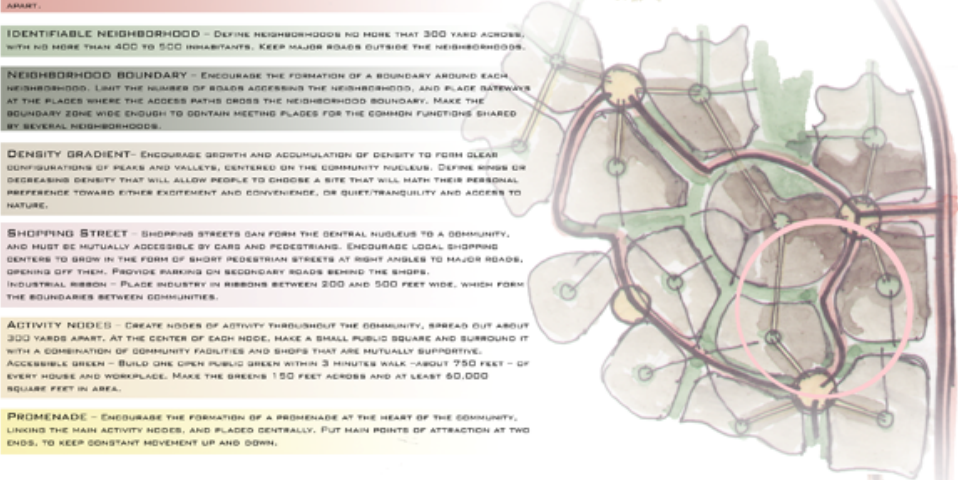
**DEGREE OF PUBLIC-NESS** - PEOPLE ARE DIFFERENT AND THE WAY THEY WANT TO PLACE THEIR HOUSES IN A NEIGHBORHOOD IS ONE OF THE MOST BASIC KINDS OF DIFFERENCE. TO ACCOMMODATE DIFFERENT PREFERENCES, DISTINGUISH 3 KINDS OF HOMES: THOSE ON QUIET BACKWATERS, THOSE ON BUSY STREETS, AND THOSE MORE OR LESS IN BETWEEN. GIVE EACH NEIGHBORHOOD ABOUT EQUAL NUMBERS OF EACH.

**HOUSE CLUSTER** - ARRANGE HOUSES TO FORM VERY TIGHT, BUT IDENTIFIABLE CLUSTERS OF 9-12 HOUSES OR AROUND SOME COMMON LAND AND PATHS. ARRANGE THE CLUSTER SO THAT ANYONE CAN WALK THROUGH THEM WITHOUT FEELING LIKE A TRESPASSER.

**COMMON LAND** - IN ORDER TO CREATE A PHYSICAL PLACE FOR THE DEVELOPMENT OF A SOCIAL SYSTEM. GIVE OVER 25 PERCENT OF THE LAND IN HOUSE CLUSTERS TO COMMON LAND WHICH TOUCHES, OR IS VERY NEAR THE HOMES WHICH SHARE IT.

**PEDESTRIAN STREET** - ARRANGE BUILDINGS SO THAT THEY FORM PEDESTRIAN STREETS WHERE PEOPLE CAN SEE SHOULDERS AND INTERACT CASUALLY AND ACCIDENTALLY. PATHS SHOULD BE STRAIGHT BETWEEN GOALS, AND PAVING SHOULD SWELL AROUND THE GOALS. GOALS SHOULD BE NO MORE THAN A FEW HUNDRED FEET APART.

**SOUTH FACING OUTDOORS** - ALWAYS PLACE BUILDINGS TO THE NORTH OF THE OUTDOOR SPACES THAT GO WITH THEM.



## USER PREFERENCES

### SPATIAL REQUIREMENTS

WHAT SIZE OF FAMILY WILL WILL THIS DWELLING ACCOMMODATE?

**SINGLE PERSON (DETACHED)**  
480 SQ FT BASE (200 PUBLIC, 150 PRIVATE, 130 SERV-VIDE)

**MULTIPLE ROOMMATES**  
250 SQ FT BASE (1150 PUBLIC, 100 SERVICES) + 200 SQ FT PER ROOMMATE, (120 PRIVATE/50 PUBLIC/30 SERV-VIDE)

**MARRIED COUPLE WITHOUT KIDS**  
650 SQ FT BASE (250 PUBLIC, 240 PRIVATE, 150 SERV-VIDE)

**MARRIED COUPLE WITH KIDS**  
700 SQ FT BASE + 120 SQ FT PER CHILD (60 PRIVATE/40 PUBLIC/20 SERVICES) + 170 PER TEEN (110 PRIVATE/40 PUBLIC/20 SERVICES)

**SINGLE PARENT**  
480 SQ FT BASE + 120 SQ FT PER CHILD (80 PRIVATE/40 PUBLIC + 150 PER TEEN (100 PRIVATE/50 PUBLIC)

**MARRIED COUPLE "EMPTY NEST" (WITH TENANT)**  
700 SQ FT BASE + 350 SQ FT FOR TENANT

HOW MANY GUESTS WOULD YOU LIKE TO BE ABLE TO ACCOMMODATE?

ADD 50 SQ FT PER GUEST (ALL PUBLIC)

**3**

WHAT IS THE TOTAL SQUARE FOOTAGE REQUIRED OF THE DWELLING?

**1100**

### SYSTEM'S BASIC STRUCTURAL FORM:

IN THE BASIC FRAMEWORK OF THIS SYSTEM....

THERE ARE 4 LARGE QUADRANTS, ORIENTED TOWARD THE 4 CARDINAL DIRECTIONS, AND 4 DIAGONAL "ARMS," POSITIONED BETWEEN THESE 4 QUADRANTS, SURROUNDING A CIRCULAR SPACE BETWEEN 16 AND 18 FEET IN DIAMETER.



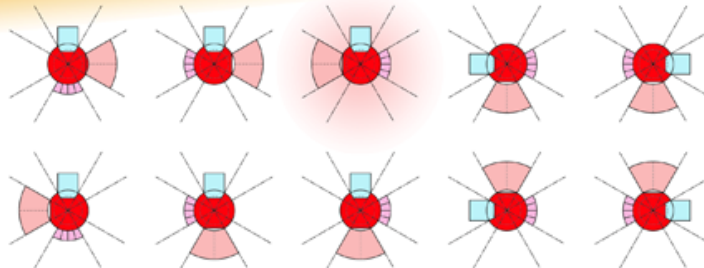
WHEN MAKING SELECTIONS, KEEP IN MIND, THE DIAGRAMS TO THE RIGHT TEND TO REPRESENT A MORE ENGLOBED CONFIGURATION, WHILE THE ONES ON THE LEFT REPRESENT THE MOST ENGAGING.

NOTE! THE EXAMPLE ENTRY DATA ON THIS BOARD IS THE DATA THAT WENT INTO THE DESIGN OF THE EXAMPLE UNIT

### LOCATING QUADRANT SPACES

MATCH YOUR LOCATION PREFERENCES FOR THE INTERIOR QUADRANTS.

**KITCHEN** FRONT  
**BATHING** BACK  
**ALCOVES** SIDE



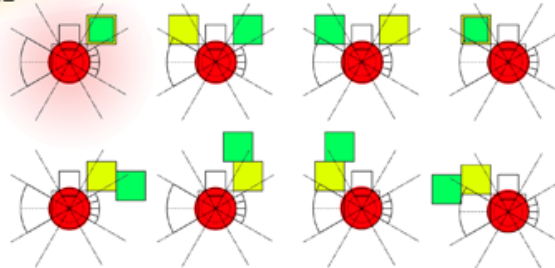
### LOCATING DIAGONAL "ARM" SPACES

WHAT LAYOUT DO YOU WISH TO HAVE FOR THE PRIVATE WINGS?

SEPARATED  
**STACKED**  
SPREAD

MATCH YOUR LOCATION PREFERENCES FOR THE PRIVATE WINGS.

**CHILD'S REALM** FRONT  
**COUPLE'S REALM** BACK



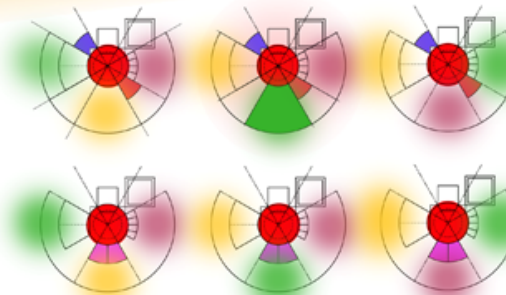
### LOCATING EXTERIOR SPACES

WHERE WOULD YOU LIKE THE ENTRY SPACES?

**FRONT** + **BACK**  
**SIDE** (SHARED)

WHICH EXTERIOR SPACE DO YOU WANT ON THE OPEN QUADRANT?

**FRONT TERRACE**  
**GARDEN**  
**BACK TERRACE**

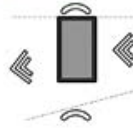




**ADJACENCY:**

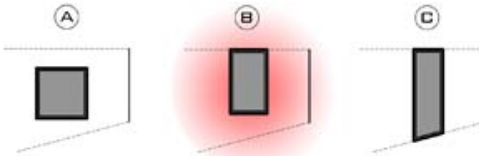
MATCH THE CARDINAL DIRECTION AND ITS CONDITION:

- NORTH FRONT
- SOUTH BACK
- EAST OPEN SIDE
- WEST CLOSED SIDE



WHAT IS THE DEVELOPMENT PATTERN?

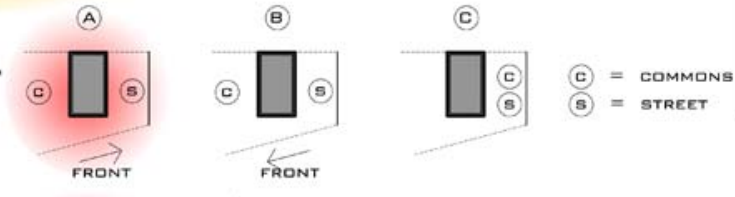
- A. DETACHED \* OPEN ON BOTH SIDES
- B. OPEN ON ONE SIDE ATTACHED TO ONE STREET
- C. TOWNHOUSE \* ATTACHED ON BOTH SIDES



**ORIENTATION**

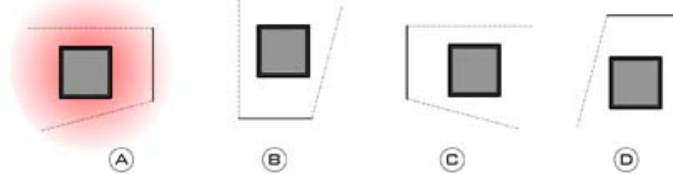
WHAT IS CONSIDERED THE "FRONT," ACCORDING TO THE PATTERN EMPLOYED BY THE PARTICULAR CLUSTER TO WHICH THE DWELLING BELONGS?

