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TIMBER FRAME HOUSES

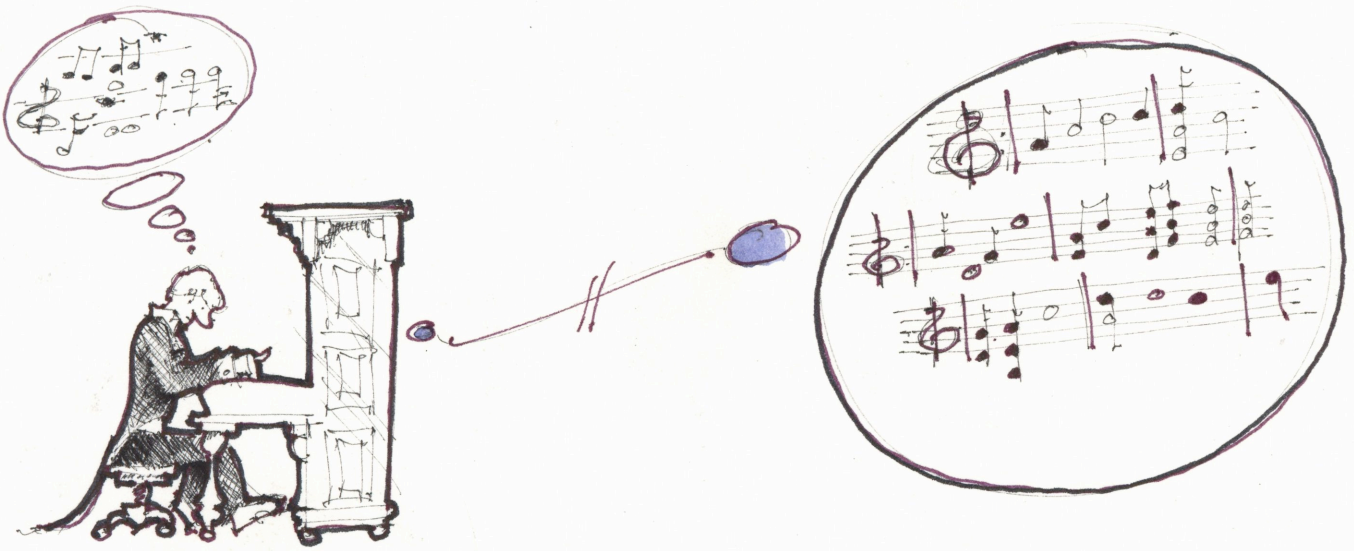
SCOTT WARREN HOMMAS

THESIS I & II DEC. 1986

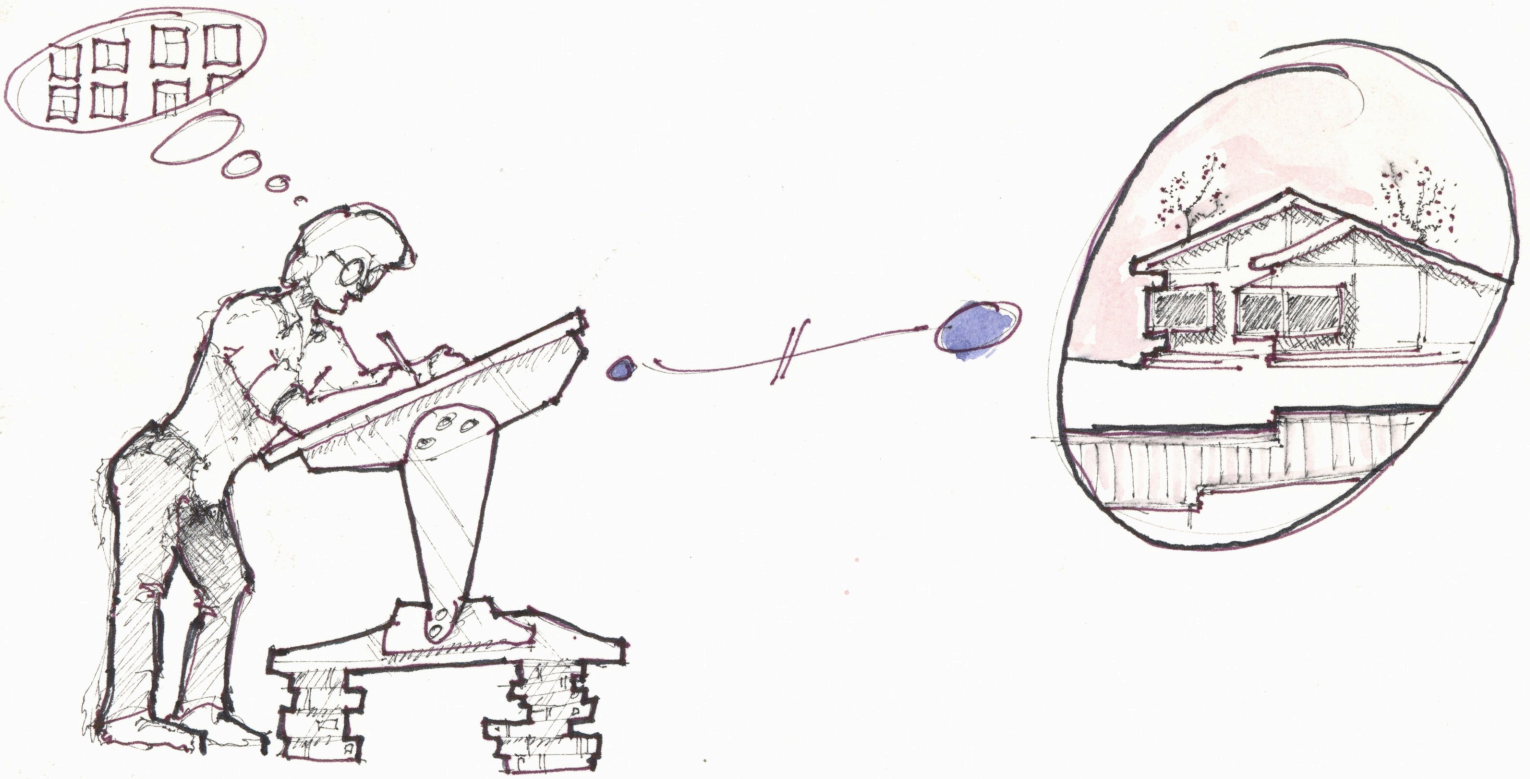
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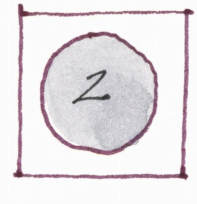
Panels — Architecture

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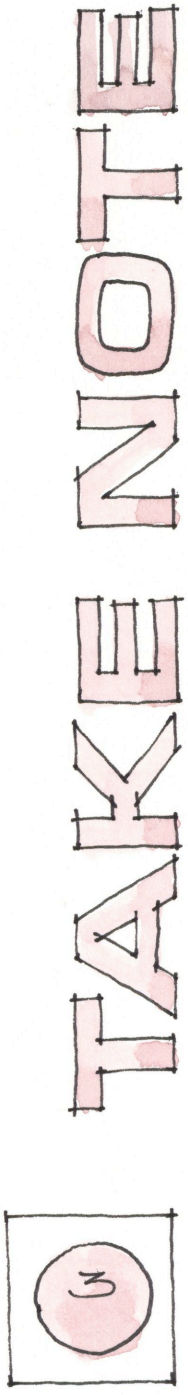
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I have quoted extensively throughout this thesis book without reference to the original author. It was not my intention to plagiarize and I thank each and everyone of those that I have quoted for their words and the insights which they have given me.



SINGLE FAMILY EXPANDABLE HOUSING

by

SCOTT W. HOMMAS

An undergraduate thesis submitted
in partial fulfillment of the requirements
for the degree of

Bachelor of Architecture

Approved by:

Robert Utzinger, Thesis Advisor

Robert Utzinger, Director

MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
JUNE, 1986

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DEDICATION

This thesis is dedicated
to those who still believe
in the American dream.

Keep on keep'n on dreamers,
there is a solution that will
turn magic into technology
and dreams into reality.

CONTENTS

Statement	8 - 13
Goals	14
User	15 - 19
Site	20 - 28
General Information	20 - 28
Cool Climate	21 - 24
Temperate Climate	25 - 28
Case Studies	29 - 43
Metabolic Cycle Theory	30
Carl Kotch	31
Neil Mitchell Associates	32
Hirshen and Van der Ryn	33
Robert Martin Engelbrecht & Asso.	34
Building Block Modules, Inc	34
Fred Koetter	35
Habitat	36
Dingman - Fauteux & Partners	37
Seed Consortium	37
Levitt Technology	38
John H. Suhr	39
National Homes	40
Canistar & Link	41
Tod E. Waxman	42
Terrapin Mark 45	43

Proposals 44 - 71
Link Modules 45
Concrete Log 46 - 48
Modular Unit System 49 - 55
Structural Panel System 57 - 62
Post & Beam Panel System 63 - 71
Conclusion 72
Bibliography 73 - 75
Books 73 - 74
Articles 75

* Additions from thesis II

Bibliography 76
Revised Thesis proposal 77
Revised Thesis goals 78
Client Profile 79 - 137
Client introduction 81 - 84
Typical day 85 - 87
Room Summary 88 - 91
Photo copied questionaire 92 - 137
Hommas 92 - 114
Hooper 115 - 137
Hooper site information 138 - 141
Slides of presentation
Estimate Sheets

INITIAL THESIS STATEMENT

(Not Final)

Home designs that can be expanded easily and efficiently depending on the client's needs and/or financial ability.

Expandable homes immediately brought to mind modular housing. They could be fit together and expanded upon very nicely, like little toy building blocks. Their ability to be mass produced would lower the cost as would the small amount of time it would take to construct on site. It seemed to be the only good route to take; so I took to researching modular housing.

Modular housing systems had been tried in the late sixties, early seventies and failed. J.R. Raidelback, Jr.; president of the National Association of Building Manufacturers, Professional Engineer, Author of three books on Industrialized Housing, and partner in the firm of Raidelback-Simpson and Associates (which specializes in computer designed modular units); wrote a book entitled Modular Housing 1972: Statistics & Specifics in which he wrote,

"The "Bullish" nature of modular housing has all of the statistical odds in its favor, and as time goes on it should flourish and become a primary provider of the American housing industry." (Raidelback, pg. 76)

Mr. Raidelback's projected future of modular housing was a very common one. I read over and over again how in the next decade the industrialized housing industry was just going to explode. Well then, why did this exciting new field with seemingly endless possibilities for affordable housing, not to mention design ideas, fizzle out?

Here is a list of some reasons.

Disadvantages of Modular Housing

* Peoples Preference
  + No individuality
  + Looks bad
  + Seen as temporary housing
* Manufacturing, Construction and Management
  + Inexperience in the field
    · Designers · Management · Labor
  + Lack of adiquate manufacturing facilities
    · Location
* Lack of Cooperation
  + Socialistic answer to a capitalistic nation's problem.
  + Building Code restrictions

Knowing modular housing's faults will help me exactly define my thesis and its relationship with standardized design systems and modular components.

I would like to state, again, my initial thesis statement and explain exactly what I meant.

"Home designs that can be expanded easily and efficiently depending on the client's needs and/or financial ability."

The idea behind this statement is to design a house that a couple, of moderate income could build and then add onto as their living requirements changed. Knowing the house will change over time, I would anticipate obstacles such as additional structure, mechanical systems, major fixtures in kitchens and baths, etc., that one normally would have to go out of his way to deal with when adding onto a house.

A house designed for future additions could provide sufficient structure to support one or more floors, anticipate circulation paths and prevent the rearranging of entire house plans and areas that are extremely expensive to rearrange or move could be placed where it would not be necessary.

This may or may not increase the cost of the initial structure, depending on what the future expansion would be; but would definately allow for the owners to expand "easily and efficiently" when the time comes to do so. This is ultimately what I want to achieve.

This is not a strictly 'Modular Housing' project, there is room for some custom construction. Nor am I trying to provide a home everyone can afford. It is more accurate to say I am proposing an alternative means of financing a home to those people, of moderate income, who have lost the ability to pay for their completed dream home. Then why have I spent so much time researching and proposing modular projects? Because they are the closest example of what I want to achieve in my house design. They have extremely efficient floor plans showing clear organization of spaces which is essential to achieving my goal. Their details and methods of construction are the ultimate in ease and

efficiency, and they are the most cost consciouse homes ever designed.

Please understand, cost is a consideration not the consideration. If the final cost ends up the same as a custom built home, so be it. I see here, an opportunity to begin introducing standardized design systems and manufactured components into every house-hold to a greater degree than it already is. A home doesn't have to be 100% modular; but it can be more so than our standard wood framed house. There are elements of a house that are consistantly a part of every house, from a mansion to a dog house, that could be standardized or could be partially built of standardized components, such as walls, roofs, and structure. Once this is introduced into the market and widely practiced, it would reduce the overall cost of the house. But until then, it might be just as expensive as a custom built home.

Some ideas, no matter how good or practical,

have to grow into a society. People don't like to change and I believe this is one reason why the new and innovative idea of modular housing has not been given the credit it deserves. It was introduced too quickly. I believe that todays dream house must evolve into a modular house in order for people to accept it as their new dream. My intention is to take one of the first steps in that evolution by using a standardized design system and modular components to build a house that anticipates future expansion and uses the technology of the modular house to do so easily and efficiently.

Thesis Statement (Revised)

My thesis will be to devise a system of design for single family residences, located in north-western United States, using a post, beam and panel system that relates to each other dimensionally and is based on a rectangular grid.

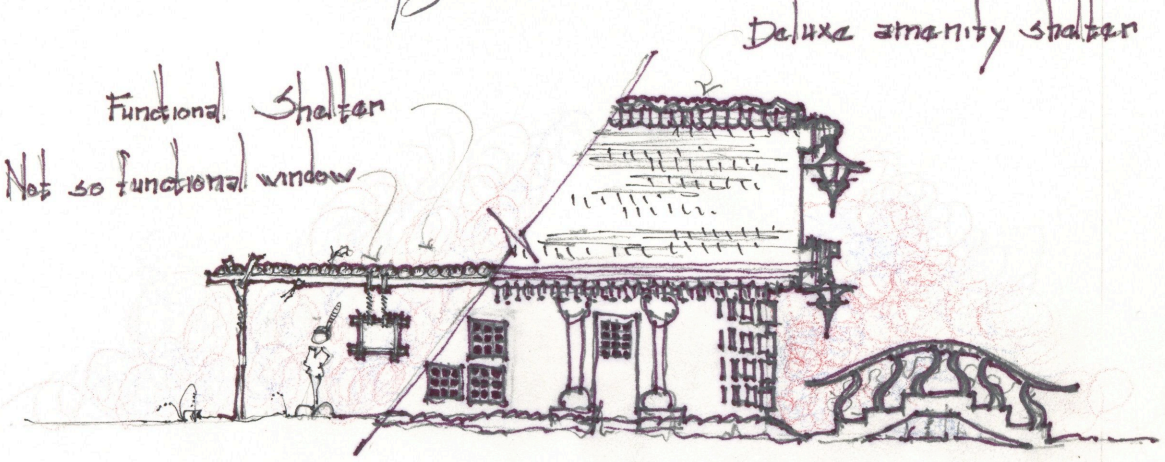
What I Want to Achieve, and Why.

- Design a single family residence who's components can be manufactured.
  - Why? Reduce construction time & cost.
    Allow for easy & economical expansion.
- Utilize a standardized design system.
  - Why? Use of standard connections & components will save design & drafting time.
- Design for easy & economical expansion.
  - Why? Allow client to expand without disrupting traffic patterns, mechanical spaces, major appliances, etc.
    Anticipate future structural needs.
- Provide an opportunity to express individuality.
  - Why? Avoid repetative, monotonous, stereotyped housing units.
    Develope pride in ownership.
- Achieve a standard of quality in construction and design equal or above a wood frame house.
  - Why? Longer life span.
    More desirable aesthetically.
    More desirable financially.

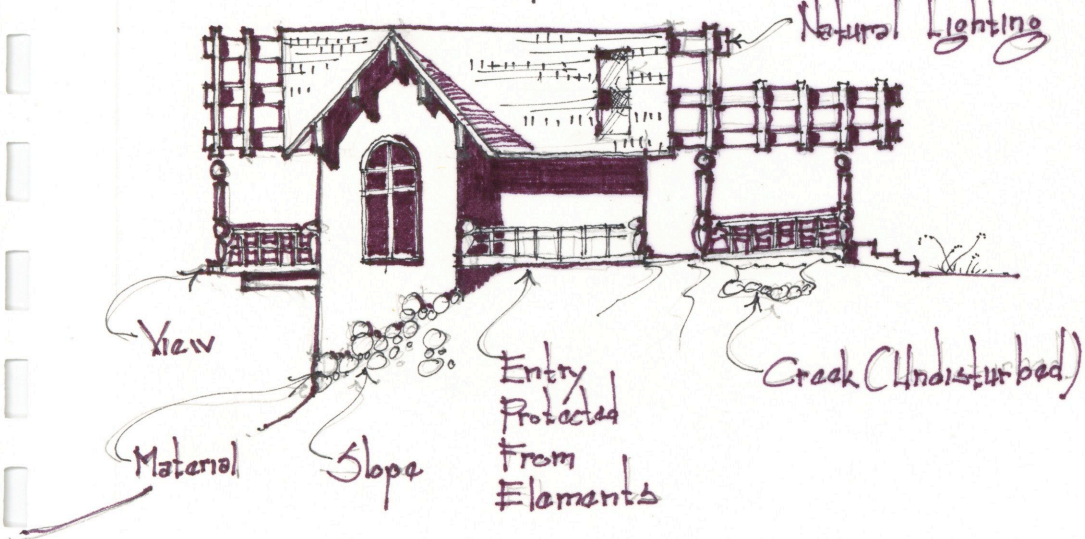
GOALS

Determinants of house quality

"Basic human needs cannot be compromised; the house must establish an equilibrium between function and amenity without being wasteful. (Uterman, Small; pg. 38)



"The house must "fit" the site; the house must express a compatibility with, and respect for, the natural amenities of the site." (Uterman, Small; pg. 38)



ARCH

Income

Size

Anticipated Users	Low	Moderate	Middle	High
Young Single	○	○		
Young Couple	○	●	○	
Young Couple w/ Young Children		●	○	
Middle Age Couple w/ Teen Age Children		●	○	○
Middle Age Couple w/ Grown Children		●	○	○
Elderly Couple		◐	○	
Elderly Single ♿	○	○	○	

♿ · A single floor dwelling can be designed for the elderly & handicap, but will not be a requirement for any proposal/s.

USER

- **Young Couple**

  Needs : At least one bedroom, daylighting, sunshine, view, privacy, full kitchen, good orientation, social gathering space, small yard, garage, full accessibility

- **Young Couple w/ Young Children**

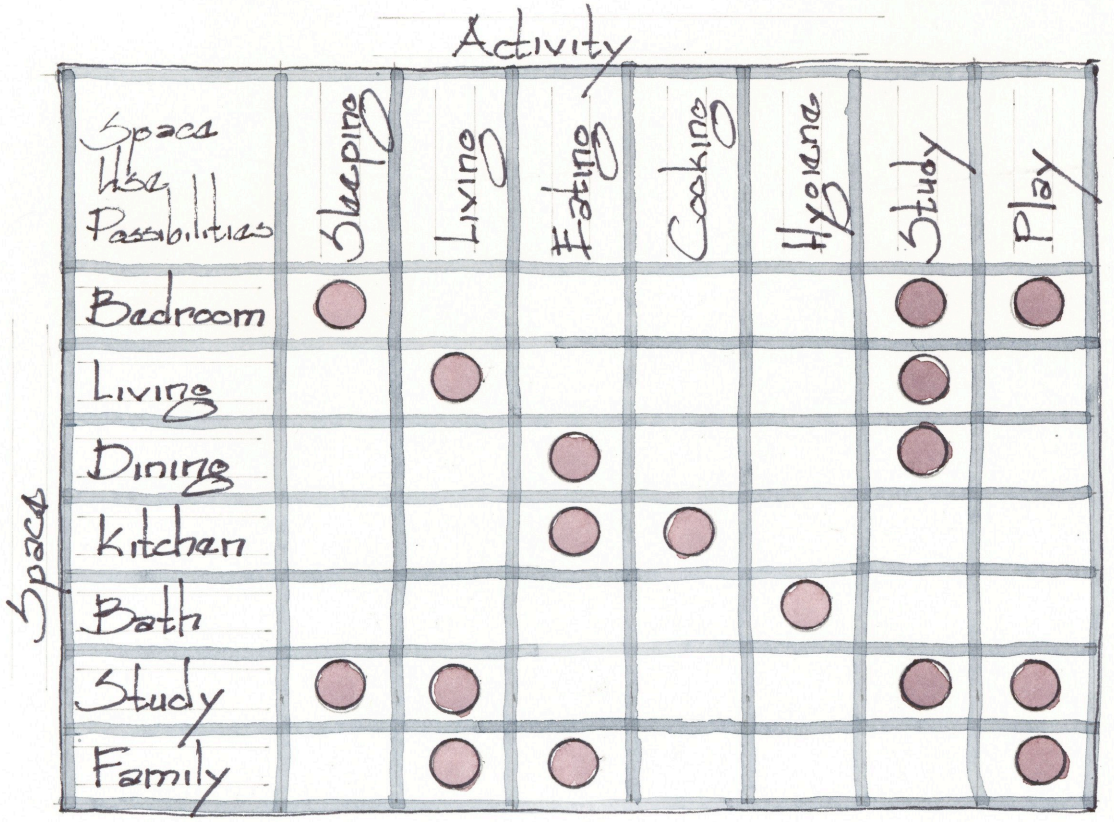
  Needs : Protected childrens area, at least two bedrooms, daylighting, sunshine, view, full kitchen good orientation, medium to large yard, garage partial accessibility

- Middle Age Couple w/ Teenage Children

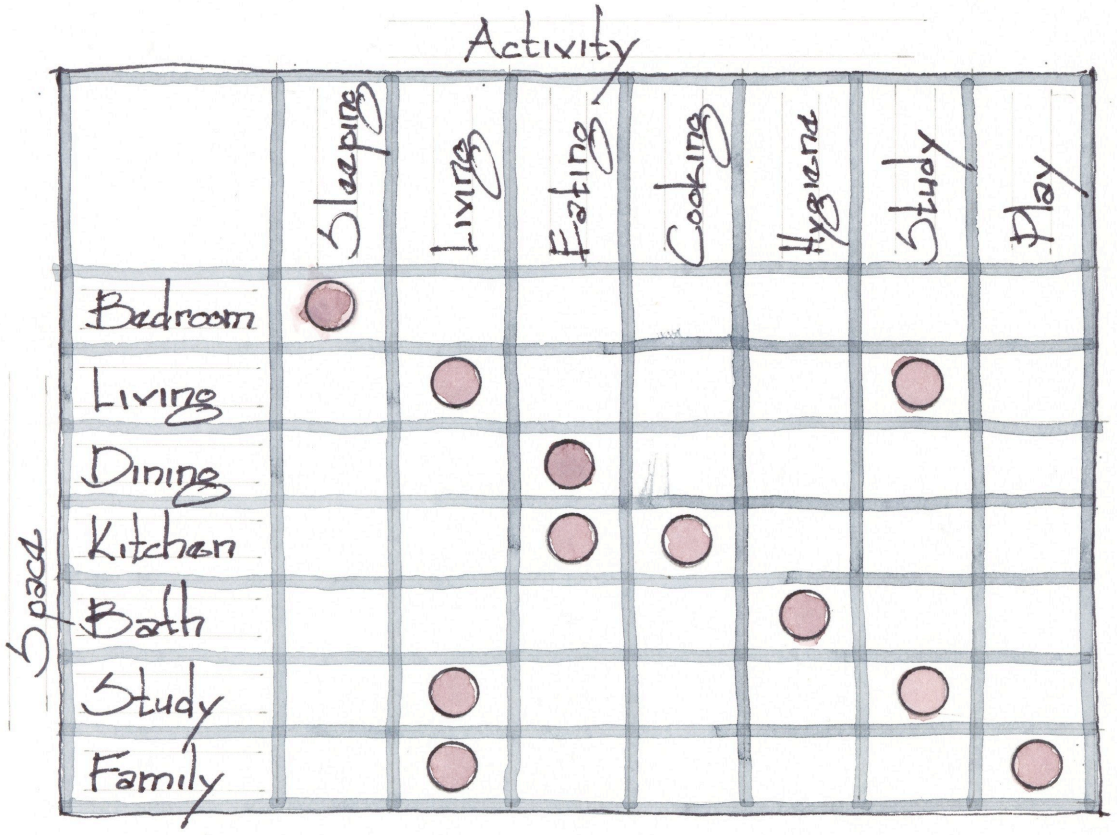
  Needs: Privacy, one bedroom per/teenager day lighting, sunshine, view, good orientation, social gathering space, private outdoor space, medium to large yard, garage, full accessibility

- Middle Age Couple w/ Grown Children

  Needs: Privacy, two bedroom at least, daylighting, sunshine, view, good orientation, small yard, social gathering space, garage full accessibility

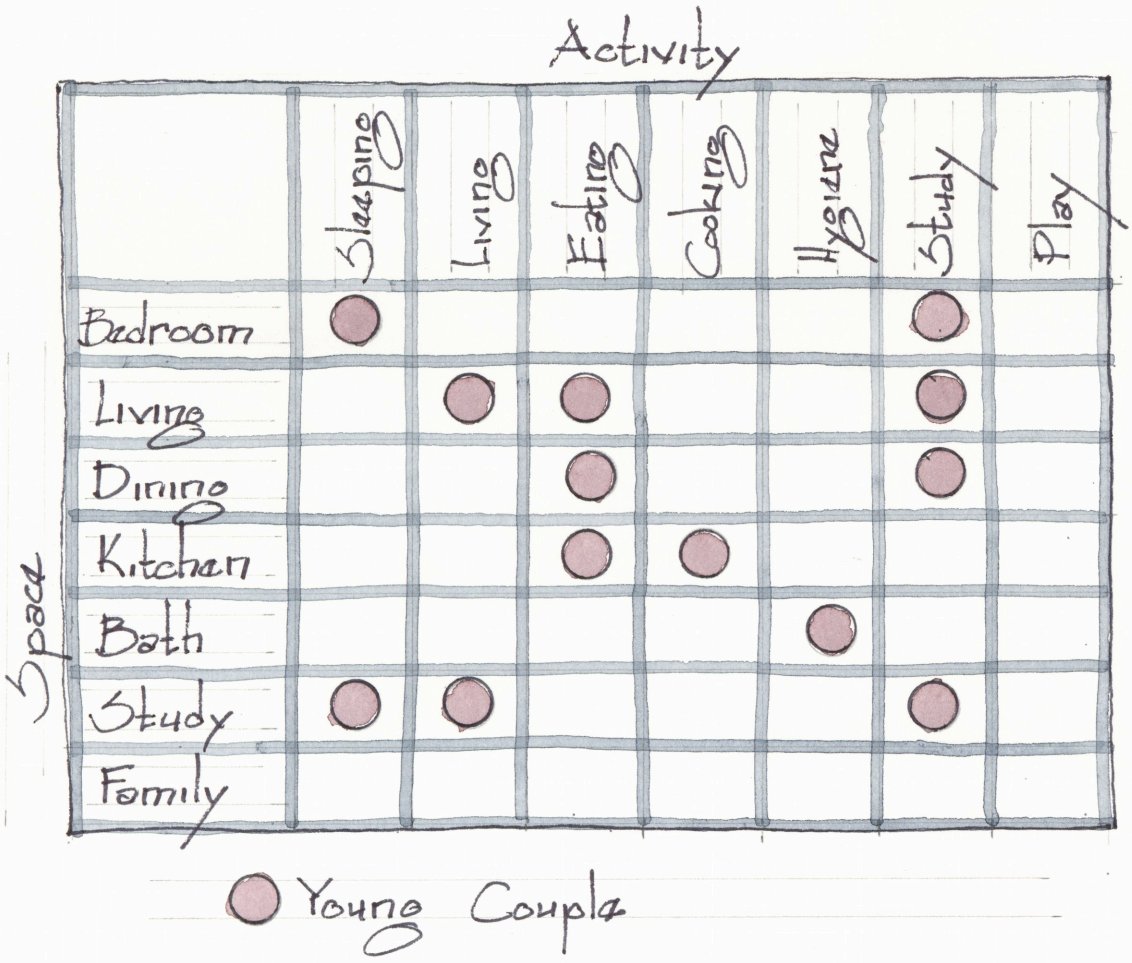


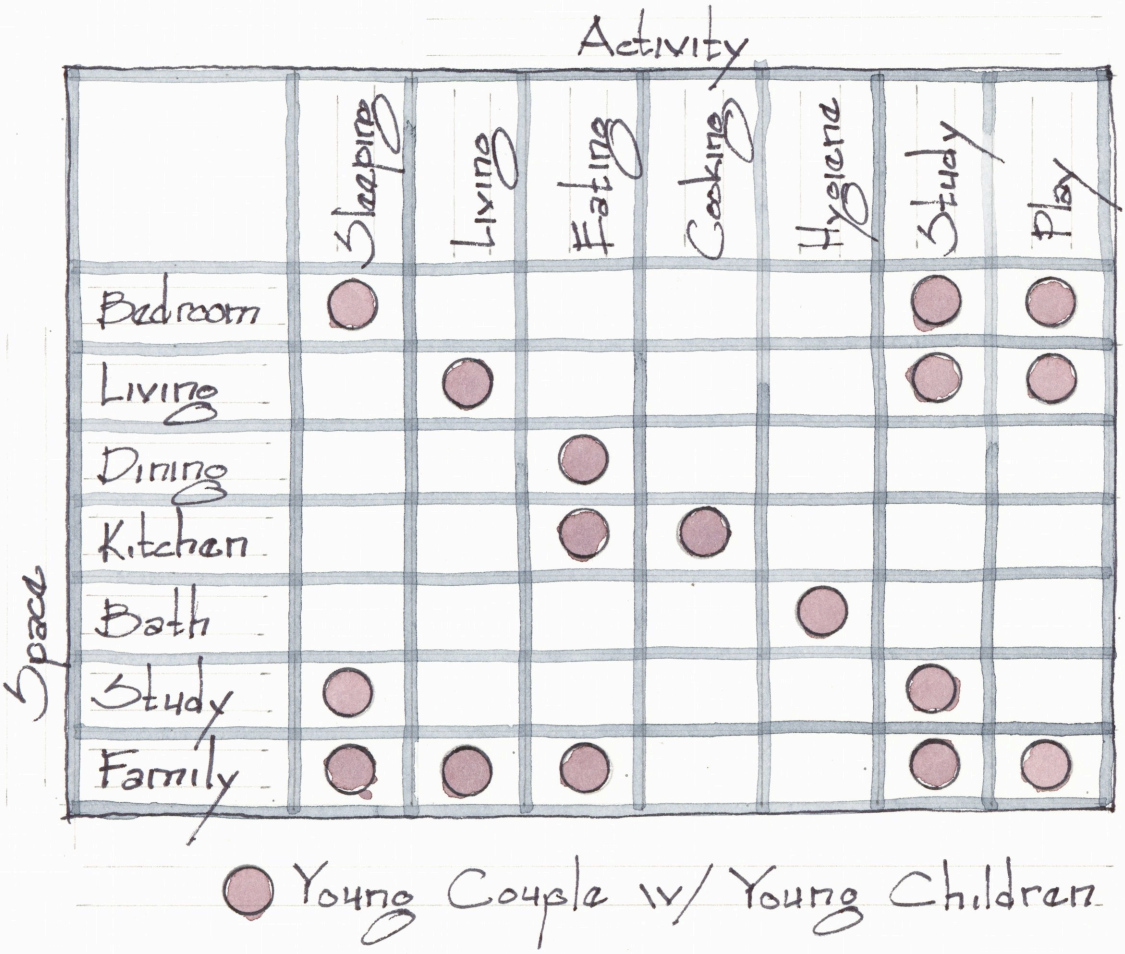
● Middle Age Couple w/ Teenagers



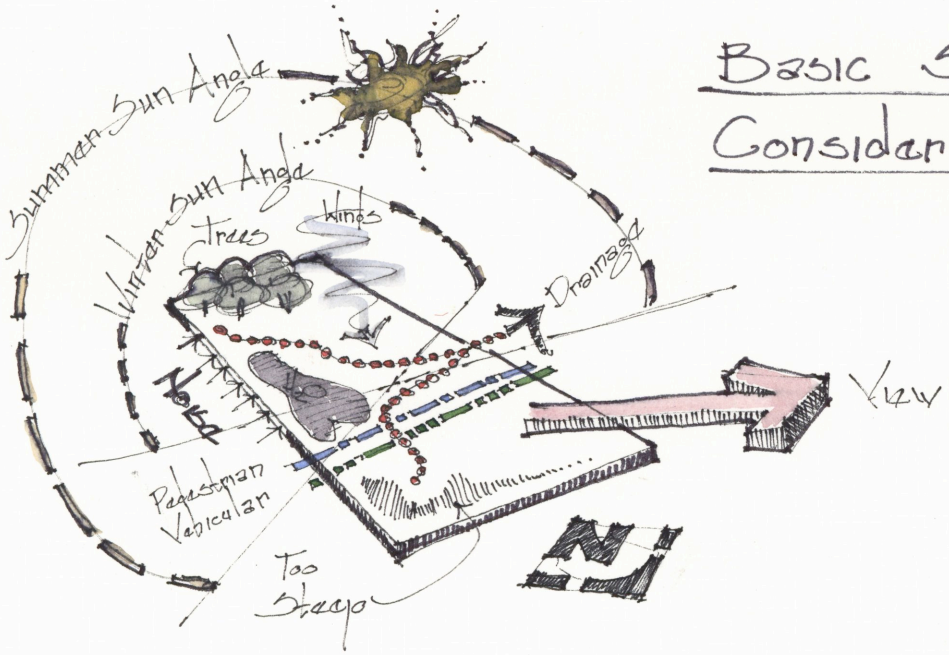
● Middle Age Couple w/ Grown Children

USER

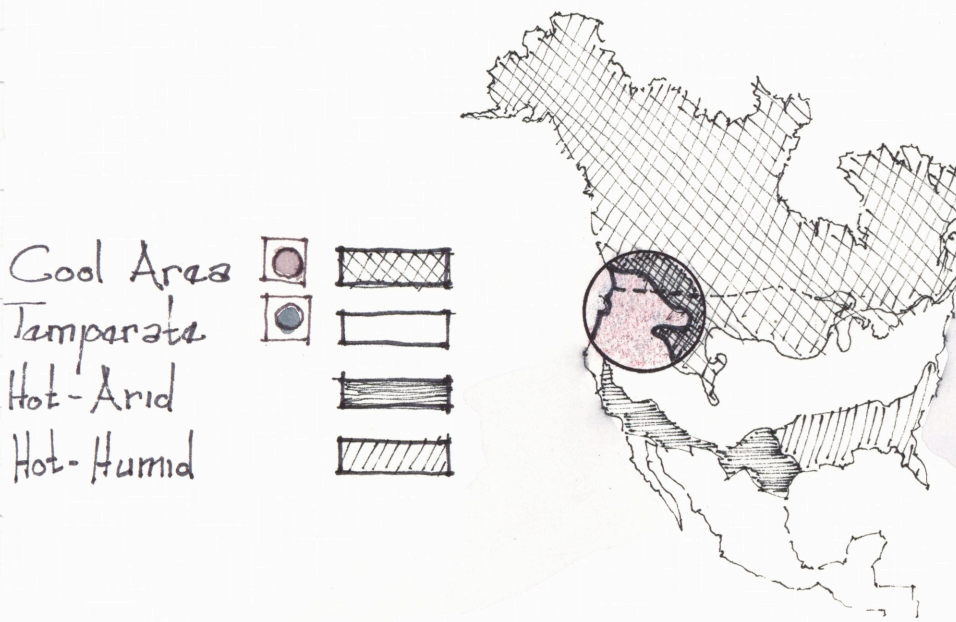

Activity
Sleeping
Living
Eating
Cooking
Hygiene
Study
Play
Space
Bedroom
Living
Dining
Kitchen
Bath
Study
Family
Young Couple


Activity
Sleeping
Living
Eating
Cooking
Hygiene
Study
Play
Space
Bedroom
Living
Dining
Kitchen
Bath
Study
Family
Young Couple w/ Young Children

Basic Site Considerations



The area circled on the map below is the region the prefabricated houses will be designed for. As you can see, I must consider cool and/or temperate climate zones along with the usual site considerations like the ones on the illustration above.