- A. THE "FRONT" FACES THE COMMON GREEN
- B. THE "FRONT" FACES THE STREET
- C. THE COMMON GREEN AND THE STREET ARE THE SAME DIRECTION



WHAT IS THE ORIENTATION OF THE FRONT TO BACK GRADIENT?

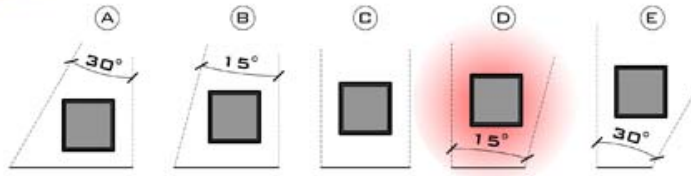
- A. SOUTHERLY
- B. NORTHERLY
- C. WESTERLY
- D. SOUTHERLY



**SHAPE**

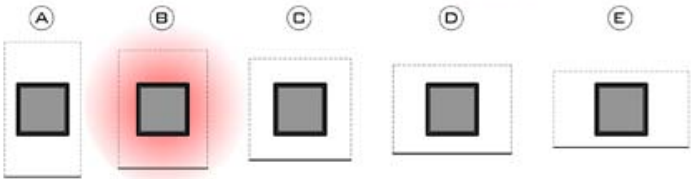
WHAT IS THE ANGLE CREATED BY THE SIDE LINES?

- A. ROUGHLY 30° (22.5 - 37.5) OPENING FORWARD
- B. ROUGHLY 15° (5 - 22.5) OPENING FORWARD
- C. PARALLEL (LESS THAN 5)
- D. ROUGHLY 15° (5 - 22.5) OPENING BACKWARD
- E. ROUGHLY 30° (22.5 - 37.5) OPENING BACKWARD



WHAT IS THE RATIO OF WIDTH TO DEPTH?

- A. SIGNIFICANTLY DEEPER
- B. ROUGHLY EQUAL
- C. SLIGHTLY WIDER
- D. SIGNIFICANTLY WIDER



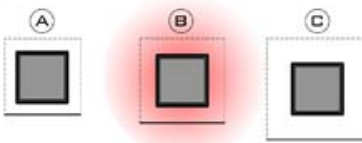
**DENSITY**

WHAT IS THE WIDTH AND DEPTH OF THE SITE?

CALCULATE: WIDTH X DEPTH = AREA

BASED ON THE AREA OF THE SITE, WHAT IS THE UNIT DENSITY?

- A. HIGH (1800-2000 SQ FT)
- B. MEDIUM (1200-1800 SQ FT)
- C. LOW (2500-2000 SQ FT)



**SITE ASESMENT**








## MATERIALS

**MATERIAL SELECTION CRITERIA:**

GIVEN THE CONDITION OF A SMALL RURAL COMMUNITY WITH OUT ALOT OF CAPITAL OR ASSETS, THE BUILDING MATERIAL SHOULD BE AS MUCH AS POSSIBLE HARVESTED FROM THE LOCAL REGION, BY LOCAL PRODUCERS PREFFY ALSO SHOULD US AS LITTLE MECHANIZED EQUIPMENT, IF ANY AT ALL. INSTEAD IT SHOULD BE A SYSTEM THAT IS READILY ADAPTABLE BY HANDICAPER ALIENS.

THE MATERIAL SHOULD ALLOW FOR ON SITE ACAPATION ON THE PLT TO EXPLORE SITE CONDITONS UNFORSEEN BY THE DESIGNER. WINDOW ADAPTIONS ESPECIALLY SHOULD BE ADJUSTABLE TO CREATE THE BEST POSSIBLE FRAMED VIEWS.

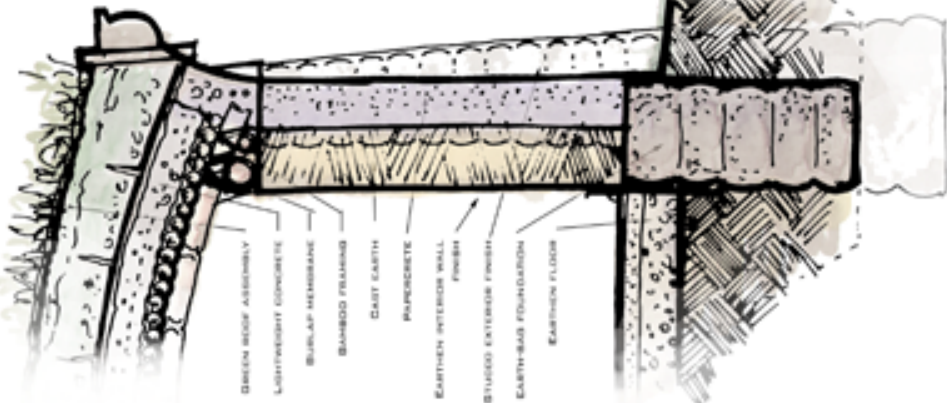
**MATERIALS LIST:**

-  BAMBOO
-  RAFCREEKE
-  LIGHTWEIGHT CONCRETE
-  STABILIZED EARTH
-  CAST EARTH
-  EARTHEN FLOORS
-  GREEN ROOF

**MATERIAL DESIGN CONSEQUENCES:**

BECAUSE NATURAL, LOCALLY HARVESTED MATERIALS WILL TEND TO BE COMPRESSIVE IN NATURE (HIGH TENSION) STRENGTH MATERIALS LIKE STEEL REQUIRE CENTRALIZED INFRASTRUCTURE AND HIGH ENERGY INPUT TO PRODUCE. RESOURCES TYPICALLY NOT AVAILABLE TO RURAL COMMUNITIES LIKE GANGLIBALLS THE FORM OF THE BUILDING WILL HAVE TO EMPLOY THE VAST, ALTHOUGHT ENCLUSIVE USAGE OF ARCHES, DOMES AND VAULTS.

WALLS WILL BE THICK, ESPECIALLY THE EXTERIOR, IN ORDER TO ACHIEVE THE REQUIRED STRUCTURAL AND INSULATION VALUE.



**STEP 1: FOUNDATION:**

THE EXTERIOR FOUNDATION WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE.

**STEP 2: COLUMNS:**

THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE.

**STEP 3: EXTERIOR WALLS:**

THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE.

**STEP 4: CEILING:**

THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE.

**ROOF 5: ROOF:**

THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE.

**STEP 3A, 4A: OPENINGS:**

THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE.

**STEP 6: INTERIOR EARTHEN FLOOR:**

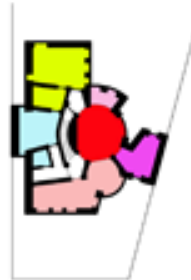
THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE.

**STEP 7: INTERIOR WALL/FINISH:**

THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE. THE EXTERIOR WALLS SHOULD BE CONSTRUCTED WITH A MINIMUM OF 18" ABOVE GRADE.

## DESIGN VARIATION

THE DRAWING BELOW ARE EXAMPLE PLANS OF ALTERNATIVE PROPOSALS OF THIS SYSTEM



## DESIGN PARAMETERS:

THE FOLLOWING TEXT EXPLAIN A BRIEF OVERVIEW OF THE DESIGN PROCESS AND THINGS TO KEEP IN MIND ABOUT EACH SPACE.

### QUADRANT SPACES:

**OPEN QUADRANT** - AN OPEN QUADRANT WILL ALLOW THE HOME OPEN SIDING TERRACES AND PORCHES AT THE FRONT AND BACK OF THE QUADRANT TO COME RIGHT UP TO AND INTERACT WITH THEMSELVES WITH THE CENTRAL LOBBY SPACE. THIS IS THE MOST FAVORABLE OF ALL THE QUADRANT OPTIONS, IF PLACED TOWARD THE FRONT OR BACK.

**CONNECTED QUADRANT** - THIS SPACE WILL ALLOW THE FRONT AND BACK OF ALL THE QUADRANTS TO INTERACT WITH EACH OTHER. CONSEQUENTLY, THIS SPACE ALLOWS FOR THE MOST ABOUT LOBBY AND INTERACTION WITH THE EXTERIOR. THE USER'S PREFERENCE SHOULD BE FULLY CONSIDERED ON WHETHER THE FRONT OR BACK SHOULD BE PLACED TOWARD THE FRONT OR BACK. HOWEVER, DEPEND ON THE USER'S PREFERENCE, IT IS PREFERABLE TO PLACE THE FRONT WALL AND BECAUSE THE HIGH LEVEL OF GLAZING ALLOWED BY THE PUBLIC MARKET OF THIS ROOM MAKES IT IDEAL FOR A VENTILATED EAST-WEST ACCESS TO THE SOUTH, WHEREVER POSSIBLE.

**ALIGNED** - THIS SPACE LAYS OUT ALIGNED IN THE MIDDLE OF THE OPEN-CLOSED QUADRANT, LESS ENCLAVING THAN THE OTHER QUADRANT SPACES, BUT MORE ENCLAVING THAN A BATHING QUADRANT. THEY CAN BE EASILY ADAPTED TO CLIMATE ORIENTATION. HOWEVER, THEY CANNOT BE PLACED IN A QUADRANT THAT ADJACENT TO A SIDE WALL. FOR AN MODERATELY OPEN-TO-OPEN FEEL, PLACE ALLOWS TO THE FRONT OR BACK, AND TO THE SIDE IF A MORE EXTREME RESPONSE TO THE SUBURBANISM IS DESIRED.

**BATHING** - THIS IS THE MOST CLOSED AND PRIVATE OF THE FOUR QUADRANTS, WITH THE LEAST AMOUNT OF GLAZING AND ITS POSITION SHOULD BE LARGELY DETERMINED BY THE USER'S PREFERENCE FOR EITHER AN ENCLAVING OR WITHDRAWN DWELLING. UNLESS NECESSARILY DEMANDED OTHERWISE BY USER PREFERENCE FOR OPEN-CLOSED-HEAVY-TYP TO PLACE THIS SPACE IN THE FRONT QUADRANT, OR ALONG AN ADJOINING SIDEWALL.

### DIAGONAL "ARM" SPACES:

**FORMAL ENTRY** - THIS SPACE SHOULD BE ORIENTED TOWARD THE FRONT OF THE DWELLING, AND WILL CONNECT ONTO THE FRONT TERRACE, AND POSSIBLY THE GARDEN. IT MAY BE ADJACENT TO ANY OF THE QUADRANTS, AND MAY EVEN COMBINE WITH EITHER THE KITCHEN (ORIGIN SPACE) OR MAIN LIVING AREA.

**BACK ENTRY** - THIS SPACE SHOULD BE ORIENTED TOWARD THE BACK OF THE DWELLING, AND WILL CONNECT INTO EITHER THE GARDEN OR MAIN LIVING, OR BOTH.

**CONNECTED ENTRY** - THIS SPACE IS LOCATED IN THE MIDDLE OF THE DWELLING, CONNECTING THE FRONT OF BOTH THE ENTRY AND THE FORMAL ENTRY, AND GIVES ACCESS TO BOTH THE FRONT AND BACK.

**PRIVATE ROOM** - PLACE THE ROOM TO THE NORTH OF THE SITE, IF AT ALL POSSIBLE, OR ADJOINING ADJOINING SIDE WALL. PROBABLY MOST FAVORABLE FOR BED ALWAYS, WHENEVER POSSIBLE, LOCATE THEM ADJOINING TO THE BATHING QUADRANT.

### EXTERIOR SPACES:

**GARDEN** - THIS IS A RELATIVELY PRIVATE SPACE ON THE OPEN-CLOSED QUADRANT (OR AN EXTERIOR SPACE). THE GARDEN MAY BE PLACED DIRECTLY NEXT TO THE LOBBY ROOM IN ITS OWN QUADRANT, OR MAY BE PLACED "BEHIND" OR "IN BETWEEN" TO THE CENTRAL SPACE AND ONE OF THE OTHER QUADRANT SPACES. THE GARDEN SHOULD BE PLACED AS NEAR AS POSSIBLE TO THE SOUTH EDGE OF THE SITE, OR COHERENT WITH THE CONTEXT OF SOLAR ACCESS, WHICHEVER POSITION ON THE SITE THAT AFFORDS IT THE MOST SUNLIGHT. PLACE THE GARDEN SOUTH OF ANY SPACE IN WHICH A DIRECT SUN-STRUCK STRATEGY EXISTS.

**FRONT TERRACE** - THESE ARE THE MOST PUBLIC EXTERIOR SPACE, AND IS CHARACTERIZED BY BEING ON THE FRONT, WEST PUBLIC SIDE OF THE HOUSE. PLACE THIS SPACE ON A OPEN QUADRANT, OR BEHIND ANY OF THE INTERIOR QUADRANTS. IT IS POSSIBLE TO PLACE THIS IN A SIDE QUADRANT AS WELL WITH A WIDE PATH LEADING BACK TO IT FROM THE STREET, BUT THIS SO WILL NECESSITATE THE GARDEN BEING PLACED TOWARD THE FRONT.

**BACK TERRACE** - THIS IS A RELATIVELY PUBLIC EXTERIOR SPACE, CHARACTERIZED BY ITS POSITION AT THE BACK OF THE HOUSE. PLACE THIS SPACE ON A OPEN QUADRANT, OR BEHIND ANY OF THE INTERIOR QUADRANTS. IT IS POSSIBLE TO PLACE THIS ON A SIDE QUADRANT AS WELL WITH A WIDE PATH LEADING BACK TO IT FROM COMMON GREEN, BUT THIS SO WILL NECESSITATE THE GARDEN BEING PLACED TOWARD THE BACK.

## UNIT ADAPTATION:

THE FOLLOWING DRAWINGS DEMONSTRATE THE PROCESS OF HOW A HOME CAN BE ADAPTED THROUGHOUT ITS LIFETIME TO ACCOMMODATE THE CHANGING NEEDS OF THE USER.



THE HOUSE WOULD FIRST BE BUILT AS A 3-BEDROOM MODERN-STYLE DWELLING.



THE ADAPTATION OF A SPACE TO ACCOMMODATE A SECOND CHILD WOULD BE ACHIEVED BY BREAKING A LARGER ROOM TO ACCOMMODATE THE PLANNING FOR SMALL.



THE ADAPTATION OF THE HOUSE TO ACCOMMODATE A SECOND CHILD WOULD BE ACHIEVED BY BREAKING A LARGER ROOM AND ADJUSTING AS THE USER NEEDS INTO TERRACES. AFTER WHICH THE USER COULD THEN BE ACCOMMODATED BY A SECOND UNIT.

## MICRO-CLIMATE ANALYSIS:



WHAT ARE THE MICROCLIMATE WIND CONDITIONS, IN REFERENCE TO DIRECTION?

- 1 BAR: AVERAGE WIND INTENSITY
- 2 BAR: AVERAGE WIND INTENSITY
- 3 BAR: ABOVE AVERAGE WIND INTENSITY

Since wind conditions are less severe to the northwest, reducing glazing and providing high insulation to the north becomes less critical.



WHAT ARE THE MICROCLIMATE SOLAR CONDITIONS IN REFERENCE TO DIRECTION?

- 5 BAR: FULL ACCESS
- 4 BAR: SLIGHT OBSTRUCTION
- 3 BAR: MODERATE OBSTRUCTION
- 2 BAR: SEVERE OBSTRUCTION
- 1 BAR: FULLY OBSTRUCTED

Since solar access is restricted to the direct south, it becomes more important to take advantage of the SSE and SSW orientation for solar gain.



WHAT IS THE SEVERITY AND DIRECTION OF THE BLOPPY?

- SEVERE
- MODERATE
- SLIGHT

With a southeast sloping site, it becomes possible to use the north edge of the building as the earth-providing insulation where it is most critical while still allowing solar access to the south. A more effective strategy and demanding an elongated east-west axis.

## MACRO-CLIMATE DATA:

**Orientation**  
The wind comes from the north and west in winter and from the south and east in summer. The wind from the north and east that brings winter weather is prevalent during the summer months.

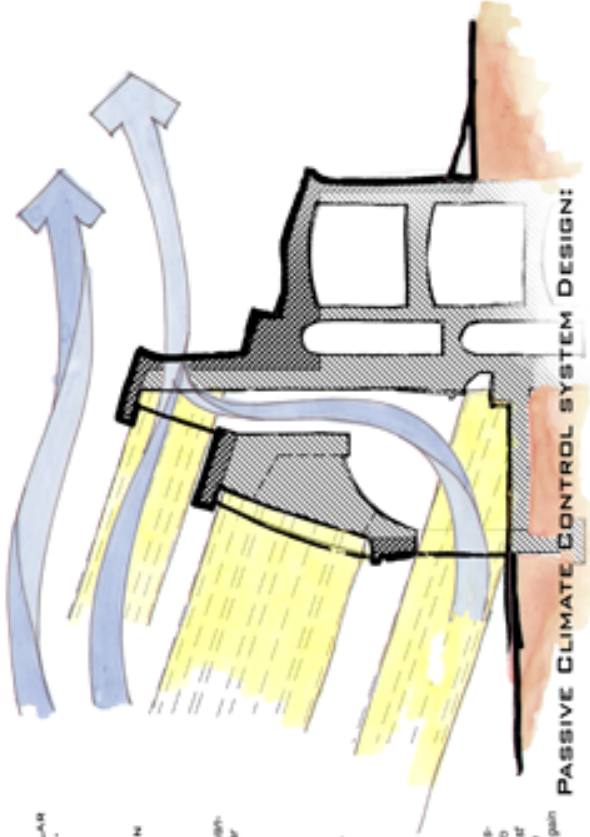
**Direction**  
Be sure to calculate the wind wall generally well. The wind from the north and east that brings winter weather is prevalent during the summer months.

Maximum summer and winter wind speeds are shown in the diagram. The wind from the north and east that brings winter weather is prevalent during the summer months.