Regional Climate Zones

Cool Climate

Housing Layout

Site Selection

- SSE. slope for sun gain is desirable.
- Middle or lower middle of slope is preferable to prevent excessive wind effects and to avoid cool air pools.

Public Space

- Wind sheltered, open, with periodically shaded areas.

Landscape

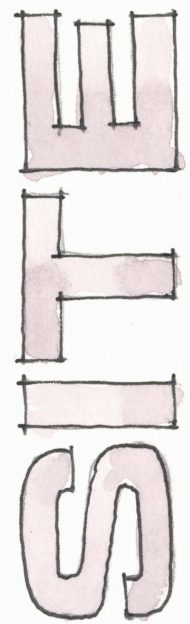
- Varying topography may shape street layout and space utilization into an irregular pattern.

Vegetation

Evergreen windbreaks in NE-SW direction at a distance of 20 times the tree height are desirable.

Deciduous shade trees near house.

Avoid dense planting too close to structure because of dampness effect.



Cool Climate Shelter Design

House Types

In residential structures, two story houses, or arrangements under one roof are preferable for compactness.

General Arrangement

Conservation and economy of heating is about three times as important as provisions for summer comfort.

Entrance spaces with storage of clothing is desirable.

Avoid exterior steps and steep drives.

Plan

Design mainly determined by conditions prevailing in cool and cold months.

Provide for summer comfort with additional living areas and/or utilization of outdoor space is essential.

Orientation

Determin optimum sun orientation for each individual site.

The prevailing wind pattern may influence the orientation of free standing buildings.

Color

Sun exposed surfaces in medium colors; recessed surfaces can be of dark absorbent colors if shade in summer can be provided.

Cool Climate Building Elements

Openings and Windows

Sun windows will provide good auxilary heat source.

Except on the south side and partly east, the windows should be small.

Windows should be shade-protected during overheated times.

Double glazing is essential.

Controlled ventilation is a primary consideration

Walls

Exterior surfaces of smoth non-absorbant materials are preferable.

Roof

A sloping roof is desirable to encourage snow removal by wind action.

Flat roofs without parapet walls clear faster.

Consider snow load.

Shading Devices

Toward South, horizontal shading devices may be used.

Near SE corner one deciduous tree, and at W side two deciduous trees, can provide adequate shade for smaller residential structures.

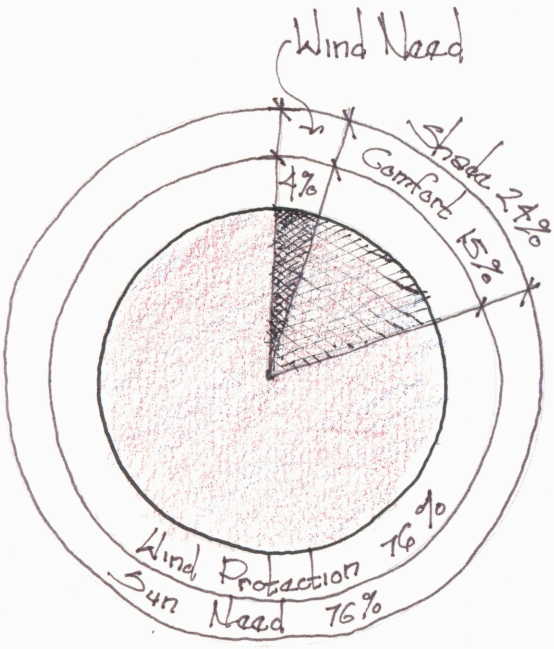
Cool Climate
Building Elements Con't

Foundation, Basement

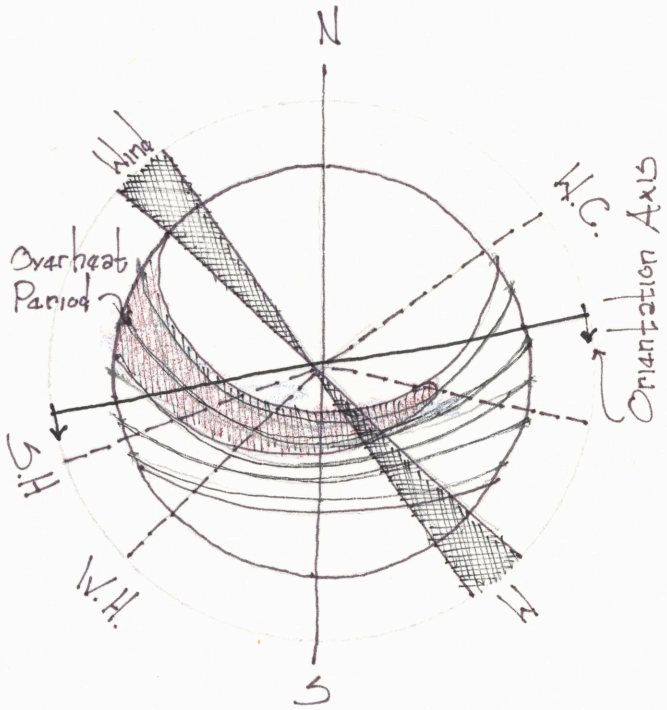
Basements should receive sunlight in summer or have artificial dehumidification to prevent condensation resulting from earth temperatures.

Mechanical Equipment

Water and sewer pipes should be kept out of exterior walls, particularly NW and SE walls.



Weighted Bioclimatic Needs



Directional Analysis

Temperate Climate Housing Layout

Site Selection

Slopes East of South are preferable.

"Warm slope" area is best, but lower and upper inclined portions are also advantageous if wind sheltering is provided.

Breeze utilization in warm periods is important.

Public Spaces

Open lawns with grouped shade trees are desirable.

Landscape

Indoor and outdoor relationships in house design should be considered.

Use of outdoor living ~~relationships in hot~~ areas can be extended for several months as adjuncts to interior areas, if properly designed.

Vegetation

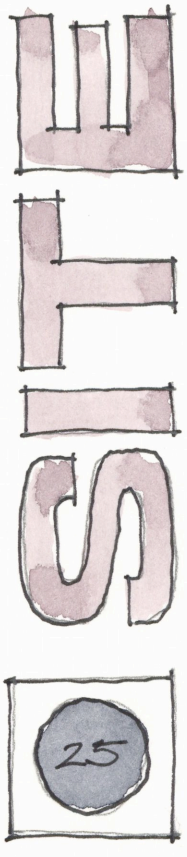
Windbreaks are desirable against winter NW wind direction.

Tree layouts should not block prevailing S-SW summer breezes.

Evergreen trees are best for wind protection, deciduous for shading purposes.

Lawns near structure are useful for radiation absorption.

Shade trees are preferred on E and W sides of residence.



Temperate Climate Shelter Design

House Types

This region permits the most flexible arrangements.

A close relation between house and nature is desirable and possible.

General Arrangement

The large range of thermal conditions requires the utilization of radiation and wind effects, as well as protection from them.

Plan

Freedom in plan design is characterized by spacial connections of outdoor and indoor spaces.

Buildings should open to S-SE and be closed on westerly sides.

Orientation

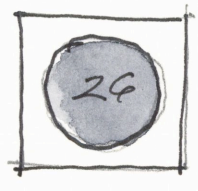
Determin, Sol-air orientation that secures balanced heat distribution.

Interior

Provision for adequate ventilation is necessary.

Humidity-producing areas should be separated from rest of building.

Sun penetration is desirable; therefor depths of interiors should not be excessive.



Color

Medium colors are advantageous: dark colors in recessed places protected from summer sun; light colors on roof surfaces.

Temperate Climate Building Elements

Openings and Windows

South exposed glass areas work well on seasonal basis.

Protection is needed from summer sun.

Openings should be screened. and located to allow cross ventilation.

Reduced openings on westerly side is desirable.

Walls

Avoid absorption type materials, or those which are affected by freeze-thaw action: rain and moisture penetration is mostly on NW exposures.

Roof

Eave and gable ventilation is needed: this might be closed in winter.

Attic fan is useful.

Gutters should be able to carry 1" of rain off total roof area in 15 minutes.

Snow and rain pockets must be avoided.

Shading Devices

Deciduous trees on E and W sides, 65° overhang on S exposure, protects low structures.

Temperate Climate Building Elements Cont

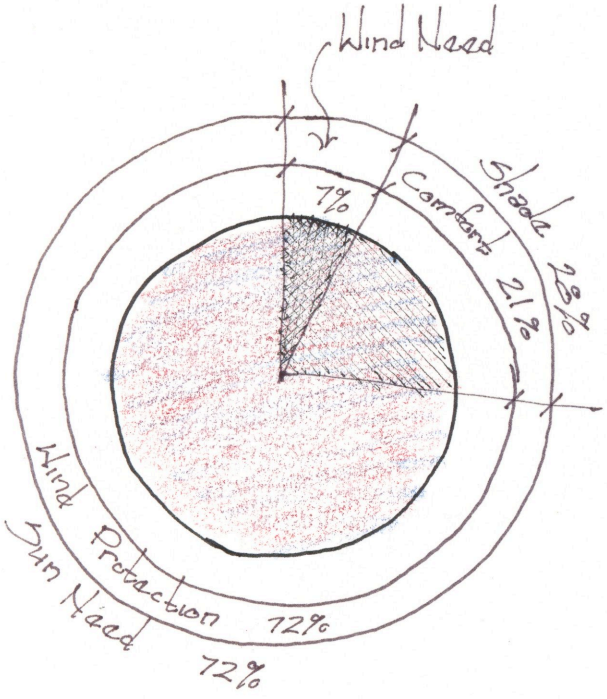
Foundation and Basement

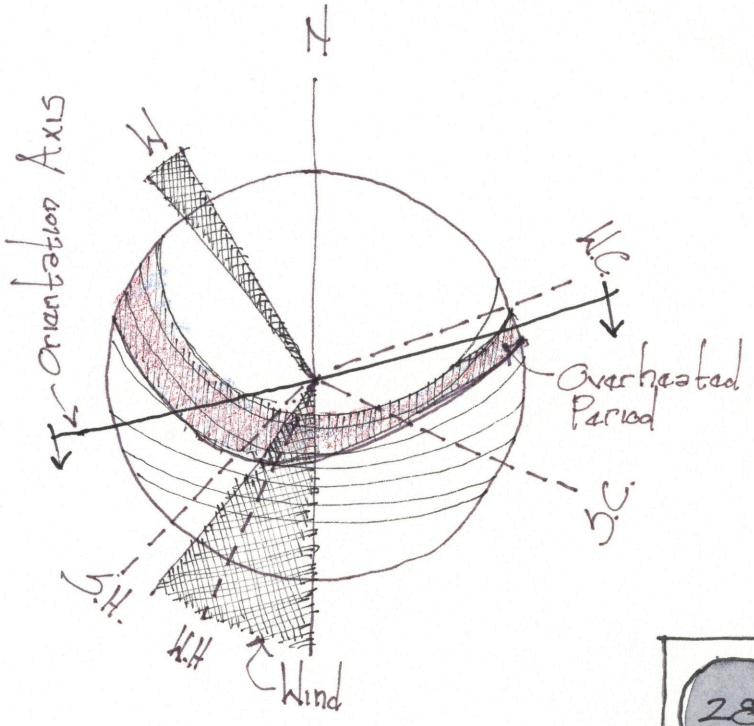
Sumer basement temperature will remain approximately midway between deep ground temperatures (53) and average diurnal temperature (73), at about 63.

Dehumidification is desirable for about 30-40% of the year.

Mechanical Equipment

Water and sewer pipes should be kept out of external walls.



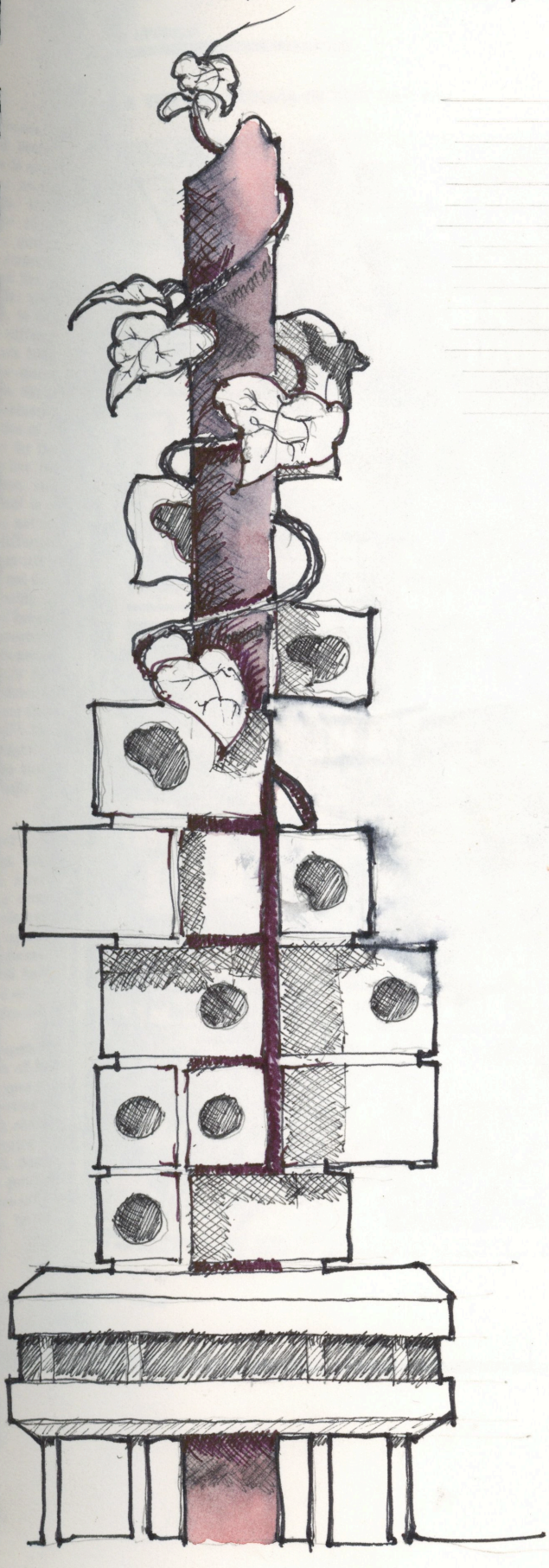


CASE STUDIES

These projects were selected, not for their design or practicality, but for their ideas and methods of construction. I want to show the variety of ideas that have been studied and pursued; and then from here, carry on and elaborate on those that are the most feasible. The judgement of whether the projects are successful or not is irrelevant; they are merely a sample portion of a larger body of modular housing concepts.

* Note: The explanation of each modular concept has been quoted directly from the project's designer/ designers.

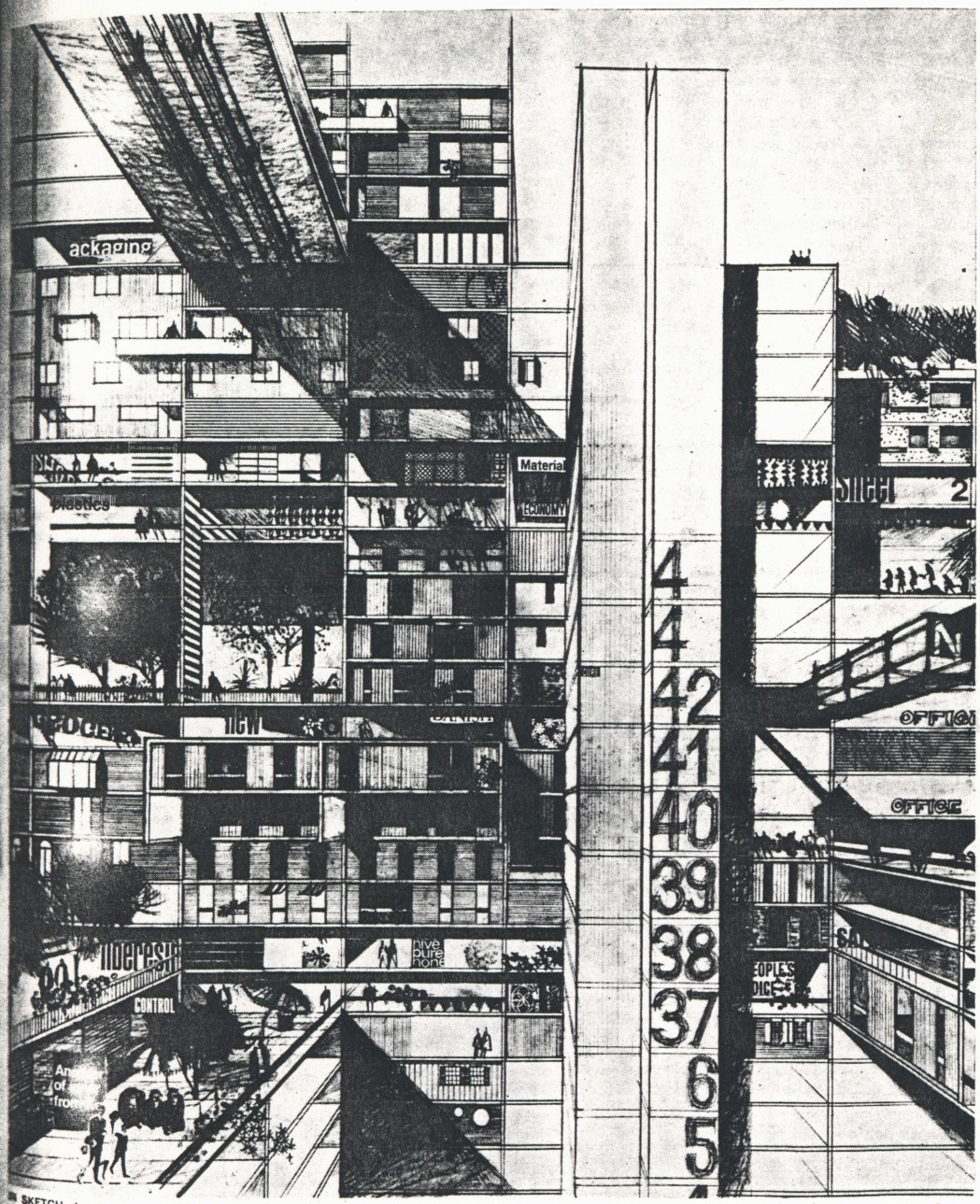
METABOLIC CYCLE IN THEORY



"replace the outdated parts and in this way contribute to the conservation of resources by using buildings longer, a concept that owes much to the Buddhist philosophy of cosmic change and eternal growth."

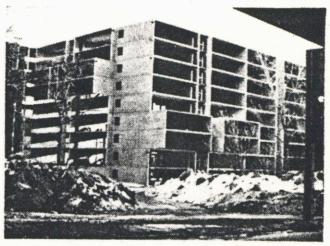
Incorporating an idea like this could promote versatility, individuality and (hopefully) continuous improvement. I believe these elements would be important to people looking for a single family dwelling.

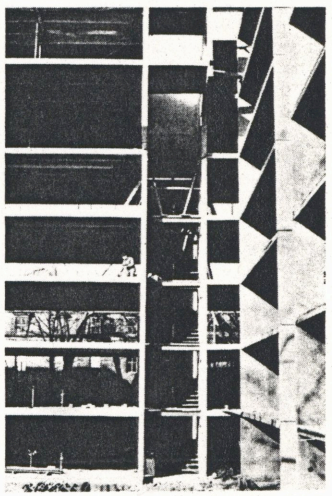
1. THE INDIVIDUAL IN THE CROWD



Individual ownership within a large structure could well take the form proposed by Carl Koch and Associates in the rendering at left. Using the already developed Techcrete system of precast wall, floor and stair units, a person could either lease or purchase open space within which he could arrange partitions to his own liking. Any amount of space could be obtained either horizontally or vertically to assemble a one or multi-floor dwelling. The exterior wall chosen by the tenant would become part of the whole facade.

Modular partitions, bathrooms, kitchens and exterior walls could all be purchased separately, replaced when damaged or simply traded in for new when replanning a unit. A used market could develop for such items, assuring a supply for those not able to afford them new.





IN SKETCH developed for A&E NEWS, Carl Koch shows how individuality of living units might be expressed on exterior of large structure. One or more floors could be leased with partitions purchased and installed by tenant to meet his own requirements. Structure would be the same Techcrete system shown in photos at right.

2. CHANGE-AS-YOU-GO SYSTEM

"What if a young couple could buy a lot with foundation holes dug for six, eight, even a ten room house and add the rooms on as they need them? The amount they would pay for mortgage interest would be reduced, for one thing, because they'd be taking out a succession of small loans rather than one big spread over a period of 25 years or so."

This is the approach Neal Mitchell Associates has taken in developing a universal framing system incorporating only four basic factory produced components. Made from a cellular concrete, also developed by Mitchell, none of the components weighs over 150 lbs. The four pieces are a column, cantilever beam, tie beam and slab. Because of their weight and simple connections, two people with no prior construction experience could erect a building.

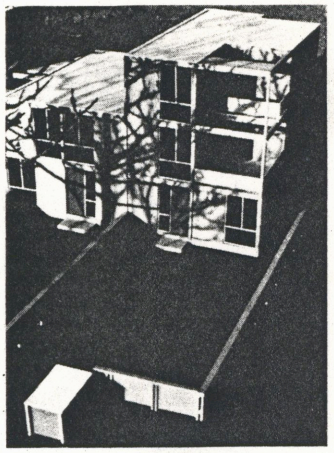
"We believe we've got a revolutionary combination here," said Mitchell, "because we're giving people the means to help themselvs, to own thir own homes and expand and improve them as their needs and income increase. It's like buying a car; you can buy a stripped down version and add parts to it if you want. Or if a fender is dented, you have it unbolted and a new one put on."

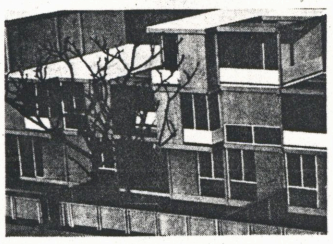
Since the structural integrity of the entire system is in the frame, nonbearing wall materials provide only climate control, privacy and security. These mass produced panels can therefore be adapted to local climate, environmental and cost conditions. The structure is capable of rising four stories without additional support. The mechanical system rather than being replaced as the structure increases, simply grows with it by addition of ductwork, a larger fan or even air-conditioning.

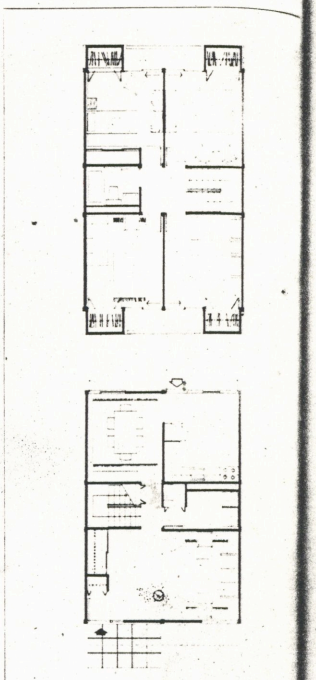
In an urban environment, Mitchell, sees the system replacing substandard dwellings in an incremental fashion. By first dividing a city block into modular segments, the first construction could begin on vacant lots. These units could be used to relocate families from neighboring buildings which could then be torn down permitting the system to continue.

As the social structure of the neighborhood changes, and since the system's structure is adaptable to other uses, Mitchell foresees the day when in preparation of another use, emptied units could be stripped of all walls and mechanical systems, leaving the structure to be "sterilized" and re-used. "The walls can be repainted and repaired in an outside shop, and new ones substituted for those beyond repair." A used market could even develop where those who could not afford new parts, could buy used ones at reduced cost.

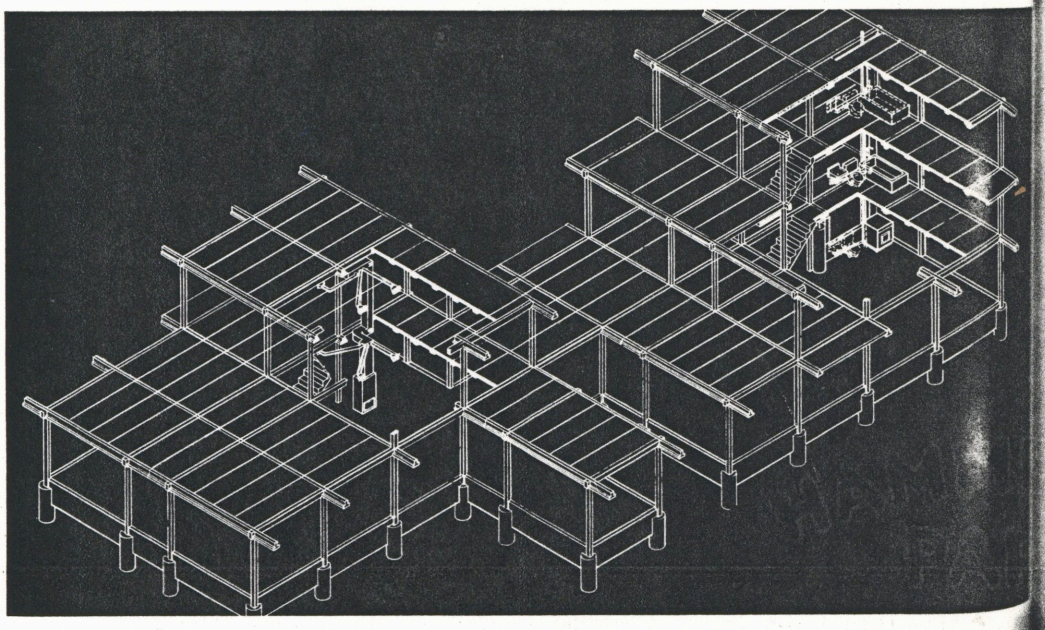
The success of the system thus far has not been too encouraging. Slated for some 17 sites in Detroit, progress has been slowed to a near standstill as the city disputes its conformity with codes; as Mitchell says, "The penalty for innovation is fantastic."







PRECAST CELLULAR CONCRETE beams, columns and slab units comprise the only parts of Neal Mitchell's framing system. The expandable system is adaptable to different uses as social structure of neighborhood changes. Typical first and second floor plans are at right.