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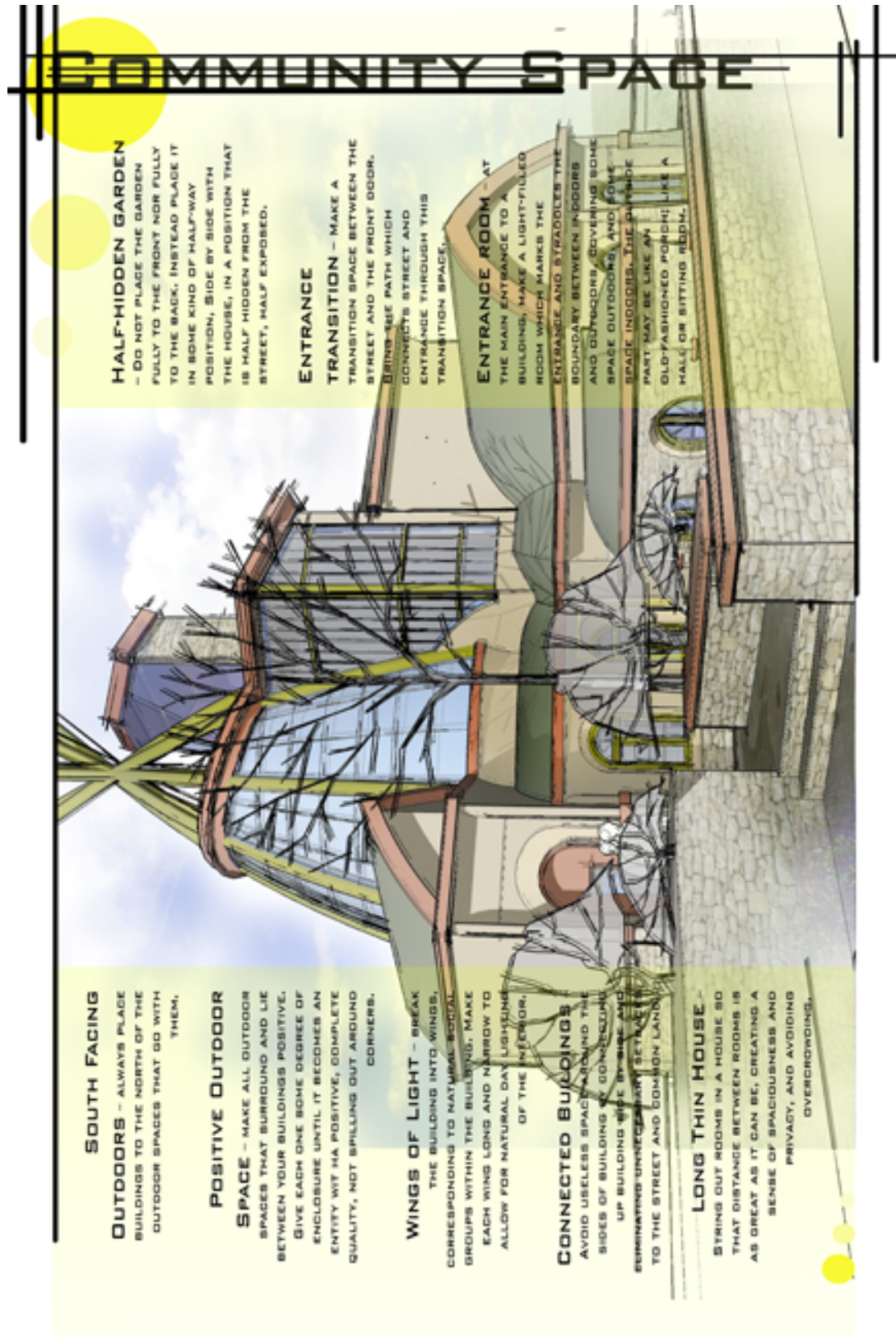
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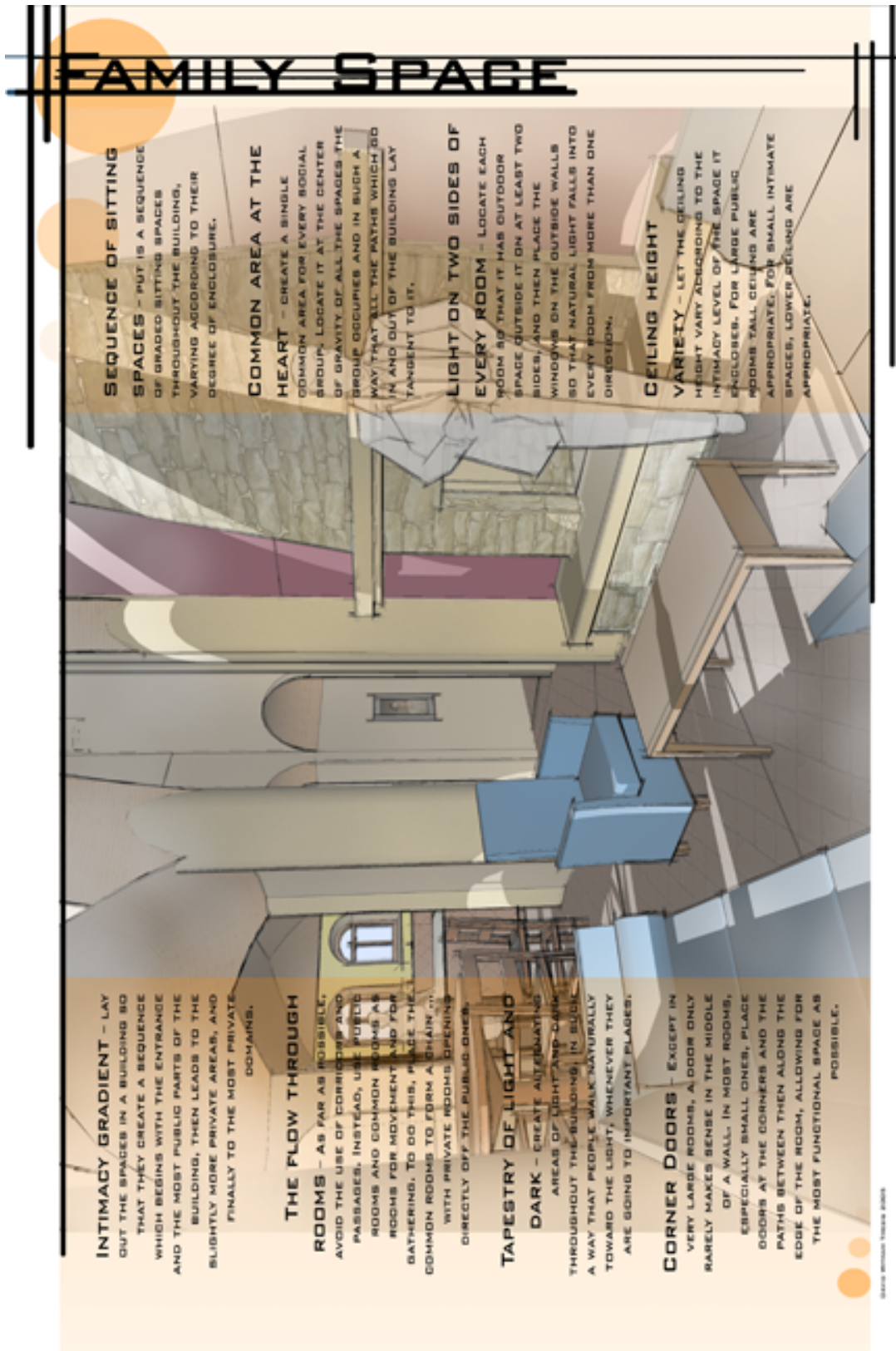
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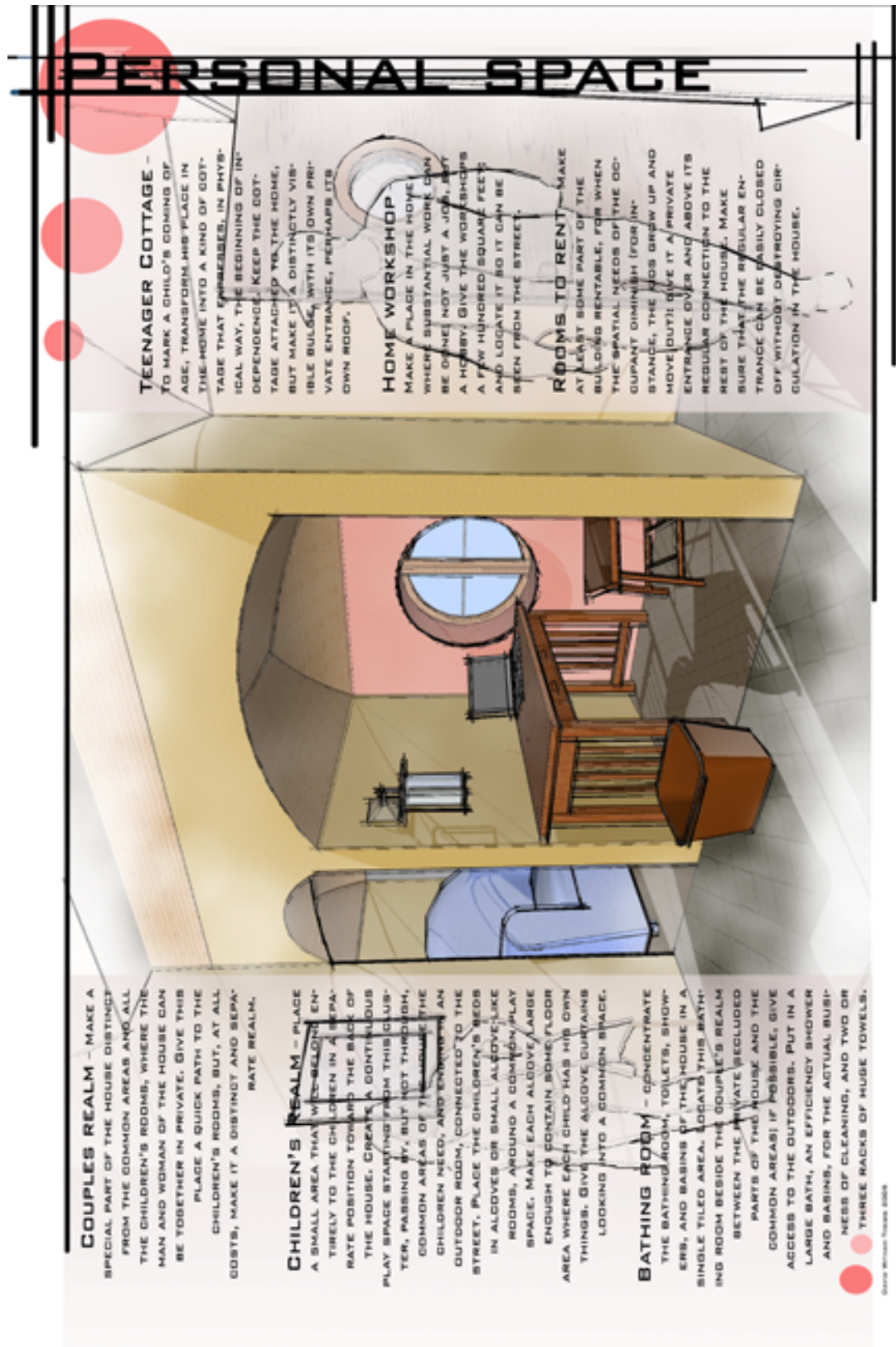


PASSIVE CLIMATE CONTROL SYSTEM DESIGN:

## CLIMATE











# References

### References:

Bailey, Robert G. (2002). *Ecoregion-based design for Sustainability*.

New York, NY: Springer-Verlag New York, Inc.

Audirac, Ivonne. (1997). *Rural Sustainable Development in America*.

New York, NY: John Wiley & Sons, Inc.

Bell, Bryan. (2004). *Good deeds good design: community service*

*through architecture*. New York, NY: Princeton Architectural Press.

Black Elk, Nicholas, & Neihardt, John G. (1932, 2000). *Black Elk Speaks:*

*Being the life story of a holy man of the Oglala Sioux*. Lincoln, NE: University of Nebraska Press.

Coupland, Robert t. (1992). *Ecosystems of the World 8A: Natural*

*Grasslands*. New York, NY: Elsevier Science Publishing Company Inc.

De Chiara, Joseph. (1990). *Time Savers Standards for Building Types*.

New York, NY: McGraw-Hill.

DeMallie, Raymond J. (2001). *Handbook of North American*

*Indians: Volume 13 part 2 of 2*. Washington D.C: Smithsonian Institute

Gibbon, Guy. (2003). *The Sioux: the Dakota and Lakota nations*.

Malden, MA: Blackwell Publishing Ltd.

Hassrick, Royal B. (1964). *The Sioux: life and customs of a warrior society*. Norman, OK: University of Oklahoma Press.

Licht, Daniel S. (1997). *Ecology and Economics of the Great Plains*. Lincoln, NE: University of Nebraska Press.

McDonough, William, & Braungart, Michael. (2002). *Cradle to cradle: Remaking the way we make things*. New York, NY: North Point Press.

Nelessen, Anton Clarence. (1994). *Visions for a new American dream: process, principles, and an ordinance to plan and design small communities*. Chicago, IL: American Planning Association.

Powers, William K. (1977). *Oglaia Religion*. Lincoln, NE: University of Nebraska Press.

Saunders, Thomas. (2002). *The Boiled Frog Syndrome: Your Health and the Built Environment*. West Sussex, England: Wiley-Academy.

Susanka, Susan. (1998). *The not so big house: a blueprint for the way we really live*. Newtown, CT: The Taunton Press, Inc.

Susanka, Susan. (2002). *Not so big solutions for your home*. Newtown, CT: The Taunton Press, Inc.



# Appendixes

- A: Demographic Data
- B: Climate Data
- C: Related Writings by Author
- D: Statement of intent

# Appendix A

## QT-P27: Occupation by Sex: 2000

Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

Geographic Area: Tribal Census Tract 9402, Standing Rock Reservation, SD--ND

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definitions see <http://factfinder.census.gov/home/en/datanotes/expsf3.htm>.

Occupation	Both sexes	Male	Female
Employed civilian population 16 years and over	249	122	127
Management, professional, and related occupations	69	33	36
Management, business, and financial operations occupations	28	23	5
Management occupations, except farmers and farm managers	13	10	3
Farmers and farm managers	11	11	0
Business and financial operations occupations	4	2	2
Business operations specialists	4	2	2
Financial specialists	0	0	0
Professional and related occupations	41	10	31
Computer and mathematical occupations	0	0	0
Architecture and engineering occupations	0	0	0
Architects, surveyors, cartographers, and engineers	0	0	0
Drafters, engineering, and mapping technicians	0	0	0
Life, physical, and social science occupations	0	0	0
Community and social services occupations	14	6	8
Legal occupations	0	0	0
Education, training, and library occupations	15	0	15
Arts, design, entertainment, sports, and media occupations	6	2	4
Healthcare practitioners and technical occupations	6	2	4
Health diagnosing and treating practitioners and technical occupations	4	2	2
Health technologists and technicians	2	0	2
Service occupations	99	53	46
Healthcare support occupations	0	0	0
Protective service occupations	4	2	2
Fire fighting, prevention, and law enforcement workers, including supervisors	2	2	0
Other protective service occupations, including supervisors	2	0	2
Food preparation and serving related occupations	31	13	18
Building and grounds cleaning and maintenance occupations	45	29	16
Personal care and service occupations	19	9	10
Sales and office occupations	45	9	36
Sales and related occupations	17	4	13
Office and administrative support occupations	28	5	23
Farming, fishing, and forestry occupations	5	5	0
Construction, extraction, and maintenance occupations	13	13	0
Construction and extraction occupations	7	7	0
Supervisors, construction and extraction workers	1	1	0
Construction trades workers	6	6	0
Extraction workers	0	0	0
Installation, maintenance, and repair occupations	6	6	0
Production, transportation, and material moving occupations	18	9	9
Production occupations	2	2	0
Transportation and material moving occupations	16	7	9
Supervisors, transportation and material moving workers	0	0	0
Aircraft and traffic control occupations	0	0	0
Motor vehicle operators	8	6	2
Rail, water and other transportation occupations	0	0	0
Material moving workers	8	1	7

## QT-P32: Income Distribution in 1999 of Households and Families: 2000

Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

Geographic Area: Tribal Census Tract 9402, Standing Rock Reservation, SD--ND

NOTE: Data based on a sample except in P3,P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definition, see [factfinder.census.gov/home/en/datanotes/xfpsf3.htm](http://factfinder.census.gov/home/en/datanotes/xfpsf3.htm).

Subject	Households	Families			Nonfamily households
		Total	Married/couple families	Female household, no husband present	
<b>NUMBER</b>					
Total	233	198	74	88	40
Less than \$10,000	44	53	4	39	21
\$10,000 to \$14,999	34	32	5	24	5
\$15,000 to \$19,999	28	24	9	7	0
\$20,000 to \$24,999	28	13	4	7	8
\$25,000 to \$29,999	9	8	2	3	0
\$30,000 to \$34,999	14	12	10	2	4
\$35,000 to \$39,999	13	13	11	4	0
\$40,000 to \$44,999	3	3	3	2	0
\$45,000 to \$49,999	10	7	7	0	0
\$50,000 to \$59,999	13	11	11	0	2
\$60,000 to \$74,999	8	8	5	0	0
\$75,000 to \$99,999	2	2	2	0	0
\$100,000 to \$124,999	1	1	1	0	0
\$125,000 to \$149,999	0	0	0	0	0
\$150,000 to \$199,999	0	0	0	0	0
\$200,000 or more	0	0	0	0	0
Median income (dollar)	18,947	17,848	33,423	10,883	9,583
Mean income (dollar)	22,970	22,917	34,494	12,772	14,438
<b>PERCENT DISTRIBUTION</b>					
Total	100.0	100.0	100.0	100.0	100.0
Less than \$10,000	27.3	27.3	7.9	44.3	52.5
\$10,000 to \$14,999	14.4	14.4	4.4	27.3	12.5
\$15,000 to \$19,999	12.0	13.5	11.8	8.0	0.0
\$20,000 to \$24,999	12.0	4.7	5.3	8.0	20.0
\$25,000 to \$29,999	3.9	4.1	2.4	3.4	0.0
\$30,000 to \$34,999	6.9	6.2	13.2	2.3	10.0
\$35,000 to \$39,999	6.4	7.8	14.3	4.5	0.0
\$40,000 to \$44,999	2.1	2.4	3.9	2.3	0.0
\$45,000 to \$49,999	4.3	3.4	9.2	0.0	0.0
\$50,000 to \$59,999	5.4	5.7	14.3	0.0	5.0
\$60,000 to \$74,999	3.4	4.1	4.4	0.0	0.0
\$75,000 to \$99,999	0.9	1.0	2.4	0.0	0.0
\$100,000 to \$124,999	0.4	0.5	1.3	0.0	0.0
\$125,000 to \$149,999	0.0	0.0	0.0	0.0	0.0
\$150,000 to \$199,999	0.0	0.0	0.0	0.0	0.0
\$200,000 or more	0.0	0.0	0.0	0.0	0.0

# Appendix A

QT-P35: Poverty Status in 1999 of Families and Nonfamily Householders: 2000

Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

Geographic Area: Tribal Census Tract 9402, Standing Rock Reservation, SD--ND

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definitions see <http://factfinder.census.gov/home/en/datanotes/expsf3.htm>.

Poverty Status	Number		Percent below poverty level
	All income level	Below poverty level	
<b>Families</b>			
With related children under 18 years	193	100	51.8
With related children under 5 years	170	98	57.4
With related children under 5 years	59	39	64.1
How the head worked in 1999	114	55	48.2
Full-time, year-round	54	12	22.2
How the head 65 years and over	20	3	15.0
Family received:			
Supplemental Security Income (SSI) and/or public assistance income in 1999	49	52	75.4
Social Security income in 1999	21	4	28.4
Mean income deficit (dollar)	8,991	(X)	(X)
<b>Married-couple families</b>			
With related children under 18 years	74	19	25.0
With related children under 18 years	63	19	29.2
With related children under 5 years	19	8	42.1
How the head worked in 1999	48	12	25.0
Full-time, year-round	24	0	0.0
How the head 65 years and over	9	0	0.0
Family received:			
Supplemental Security Income (SSI) and/or public assistance income in 1999	14	8	50.0
Social Security income in 1999	7	0	0.0
Mean income deficit (dollar)	8,314	(X)	(X)
<b>Families with female householder, no husband present</b>			
With related children under 18 years	88	47	74.1
With related children under 18 years	78	45	83.3
With related children under 5 years	32	28	87.5
How the head worked in 1999	44	34	81.8
Full-time, year-round	14	12	75.0
How the head 65 years and over	11	3	27.3
Family received:			
Supplemental Security Income (SSI) and/or public assistance income in 1999	44	40	87.0
Social Security income in 1999	14	4	42.9
Mean income deficit (dollar)	8,890	(X)	(X)
<b>Nonfamily householder</b>			
Below 50 percent of poverty level	40	17	42.5
Below 50 percent of poverty level	28	(X)	(X)
<b>Families below:</b>			
150 percent of poverty level	122	(X)	(X)
185 percent of poverty level	140	(X)	(X)
With related children under 18 years	128	(X)	(X)
With related children under 5 years	54	(X)	(X)



## QT-P24: Employment Status by Sex: 2000

Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

Geographic Area: Tribal Census Tract 9402, Standing Rock Reservation, SD--ND

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definition, see <http://factfinder.census.gov/home/en/datanotes/expsf3.htm>.

Employment Status	Number			Percent		
	Both sexes	Male	Female	Both sexes	Male	Female
Population 16 years and over	573	282	291	100.0	100.0	100.0
In labor force	314	149	167	55.1	52.8	57.4
Armed force	0	0	0	0.0	0.0	0.0
Civilian labor force	314	149	167	55.1	52.8	57.4
Employed	249	122	127	43.5	43.3	43.4
Unemployed	67	27	40	11.7	9.4	13.7
Percent of civilian labor force	21.2	18.1	24.0	(K)	(K)	(K)
Not in labor force	257	133	124	44.9	47.2	42.6
Population 16 to 19 years	93	34	39	100.0	100.0	100.0
Employed civilian	0	0	0	0.0	0.0	0.0
Unemployed	4	2	2	4.3	3.7	5.1
Not in labor force	89	32	37	95.7	96.3	94.9
Population 20 to 24 years	80	34	44	100.0	100.0	100.0
Employed civilian	43	23	20	53.8	43.9	45.5
Unemployed	17	4	13	21.3	11.1	29.5
Not in labor force	20	9	11	25.0	25.0	25.0
Population 25 to 34 years	304	152	152	100.0	100.0	100.0
Employed civilian	170	82	88	55.9	53.9	57.9
Unemployed	44	21	23	15.1	13.8	14.4
Not in labor force	88	49	39	28.9	32.2	25.7
Population 35 to 39 years	38	22	14	100.0	100.0	100.0
Employed civilian	22	13	9	57.9	59.1	54.3
Unemployed	0	0	0	0.0	0.0	0.0
Not in labor force	14	9	7	42.1	40.9	43.8
Population 40 to 44 years	19	4	15	100.0	100.0	100.0
Employed civilian	4	2	2	21.1	50.0	13.3
Unemployed	0	0	0	0.0	0.0	0.0
Not in labor force	15	2	13	78.9	50.0	86.7
Population 45 to 49 years	12	2	10	100.0	100.0	100.0
Employed civilian	10	2	8	83.3	100.0	80.0
Unemployed	0	0	0	0.0	0.0	0.0
Not in labor force	2	0	2	14.7	0.0	20.0
Population 70 years and over	27	12	15	100.0	100.0	100.0
Employed civilian	0	0	0	0.0	0.0	0.0
Unemployed	0	0	0	0.0	0.0	0.0
Not in labor force	27	12	15	100.0	100.0	100.0

# Appendix A

QT-P20: Educational Attainment by Sex: 2000

Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

Geographic Area: Tribal Census Tract 9402, Standing Rock Reservation, SD--ND

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, and definitions see [factfinder.census.gov/home/en/datanotes/expsf3.htm](http://factfinder.census.gov/home/en/datanotes/expsf3.htm).