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3. PREPACKAGED CORE SYSTEM

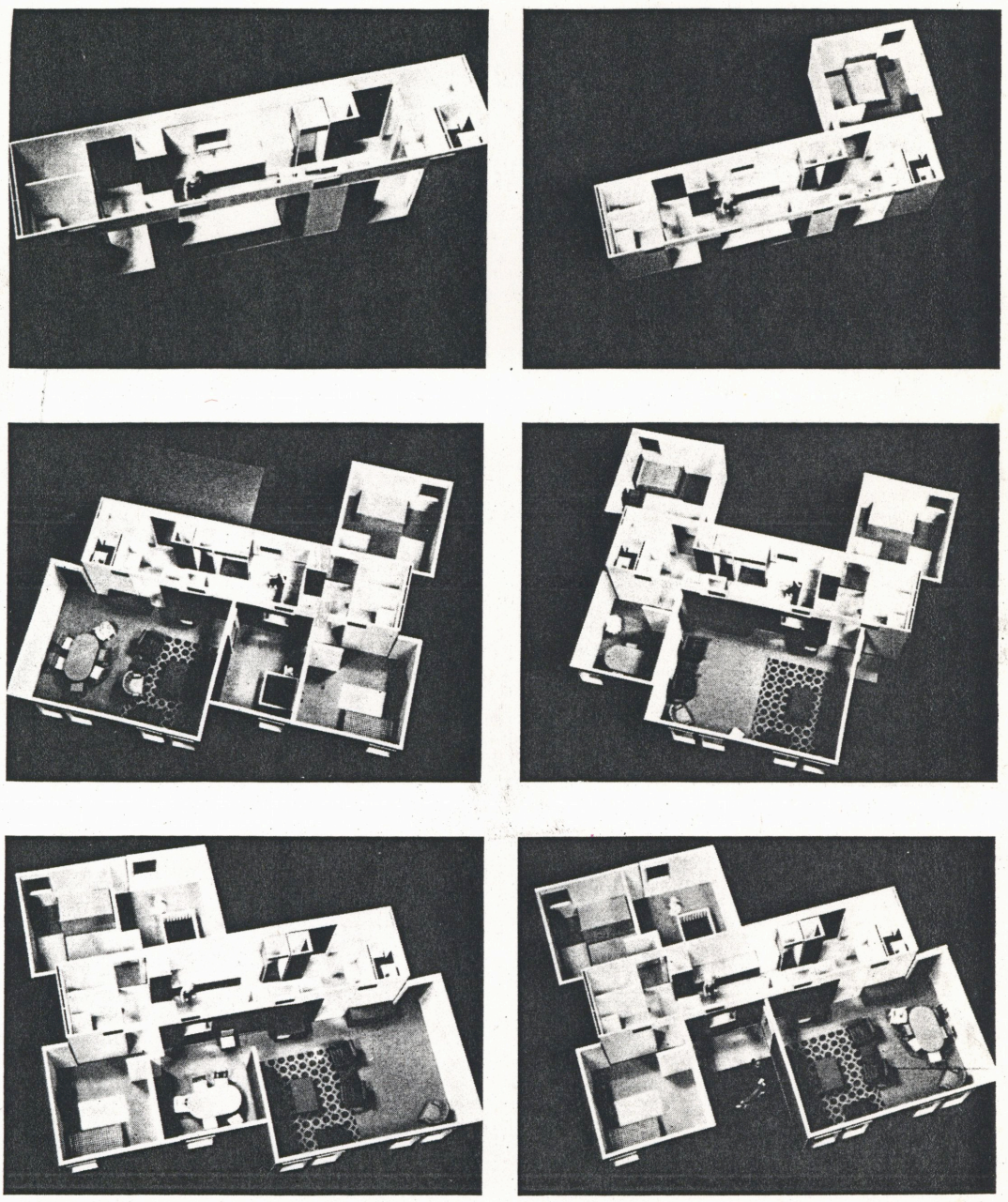
One 8 x 36 ft. container designed by Hirshen and Van der Ryn, of Berkeley, Calif. provides all mechanical, utility, hygienic and storage components normally needed in a single family dwelling. Designed to correct many of the shortcomings in existing self-help projects, the 'core' prepackages all those components of the house that families usually cannot build without a lot of training or previous construction experience, or else are often sub-contracted during the building process.

At one end of the 'core' is the bathroom, which includes a bathing-drying area with lavatory, and a separate toilet room. At the opposite end is an additional toilet room, a laundry alcove and a mechanical service area which will accommodate electric panel, water heater and heating and cooling equipment.

Clear span beams connecting these two end units are designed to carry all roof structure, heating ducts, electrical wiring conduit and lighting fixtures for both the core area and the peripheral spaces which will be built around it. Ductwork surrounding the perimeter can have registers installed at any point to provide for all peripheral space configurations. End walls of the core contain vents and piping for bathrooms and mechnical equipment.

Kitchen components are designed on a two-foot module to permit various arrangements. Counters, cabinets and storage closets can be arranged to form linear or a number of U-shaped kitchen configurations.

Surrounding rooms may be added as needed, as primary circulation occurs within the 'core.' Costing about $3,500, the 'core' can be combined with materials to complete a conventional 1,200 sq. ft. four bedroom home for an additional $3,000. "In other words," Van der Ryn said, "the system is comparable in cost with other sectional house concepts with the added advantages of providing more options in terms of construction and appearance, such as building the housing shell yourself, using conventional methods, using the core in combination with panel systems, or simply totally prefabricating the whole unit."



FACTORY PRODUCED "core' by Hirshen and Van der Ryn (above left) contains all mechanical, utility, hygienic and storage components normally needed in a single family dwelling. The 'core' is delivered to a site and peripheral spaces added by either conventional construction or with panel systems. Rooms may be added as needed; all basic circulation is within the 'core' unit.

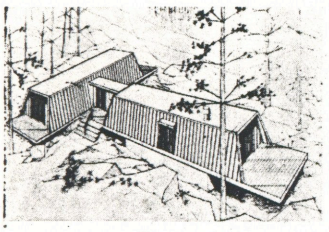
4. VACATION HOUSE MODULE

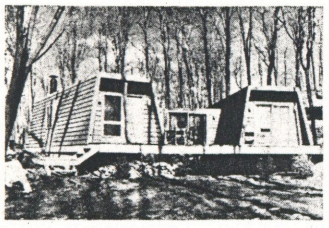
To meet increasing demands in the vacation house market, Robert Martin Engelbrecht and Associates have designed a completely factory finished house which can be trucked, towed or flown to any site. The modules (below, top and center) can be supported on piers or foundation walls, can be cantilevered at either end, and can have prefab decks slipped on their ends.

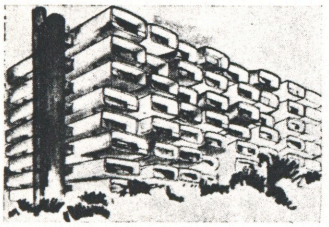
Designed for all climates, the units contain freezeproof plumbing and stand-by heating units. One module is a complete studio house sleeping from one to four people. Two combined sleep up to ten.

Filament wound high-rise

Another project Engelbrecht is working on (below, bottom) proposes the stacking of filament wound modular living units into a megastructure.







5. STACKED CONCRETE BOXES

Building Block Modules, Inc., of Calif. has developed a system of stacking concrete boxes alternately while keeping floor levels constant. This is achieved with dove-tail joints which also help alignment during erection. Architect John Fisher of Fisher/Jackson Assoc. explains that the 150 sq. ft. units when stacked alternately yield about 275 sq. ft., and that their open ends provide for infilling to meet various climatic conditions.

The 4 in. thick tubes are cast vertically, leaving only the top edge to be finished by hand. Various blockouts can be placed in the form for nearly any combination of interconnecting door openings. In fact, all the various shaped pieces that provide balconies, sun shield, etc. are cast from one form. Steam cured for 12 hours, the units ar then lifted from the form and rotated to a horizontal position.

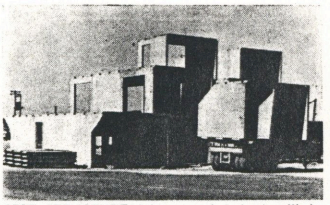
The building shown at right under construction at the casting plant is an experimental test structure which Fisher plans to disassemble and re-erect on a permanent site. Final plans call for totally factory finished units trucked to location and lifted in place with lightweight equipment (the units weigh only 10 tons vs. about 90 tons for the Habitat module). The basic module's overall dimensions are 12 ft. wide x 12 ft. 8 in. deep x 8 ft. 8 in. high. By using modules less than 12 ft. long other variations are possible.

All electrical wiring conduit can be cast inside the walls, while plumbing chases occur in the center of modules designed for back-to-back bathrooms and kitchens. These modules are aligned vertically.

105 apartments for Oakland

Negotiations are under way for a 105-unit development in Oakland. The 600 modules needed will take only two months to produce. Pouring of foundations and erection will take one month, and on site finishing only 15 days.

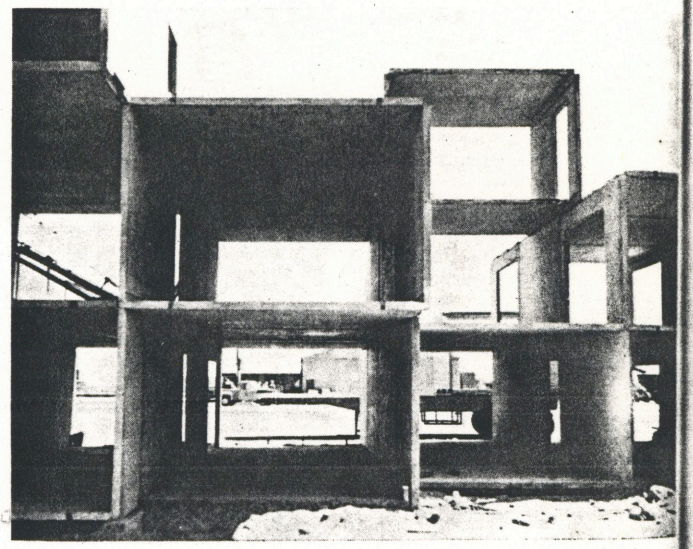
Building costs for this development are calculated at $9.75 per sq. ft. including contractor's overhead and profit. These costs, Fisher points out, reflect the additional work in starting production and the need to go to some conventional building techniques; on a mass production basis, he expects costs to drop to $8.00 per sq. ft. or less.

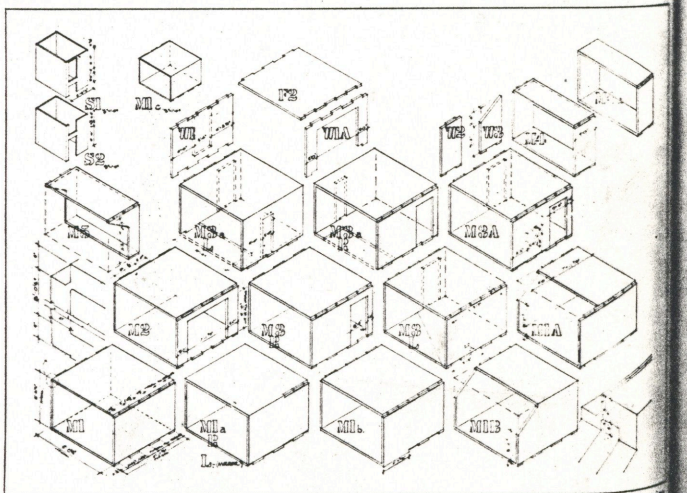


TEST STRUCTURE (above and below) will be disassembled and moved to a permanent site.

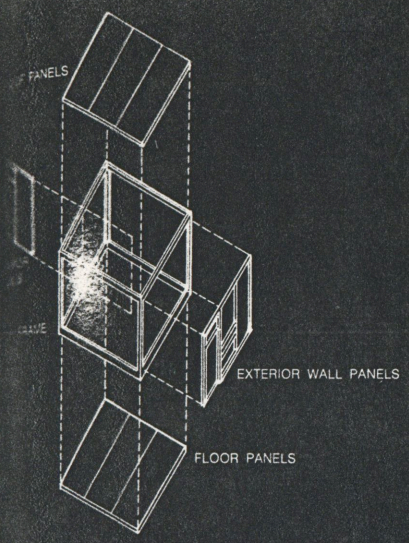


RENDERING of test structure as it will appear after its completion and move to final site

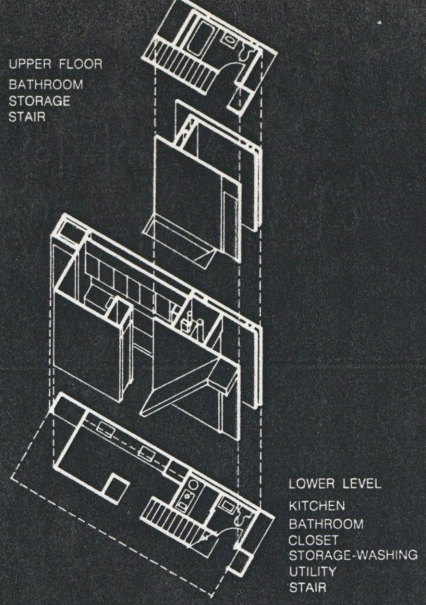




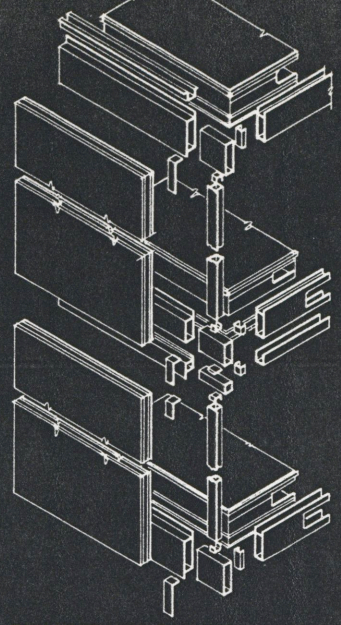
ONE FORM produces the basic box and all the various auxiliary pieces required to form balconies, sunshields, end walls, etc. Electrical conduit is cast within walls.



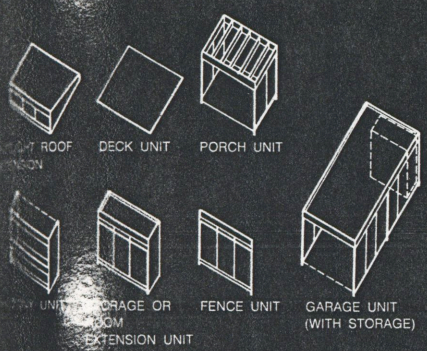
FRAME & PANEL SYSTEM



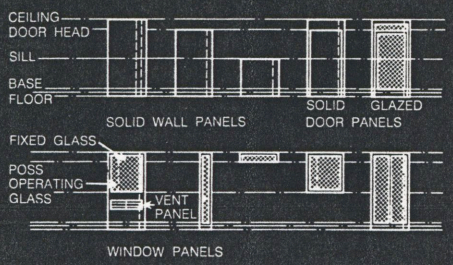
CORE ASSEMBLY



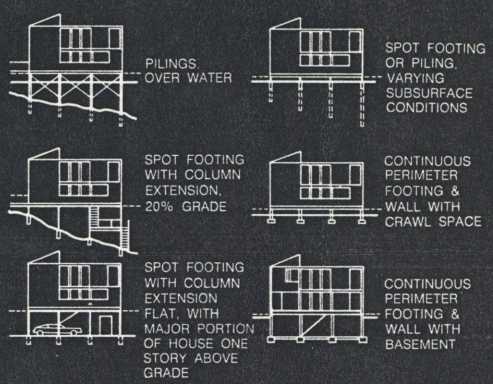
EXPLODED VIEW OF BASIC FRAME AND PANEL SYSTEM



EXTENSION SYSTEMS

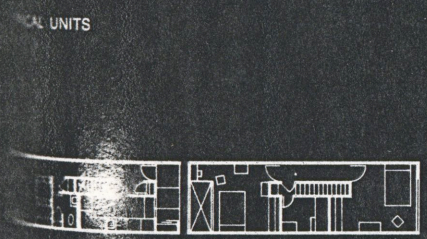


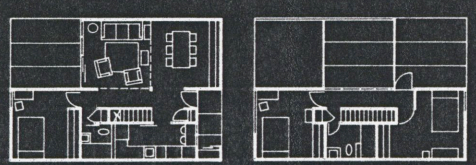
EXTERIOR VERTICAL CLOSURE PANELS



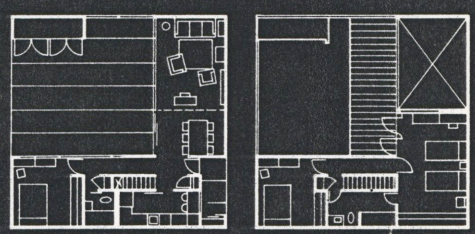
FOUNDATION & SITE VARIATIONS

TYPICAL UNITS

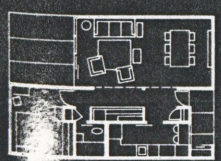




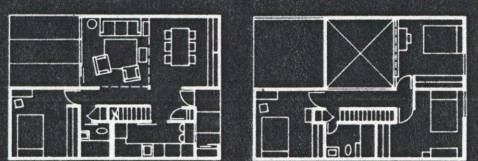
UNIT TYPE BB-4



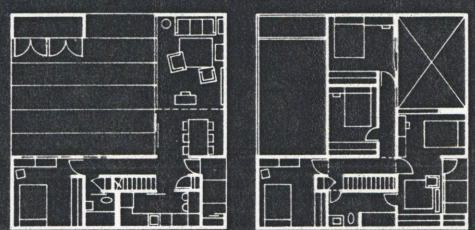
UNIT TYPE B-2



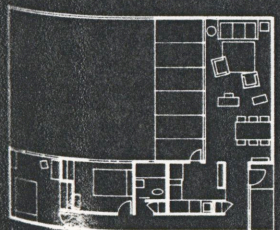
UNIT TYPE AA-1

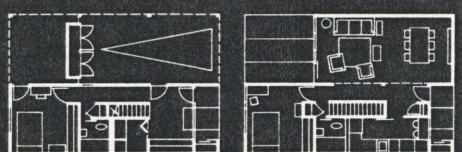


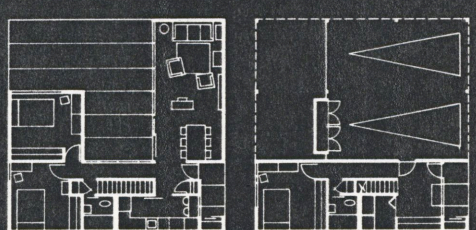
UNIT TYPE BB-1

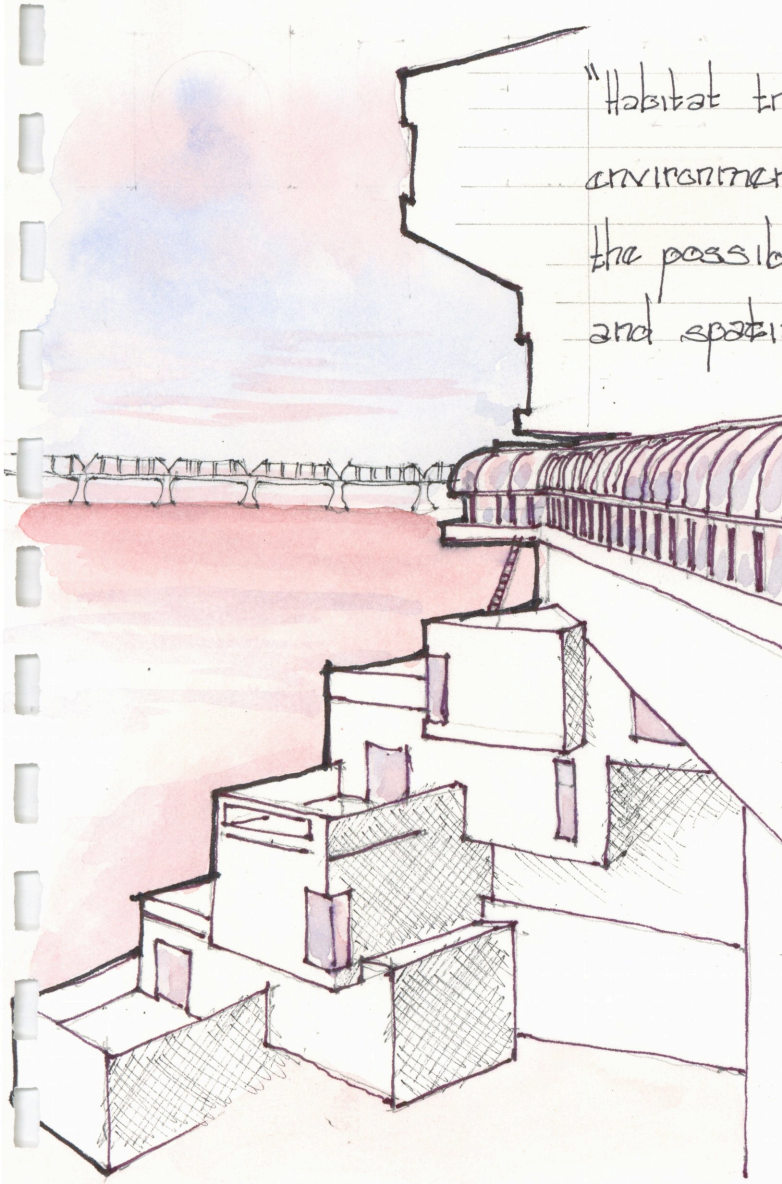


UNIT TYPE B-4









"Habitat tries to show that it is possible to have an environment that is not monotonous, one that has the possibility of identity and of variety, choice and spatial richness, and yet at the same time the use of repetitive mass-produced systems."

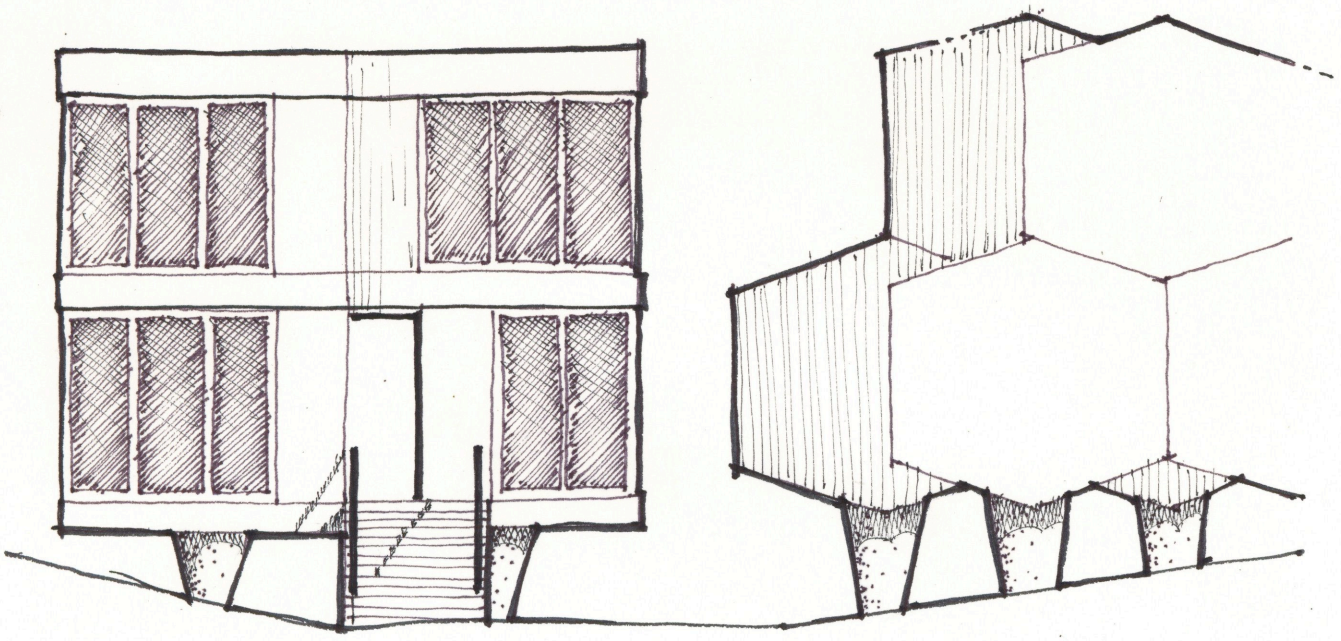
"any system that didn't permit you to take 75% into the factory was automatically obsolete."

"Rhythm is the essential ingredient of a sense of location."

"in the Greek village they didn't have to paint every house a different color, people recognized their own houses because difference was the result of complex forms."

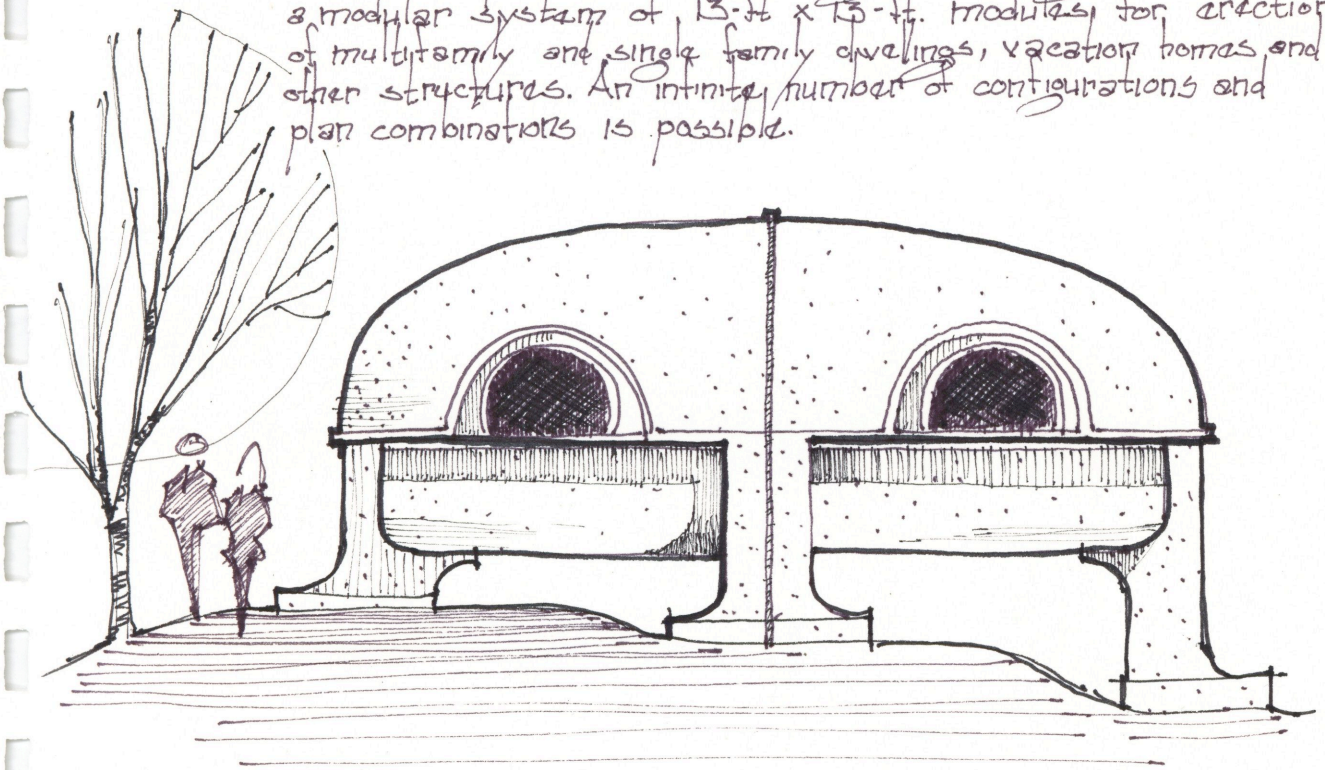
"Technology is process and is only the means to an end; it is no guarantee of anything."

HABITAT



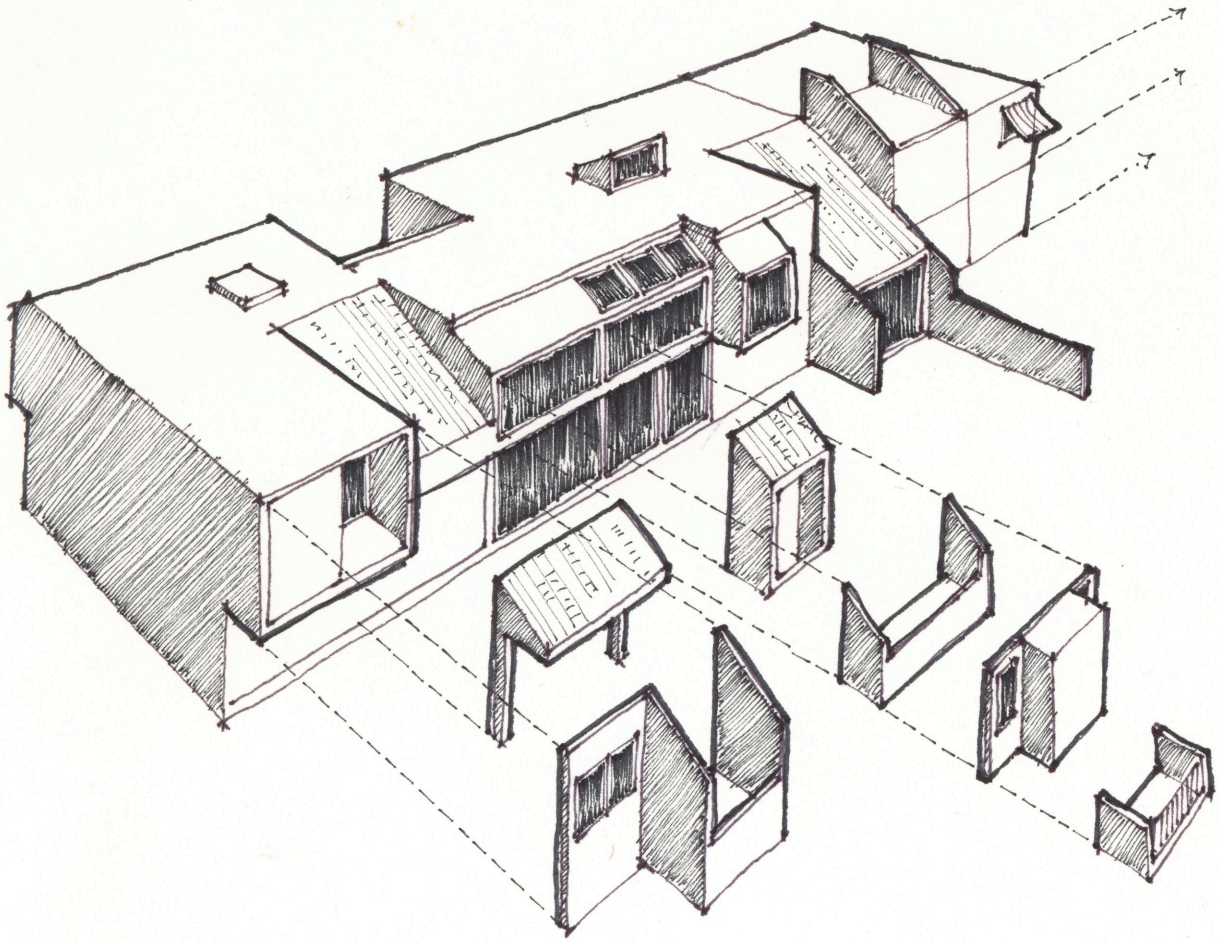
Dingman - Fouteux & Partners

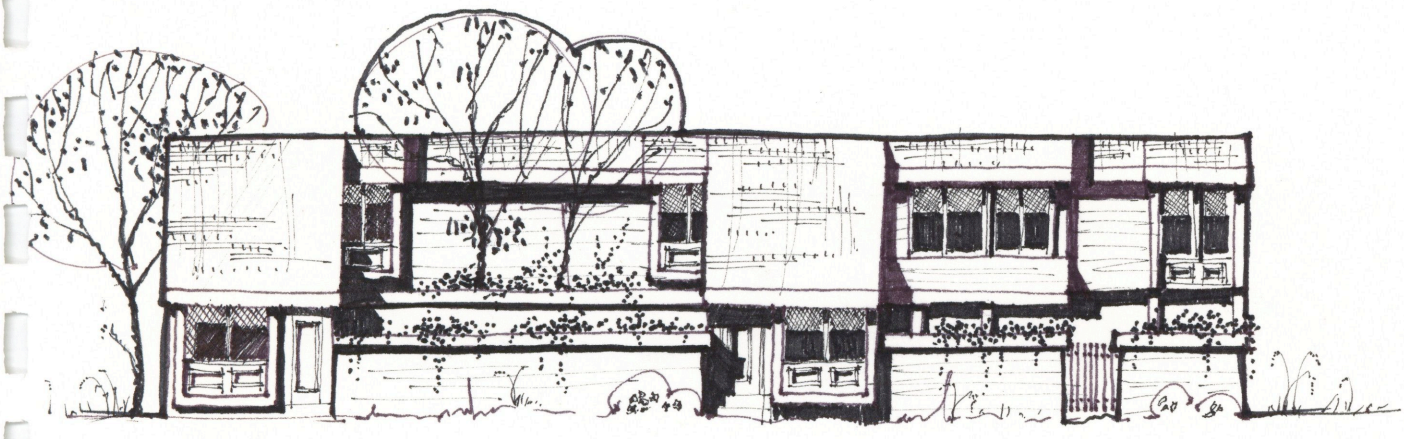
This proposal is centered on an architectural design concept which does not offer a finished structural product at this stage. The designer offers a modular system of 13-ft x 13-ft. modules for erection of multifamily and single family dwellings, vacation homes and other structures. An infinite number of configurations and plan combinations is possible.