Subject	Both sexes	Male	Female
<b>EDUCATIONAL ATTAINMENT (highest level)</b>			
Population 18 to 24 years	119	53	66
Less than high school graduate	43	24	17
High school graduate (incl. equivalency)	43	23	40
Some college or associate degree	11	2	9
Bachelor's degree or higher	0	0	0
Population 25 years and over	400	192	208
Less than 5th grade	4	0	4
5th to 8th grade	23	17	4
9th to 12th grade, no diploma	70	34	34
High school graduate (incl. equivalency)	137	70	67
Some college credit less than 1 year	27	13	12
1 or more years of college, no degree	44	23	39
Associate degree	44	13	29
Bachelor's degree	24	10	14
Master's degree	7	4	3
Professional degree	0	0	0
Doctorate degree	0	0	0
Percent of population 25 years and over	100.0	100.0	100.0
Less than 5th grade	1.0	0.0	1.9
5th to 8th grade	5.8	8.9	2.9
9th to 12th grade, no diploma	17.5	18.8	14.3
High school graduate (incl. equivalency)	34.3	34.3	32.2
Some college credit less than 1 year	6.8	7.8	5.8
1 or more years of college, no degree	14.0	13.0	18.8
Associate degree	11.0	7.8	13.9
Bachelor's degree	6.0	5.2	6.7
Master's degree	1.8	2.1	1.4
Professional degree	0.0	0.0	0.0
Doctorate degree	0.0	0.0	0.0
Percent high school graduate or higher	73.8	72.4	78.8
Percent bachelor's degree or higher	7.8	7.3	8.2
<b>PERCENT BY AGE GROUP</b>			
High school graduate or higher			
25 to 34 years	71.9	64.4	78.4
35 to 44 years	80.3	84.4	74.4
45 to 64 years	77.4	73.0	82.4
65 years and over	64.1	33.7	80.0
Bachelor's degree or higher			
25 to 34 years	0.0	0.0	0.0
35 to 44 years	9.8	8.3	11.1
45 to 64 years	11.9	12.2	11.4
65 years and over	3.1	0.0	8.0

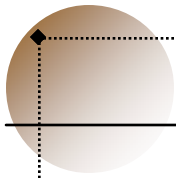
## QT-P1: Age Groups and Sex: 2000

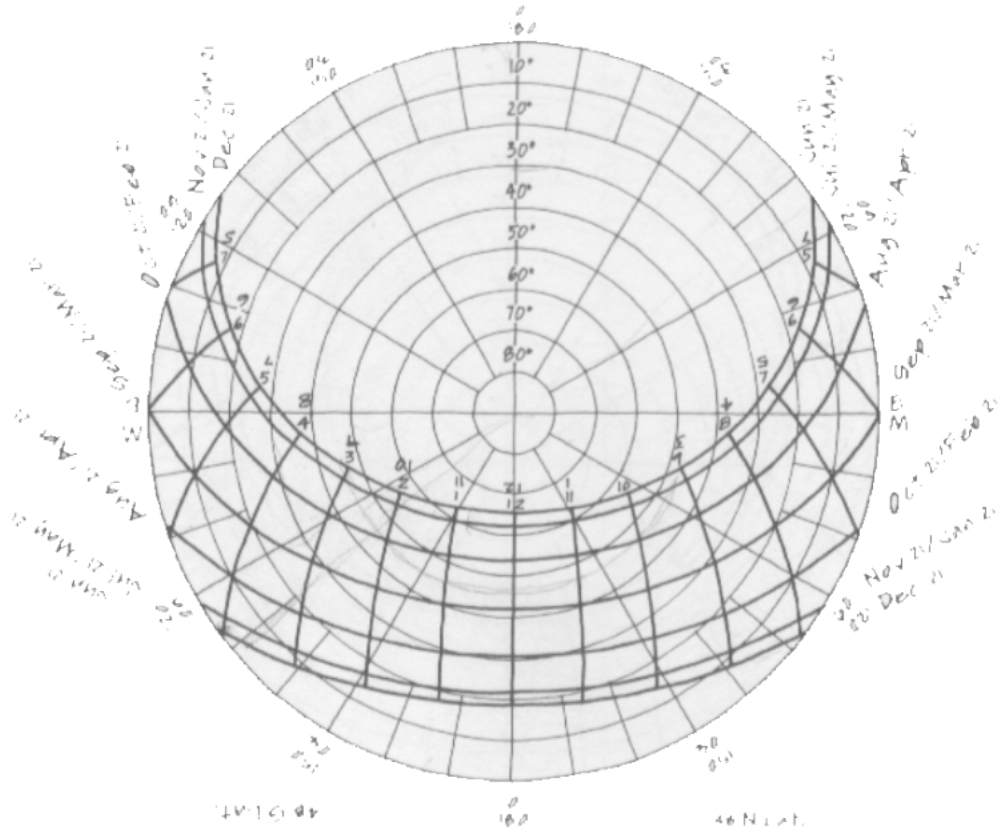
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

Geographic Area: Tribal Census Tract 9402, Standing Rock Reservation, SD--ND

NOTE: For information on confidentiality protection, nonsampling error, and definitions,

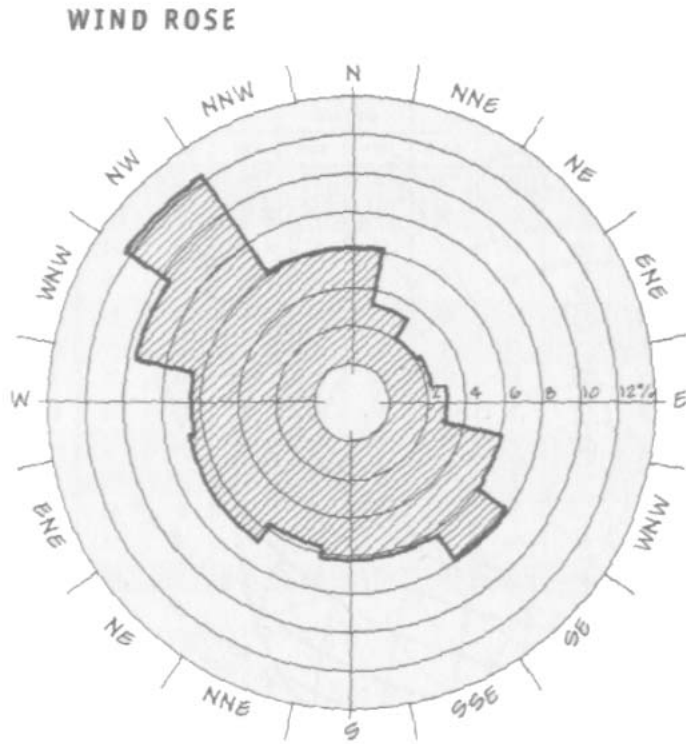
Age	Number			Percent			Male per 100 female
	Both sexes	Male	Female	Both sexes	Male	Female	
Total population	971	489	502	100.0	100.0	100.0	98.4
Under 5 years	102	44	58	10.5	9.4	11.4	73.9
5 to 9 years	139	73	66	14.3	15.4	13.1	110.4
10 to 14 years	119	60	59	12.3	12.8	11.8	101.7
15 to 19 years	103	51	52	10.6	10.9	10.4	98.1
20 to 24 years	72	30	42	7.4	6.4	8.4	71.4
25 to 29 years	53	24	29	5.5	5.1	5.8	82.8
30 to 34 years	45	34	31	4.7	7.2	4.2	109.7
35 to 39 years	43	32	31	4.5	6.8	4.2	103.2
40 to 44 years	49	21	28	5.0	4.5	5.4	73.0
45 to 49 years	41	34	27	4.3	7.2	3.4	123.9
50 to 54 years	43	20	23	4.4	4.3	4.4	87.0
55 to 59 years	35	19	14	3.4	4.1	3.2	118.8
60 to 64 years	25	10	15	2.4	2.1	3.0	64.7
65 to 69 years	13	5	8	1.3	1.1	1.4	62.3
70 to 74 years	13	4	7	1.3	1.3	1.4	83.7
75 to 79 years	7	3	4	0.7	0.4	0.8	73.0
80 to 84 years	7	1	4	0.7	0.2	1.2	14.7
85 to 89 years	2	2	0	0.2	0.4	0.0	(X)
90 years and over	0	0	0	0.0	0.0	0.0	(X)
Under 18 years	431	213	218	44.4	43.4	43.4	97.7
18 to 44 years	498	239	259	51.3	51.0	51.4	92.3
18 to 24 years	104	45	59	10.7	9.4	11.8	74.3
25 to 44 years	230	111	119	23.7	23.7	23.7	93.3
25 to 34 years	118	58	60	12.2	12.4	12.0	94.7
35 to 44 years	112	53	59	11.5	11.3	11.8	89.8
45 to 44 years	144	83	81	14.9	17.7	14.1	102.3
45 to 54 years	104	54	50	10.7	11.5	10.0	108.0
55 to 64 years	40	29	31	4.2	4.2	4.2	93.3
65 years and over	42	17	25	4.3	3.4	5.0	68.0
65 to 74 years	24	11	15	2.7	2.3	3.0	73.3
75 to 84 years	14	4	10	1.4	0.9	2.0	40.0
85 years and over	2	2	0	0.2	0.4	0.0	(X)
14 years and over	591	285	304	60.9	60.8	61.0	93.1
18 years and over	540	254	288	55.4	54.4	54.4	90.1
21 years and over	493	233	240	50.8	49.7	51.8	89.4
40 years and over	47	27	40	4.9	5.8	8.0	67.3
62 years and over	53	22	33	5.7	4.7	6.4	64.7
67 years and over	33	12	23	3.4	2.4	4.4	52.2
73 years and over	14	4	10	1.4	1.3	2.0	60.0
Median age (years)	21.4	20.8	22.3	(X)	(X)	(X)	(X)