Seed Consortium

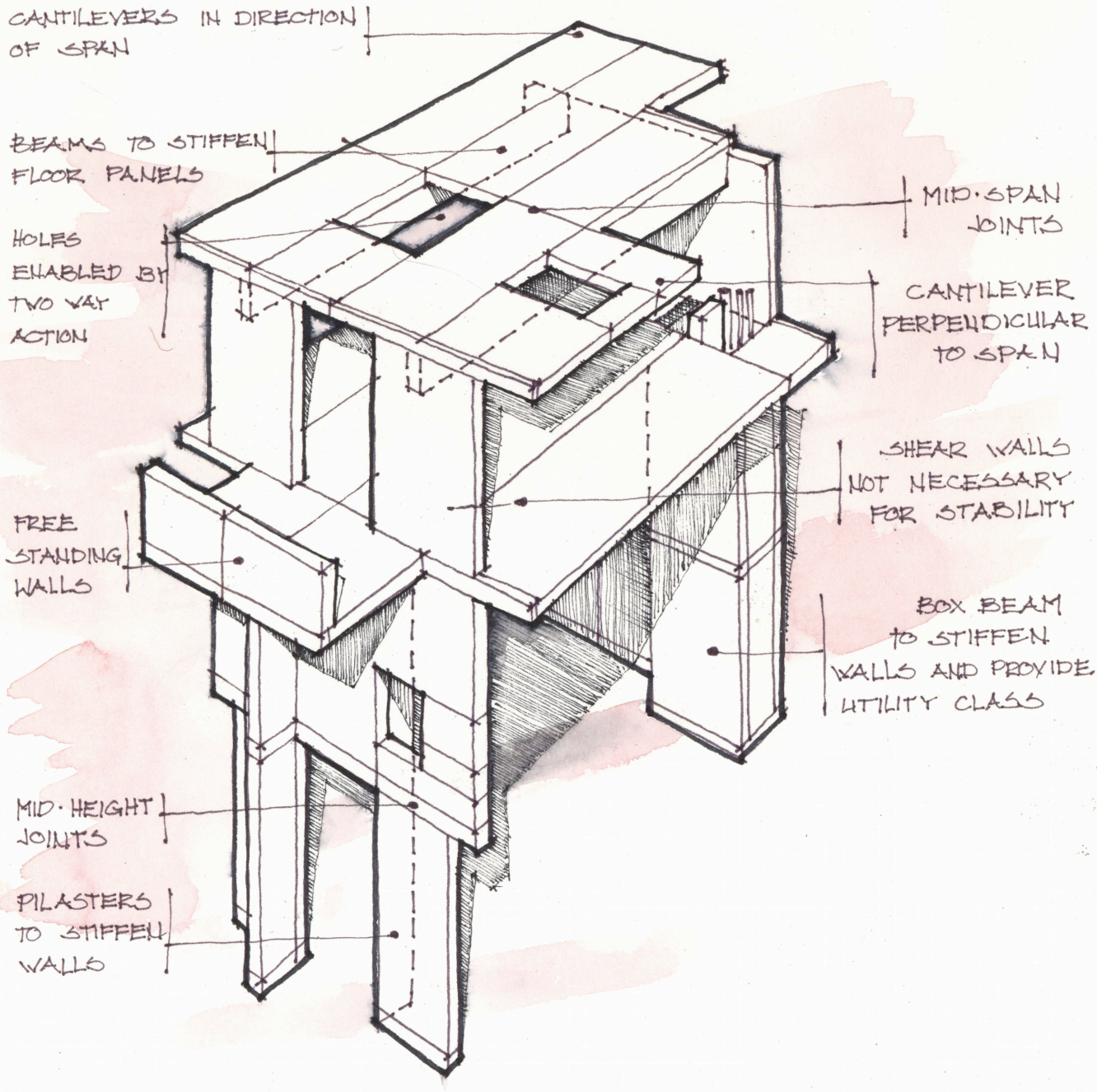
Feasibility of an all-molded, fiberglass home, built in a series of four partial modules complete to furniture and bed-bases, would be studied under this proposal.





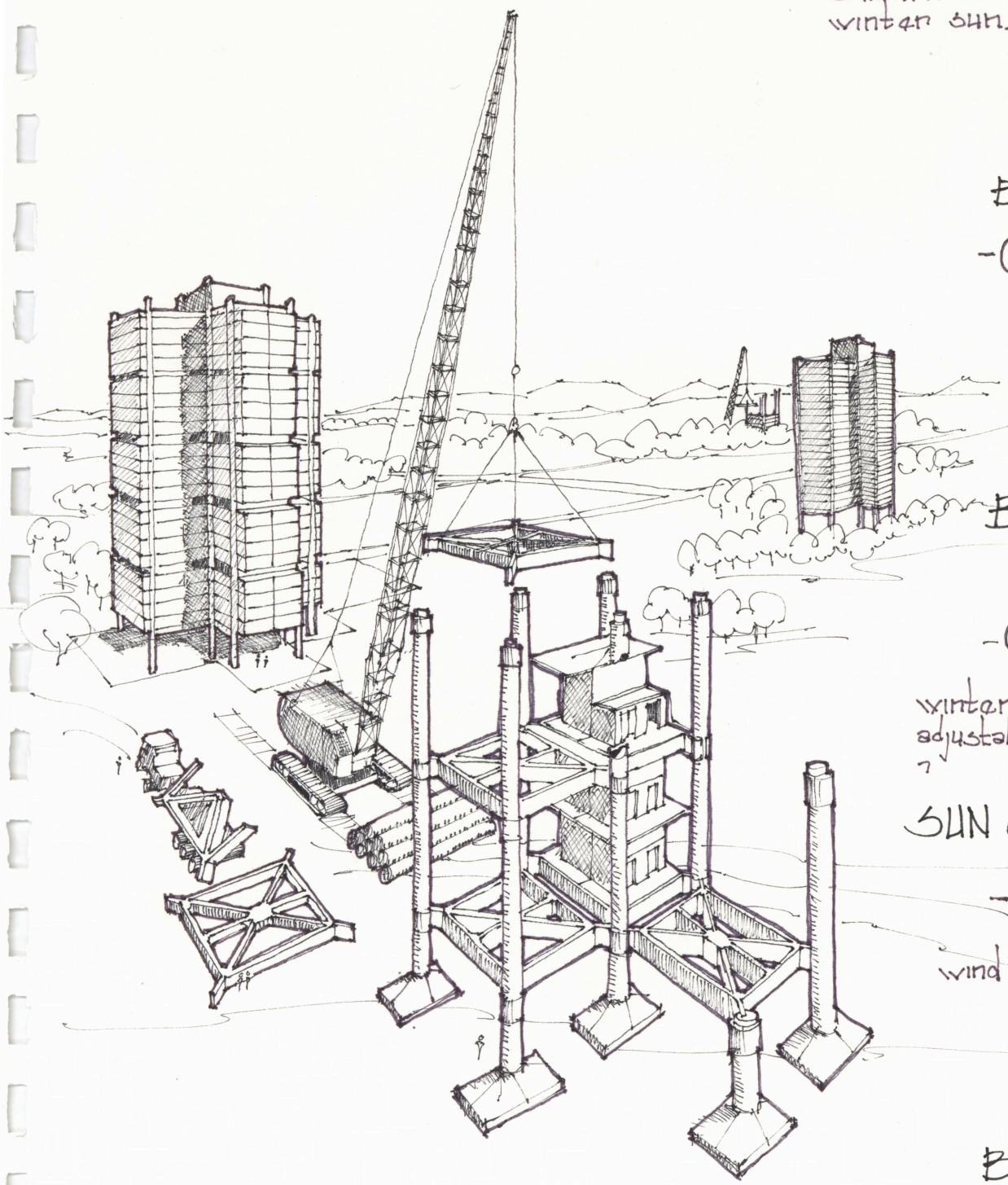
Levitt Technology

Two basic building systems are included in this proposal - a wood frame module system for immediate application; a concrete module system for future development. Provisions of medium-density townhouses and apartments is the aim of the five part wood-frame module plan proposed here. The system is fully adaptable to both single-family and high-rise construction.



John H. Suhr

Proposed for developing and testing is a self-locking joint which can be used to snap together, on-site building components of many types and in many sizes and configuration.



summer sun
winter sun
rain

Balcony weather protected

BALCONY north exposure

summer sun

winter sun
adjustable louvers

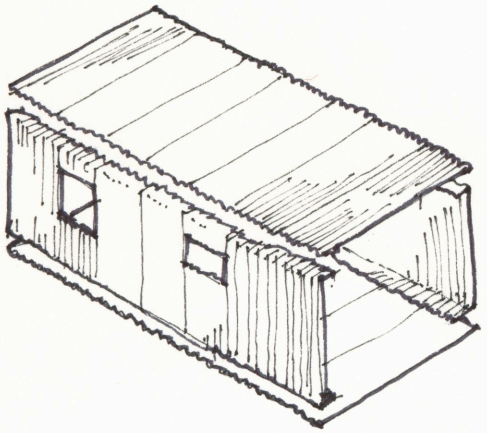
SUN CONTROL

wind

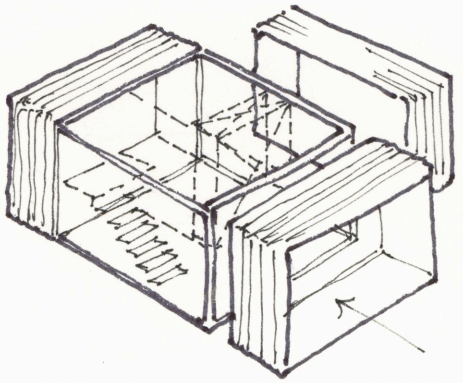
BALCONY
view oriented private
weather protected

National Homes

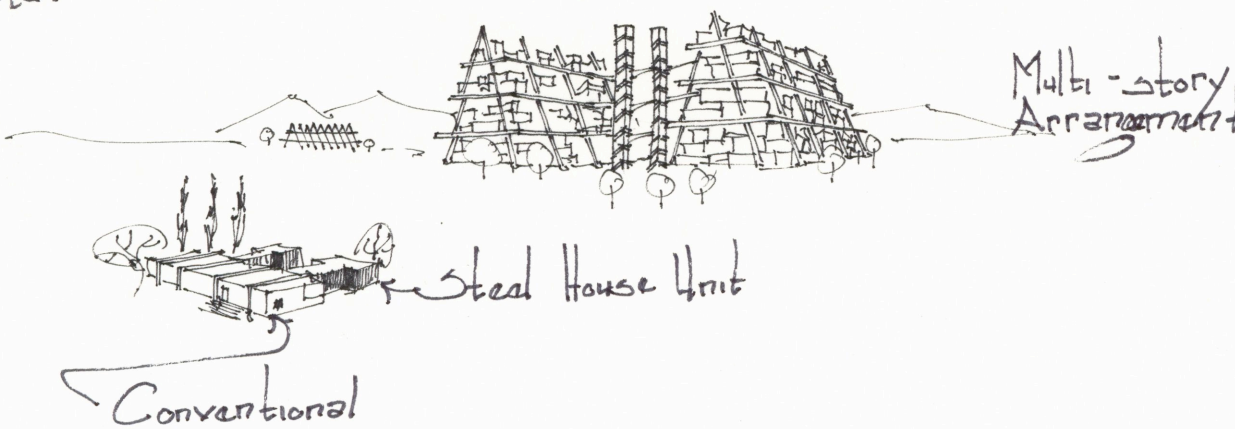
Factory-produced volumetric modular dwelling units are stacked vertically in this system. The proposal also involves extensive use of computer applications to program preparation, site analysis, master plan preparation, design development, and cost-benefit analysis. A principle innovation is use of computer aided vacuum sewage system developed and used in Sweden for the past ten years, demonstrating a major savings in operating and ancillary construction costs.

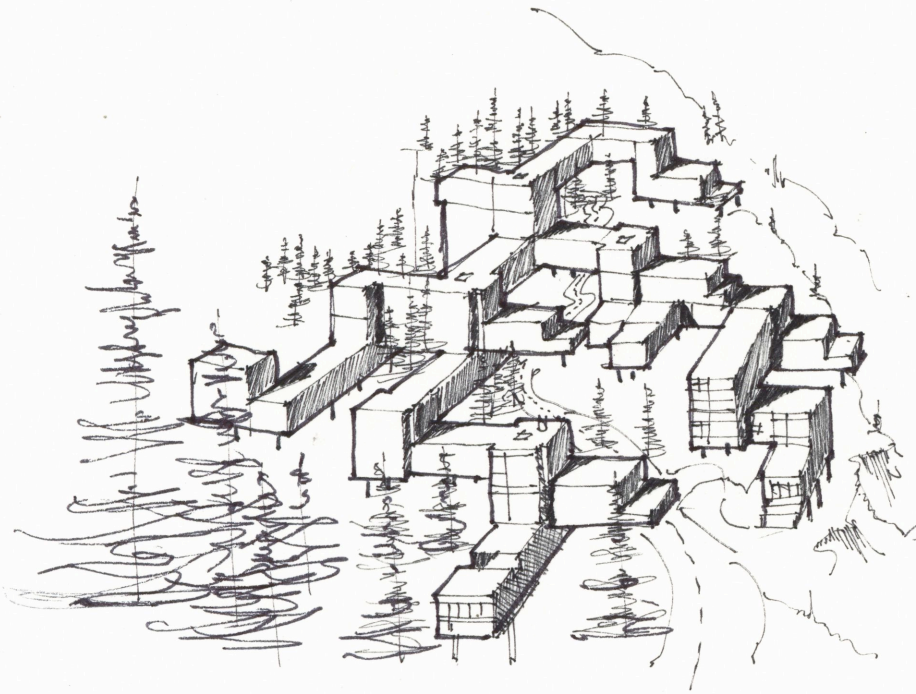


Canister



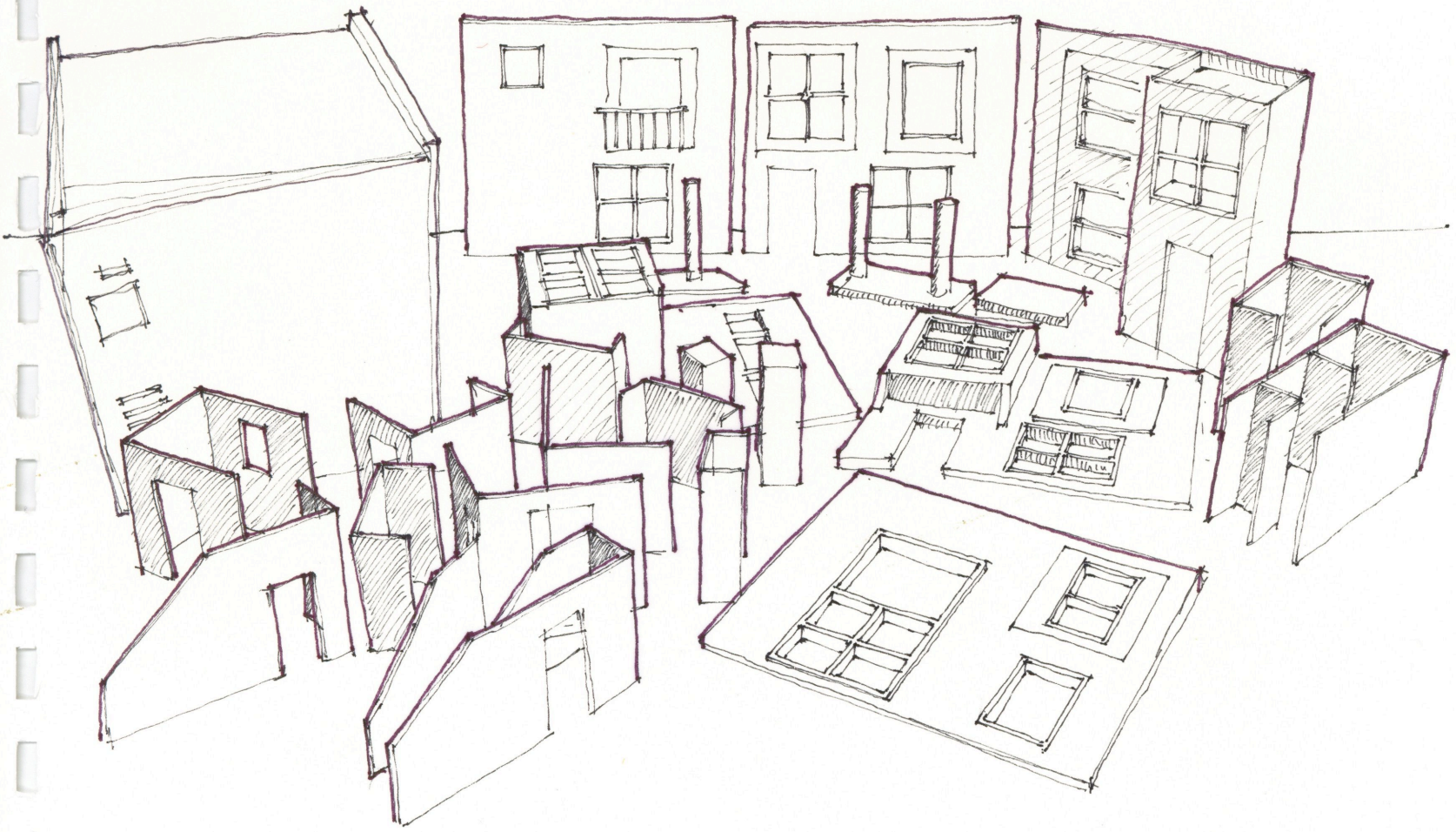
Link





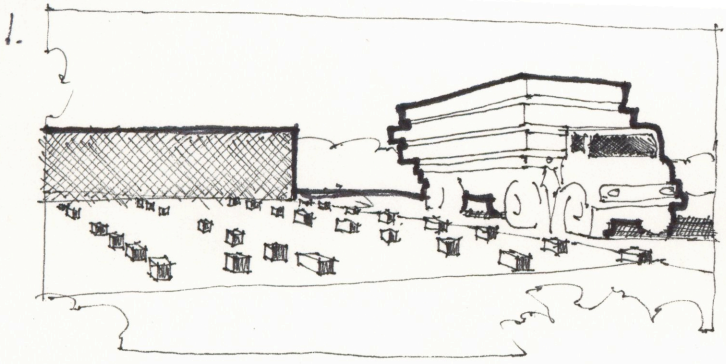
Arrangement of modules in accordance with the changes in grade & terrain.

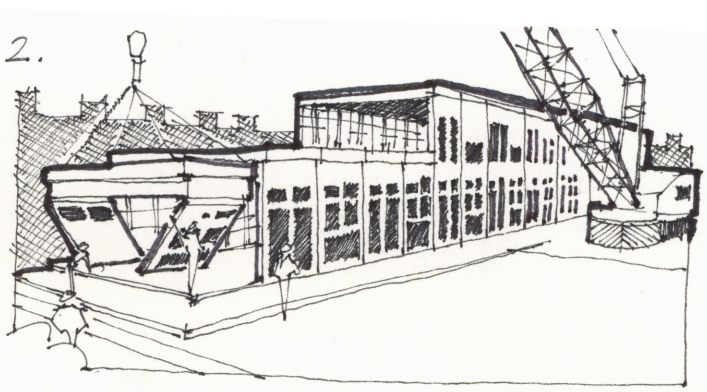
The Canister and Link Design

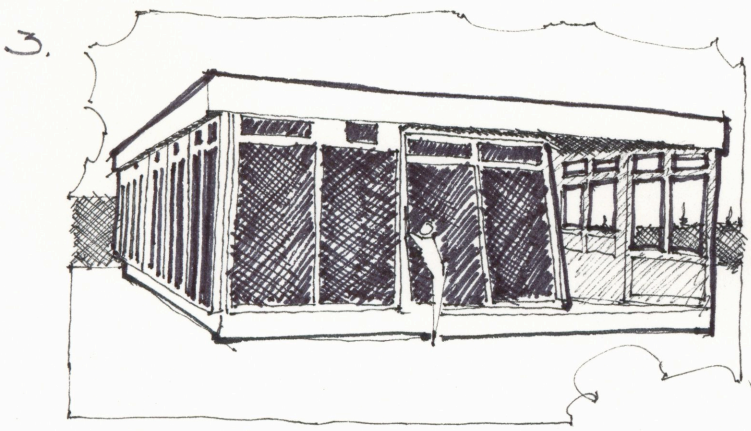


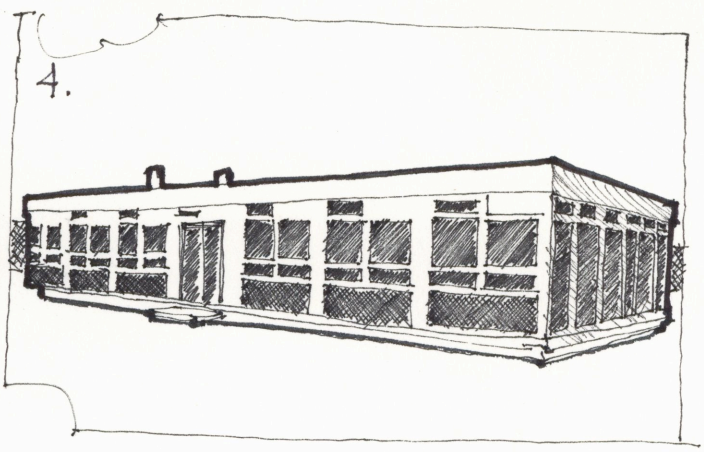
Tod E. Waxman

A housing system is proposed that is essentially a catalog of parts. The philosophy which underlies this concept may be stated as an awareness of the importance of living in an environment which responds to us. Allowances must be made for the need of persons to manipulate things and make their own mark.

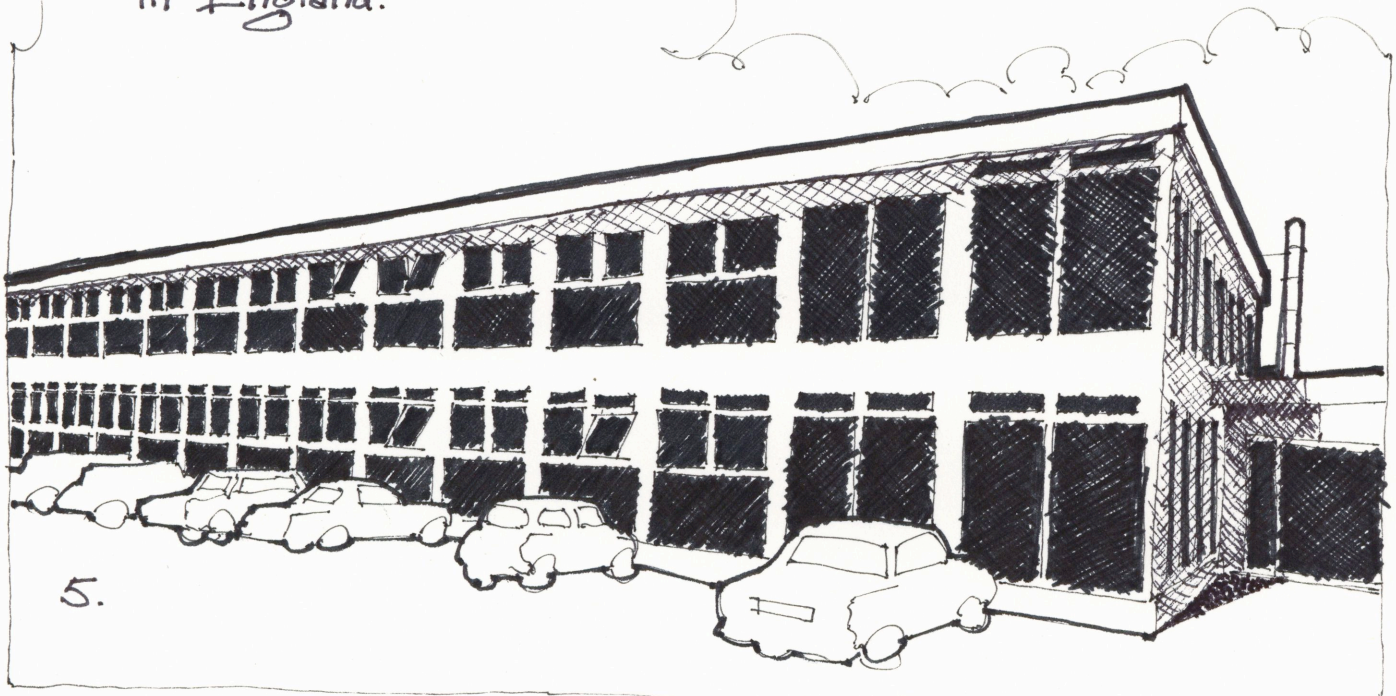








1. The folded walls arrive at the building site...
2. ... are unfolded and assembled...
3. The front components are fitted...
4. ... and the structure is completed after a very short time.
5. Office building of the Skalmersdale Development Corporation in England.



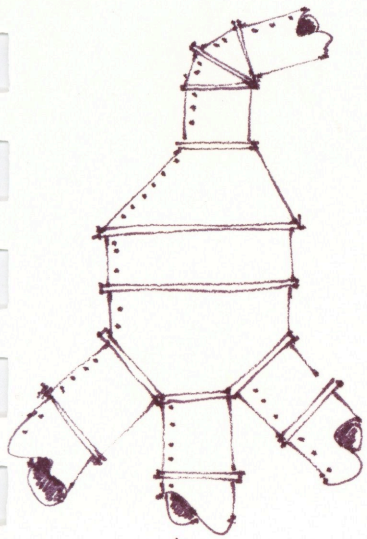
TERRAPIN MARK 45

"Any fool can add, it takes a genius to subtract."

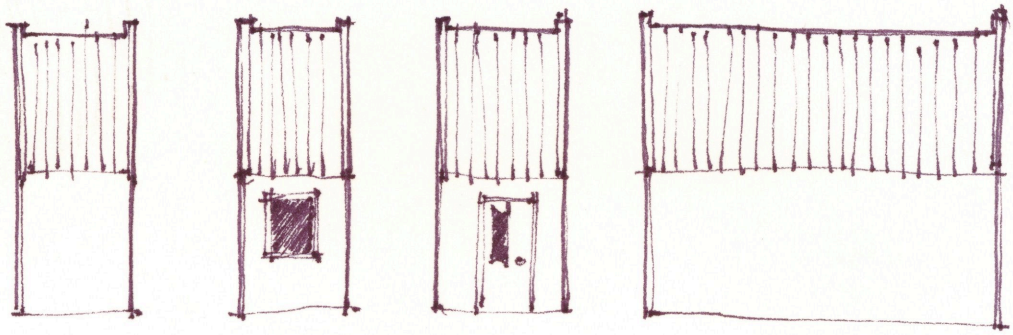
Genius refers to - "the sensitivity to know what information will be useful and what should be discarded."

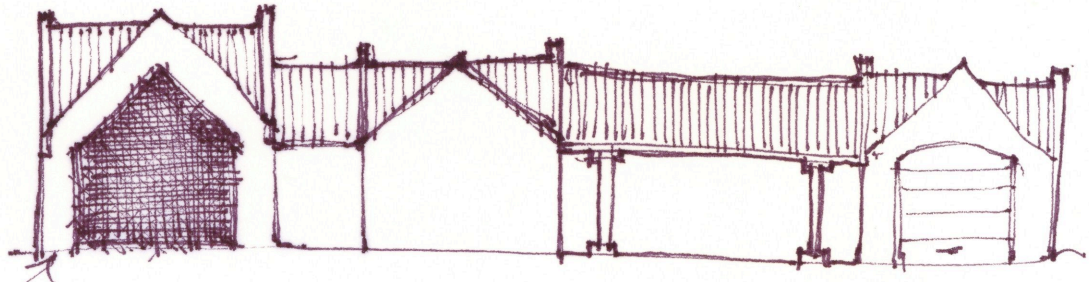
A fundamental key to the design of modular housing is simplicity. I will strive for a simplicity that enhances the architectural aspects and contributes to the functional necessities of a home. (Structure, mechanical, electrical, etc.)

Linking Modules.

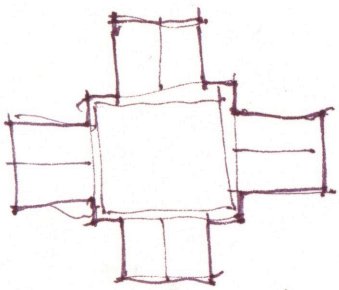


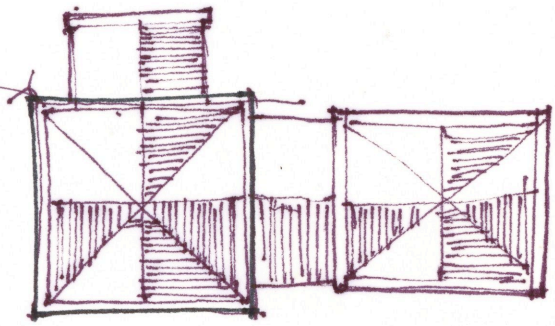
Metaphor

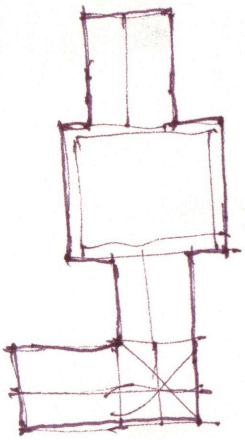


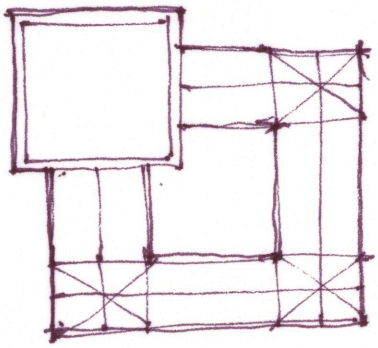


Core Unit







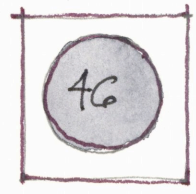


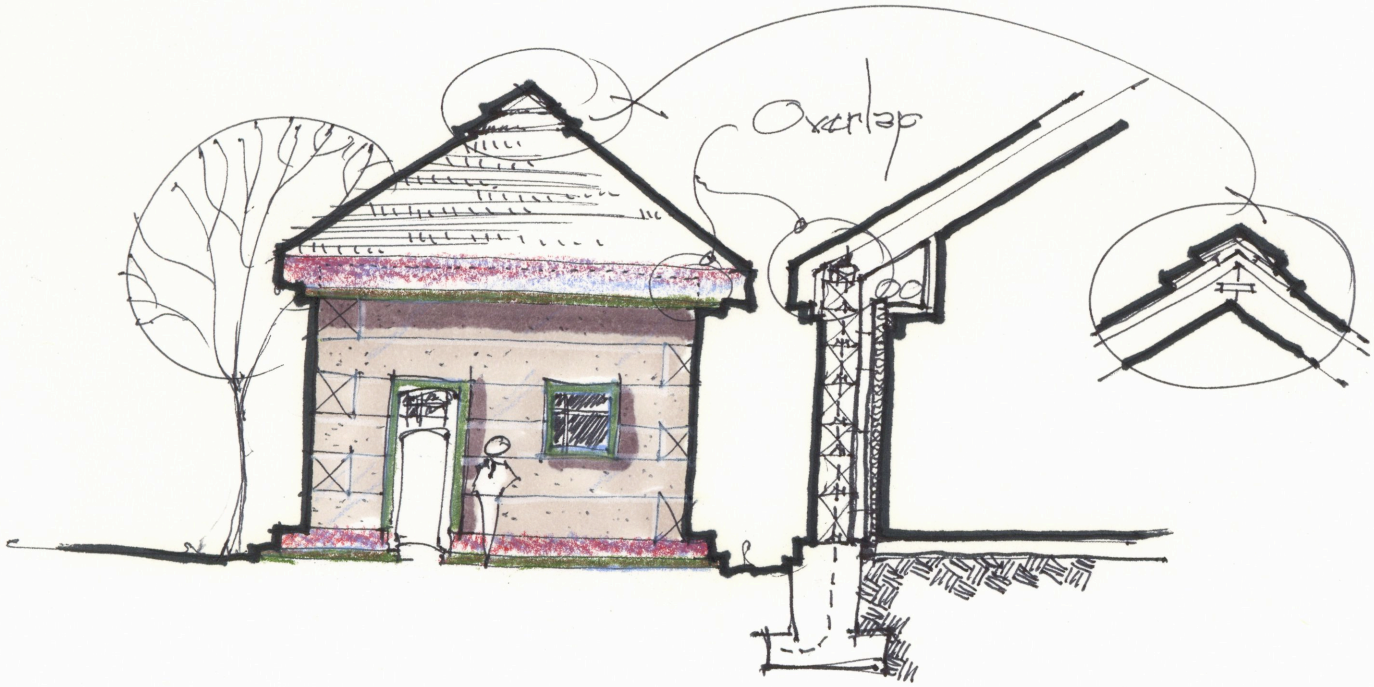


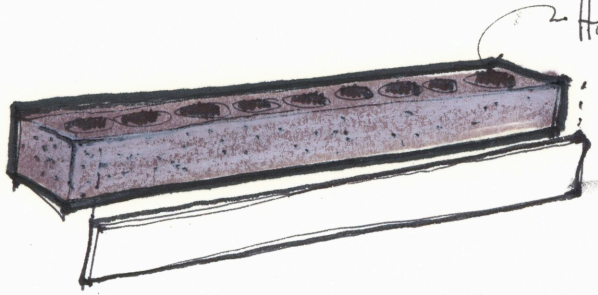
Flat Site
or
Level Foundation



"Technology is process and is only the means to an end; it is no guarantee of anything."

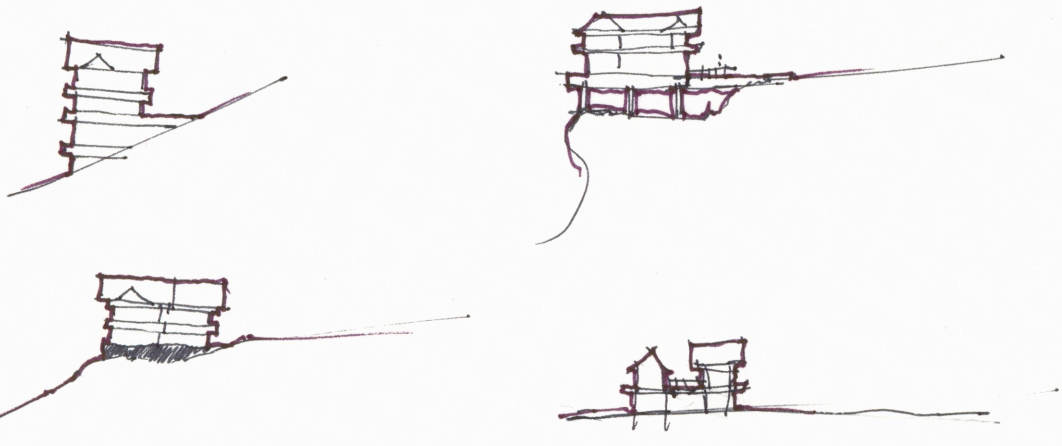


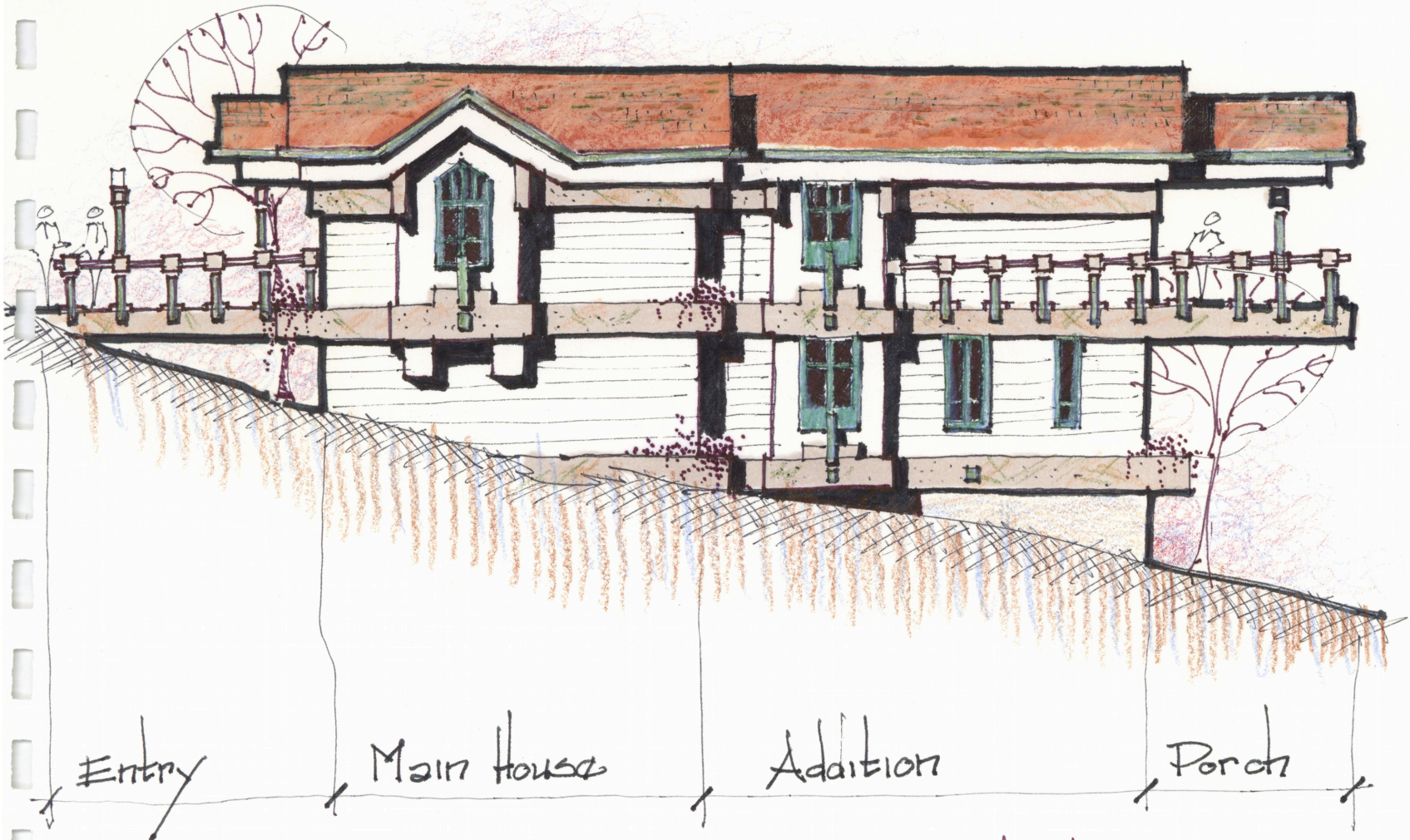


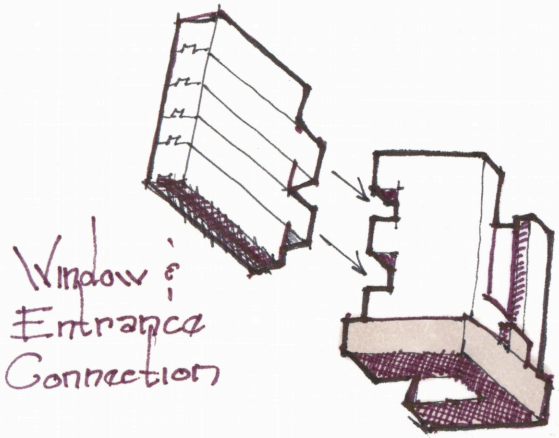


Concrete Log Study

1. Can be built on any site.
2. Organized in any shape.







Steps in Construction

#1. Pick Site

#2. Pick Basic Plan
3 or 4 for variety
Choose window & entry
Optional porch & decks

#3 Foundation
Piers or Solid Concrete

#4. Load Concrete Log in sequence in trucks.

#5. Unload & stack in position

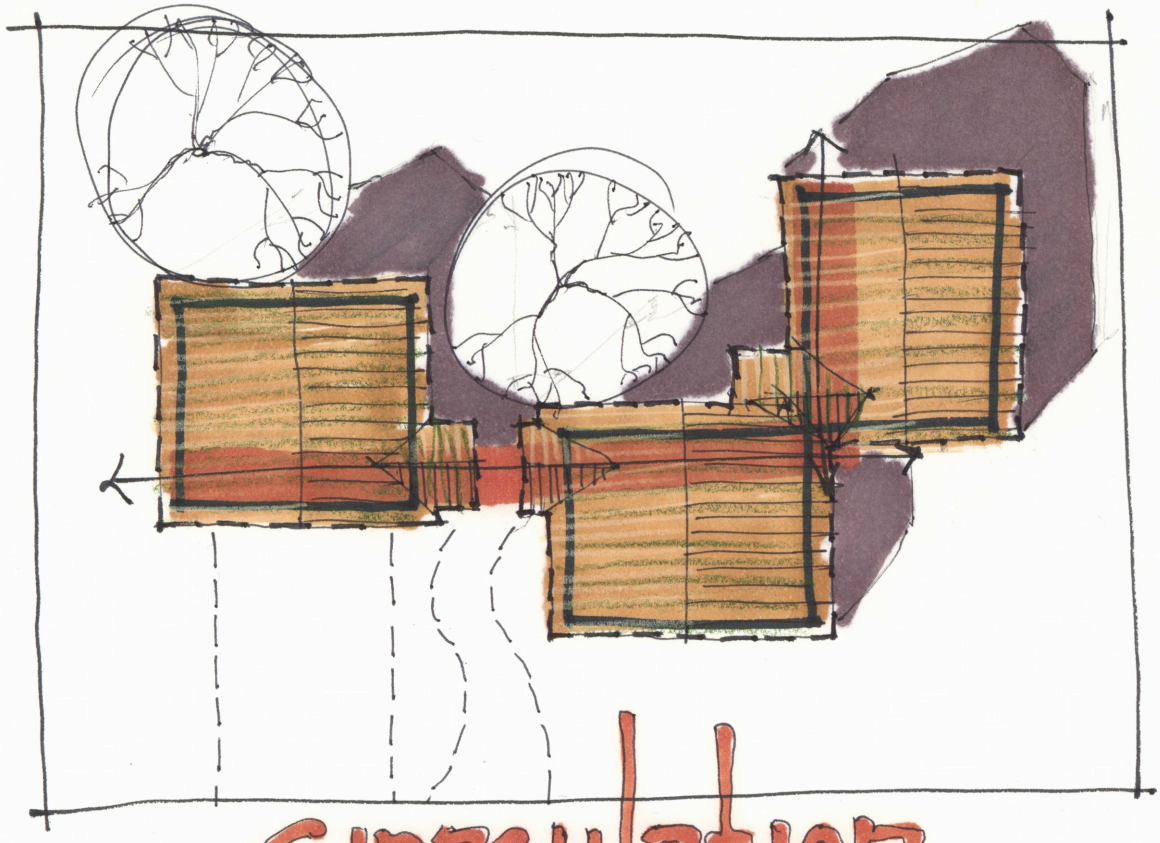
#6. Finish work
stucco, paint, whatever

Modular Unit System

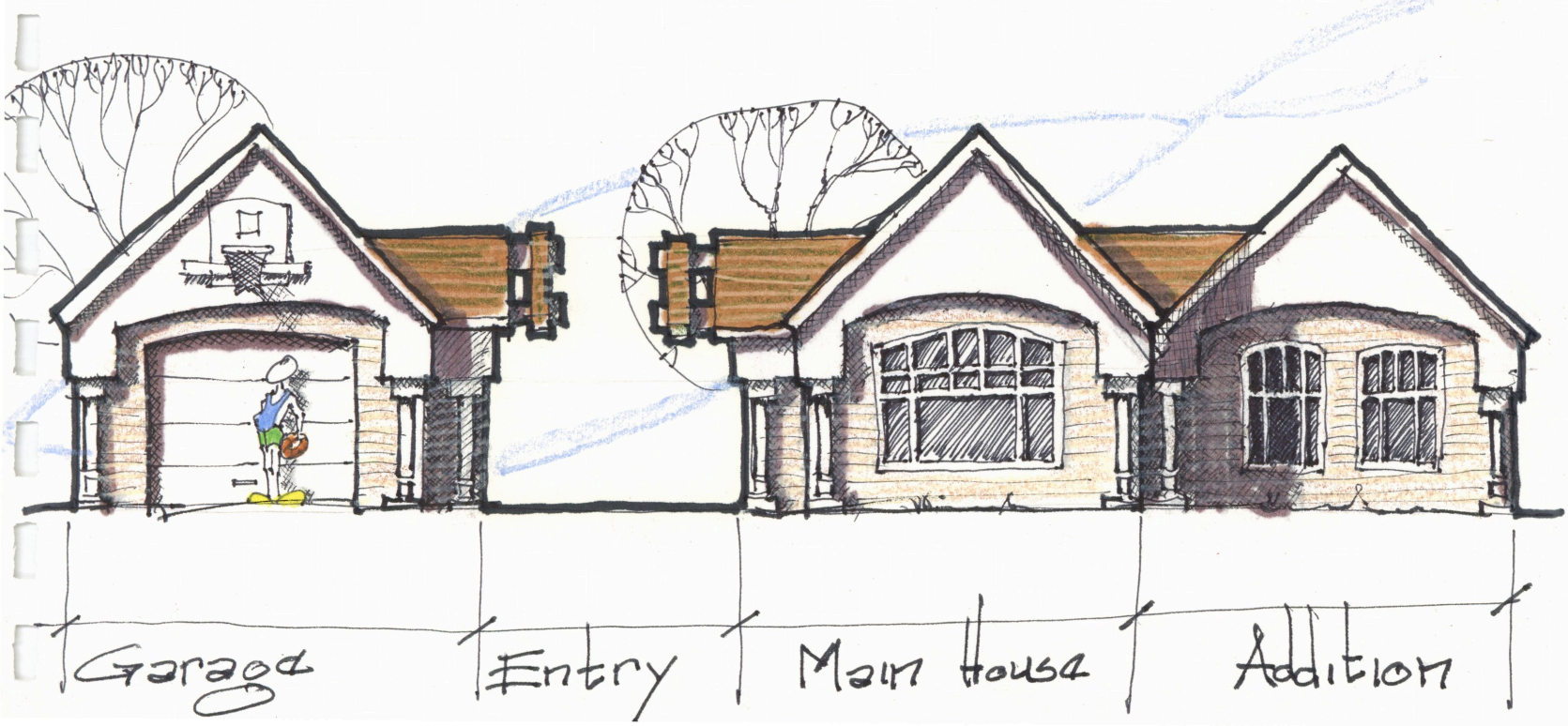
"Design should not freeze the status quo, locking individuals, communities, and whole cities into immutable, yet soon-to-be-outdated patterns."

Outdated patterns have been the case with most attempts at modular housing design, and will be a challenge for me to overcome by providing variety and the opportunity for change.

Modular Unit System

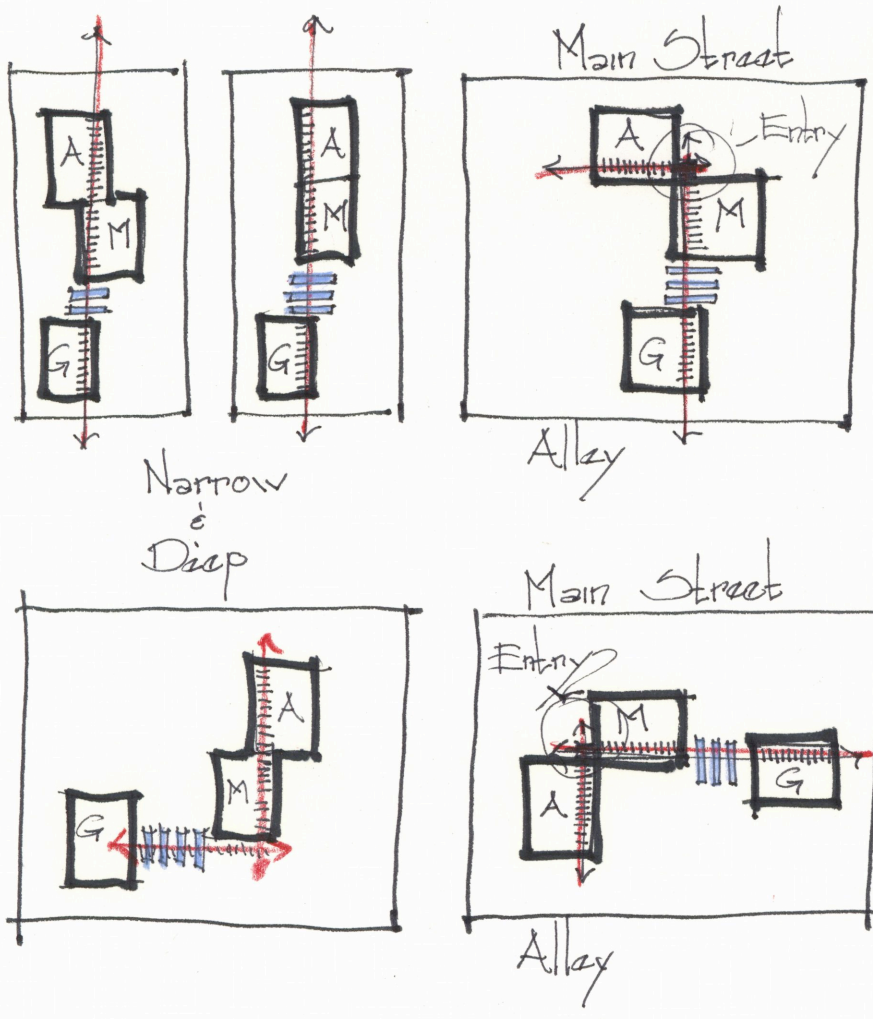


circulation

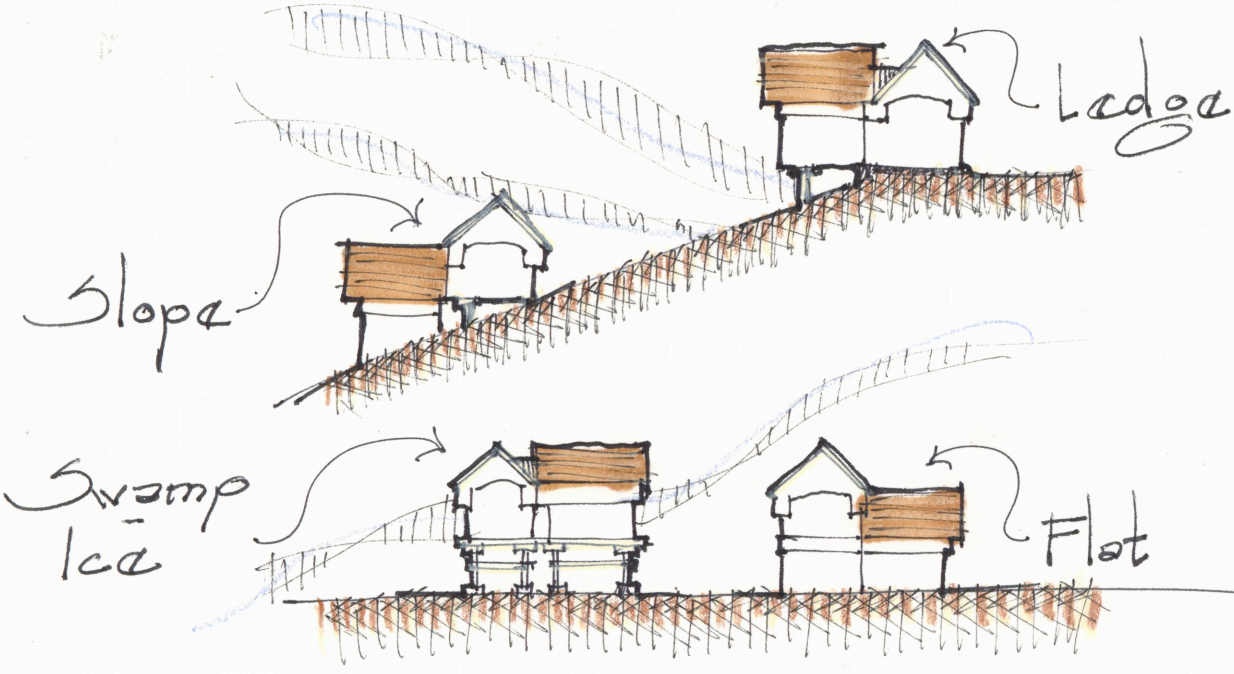


G - Garage
M - Main House
A - Addition

Possible Site Organization



Site Terrain

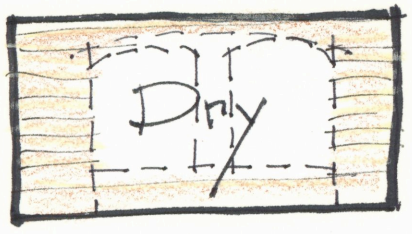


Roof Unit

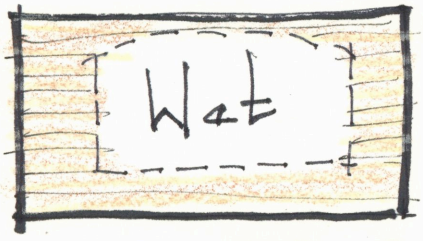
Posts

Entrance Units

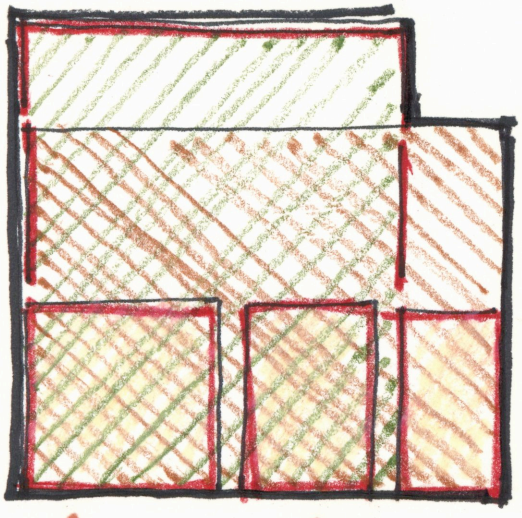
Modular Unit



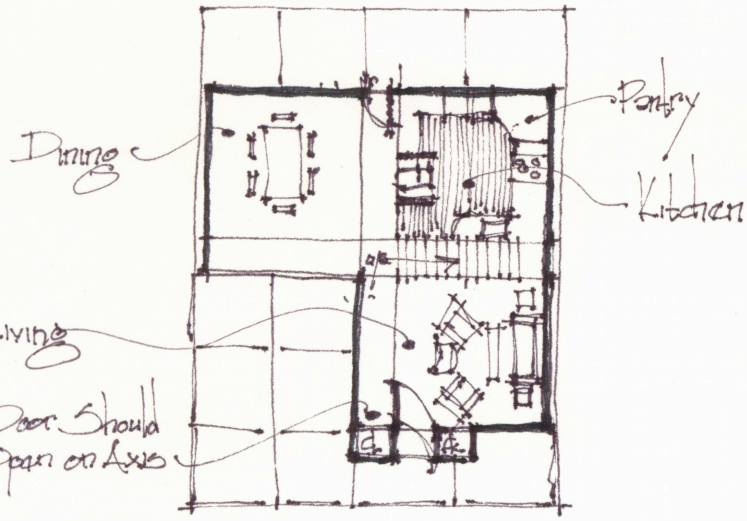
Modular Unit w/Kitch &/or Bath

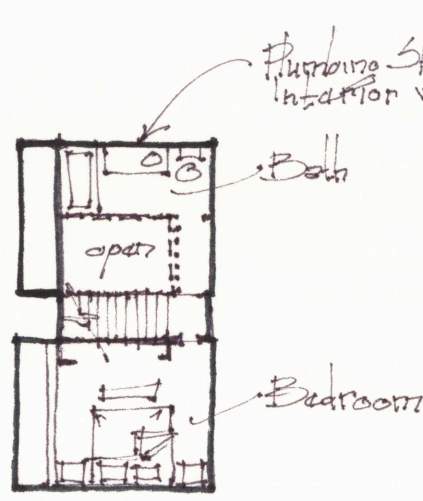


Basic Kit of Parts



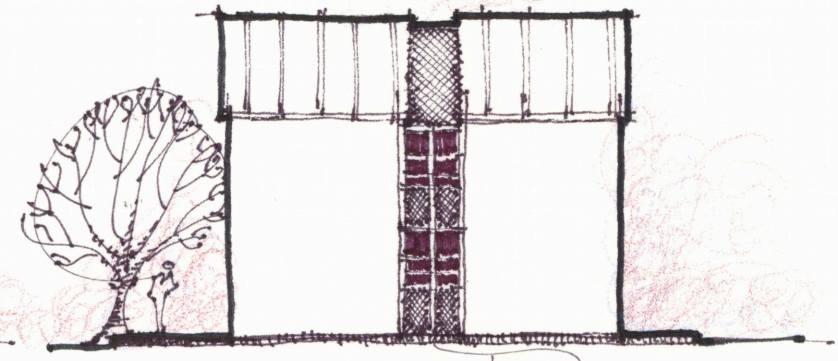
Plan Possibilities



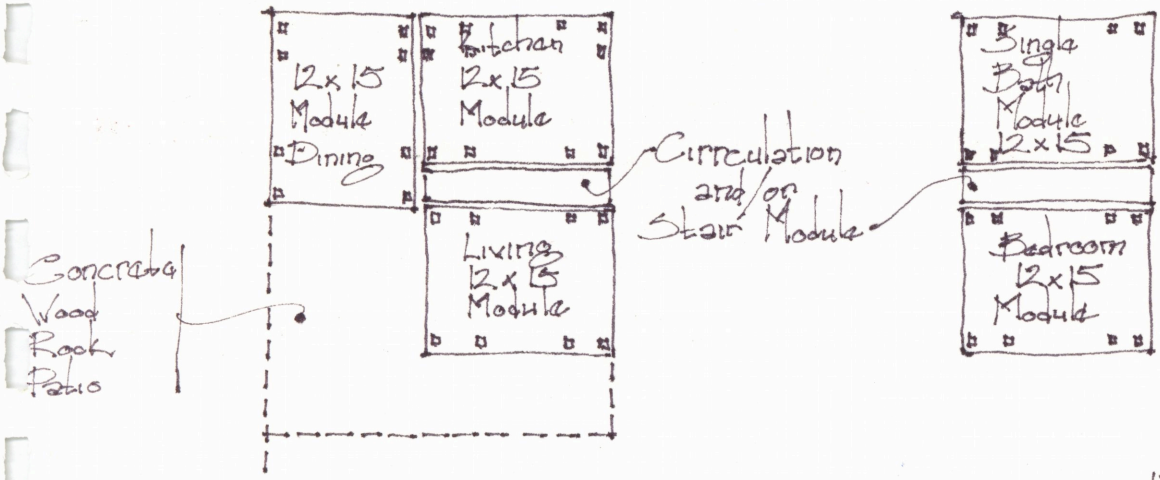


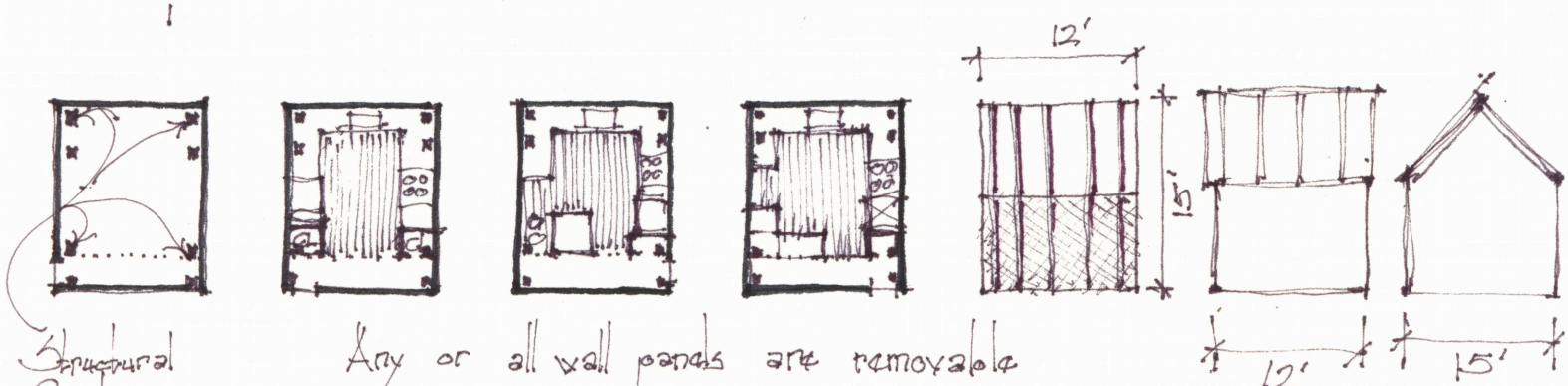


Entrance Unit



Stair Unit





Structural Grid
2/12x12/offset

Any or all wall panels are removable

Roof Plan

Elevation of basic Modules

1st Floor

2nd Floor

Entrance Module

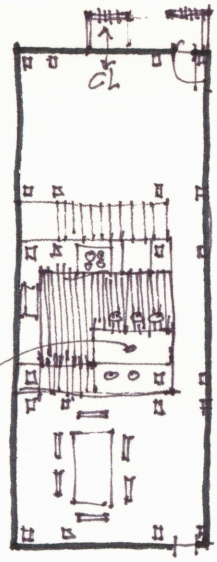
Living

Circulation

Kitchen

Possible Bath

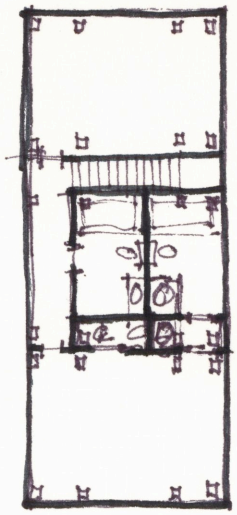
Family or Dining



Bedroom

Bath

Master Bedroom



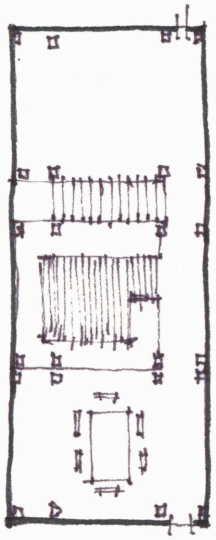
Two Bedroom Unit

Living

Circulation

Kitchen

Family or Dining



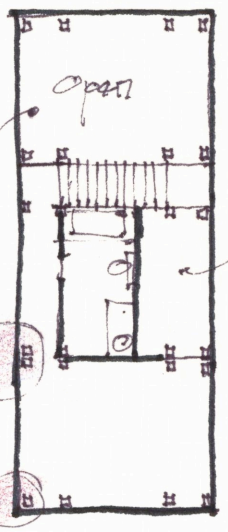
Either 1 story or Open to Living

Open

Walk in Cl

A

B



One Bedroom Unit

Steel Columns / Wood Columns

Exterior Siding

Steel Batts

Panel

A

Exterior Siding

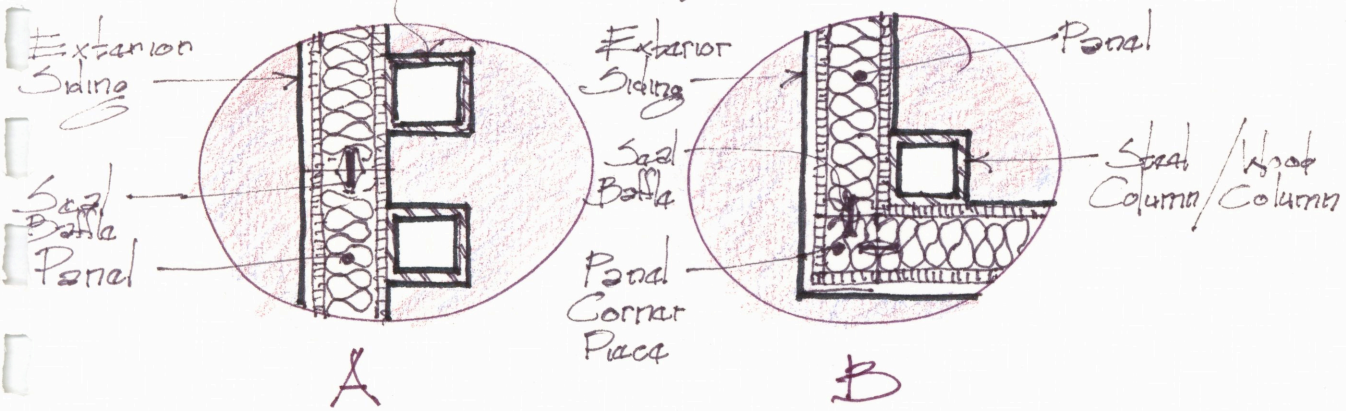
Panel

Steel Batts

Steel Column / Wood Column

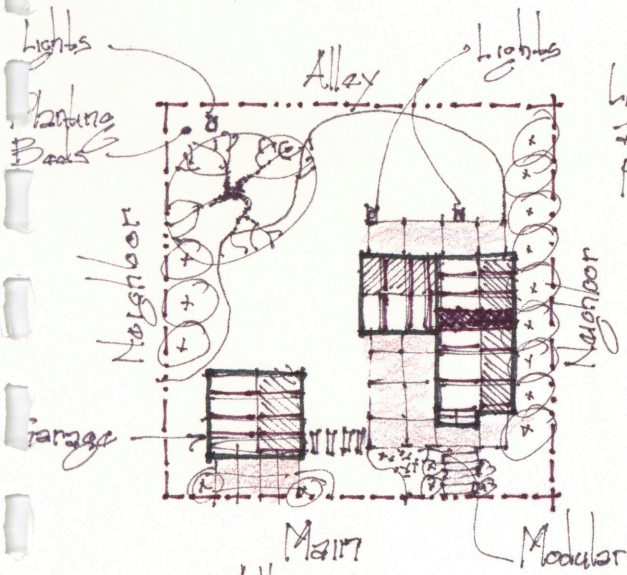
Panel Corner Piece

B

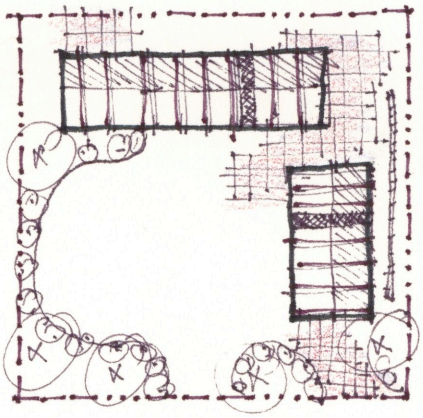


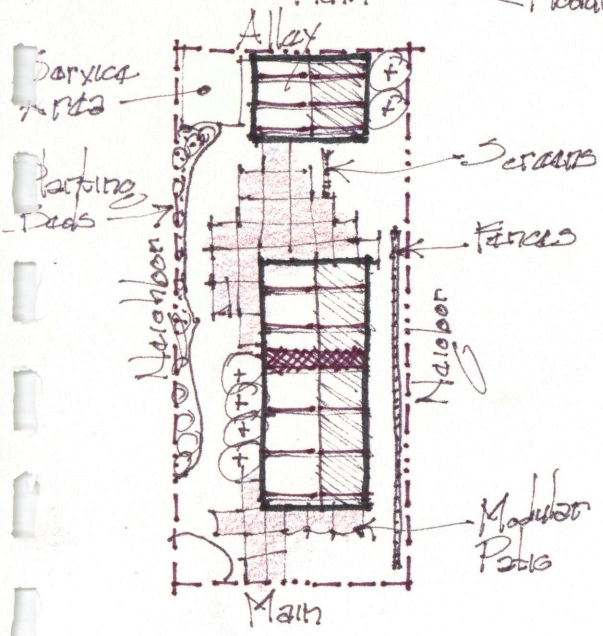
Details

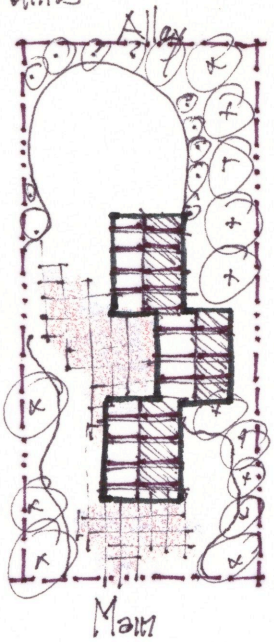
scale: 1'-00" = ?