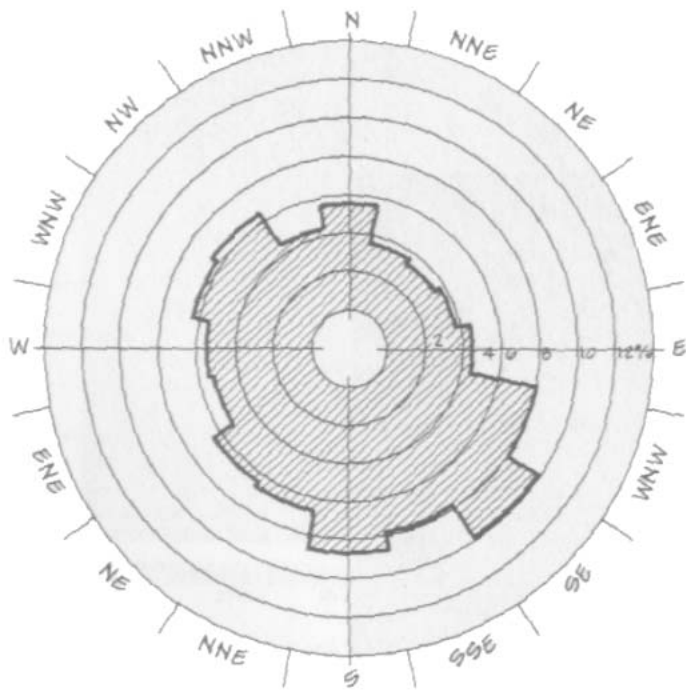


Sun Path Diagram 46° Latitude

# Appendix C



December Wind Rose,



June Wind Rose,

## 8 SKY COVER

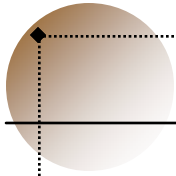
	J	F	M	A	M	J	J	A	S	O	N	D
1 am	4.9	5.3	6.5	5.9	5.8	4.5	4.8	5.0	4.3	3.7	6.0	7.0
2	5.3	5.1	6.9	6.6	5.9	4.8	4.7	4.8	4.5	4.0	5.2	7.4
3	5.8	5.0	7.4	6.5	6.7	5.1	4.8	4.6	4.7	4.2	5.3	7.1
4	6.3	5.4	7.2	6.2	6.2	5.6	4.7	4.4	5.1	4.2	5.4	7.0
5	6.2	5.1	6.6	5.8	6.5	5.9	4.8	4.3	5.4	4.1	5.6	6.5
6	6.0	5.3	6.8	6.0	6.9	6.5	4.7	4.6	5.7	4.2	5.7	6.5
7	5.8	5.9	7.4	6.1	6.8	6.4	5.0	4.9	5.9	4.7	6.1	6.5
8	5.6	6.4	6.5	6.1	6.6	6.2	5.1	4.7	5.9	5.3	6.3	7.0
9	5.7	5.8	6.4	6.8	6.4	6.1	5.4	5.1	6.0	5.6	6.7	6.8
10	6.0	5.9	6.5	6.6	6.4	6.0	5.5	4.9	6.0	5.8	7.0	6.8
11 am	6.1	6.1	6.8	6.5	6.4	5.9	5.5	5.1	6.1	5.9	7.2	6.9
12 noon	6.4	5.9	6.7	6.7	6.4	5.8	5.6	5.0	6.1	5.9	7.5	6.9
1 pm	5.9	6.5	7.0	7.1	6.5	6.2	5.7	5.6	6.1	6.0	7.4	6.8
2	6.1	5.6	6.9	7.3	6.6	6.4	5.8	5.7	5.9	6.1	7.4	6.6
3	5.6	6.2	6.9	7.3	6.7	6.8	5.9	5.7	5.9	6.2	7.3	6.6
4	5.8	6.0	6.7	7.0	6.6	6.6	5.4	5.7	5.9	5.7	7.2	6.4
5	5.9	6.0	7.4	7.3	6.5	6.4	4.7	5.6	5.8	5.3	7.1	6.1
6	5.1	5.8	7.4	7.4	6.4	6.2	4.2	5.2	5.8	4.8	7.1	6.3
7	5.1	5.5	7.0	6.7	6.2	5.9	4.3	5.0	5.3	4.7	6.8	6.3
8	4.8	5.4	7.0	6.3	5.9	5.4	4.5	4.7	4.8	4.7	6.5	6.2
9	4.7	6.1	6.4	5.9	5.6	5.6	4.5	4.8	4.5	4.6	6.2	6.3
10	4.8	6.1	6.2	5.9	6.7	4.5	4.5	4.8	4.4	4.4	6.3	6.7
11 pm	4.6	6.6	5.9	5.5	5.9	4.5	4.6	4.9	4.2	4.0	6.3	7.2
12 mid	4.7	5.8	6.5	5.1	6.0	4.2	4.7	5.1	4.1	3.8	6.4	6.9

0-2 3-5 6-8 9-10  
Clear Partly Cloudy Breezy Partly Clear

## 9 DAYLIGHT AVAILABILITY

	J	F	M	A	M	J	J	A	S	O	N	D
1 am	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	89	471	607	477	179	0	0	0	0
7	0	0	145	787	1607	1889	1691	1067	432	100	0	0
8	0	221	996	1975	3186	3368	3234	2572	1635	834	211	0
9	551	1165	2282	3429	4489	4780	4601	3976	2777	1897	961	532
10	1577	2423	3465	4588	5970	6113	6111	5263	4244	3068	1935	1275
11 am	2596	3658	4844	6313	6573	7480	7094	6271	5194	3950	2645	2160
12 noon	3106	4272	5305	5687	7261	7763	7052	6623	5696	4364	2970	2524
1 pm	3394	4590	5468	5836	7187	8146	7509	6946	5779	4479	2930	2551
2	3101	4362	5083	5448	6840	7366	7060	6474	5631	3956	2610	2297
3	2309	3583	4274	4912	5834	5748	6251	5704	4665	2912	1766	1657
4	1562	2416	3224	3866	4697	5167	5592	4724	3654	1974	968	828
5	366	1139	1907	2532	3622	3939	4179	3248	2127	832	313	49
6	0	192	651	1225	2013	2493	2713	1941	724	102	0	0
7	0	0	37	293	806	1224	1209	609	73	0	0	0
8	0	0	0	0	97	269	233	24	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11 pm	0	0	0	0	0	0	0	0	0	0	0	0
12 mid	0	0	0	0	0	0	0	0	0	0	0	0

>250 251-1000 1001-2000 >2000





## Pollution and the Built Environment

By David Witham

Fall 2004 in association with NDSU Architecture Department

*What are we talking about?*

Before beginning a discussion of pollution and the built *environment*, it is important to establish a way of thinking about the terms *pollution* and *built environment* and how they will be defined to create a framework for this discussion.

When attempting to define pollution, a description that might first come to mind might be *the presence of anything undesirable*. However, this definition is problematic. It defines pollution in subjective terms. If you consider the case of noise pollution, what might be distracting noise to one person, could be meaningful music to somebody else. Perhaps it would be better to narrow pollution down, for the purpose of this discussion, from *anything* to *any substance* undesirable. Narrowing the field to physical substances does not entirely remove the degree of subjectivity. *Undesirable* is where the real problem lies. A more objective phrase is needed. Perhaps *the material source of disruption in a system* would be a more accurate and useful definition. This definition substitutes *source of disruption* for *undesirable*, and allows us to detach personal preferences in evaluating the health of a system.

Moving on to the built environment, some good definitions might be *the material artifacts of human lifestyle*, or *anything produced by man, that would not otherwise naturally occur*. The tendency might be to only think of buildings, when defining the built environment, but a broader definition is both more accurate and more useful for the purposes of this discussion. Another tendency might be to point out that humans are a part of nature and therefore anything we do can be considered part of the natural environment, making the built environment a subcategory of the natural environment. We must consider whether that distinction between the built and the natural is accurate and useful. If we consider that the development of natural systems is a slow process taking lifetimes on top of lifetimes, and if we take in to account the uniqueness of humans to this process, how humans are able to develop new technologies and materials and introduce them into the environment in an evolutionary blink of any eye, we can only conclude that built and natural elements are fundamentally different. Because of the drastic difference in the scale of change and adaptability, we must conclude that the built environment is in fact distinct from the natural environment. A better definition can be had by re-working the original definition slightly to be *Mankind's unnatural (built) system*

## Appendix C

*of adaptation.*

With these terms individually defined, an examination of the relationship is next. In nature pollution does not exist. It is within the capabilities of the natural system to adapt to any anomaly of natural origin. Natural anomalies may in fact change the system, but they are a part of the system. They emerge and disappear within the parameters of the systems processes, in a dialogue. This is in stark contrast to the built anomalies, polluting substances, introduced by mankind. Many modern synthetic materials are entirely alien to natural systems. They emerge instantaneously, and wreak havoc to the planetary ecosystem. The relationship between pollution and the built environment is that the presence of material that breaks down natural systems is due to entirely to the built, unnatural systems of mankind.

However, one cannot go so far as to say that the built environment is entirely polluting. One could find many examples of human activity and production that work within an existing, working, natural system, even enhancing it. However it cannot be denied that there are many instances of a conflicting relationship between built and natural systems. Perhaps the most important thing to keep in mind is that pollution is not an end in itself. Nobody does anything with the sole intention to pollute. It is an unfortunate byproduct of the built system that we create to support our lifestyle. Pollution, a byproduct of the built environment, serves no purpose and holds no *positive* value. The essential relationship between pollution and the built environment is that built systems, though they often are, do not necessarily have to be a polluting presence on this planet.

Conflicting relationships between the natural and built systems, namely pollution, is the source of environmental problems and should be eliminated. According to Pope John Paul II, this conflict lies in our morality. To him, environmental problems are a 'moral crisis.'

*The ecological crisis has assumed such proportions as to be everyone's responsibility. Modern society will find no solution to the ecological problem (pollution) unless it reviews its own lifestyle (the built environment.) In many areas of the world today, society is given to instant gratification and consumerism while remaining indifferent to the damage these cause. (Hirschhorn, 1991, p. 9)*

There can be no argument that our current paradigm of consumerism is causing environmental problems. Proving this relationship is not the focus of this discussion, but rather, acknowledging the truth of the matter, and determining what to do about it. The essence of a solution is this: In order to solve to the larger environmental problem of pollution, we must first address the question of morality, and

the lifestyles we choose to lead.

*Ok, so what's the problem?*

One might ask, "what's so bad about pollution that the problems it creates demands we change our way of life?" One might find an answer to this question if he considers the emergence of environmental threats. . .

*Every year thousands of people in the United States and elsewhere discover that they are living near or on top of a toxic waste dump; that their drinking water is contaminated by toxic chemicals; or that years ago they were exposed to a chemical that once was thought harmless, but is now known to be toxic. (Hirschhorn, 1991, p. 10)*

The consequences of such threats are alarming and real. One prominent consequence is damaged genes that cause cancer.

*The disease has increased by one percent per year, and varying estimates predict that within 50 years everyone will suffer from some form of cancer. .Ultimately all cancers are genetic disease caused by damaged genes, however, studies demonstrate that the environment rather than genetic factors pose the greatest risk. Radiation and pollution are among the prime culprits. (Saunders, 2002, p. 9-10)*

Our body is a working natural system. Just as pollution is affecting us, it is also affecting everything else in nature. These threats can effect us individually or society and the planetary system as a whole. Moreover, the mere presence of these threats is psychologically damaging.

*Psychologically, the attack on personal peace of mind has traditionally come from fears about natural catastrophes, world wars, and immediate health and economic problems. Today, however, personal and global environmental catastrophes have become a prominent,*

## Appendix C

*plausible threat at both local and global level. Some people may believe otherwise, but many people all over the planet see environmental threat as a deadly reality. More and more people sense that they are being pushed closer to the edge of history, and they are rightfully afraid of falling off. (Hirschhorn, 1991, p. 10)*

Despite these fears, many people do not feel personally responsible. They don't believe environmental problems are within their individual realm of control. They blame industry and the system that they feel they cannot control. They don't know what can be done to make a difference. What's worse, they reject the plausibility of the worse-case scenario. They deny the causal relationship between the lifestyle they lead and environmental degradation. They don't see any real need to change. The prominence of these sentiments in modern culture is the source of the Pope's concern, the root of our moral dilemma. While this is the sentiment of some, others are willing to take responsibility and to sacrifice personally to make a difference:

*A survey of people in 15 prosperous and developing nations accounting for half the world's population revealed a universal preference for a lower standard of living with a cleaner environment than for a higher standard of living with a dirtier environment. (Hirschhorn, 1991, p. 13)*

While many people may be willing to make this sacrifice, such a sacrifice may not be necessary or even very helpful in dealing with environmental problems. The moral dilemma is not that each person is actively, deliberately and directly polluting the environment. Our dilemma is that we stand by passively as industry is allowed to degrade the environment

Who is to blame, the industrial process or individual consumers? More importantly, how do we go about fixing it? The Pope would argue that the individual consumer is to blame, and the key to solving this problem ultimately lies with the individual citizen. But must we, as is perceived, sacrifice our standard of living in order to preserve our environment and avoid catastrophe? Or is there another way? Could we instead adjust the processes of industry to work in harmony with nature, not against it? Under this scenario couldn't we have it both ways? If nature and industry could be made to exist in a mutually beneficial way wouldn't material abundance cease to be an atrocity? Ultimately the impetus to change must come from the individual consumer citizen, but it is not our lifestyle, but the method we employ to support that lifestyle that must ultimately change.