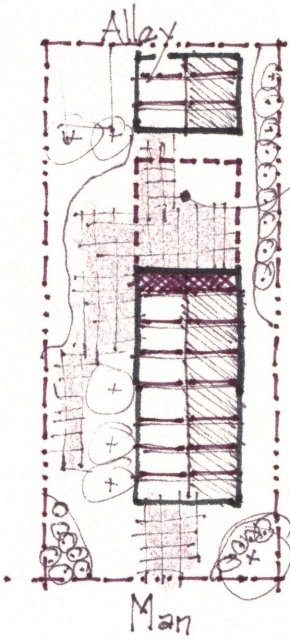


Use of Vegetation as wind, break, privacy, beauty.

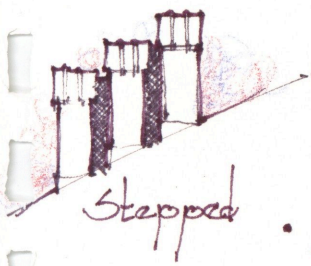








* Note: • Treatment of the site will be extremely important to the units, however, there is no one specific site to deal with here so I have dealt with a variety of sites in a general way to show it is possible to put these units on several different terrains.



• All landscaping elements such as patios, planters, screens, fences, steps etc will also be prefabricated.







Modular Unit System

Advantages

Easy prefabrication
Expadability
Cost (Low)
Circulation
Erection time
" convenience
Site relationship
Factory fabrication
& assembly
Prefab kitchen &
bath units

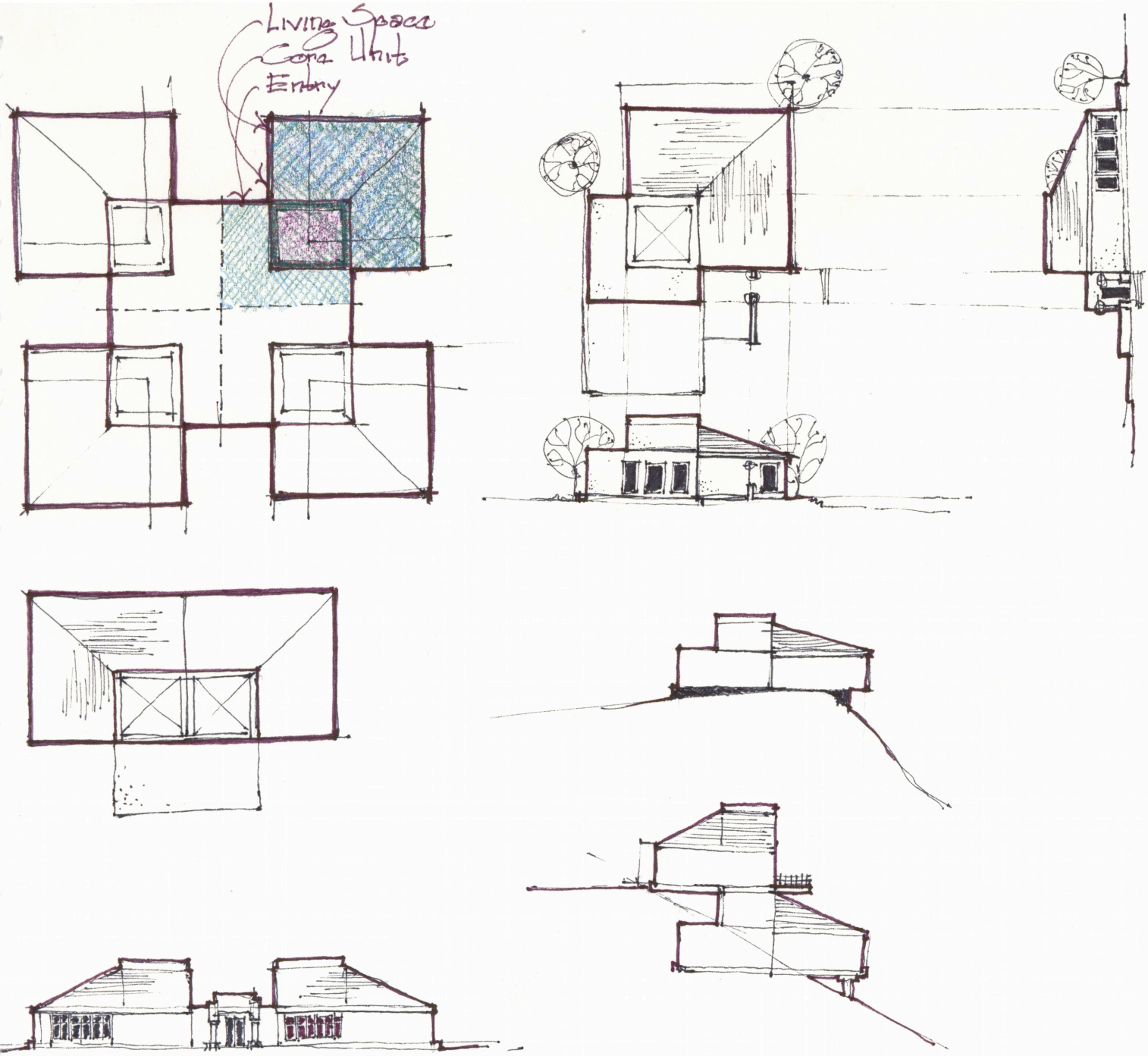
Disadvantages

Limited variety of
Forms
Plans
Room sizes
Individuality
Location of Manufacturer

Structural Panel System

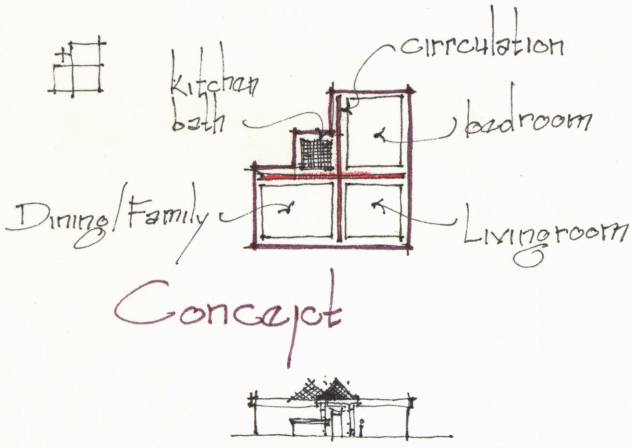
"The products of the entire building should relate to one another dimensionally so that they can be put together in an infinite variety of ways."

Infinit variety is the concept of the prefabricated panel proposal. I believe it allows for each inhabitants individuality and has the potential to relate and respond to the site better than more strict modular housing schemes.

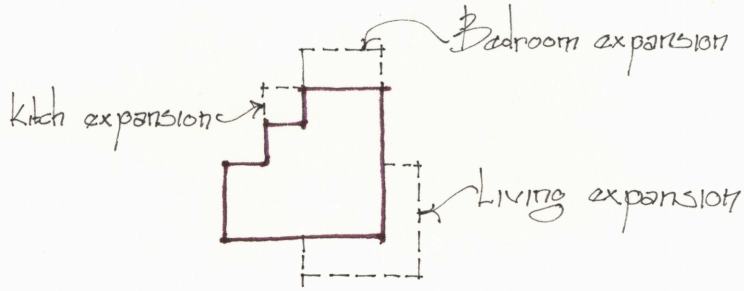


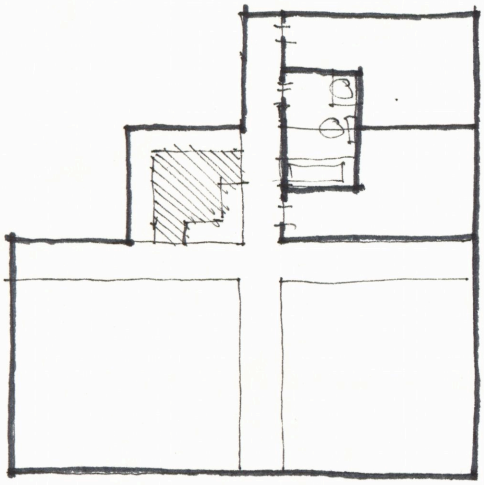
Pre-fabricated Panel Construction

Structural Panels
Prefab Core Unit

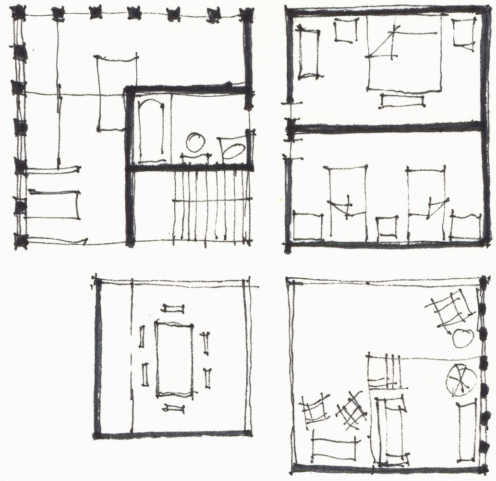


Concept

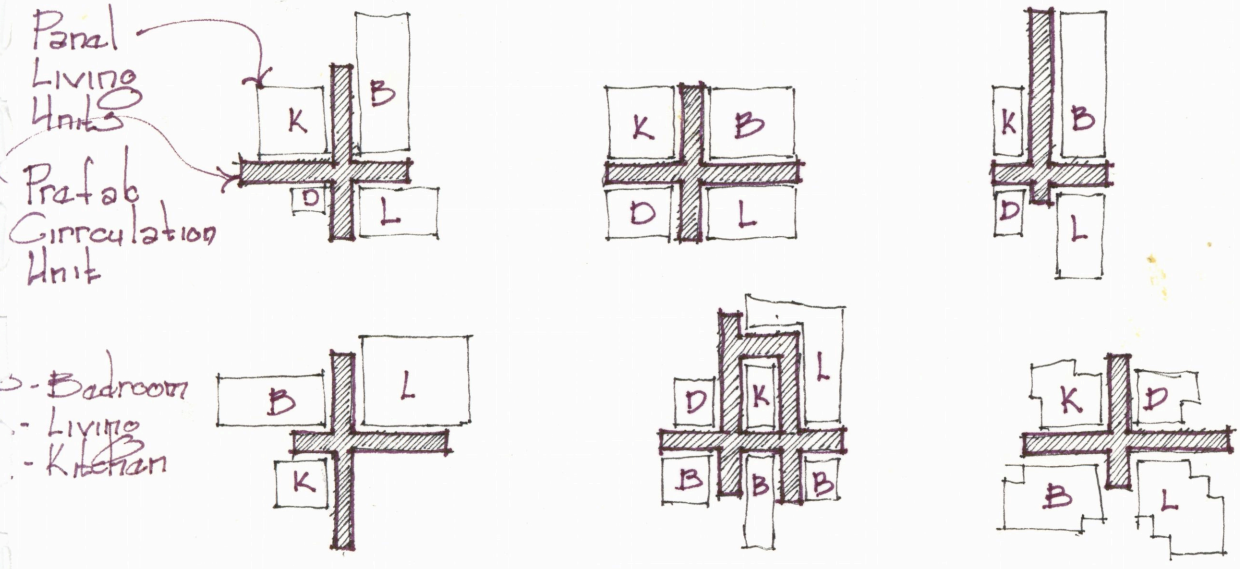




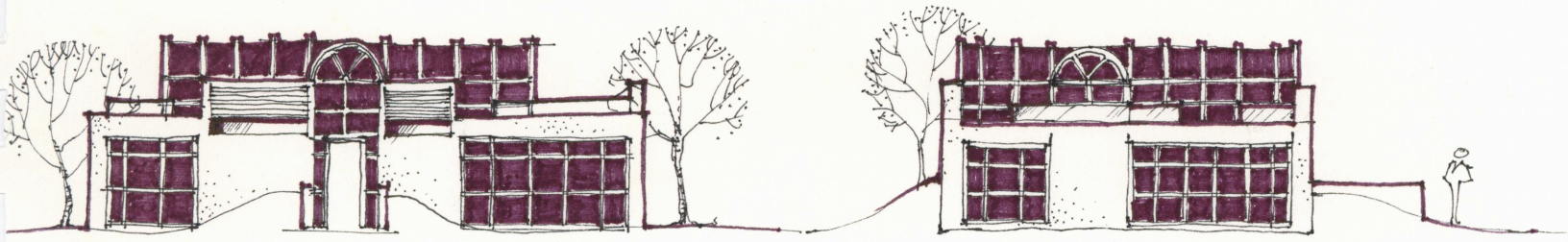
Possible Living Space Arrangement

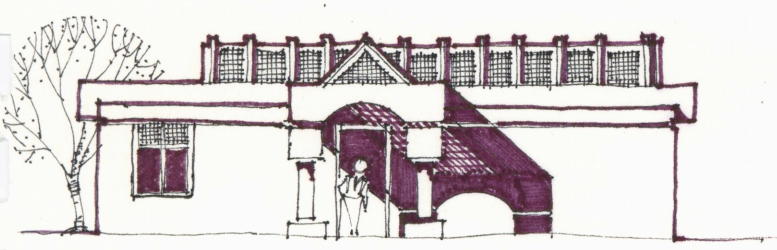


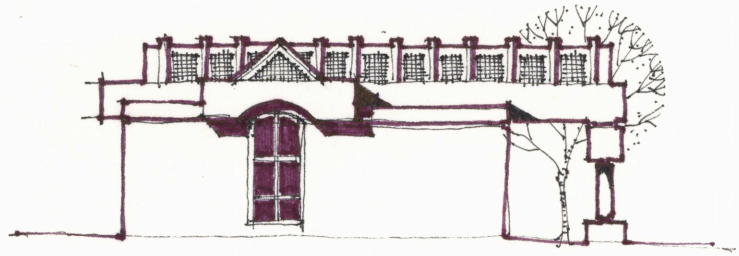
Possible Floor Plan

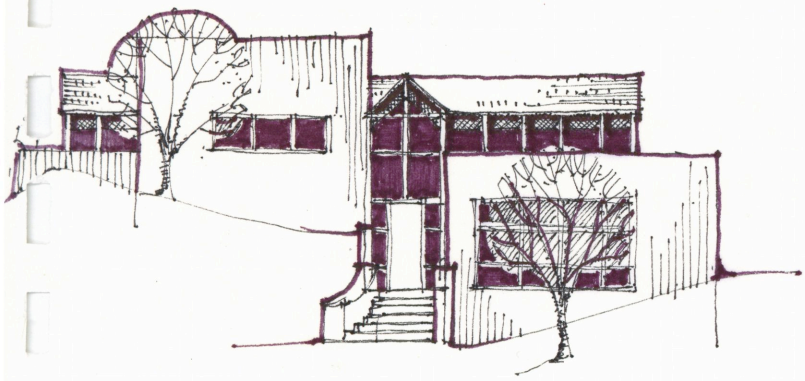


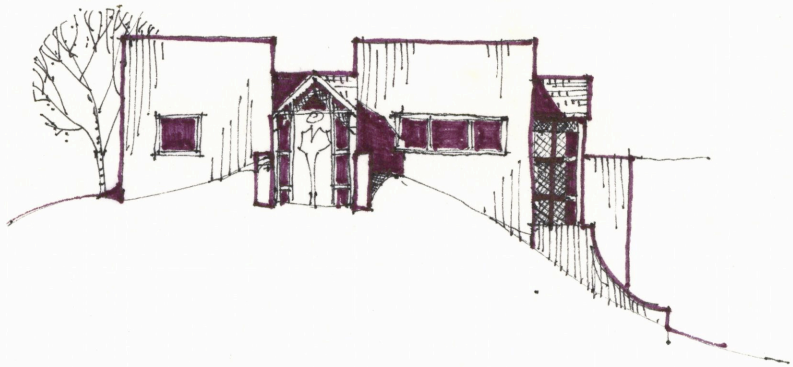
Some Possible Configurations



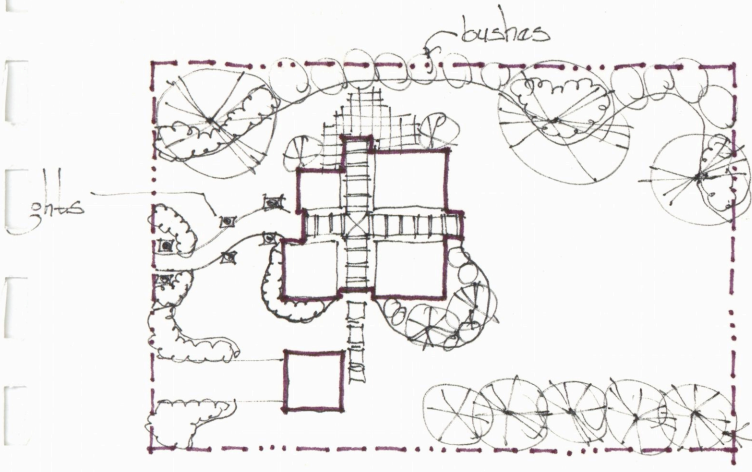








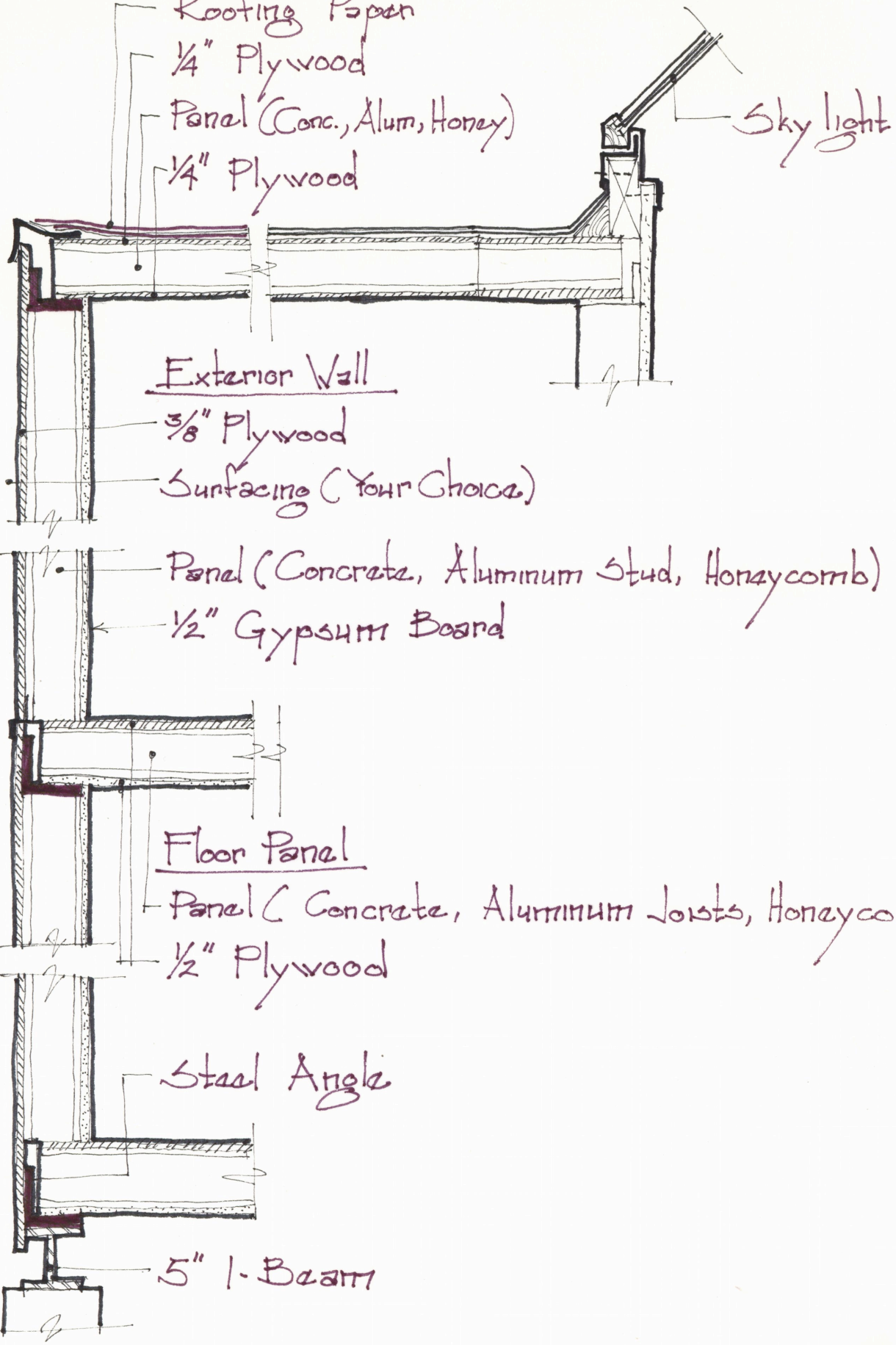
With the structural panel system it is possible to achieve variety and individuality through the use of forms, material, color and site.



One of the major differences between this thesis and other housing projects is the treatment of the site. Each project will respond to its environment and respect natural features.

Details

Roof Panel



≢ Structural Panel System

Advantages

Variety of
- Forms
- Plan organization
- Room sizes

Circulation
Expanability
Erection time
Prefabrication
Site relationship
Prefab kitchen & bath units
Individuality

Disadvantages

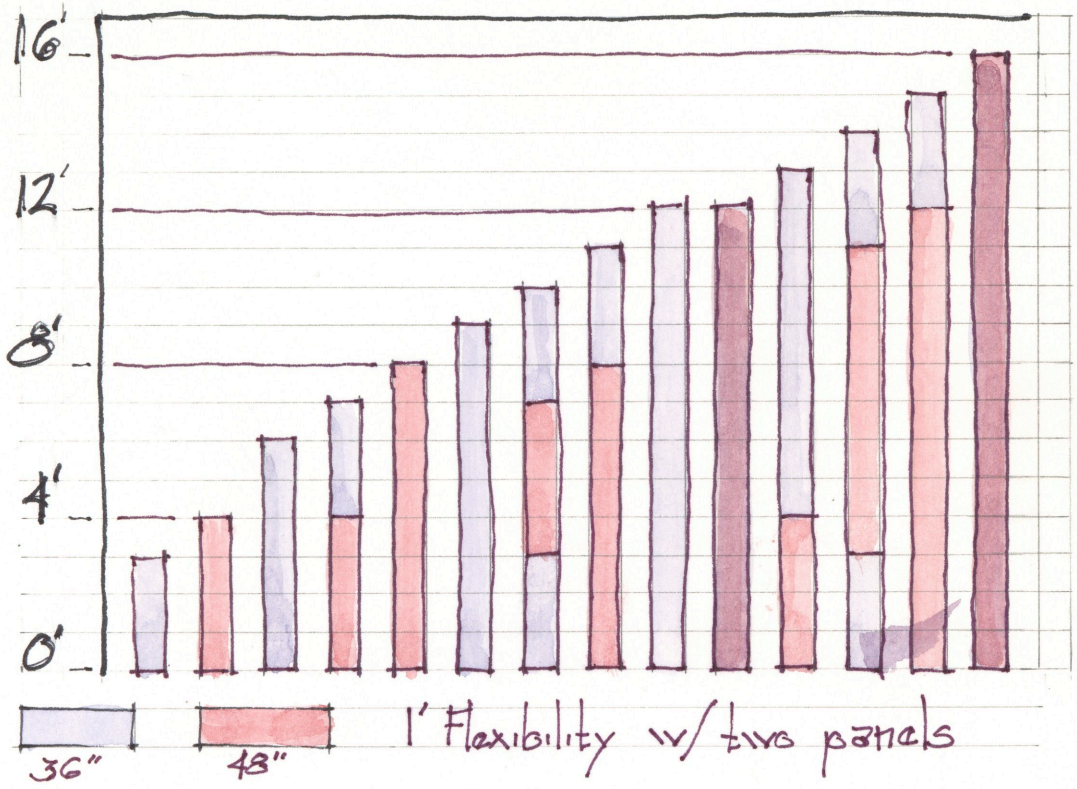
Location of Manufacturer
Connections
Labor - would require skilled
Too many diffatent panal sizes
Removal of some walls my be difficult

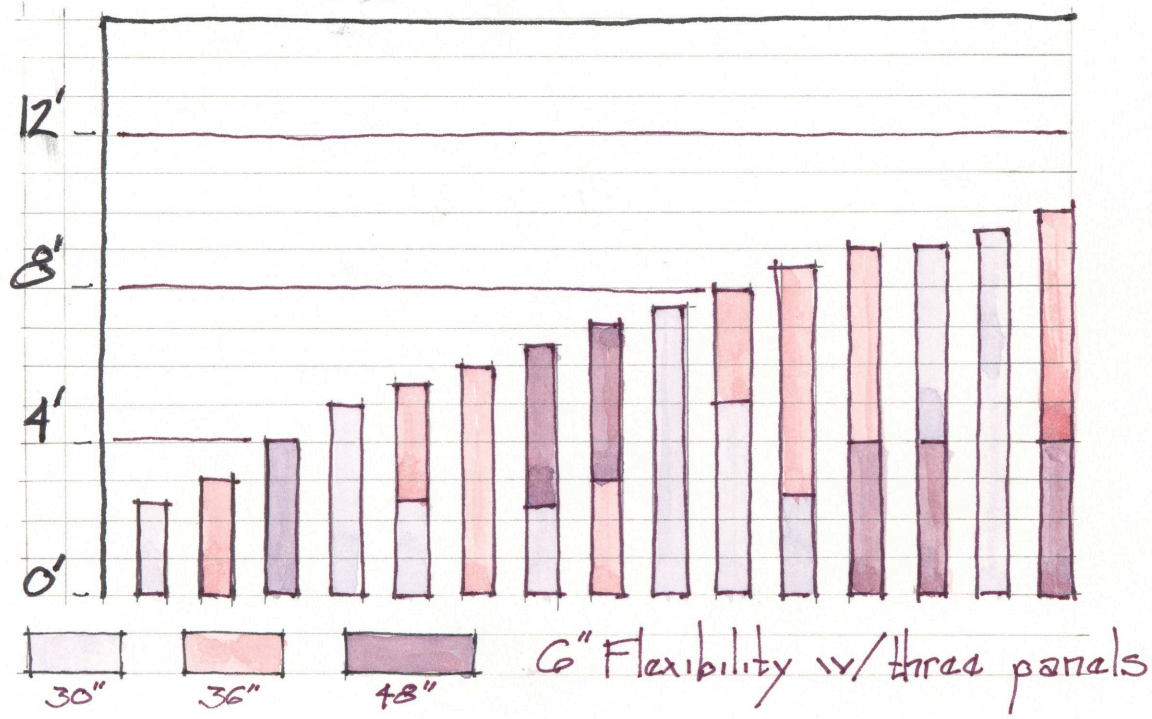
Post & Beam Panel Construction

"A single product size, though desirable economically, leads to complications in terms of corner conditions, wall thicknesses, and structural sizes. Three or four different product sizes with a variation of only a few inches may provide the necessary compensations for various materials thicknesses and jointing conditions."

This next proposal has taken into consideration varied panel sizes, not only for the convenience of connections but for variety of forms as well.

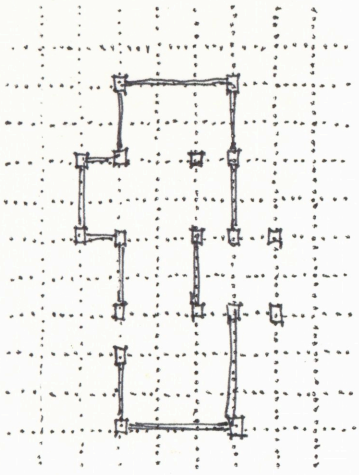
"Flexibility to small increments may be obtained by working with ranges of product* sizes rather than single products."

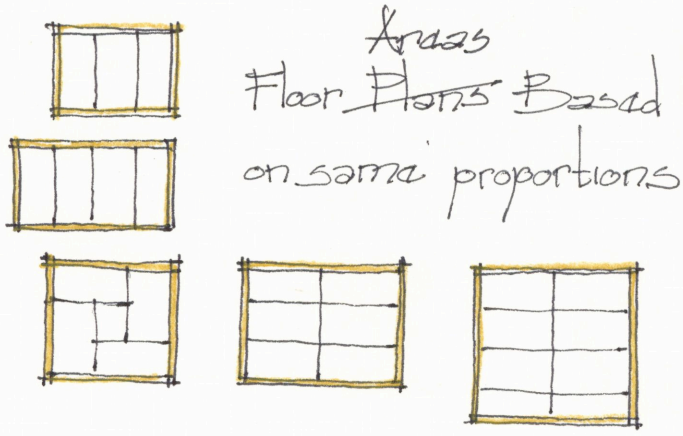




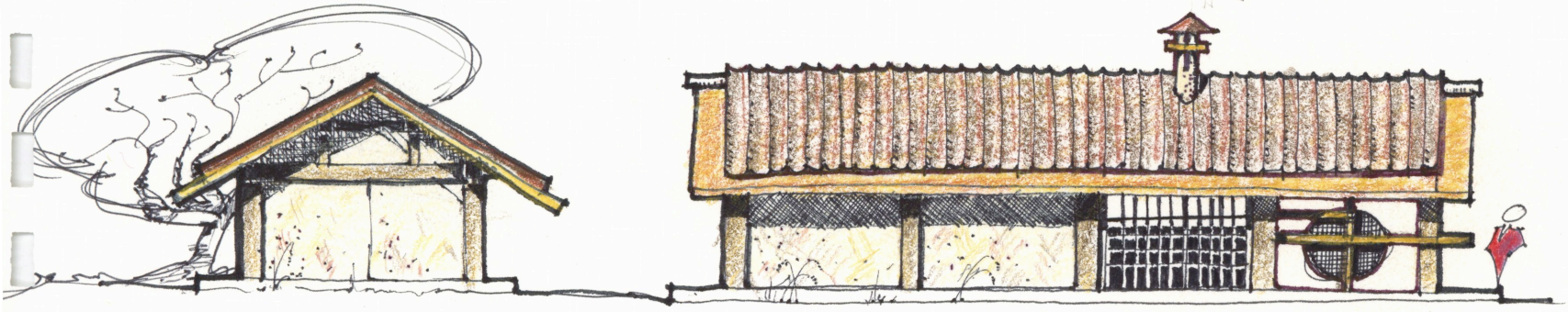
PANELS

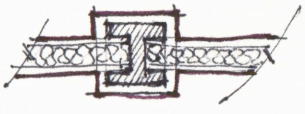
Post & Beam Panel Construction

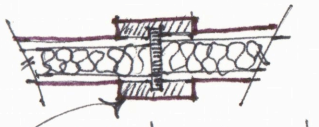




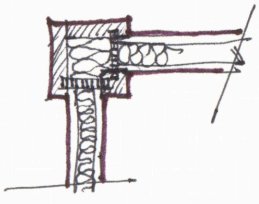
Areas
Floor ~~Plans~~ Based
on same proportions



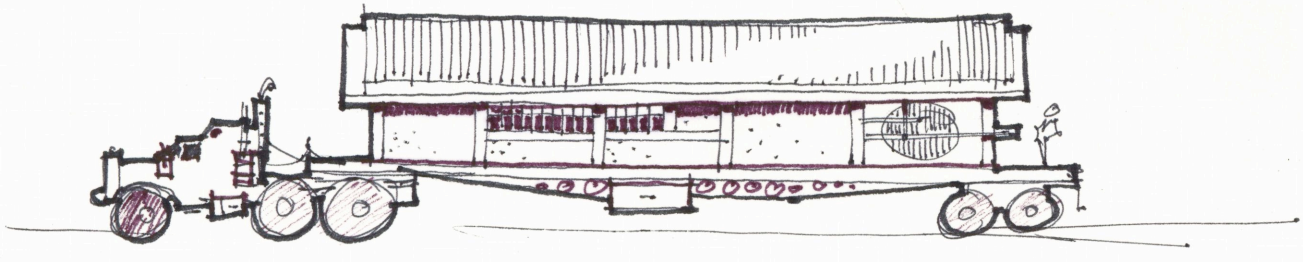


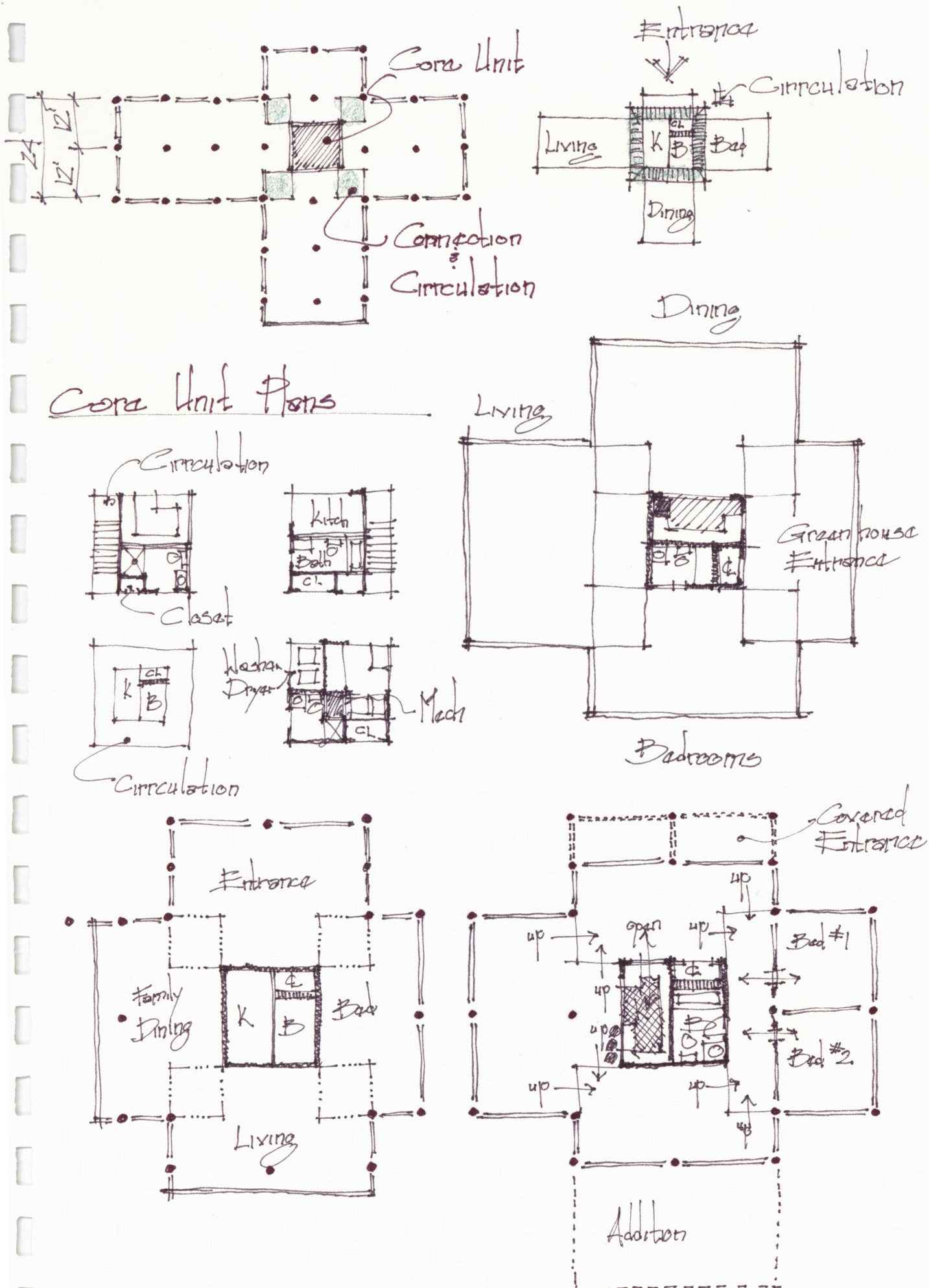


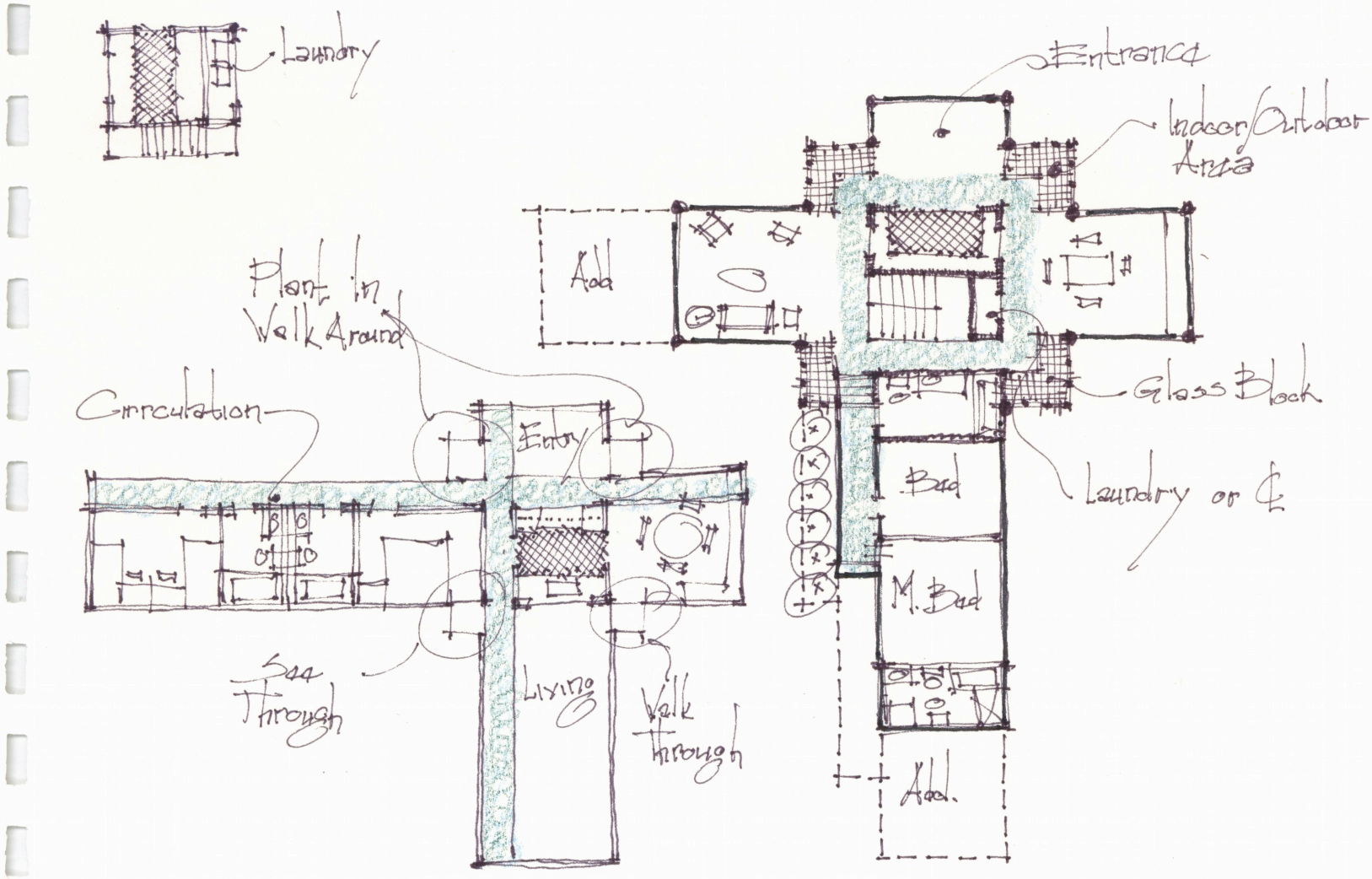
Wood & Plywood
Structural I-beam

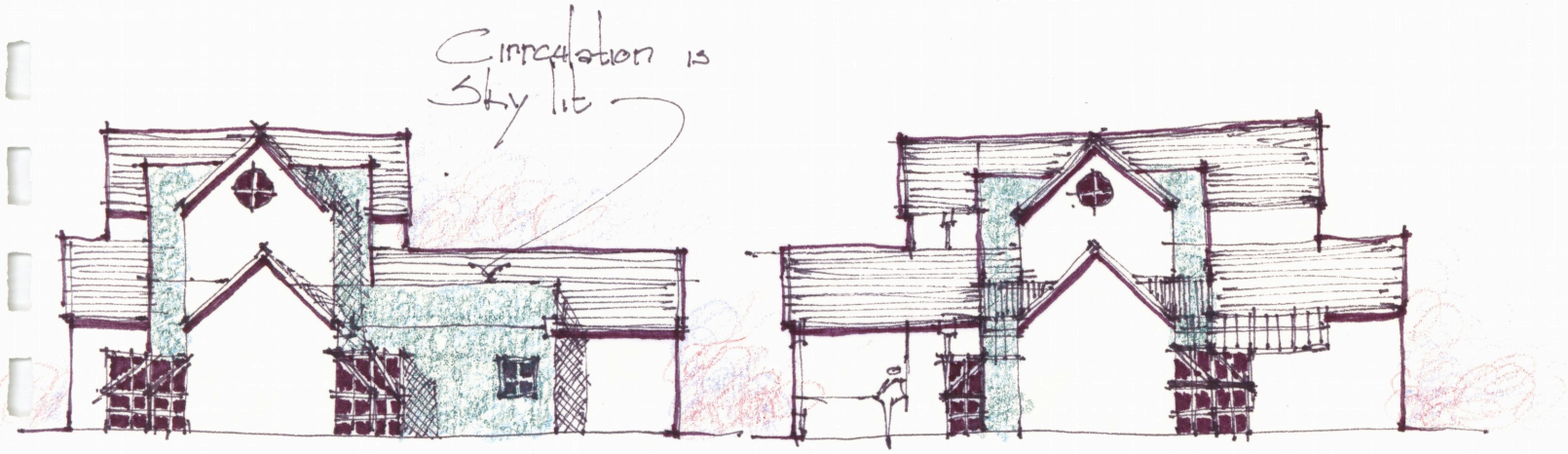


Post & Beam
Panels Based on Proportion System (Kan or?)
Structure Based on Grid
Assemble at Factory & Delivered Whole by Truck or
Assembled at Site



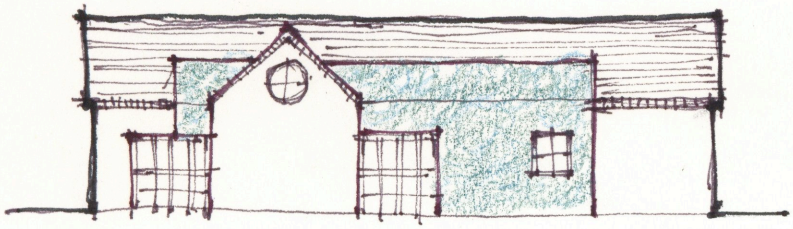

Core Unit
24'
12'
12'
Connection & Circulation
Entrance
Circulation
Living
K
B
Bed
Dining
Core Unit Plans
Circulation
Kitch
Bath
CL.
Closet
K
CL
B
Washer Dryer
Mech
CL.
Circulation
Dining
Living
Greenhouse Entrance
Bedrooms
Entrance
Family Dining
K
B
Bed
Living
Covered Entrance
up
open
Bed #1
Bed #2
Addition



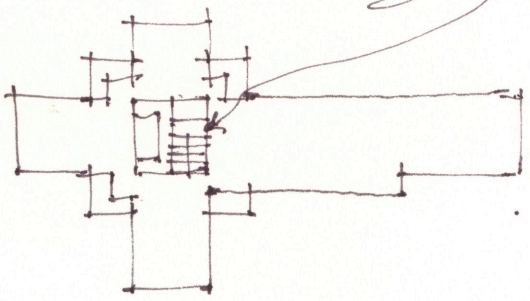


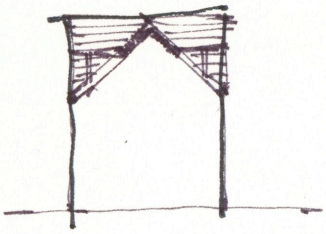
Two Story Elevations

Construction Steps



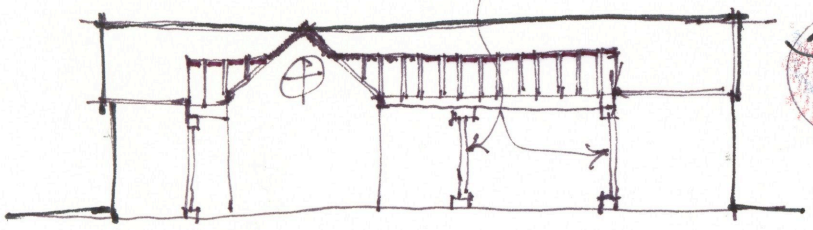
Stair Area on Single Storey will be bath or storage



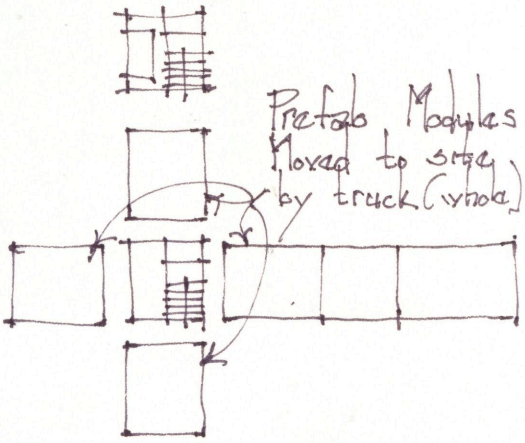


Step #1

Exposed Grid Structure



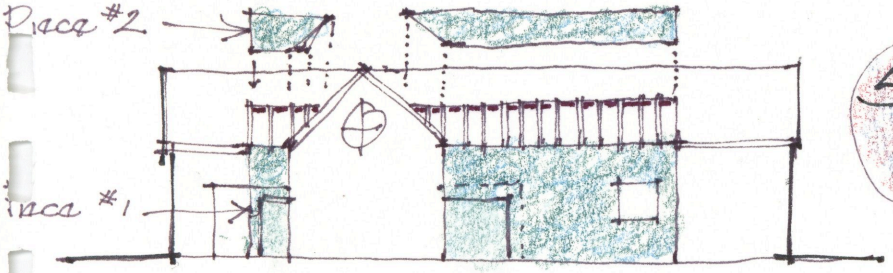
Step #2



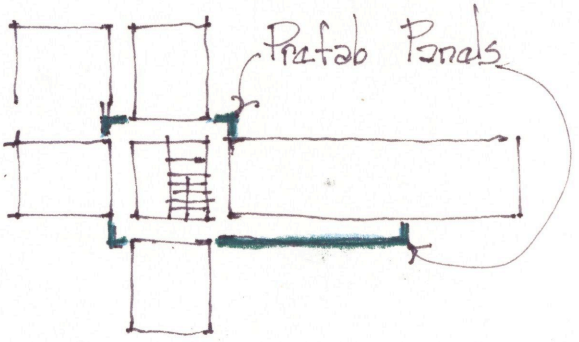
Prefab Modules Moved to site by truck (wide)

Piece #2

Piece #1

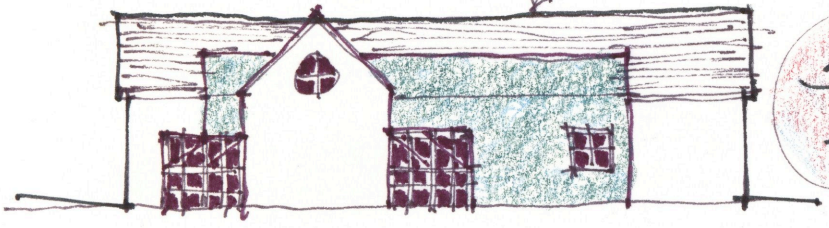


Step #3

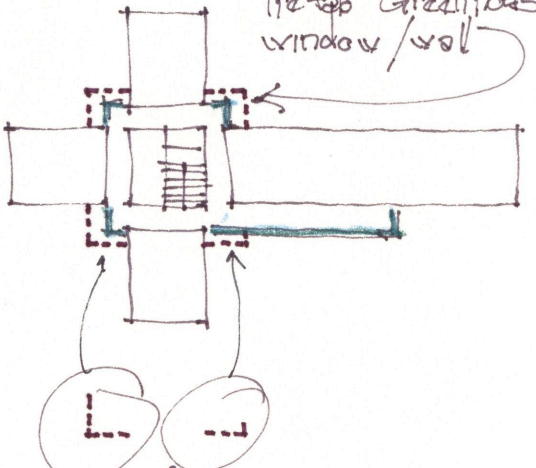


Prefab Panels

Roofing Mat'l goes on last



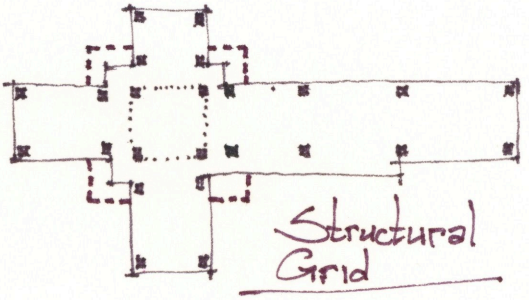
Step #4

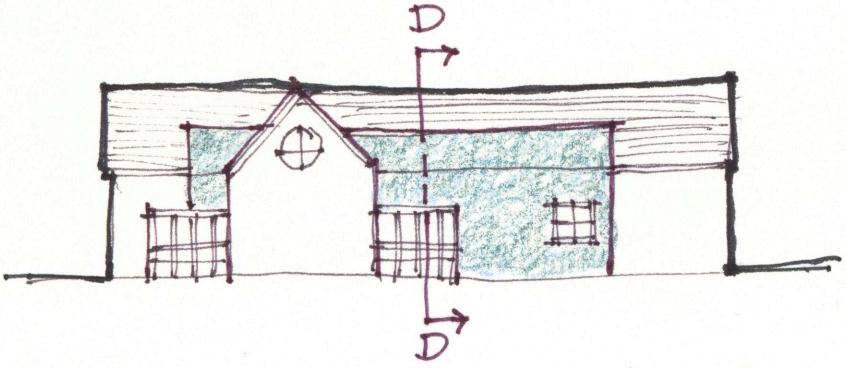


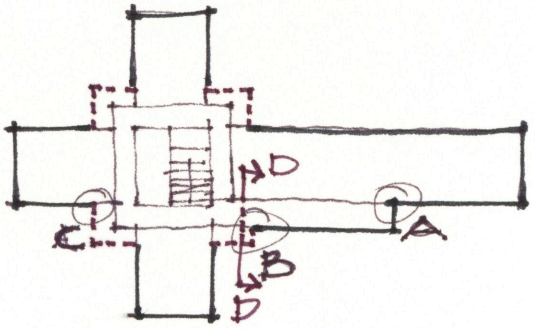
Prefab Greenhouse window/wall

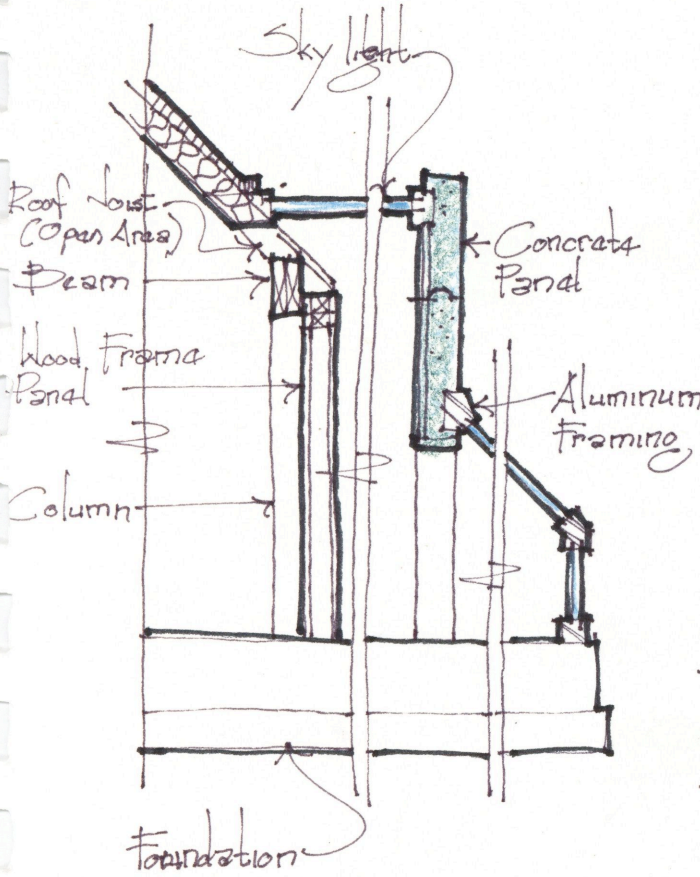
Only two standard shapes

Details



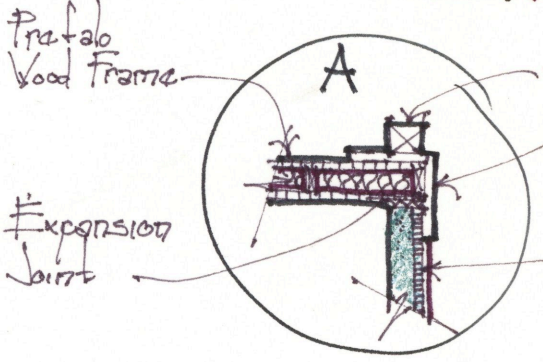


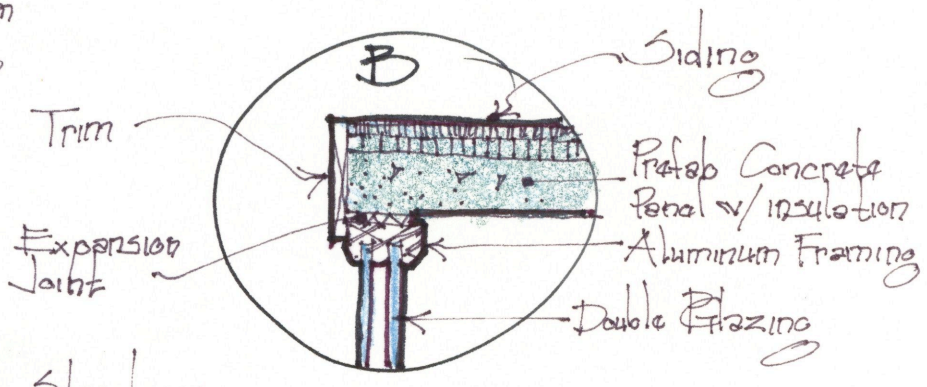


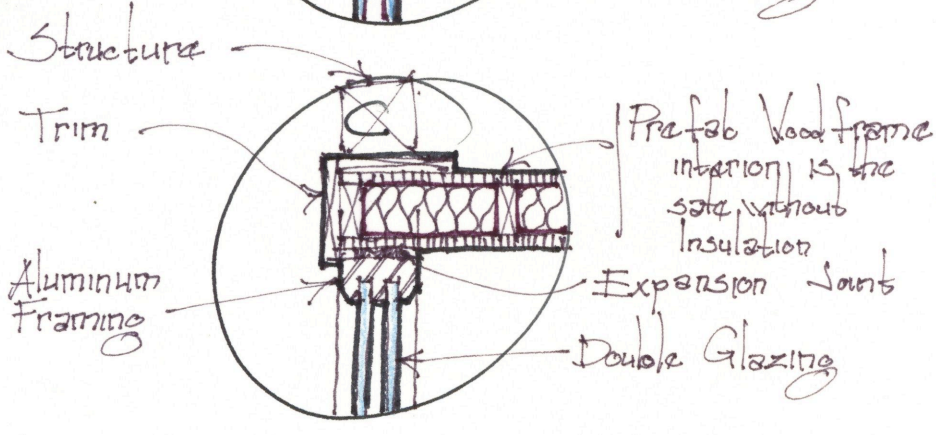


Section DD

Scale: 1'-00" = ?



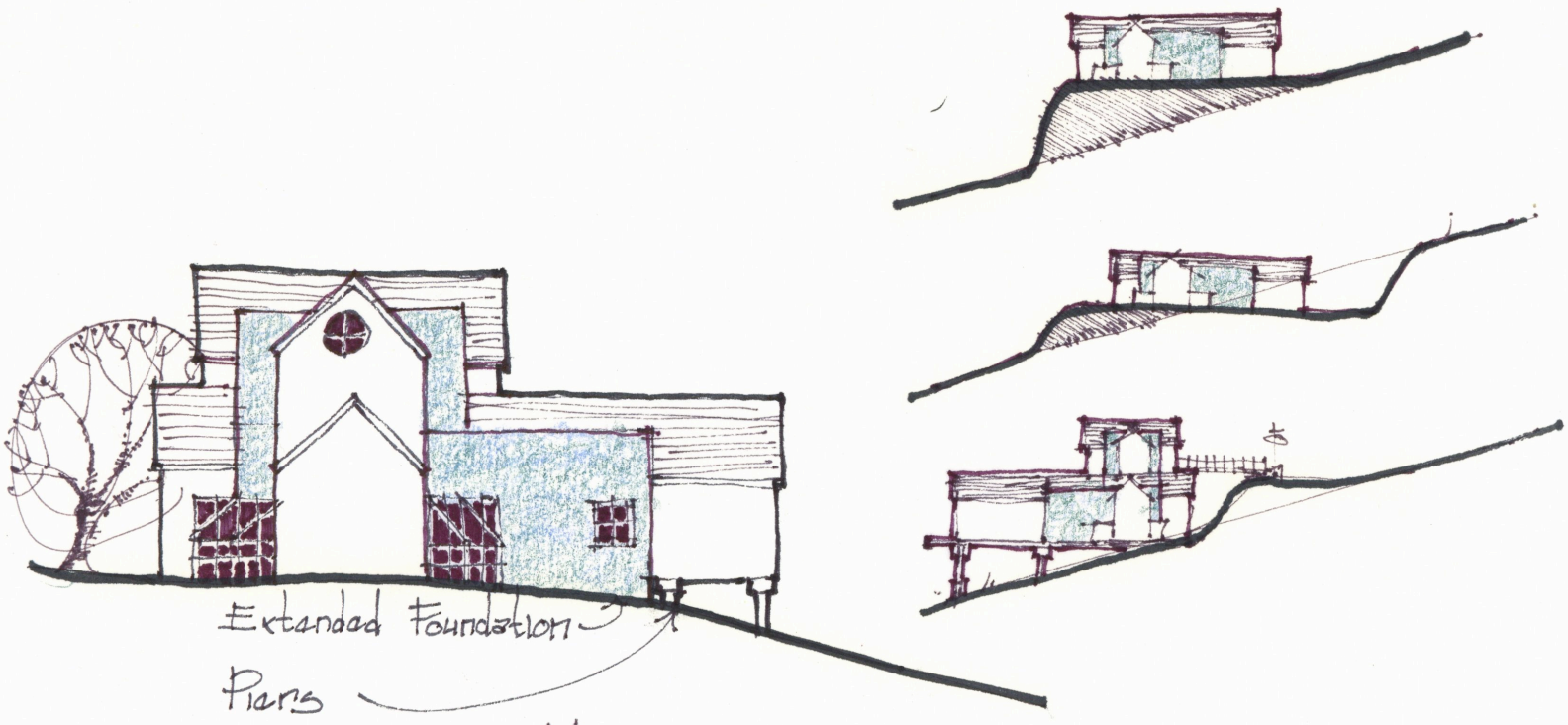


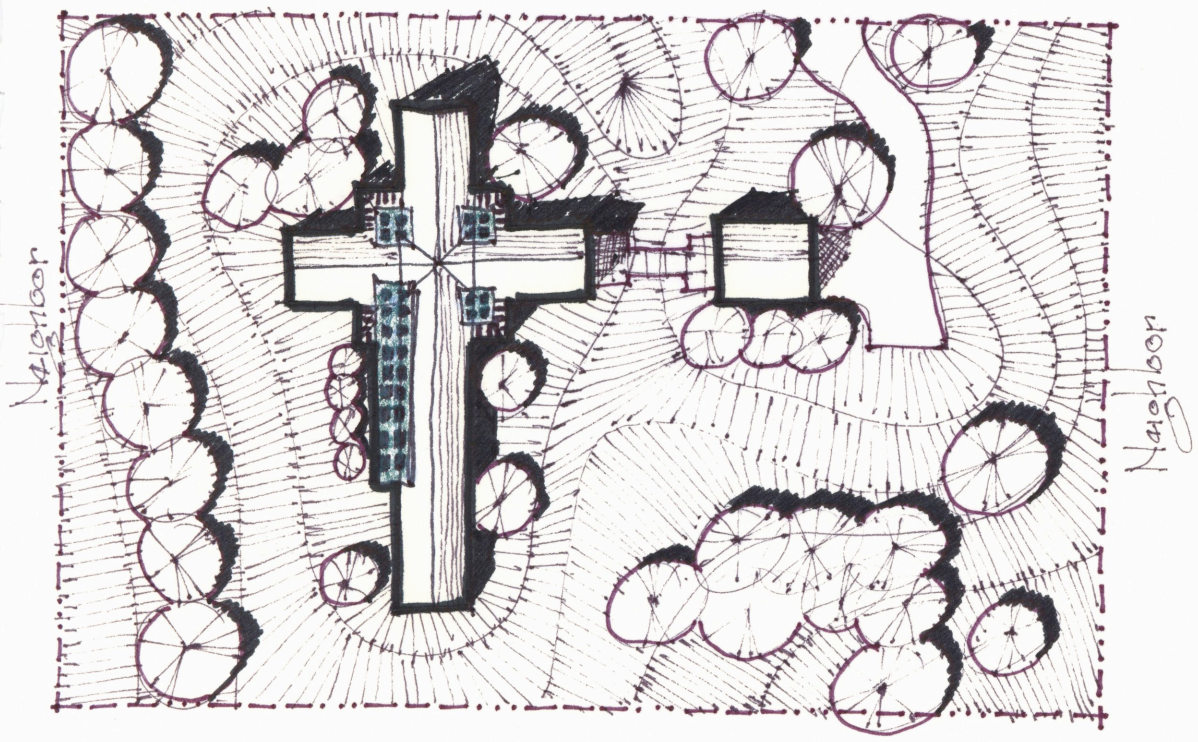


Scale: 1'-00" = ?