### *So, what's the solution?*

The goal should not be to reduce the conflict but to eliminate it entirely. This would require a shift from our current infrastructure. It would require us to examine our notion of what is good and what is bad, our notion of progress. It would in turn require us to change our methods of achieving this new definition of progress. Currently, media and politicians alike have been using an indicator called the Gross National Product (GDP) to evaluate consequences and make decisions. There are many flaws inherent in this technique.

*By counting only monetary transactions as economic activity, the GDP omits much of what people value and activities that serve basic needs. It doesn't count free services – such as community volunteer work or caring for children or elderly parents in the home. . The GDP also ignores the value of leisure time spent in recreation, relaxation, or with family or friends. The GDP omits crucial contributions of the environment, such as clean air and water, moderate climate, and protection from the sun's rays. It ignores (all these services) even though these services become expenses if they need to be bought instead. (Venetoulis, p. 9, 2004)*

Decision making based on GDP as an indicator of progress is at the root of our folly. We haven't been doing things the right way. We need a new indicator of progress.

The problem with the GDP is that, in its reasoning, all growth is good.

*Higher health care and education costs, longer commute time to work, increasing pollution, clear cutting forests and paving over open spaces, and increased use of fossil fuels can all add to the 'positive only' ledger accounting of the GDP. (Venetoulis, p. 7, 2004)*

The negative aspects of all these things are not accounted for at all. According to the GDP they are all 'good' because they involve the payment for a service or good. The advent of a flood or fire or any other catastrophe bodes well because of all the growth that will be necessary to replace the damages. The bottom line is that growth in the GDP does not necessarily translate into a higher standard of living or quality of life.

## Appendix C

One of the most troublesome consequences of the current economic paradigm is the shift in the concentration of wealth.

*Since 1968, income inequity in America has been steadily worsening. If all new economic activity moves from the middle and lower income classes to the richest 1% in America, the GDP reports the same number as if it went to all Americans. (Venetoulis, p. 7, 2004)*

The Genuine Progress indicator is an indicator that attempts to define progress in a way that is much closer to the reality that people experience. The difference between the conclusions one might make from looking at the two indicators is alarming.

*The GDP shows that in the period from January 2000 (the year before George W. Bush took the presidency) and January 2003 the economy grew approximately 2.64%, about \$272 billion or \$180 per American—adjusted for inflation. Without reference to the quality and distribution, this economic growth may look good on the surface. Using GPI analysis, however, the value of economic activity grew by less than one percent (0.12%) during the same period. On a per capita basis, from 2000 to 2003 there was a \$212 decline in GPI, with the biggest reductions coming from the degradation of natural resources and a rise in the national debt. On the other—positive—side of the ledger, the GPI shows a \$600 billion increase in the value of housework and volunteer work from 2000 to 2003, which is not counted in the GDP.*

*Using the GDP as a measure of economic progress amounted to a \$7 trillion overstatement of economic gains in 2002, or about \$25,000 per American. It is time for GDP to be relegated to the back-shelf of our intellectual measures of wellbeing and be replaced with more discerning and responsible national accounting procedures and political pronouncements, so voters can make well informed decisions. (Venetoulis, p. 8, 2004)*

Yet we still use the GDP as a basis for decisions.

*There is widespread belief in America that the GDP is a barometer of the nation's economic health and well-being. When the GDP rises, the media applauds and politicians hasten to take credit. When it falls, there is hand-wringing and general alarm. (Venetoulis, p. 9, 2004)*

It wasn't even developed for the way we currently use it.

*The government developed it primarily as a planning tool to guide the massive production effort for World War II. The GDP was never intended to be a yardstick of economic progress; it says nothing about the impacts of current modes of production upon the national's health and well-being. Yet economic analysts and the media accord the GDP totemic stature, and regard its growth as the ultimate measure of economic success. (Venetoulis, p. 9, 2004)*

Imagine if we had to pay for everything the environment does for us for free, clean air, water, and land. Unless we change our ways, we will soon realize too late the value of what has been lost.

*It assigns to social and ecological capital an implicit and arbitrary value of zero. To use the GDP as a measure of progress is to assume that families, communities, and the national habitat add nothing to economic well-being, so that the nation can safely ignore their contributions, and in fact their destruction can be regarded as economic gain. (Venetoulis, p. 11, 2004)*

Using the GDP as a model, environmental degradation will inevitably continue. We must realize that there is more to an economic system than what we pay for.

*If our measures of progress treated non-market services as elements of the economy—which they are—the supposed dichotomy between social or environmental goals and economic ones would greatly diminish. We could see that very often, these are really the same things under different names. But not to include such un-priced products and services leads to difficulties of a more serious kind. It results in a view of the economy that is fundamentally distorted, and causes our commentators and politicians to lose touch with economic reality. They are seeing only part of the economy—that part acknowledged by the GDP—and mistake it for the whole. (Venetoulis, p. 10, 2004)*

The new paradigm that attempts to achieve true progress is best described by William

## Appendix C

McDonough (2002) in "Cradle to Cradle." In it he call for a system of building and producing that tries to solve environmental problems not through efficiency (reducing, reusing, recycling) but through effectiveness. We should not be working so hard to be less bad. Instead we should strive to be 100% good. In the "less bad" solution we are told to lower our standard of living to reduce our negative impact. However the negative impact still exists in this method. Ultimately, the incoherence between built and natural systems will cause a breakdown. The "less bad" tactic simply pushes that scenario further into the future. Instead of efficiency, effectiveness, working to solve the in-compatibility of built and natural systems, is the answer. The goals should not be to reduce pollution but to prevent it entirely. Being effective calls for the elimination all toxic, synthetic materials. It calls for mimicking natural system's metabolism in the metabolism of our built systems: the elimination of the concept of waste, and the fostering of diversity. It calls for the separation of the built metabolism, alien to nature, from the natural metabolism. Once the built-natural conflict is resolved, abundance is no longer a crime. Abundance is an integral part of a working natural system, and can and should also be a part of a working built system.

### *What can we do about it?*

The Pope contends that environmental problems are, at their root, a moral issue. According to such a view, the drive for personal abundance compromises environmental health. The blame for environmental degradation is placed squarely on the shoulders of the average consumer in affluent society and the lifestyle they have the audacity to insist on living. However, that need not be the case. It is not necessary to sacrifice abundance on behalf of environmental health. While the Pope's assessment is true with our current infrastructure, there is an alternative. There is nothing wrong with wanting material abundance. What is wrong is how we are going about trying to provide this abundance. The true moral dilemma is that we are standing by passively as the system we currently support degrades the environment and channels wealth to the elite.

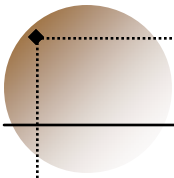
There is already a cost associated with pollution. That cost will only continue to rise. Currently a select few people are making a lot of money employing techniques that are degrading the environment. One of the reasons these few people are able to make money is they are not being held responsible for the cost they are creating for humanity at large by degrading the environment. Just one consequence of this environmental degradation is the rising cost of health care. It is the average citizen who eventually has to pay for the debt created by these powerful few. Yet, as the environment continues to degrade, many applaud because the GDP goes up. The problems with the average citizen consumer lay not so much with morality as it does with misguided stupidity.



As citizens we must change how we understand and think about progress. We must demand policy making based on creating genuine progress that can be enjoyed by all for generations and generations to come. This policy will adhere to the principles outlined by the cradle-to-cradle strategy of production. This strategy will focus not on pollution reduction but prevention.

*Pollution prevention should be the first choice, and the option against which all other options are judged. . . This in turn means that governments and persons shift their attention from deciding what 'safe' and 'acceptable' levels of waste and pollutant are to targeting any level of waste and pollutant production for elimination or reduction. No amount of waste or pollution generation should be seen as inevitable, acceptable, necessary, economically tolerable, or safe. . . The presumption should be that any waste or pollutant is potentially harmful and preventable. All too often research is called for instead of action. (Hirschhorn, 1991, p. 340)*

Inevitably, to estate such a radical change, there are risks to take and fears to overcome. There will be bumps in the road and lumps to take along the way. This process of change will only begin when we as citizens demand it. Certainly it will not be enacted by those few who are benefiting from the current model. We must create a political and business climate and a built infrastructure that serves the average citizen and the environmental systems, both built and natural alike. This strategy will localize prosperity, not just in an economic sense for all people, but holistically for nature and all living things on the planet.



Modern Goals, Native Solutions:  
Developing and Implementing a Model for  
Housing and Community Design in Cannonball ND

*Thesis Statement of Intent*

By David Witham

I know a place in need of a holistic design solution. That place is the typical Indian reservation. I believe there has been a missed opportunity to provide meaningful yet affordable housing and to this place. Sub-standard work has been standard practice, and the effects resonate deeply through the community and culture. However, the housing issue is only a manifestation of a deeper problem: the lack of ability to be self-sufficient. Solving this problem must be the ultimate goal. Though there are many obstacles to overcome, most outside the traditional realm of architecture, I believe meaningful architecture can go a long way toward integrating a holistic solution. This thesis will offer a vision as to how that can happen in the Cannonball community.

My interest in this project exists at two levels. At one level I am interested in exploring the feasibility of natural building materials in comparison with more familiar building techniques, and weighing the cultural, economic and health consequences of each. Thus, I will present a holistic, sustainable solution to the housing problem currently facing many Native American tribes. This solution may or may not utilize natural building systems. By extension this solution will spill into the realm of community planning and design. And so, on a broader scope, I am interested in integrating local considerations into an economically and ecologically sustainable community development of Cannonball's town center. I intend for this project to demonstrate my range of design ability, from thoughtful, functional detailing to urban design and even regional planning.

I believe a solution can be found that provides quality, meaningful homes and community buildings for the community of Cannonball ND. I believe this solution must also be grounded in the localization of energy and material producing enterprises in order to achieve self-sufficiency. Although achieving self-sufficiency is a goal that extends far beyond the realm of architecture, architecture can contribute to this end by utilizing locally feasible materials and providing uplifting spatial experiences that encourage meaningful social interaction and give a sense of community identity and pride. The overarching goal of this project is to demonstrate that quality architectural design can be a major tool in synthesizing social and economic as well as environmental solutions.

The unifying theme of this project is best described by how "quality design" will be defined. In addition to the basic parameters of being functional and beautiful, quality design must be native to the setting in which it is implemented. An eco-systemic theoretical approach will be used in this project in order to achieve an appropriate native solution. One size does not fit all. Everyone should demand quality, meaningful design, but the design itself will take different forms for different people. In this way I believe architecture can better achieve its ultimate goal, improving the lives of people.



## David Witham

Hometown:

Born:

“Let us be the  
change we would  
like to see in the  
world.”

—Ghandi