Site

This scheme will be limited to a fairly flat slope.
Piers will work on slight grade.





Post & Beam Panel Construction

Advantages	Disadvantages
Variety of	Site relationship?
Forms	# of connections
Plan organization	Location of manufacturer
Room sizes	
Circulation	
Structure	
Expandability	
Erection time	
Prefabrication	

~~Or~~

Partial factory fabrication & assembly

Labor - mostly unskilled

Prefab kitchen & bath units

CONCLUSION

After all the research I have done and ideas I have tried, I found that the post and beam, panel construction and structural panel system both have the qualifications I am looking for in a design system. I decided to take the post and beam approach for several reasons. (1) I believe there is a better possability of integrating custom construction and details with the post and beam system. (Like I said before in my statement, a house need not be 100% prefabricated at this point in time.) (2) If the house is designed using the post and beam system, custom construction for the sake of individuality could easily be accomadated for. And also (3) since the wall panels are not structural, they could easily be removed when it comes time to expand. Lastly; (4) the grid system, this approach would be based on, would offer an infinit variety of plan organization.

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"Case Studies". Architectural and Engineering News. August 1968, p.p. 21-24.

Dean, Edward. "The New Foreign Import: Manufactured Housing Systems." Journal of Architectural Education 37/3,4 (Spring & Summer 1984): p.p. 12-19.

Feldman, Dede. "Solar Packaging Homes." Solar Age. August 1985, p.p. 27-29.

"Housing as Process." Architectural and Engineering News. August 1968, p.p. 18.

Koetter, Fred. "Broadway East: Historical precedents." Progressive Architecture, October 1974, p.p. 68-71.

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"Modular Standard." Architectural and Engineering News. August 1968, p.p. 25-27.

Additions for Thesis II

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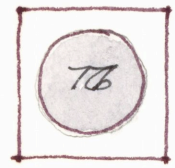
Moore, Charles., and Allen, Gerald., Lyndon, Donlyn. The Place of Houses. New York: Holt, Rinehart, Winston, 1974.

Proposal for Thesis Two

Four step plan of attack.

1. Design two, single family, residences.
   Hommas residence — Retired couple
   Lake side lot
   Hooper residence — Young couple
   City lot
2. Using Timber frame & Thermal panels
   Considering - Mechanical, Electrical, and Plumbing
   - Develope a way of integrating these systems into the timber frame house.
3. Site -
   Considering - Slope, Existing vegetation, View, etc.
   - Decks, Gardens, Garages, Sheds, etc.
   - Design for each individual site.
4. Rough cost estimate
   Learn how to finance a house.
   Show what it would cost to build these houses.

THESIS GOALS



GOALS

- Design - One house simple and elegant
  - Another intricate and individual
- Propose more aesthetically pleasing prefab housing.
- Become aware of all that is involved in designing a residence to a fine detail.
- Estimate the final cost of building these homes.

FINAL PRESENTATION

- Two models
- Site plans
- Floor plans
- Sections
- Perspectives
- Details
- Estimate sheets

Personal Profile

This personal profile is for the purpose of determining the wants and needs of the home owner.

The first step in this profile will be to introduce each individual client. These clients are real people who are in the real process of putting a home on a lot that's already in their possession.

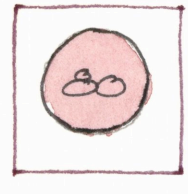
The second step in this profile will be entitled...

A Typical Day in the Life of ____.

This brief sketch of each house hold's day will be for the purpose of discovering how they would like to use their home, what special activities the house would have to allow for, and discovering any clue that would enable me to design a residence that comes as close as possible to my client's fantasy of 'My Home.'

The third part is a summary of the requirements the client has put on each room.

Lastly, I have included the questionnaire obtained from the book The Place of Houses written by Charles Moore, Gerald Allen, and Donlyn Lyndon (pg. 241-266). My clients filled this questionnaire for the purpose of giving me facts and clues as to what they want their house to be.



Hommas, Warren L. Jr.

Age: 56 Ht: 5'-7" Wt: 125 lbs
Married: 26 Yrs. Non-smoker
Retired Air National Guard Civil Eng. & Pilot. Now self employed in marketing & retailing womens clothes.
Hobbies: Singing for Montana Corale & Symphonic Choir
Sports: Fishing, Racketball, Some skiing
Personality: Outgoing, Sociable, Hard worker
Family: Three independent kids. Mother living in Pennsylvania. Father deceased. Brother deceased.
Religion: 1st Congregationalist
Reason for building: Place to retire to

Hommas, June M.

Age: 51 Ht: 5'-6" Wt: ?
Married: 26 Yrs. Non-smoker
House wife, helps with business
Hobbies: None
Sports: None, Heard tall she tried skiing once. Only once though.
Personality: Very outgoing & positive
Family: Three kids. Mother living in Great Falls. Father deceased. One sister. One adopted brother Two half sisters.
Religion: 1st Congregational ist
Reason for building: 2nd home & place to retire.

Hooper, Steve Jr.

Age: 23 Ht: 5'-10" Wt: 165 lbs
Married: 1 Yrs. Non-smoker
Employer: Midas Muffler (Gen. Mgr.)
Hobbies: Building fast cars. Remote controle boats. Gadgets - VCR, satelite dishes, stereo, etc.
Sports: H_2O skiing, snow skiing, snow mobiling, will try anything.
Personality: Likable, Hard worker, Would make a good neighbor / might have to introduce yourself first. Likes privacy & parties.
Family: Father and mother own Midas shops in Montana. One brother, one sister.
Religion: Kind of Catholic
Reason for building: Tax advantages, investment.

Hooper Elsie

Age: ? Ht: 5'-6" Wt: 120 lbs
Married: 1 Yr. Smoker
Self employed hair dresser
Hobbies: Cooking, Indoor & Outdoor gardening
Sports: None
Personality: Pleasant, quiet, likes privacy.
Hard worker.
Family: Large Italian family. Parents
are retired and live in the States.
One brother. Rest of family is in
Italy. Two nieces who she baby
sits often.
Religion: Catholic
Reason for building: Place to raise
family. Doesn't like present
neighbor hood.

A Typical Day in the Life of Warren Hommas

7:00	Wake up
7:00 - 7:30	Wake up wife
7:30 - 8:00	Play
8:00 - 10:00	Get out of bed sometime along in here.
10:00 - 10:30	Bathroom
10:30 - 11:00	Kitchen
11:00 - 6:00	Out of house errands etc.
6:00 - 630	Play
6:00 - 8:00	Evening meal sometime in here, either in the kitchen or dining room.
8:00 - 11:00	Out of house or paper work in office.
11:00 - 2:00	Living room VCR/TV
2:00 - 2:30	Read in bed
2:30 - 7:00	Sleep

Non-typical events

Carpentry type work
Entertaining on holidays
Entertaining overnight guests
2-3 nights for 3 or 4
months out of the year.

A Typical Day in the Life of June Hommas

8:00	Wake up
8:00 - 9:00	Lay there
9:00 - 9:30	Bathroom
9:30 - 10:00	Kitchen
10:00 - 11:00	Clothes, bedroom, make bed
	vacume, dishes, etc.
	(If need to - leave house for errands)
10:00 - 4:30	Errands
10:00 - 3:30	If no errands - Projects around
	House. Stay in bath robe.
3:30 - 4:30	Get dressed
4:30 - 6:00	Think about supper, relax,
	daytime play time.
6:00 - 7:00	Eat supper
7:00 - 9:00	Relax, talk w/family, videos,
	movies, T.V., etc.
9:00 - 1:00	Start another project, book work.
1:00 - 2:00	Get ready for bed.
2:00	Sleep

A Typical Day in the Life of Steve & Elsie Hooper

Elsie		Steve
6:00	Wake up	7:00
6:00-7:00	Bathroom	7:00-7:15
7:00-8:00	Kitchen	7:15-7:30
8:00-6:00	Work	7:30-6:00
6:00-6:30	Fix Dinner	
	Rest	6:00-6:30
6:30-7:00	Eat	6:30-7:00
	Work on cars	7:00-10:00
	Hobbies	
	Rest w/ VCR	10:00-12:00
	Stereo, TV	
	Goes to bed	12:00
7:00-11:00	Work around	
	house, Rest.	
	Garden	
11:00	Goes to bed	

Non-typical events.

Baby sit kids
Holiday entertainment
Gardening, Cooking, Canning

Hommas Residence

ROOM SUMMARY

* Kitchen – Double stainless steel sink. Built in dishwasher. Open area adjoining a room or an outdoor space. View. Electricity. Propane fuel. Place for sorting. Refrigerator. Shelves. Canisters. Pantry storage. Counter mount stoves. Separate ovens. Place for toaster, coffee pot, frying pan. Trash can & compactors. Shelves. Cabinets. Pegs & Racks. Cleaning supply storage
* Dining Room - Special place for eating. Dish display. Linen storage.
* Living Room - Partially enclosed spaces outdoors
* Bed Room - Partially enclosed spaces outdoors Bedside eating area. Large closets Three Bed room. Queen size 60"x76". Linen storage.
* Bath - Private counter mounted sink. Mirrors w/lights. Full length mirror. Convenient outlets. Storage for cleaners, towels. Two sinks in master bed room

Hommas Residence Cont

* Bath — Bathtub • Bathtub w/shower for guests • One-piece shower • Japanese bath • Place for relaxation after bath • View • Large enough for more than one. • Place to hang and store towels • Floor standing toilet • Separate area for stool
* Laundry Room — Sink • Ironing board • Storage •
* Garage — Short distance from house • Space for work shop • Storage
* Den — Place for desk & file cabinets

Hooper Residence

* Kitchen - Double, stainless steel sink · Built in dishwasher · Open area adjoining a room or an outdoor space · View · Metal casement windows Place for sorting food · Space for full size refrigerator & freezer · Bins, canisters, spice racks · Pantry storage · Liquor and wine storage · Electric stove, oven mounted in counter · Special place for eating · Trash can Table linen storage near by ·
* Dining Room - Buffet · Linen storage Serving 4 to 10 people · China cabinet
* Living Room - South-facing & partially enclosed spaces outdoors
* Bed Room - Large closets · Chest of drawers · Double bed 54"x 74" · King size 78"x 76" · Three bed rooms
* Bath - Counter mounted sink · Mirrors w/lights · Shelves · Convenient outlets · Towel storage · One near each sleeping area · Bathtub ·

Hooper Residance Con't

* Bath - Tiled stall shower • Steam bath Japanese bath • View • Bath large enough for more than one • Floor standing toilets • Reading material storage
* Laundry Room - Isolated • Ironing board Storage
* Garage - Short distance from house Space for work shop • Storage
* Bar - Located near living & dining room • Sink • refrigerator
* Family Room - High-tech entertainment • TV • Stereo • Satalite dish

Homma's Residence.

Yours

Please read this and check the answer boxes. Feel free to make any notes next to questions that have an exception or are in need of a special feature. Thanks

Scott

Now it is time to establish a kind of check list to identify the choices which you must make if you are to invest your house with the care which will bring it alive as the center of your world.

There are many excellent books which describe in detail the techniques for building a house and keeping it strong and weather-tight, and we shall not attempt to repeat those descriptions here. Instead, we will describe only those choices which require a value judgment from you.

Care is the natural enemy of stereotype, and stereotype of care. So we must make whatever detours are necessary to avoid even such stereotypes as "living room," lest somebody ask, "What do you *do* there?" and you find yourself having to say, "Live."

To identify the components of your house, the facts which restrict or aid choice, the choices you actually have, their importance to you, and their intersection with other choices, we have organized the lists to follow certain paths. These are the paths made through your house by water, air, paper, food, dishes, clothing and linen, electricity, cars, and other objects. Then we list the paths made (and departed from) by adults and children in your household, by others you invite, by service people, by burglars, by pets. Finally, we describe the paths along which the mind and the mind's eye are enticed. Each of the paths can be labeled, and their intersections noted.

The answers you make will not define a "plan" for your house. They will serve instead as a test to check against the ways there are of assembling rooms and machine domains and fitting them to the site. Inevitably there will be conflicts, which you can resolve in favor of whatever is more important to you. There will also be ambiguities, which you can cherish if you are of a mind to. But don't cheat on the choices, or take shortcuts. The fruit of shortcuts is stereotype.

The paths of things and of people and of the mind's eye, then, we shall list as:

Water
Air
Paper
Food
Dishes and other cooking utensils
Clothing and linen

Electricity
Dirt
Cars
Other Objects
Adults (you should note them separately)
Children (you should note them separately)
Invited guests
Service people
The uninvited
Pets
Images

The first lists include, after a description of each element, a set of choices *(in italics)* with room for you to check your decision and to note its importance to you. With most of the choices we note the difficulties, limits, special opportunities, standard equipment, or standard dimensions relevant to that choice.

Water

Water falls onto your house from the sky, and drains away on or under the ground. It also enters in pipes and bottles, is used up or mixed with pollutants, and is then swept away. You're in for the falling water, unless you live in an apartment or a desert, and if you are within the reach of sanitary inspectors, you are in for piped water, too. The bottled is optional.

Not optional is the gravity which will cause the water to run inexorably downhill, or the changes water will cause in almost any material it touches, from silver-gray weathering and warping and staining and causing fungus on wood, to streaks on stucco and concrete, to rust on iron, to corrosion on aluminum, to the beautiful green patina on copper. Thus, decisions have to be made about every surface along the water's path, so that it can be impervious (like glass, marble, glazed tile, or Formica) or even changed for the better (like copper) or be worth the continuing trouble (as some say oiled wood or a butcher block is).

How will the water from the sky get off the roof?

- ☐ *Uncontrolled* This is the cheapest, but may be forbidden by local building codes, and it can mess up the garden or splatter against the foundation of the house.
- ☐ *Through gutters and downspouts* They are relatively expensive and can clog with leaves or look bad.
- ☐ *Through spouts or gargoyles* These can look fine, but might splash onto some vulnerable surface.

What do you want to do with the water when it hits the ground?

- ☒ *Let it soak in* Okay if the soil is gravelly or sandy enough to absorb it.
- ☐ *Get rid of it underground* Like gutters and downspouts, this method can be expensive.
- ☐ *Run it in visible channels* Can be handsome and, if it fits your garden scheme, can take water to plants. like this idea for my pear & cherry & apple tree

Where will your household water come from?

- ☐ *A well* Necessary in the country and usually available.
- ☐ *A tank* Necessary in the country where a well cannot be dug.
- ☐ *The city's pipes* Always available in town and cheaper than a well or tank.

How will you heat some of it?

- ☐ *Oil*
- ☐ *Gas*
- ☒ *Electricity*
- ☐ *Other* The answer to this set of choices, if it depends on cost, can be obtained by contacting each utility supplier. propane, consider as back up heat.

Where will the heater be and how many of them?

- ☐ *Near the machines it serves* This is the cheap-

est and most efficient, but won't work if all the machines aren't close together.

- ☐ *One, serving machines spread apart* Less convenient since taps will take longer to warm up, but more economical.
- ☐ *Several, serving separate groups of machines* More convenient; less economical.

Where do you want water outside?

- ☒ *Near plants that need watering* Garden hoses are cheapest; underground and automated systems are available.
- ☐ *To form a pool or pond*

Inside, what do you want to wash your food in?

- ☒ *Single or double sink, of porcelain or stainless steel* Sinks are usually mounted in counters; the standard counter height is 36", but if you are tall or short you may want to vary this. Standard counter depth is 25".

What do you want to wash your dishes in?

- ☐ *The sink* Economical; tolerably convenient.
- ☒ *A dishwasher* This can be built under a counter beside the sink, with a front opening—in which case you will face the issue of whether it should be right or left of the sink—or in a portable machine which hooks to the sink's water supply and generally opens from the top.

Where do you want to wash your food and dishes?

- ☐ *In a secluded area* Offers privacy and insulation for the rest of the house, from the noise of your dishwasher if you have one. It also offers you privacy, if you want it, from other adults and children.
- ☒ *In a more open area adjoining a room or an outdoor space* Depends on whether or not you have someone else wash your food and on whether or not you like to be with others if you do it yourself.
- ☒ *With a view, whether from an open or a secluded area* Can be pleasant and useful for keeping an eye on your family.

Where do you like to mix drinks?

- ☒ *By the sink*
- ☐ *At a separate secluded bar* Water can be piped in for mixing drinks and washing glasses; or it can be brought in, in a pitcher, and the glasses taken back to the main sink.
- ☐ *At a separate bar in a public place* Has the advantage of being close to the activities it serves, indoors or out.

Where do you wash your clothes?

- ☐ *At a commercial laundry*
- ☒ *At home* This is done in a washer, about 30" wide x 30" deep x 36" high, loaded from top or front. The washer is generally accompanied by a dryer of about the same size. Smaller versions of each, about 24" x 24" x 36", can be bought, and these can be stacked. A tub is favored by some.

If you wash your clothes at home, where?

- ☒ *Near where clothes and linen collect and where people sleep and dress*
- ☐ *Near where the person who runs the machines would like to be*
- ☐ *Isolated in the basement* Inconvenient, but favored by those who live in terror of the machines flooding.

Where will people wash their faces and hands?

- ☐ *In the kitchen sink* Not very glamorous and provides little privacy, but it's there anyway.
- ☒ *In a sink near public spaces* Extra expense, but useful, especially for guests.
- ☒ *In a sink in a private space* It is almost essential to have a place for washing and grooming near sleeping areas.
- ☐ *In an isolated sink near a private space* Provides visual and acoustical privacy, if you want it, and the advantages of the sink in a private space.

What kind of sink do you want?

- ☐ *Mounted on the wall*
- ☒ *Mounted in a counter*

What size sink do you want?

- ☒ *Standard height*
- ☐ *Higher*
- ☐ *Lower* Sinks are generally 32″ or 33″ high, which can seem uncomfortably low if you are above medium height. Counters are generally 18″ to 24″ deep.

What color sink do you want?

- ☒ *White*
- ☐ *Other* The variety of sinks is wide and can be seen at a plumbing showroom.

What kind of accessories do you want near the sink?

- ☐ *Mirrors over it*
- ☒ *Mirrors with lights* Almost essential; the lights should be either above the mirror or on both sides, not just one side, of the mirror.
- ☒ *A full-length mirror nearby*
- ☒ *Small, movable mirrors* Helpful to see the side and back of your head.
- ☒ *Shelves or cabinets* Useful for ointments, medicines, toothpaste, and shaving cream.
- ☐ *Holders for soap*
- ☐ *Holders for toothbrushes*
- ☐ *Holders for razors*
- ☐ *Holders for towels*
- ☐ *Holders for facial tissue*
- ☒ *Convenience outlets for razors, toothbrushes, and the like*
- ☒ *Storage for towels*
- ☒ *Storage for household cleaners*

Do you want many sinks or few? How many can you afford?

- ☐ *One or more near various public areas for individual use*
- ☐ *One near each sleeping area*
- ☐ *One or more shared near sleeping areas*

☒ two sinks in master bed room

Where will people wash their whole bodies?

- ☒ *Near sleeping or dressing areas*
- ☐ *Near more-public areas* As situated, for example, in Charles Moore's house in Orinda.
- ☒ *Somewhere else* For example, an outdoor shower, if you have a pool or pond or are near the ocean.

☒ Bath house by lake.

What will people wash their bodies in?

- ☒ *Bathtub* This is the most common device, a receptacle usually 5′ long—though 4′6″, 5′6″, and 6′0″ lengths are also available—by about 2′8″ wide, and about 15″ high. These stand on the floor, or they can, for rather more money, be sunk into it. They are meant to be sat in, though modern ones are not deep enough to contain enough water to cover the recumbent bather. Therefore they are generally combined unsatisfactorily with a spray head built into the wall above. For June
- ☒ *Bathtub with shower and shower curtain* Bathtubs thus extended generally are combined with a spray head built into the wall above or fixed at the end of a flexible cable to make a shower. Refinements are available to widen the realm of possible sprays, or to reduce the likelihood of sudden changes in water temperature while you are under it. Some of the spray can be kept in the tub and off the floor by a curtain which will flap around you. For guests
- ☐ *Bathtub with shower and glass doors* Sliding glass or plastic doors do a better job of keeping the spray in the tub, but they render half of the tub inaccessible.
- ☐ *Fiberglass tubs with shower* These are obtainable as one-piece units with shower enclosures. They are cheap and easy to install, except in old houses where there may be no doorway large enough to get them through.
- ☐ *Tiled stall shower* If a stall is large enough (at least 3′ square) it provides a more comfortable shower than one in a tub, though not the possibility of sitting down or soaking. Glass or plastic doors work much better here than on a tub, though curtains are often used for economy. Tile showers look good, are permanent and are easy to clean, except for the joints. They are also relatively expensive.
- ☐ *Plastic laminate stall shower* Relatively cheap, though corner joints can leak.

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☐ *Metal stall shower* Cheap, and looks it. Rusts, except for stainless steel, which looks nice, is not cheap, and can water spot.

☒ *One-piece fiberglass stall shower* Seamless, and so doesn't leak; easy to install in new houses, often difficult in old houses because of its size. for Wanna

☐ *Sauna* This choice, like the ones which follow below, depends upon the assumption that bathing be an aspect of relaxation. A sauna is a wood-lined room which can be heated to over 200° to induce perspiration which is then meant to be washed off in a cold shower or plunge, though the Finns sometimes roll in the snow.

☐ *Steam bath* Similar to a sauna, but based on steam rather than dry heat.

☒ *Japanese bath* This is a large tub of very hot water for relaxing in after washing.

☒ *Swimming pool or plunge, indoors or out* A more usual alternative to bathing as an aspect of relaxation, it too is generally augmented by a tub or shower, and most often is kept at room temperature or just above. For a plunge, any size larger than a 6'-diameter is acceptable. For serious swimming at least a 40'-length is usually sought. Construction can be of poured or sprayed-on concrete or aluminum or fiberglass, sometimes lined with plastic, above or below the ground.

☒ *Relaxation after the bath* Benches, hammocks, mats, *chaise longues*, deck chairs.

What is your attitude toward privacy in the bath?

☐ *Complete privacy* Offers the security of a small space, and the sense that you cannot be seen.

☒ *A bath with a view* Offers openness to a large indoor space or to the outdoors.

☒ *A bath large enough for more than one person* Affords the company of your family and friends.

What accessories do you need for your bath?

☒ *Places for sponges, soap, shampoo, bath oils, brushes*

☒ *Places to hang towels and washcloths*

☐ *Places to store towels*

Do you want many baths or few?

☐ *One near every sleeping and dressing area*

☐ *One or more shared between sleeping and dressing areas*

☐ *One or more near public areas*

What kind of toilets do you want?

☒ *Standing on the floor* In the United States toilets are designed as basins meant to be sat on at a height of about 14". A space of 30" wide and at least 48" long is required for their use, and to clean around them. Behind the bowl is a tank which holds water, which is released into the bowl after its use, usually with a spinning motion which aids in the washing away of wastes into a continuation of the water system.

☐ *Hung from the wall* More expensive to install, but easier to clean around. It is also more flexible, since it allows the toilet seat to be higher than standard, for ease of rising, or lower, for improved elimination, according to some hygienists. Those who favor lowering it approve of the system used in some countries —notably in Asia—which puts the receptacle even with the floor. Enough Americans are panicked by this idea to restrict the use of such a fixture here.

☐ *Special types* The method of flushing also includes a number of options, from eliminating the tank in favor of a special valve—usually restricted to larger buildings than a house—to various alternatives which reduce odor and noise. Our experience has been that few fancy toilets work so well as the standard, inexpensive ones.

What do you want to combine the toilets with?

☒ *Nothing* Almost always in our society privacy is desired for elimination; if you prefer complete privacy, even from washing and bathing, then your toilet should be kept separate.



☐ *Washing* Can be an economical combination, especially when providing these facilities near public areas.

☐ *Washing and bathing* The standard way, economical of space.

What do you want near the toilets?

☐ *Toilet paper* It should be carefully located, generally low on a nearby wall.

☐ *Reading material* Favored by some.

☐ *Toilet cleansers* Can be conveniently stored near the toilets where they are needed; the storage space can also accommodate extra toilet paper.

What other water sources do you need?

☐ *Drinking fountains*

☐ *Sinks for hobbies* Photography or flower potting, for example.

☐ *Sinks for household cleaning*

☐ *Hose bibbs* For washing cars and windows and watering plants.

☐ service sink

What kind of waste disposal facilities will you use?

☐ *Municipal sewers* The waste from each of these fixtures will have to flow away from them—downhill—in pipes standardly 4" in diameter, much larger than the pipes which brought the water. If the municipal sewer can be found only above the house, then sewage must be pumped up to it. The pumps are expensive—several hundred dollars—but available. The municipal authorities will also be concerned about ground or storm water which will have to be led in trenches or channels or gravel-filled trenches—called French drains—or across sloping ground to where it can proceed downhill from your property without endangering neighboring land.

☐ *Septic tanks* These are large, sunken, concrete boxes where bacteria consume the solid waste. The liquid then flows into a system of perforated pipes, or a series of underground chambers from which it leaches into the soil. The appropriate experts or officials must test your soil to determine its capacity to absorb the liquid. Again, if suitable ground for leaching can only be found above the house, then liquid sewage must be pumped up to it.

It is helpful to note that all this delivery and use of water and the disposal of water-born waste forms a continuous system, downhill all the way, except when pumps raise it. If you are of a visual frame of mind, it should be helpful to make a linear diagram which shows the continuousness of this system and pinpoints the places where it intersects the other continuous systems we shall describe, such as the one which brings in food and takes out garbage. As you imagine these continuous systems, you can consider the economic and intellectual advantages of shortening and clarifying them. The Patio of the Orange Trees adjoining the cathedral at Seville presents a famous instance where the path of the water being led to the orange trees forms the basis for the visual order of the design. (1) The internal water distributing system of a house, hidden largely in pipes, is unlikely to produce that much visual drama, but the chance to make it clearer to the mind (as well as cheaper) remains.

Air

Another system of paths, even less visible than the water in its pipes and channels, is made by the air as it drifts through our houses, or is warmed or cooled by machines and then blown through.

The visible evidence of air moving through houses, especially in the heat of the summer, has been a source of pleasure for a long time. Thin curtains blowing at the windows, a fan in the ceiling gently turning, the airborne sound of buzzing bees, the scent of lilacs drifting in the open window—all enrich our enjoyment and deepen our comfort, while, for centuries, the source of

warmth radiated from an open fire has been almost synonymous with the concept of "home." By now, the temperature and even the amount of air, cooled or heated, which is delivered to us through ducts or pipes (and for our present purposes we will consider piped water in heating and cooling systems as part of the air paths) is far more precisely controlled, and the rich overtones are gone.

Also included with the paths of air are the filters and stops which control sun and sound and smell and exclude airborne insects. The controls with the longest histories, like screened porches, awnings, shutters, and chimneys, conjure up images of their own, not yet—for most of us—marked by ducts and dampers, though an aesthetic of ducts and conduits does animate some modern architecture, notably that of a British group called Archigram.

How do you want to capture cooling breezes?

- ☐ *Orienting the openings* The difficulties of capturing an errant breeze are compensated for by the delicious reward of the breeze itself. If you want to capture breezes, you should discover which way they are likely to come from, then make use of the Venturi principle. Orient small openings to windward, so the breezes can build up and rush in. Place larger openings to leeward through which the air can flow, speeded up as it joins breezes blown over the top of the building. Excellent
- ☐ *Other techniques* For hot desert climates especially, there is a whole tradition of ways to lead the dry air past pools or plants, so that evaporation from them will cool the breeze.

What kind of cooling system do you want?

- ☐ *Central air conditioning* To create eternal spring. Especially in very hot or muggy climates, or in densely populated or dirty or noisy places, this has the approval of almost everyone. Air can be cleaned before it gets in the house, and unwanted noises and burglars are readily excluded. The temperature is chosen, not chanced on, and air circulation can be closely controlled. These units can be combined with the furnace and share its ducts or pipes. In central air-conditioning systems there is a condenser, generally about 3′ in diameter, with a fan blowing up, which must be put outside or on the roof. It is connected through pipes preferably under 50′ long with the chiller unit. The pipes, or especially the ducts, describe another path through the house. Again, economy, with its conceptual as well as monetary justifications, occurs when the pattern is clear and spare.
- ☐ *Room air conditioners* These fit into windows or, if you prefer not to lose the light and view, into a wall. They are relatively inexpensive.
- ☒ *Windows* Old-fashioned; often very pleasant; inexpensive.
- ☐ *Some of each* An option is to count on the breezes until they give out, then turn on the air conditioning as a last resort, so you prepare yourself either way.

If you want to capture the winter sun, how?

- ☒ *South-facing and partially enclosed spaces outdoors* In most climates, the fickle winter sun is the cold-weather counterpart of summer's breezes. The warmth of it on your face in a sheltered space outdoors is delicious and the chance to sit in it to read or nap is much to be prized.
- ☐ *South-facing windows* The warming rays of the sun come through glass—though its ultraviolet rays which provide a suntan come only through special glass—and are undeterred by the insulating glass which helps keep the warm air inside. Its presence can markedly reduce winter fuel bills and add to the pleasures of winter habitation. Note, however, that in the summertime, south-facing windows will admit more sun and therefore more heat than you probably want. There are several ways to cope with this problem. One, obviously, is to install movable awnings. Another depends

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upon the fact that in the winter the sun is low in the sky and in summer it is high; so permanent sunscreens or eaves can be placed above windows in a way that allows the sun to enter during the winter months, but to be blocked in the summer. Still another way—perhaps the most natural and pleasant of all—is to plant deciduous trees outside south-facing windows.

What kind of heating system do you want?

- ☐ *Radiant* Radiation sends heat from a warmer surface to a cooler one—you. It is independent of the intervening air temperature, even as the sun warms us through the absolute cold of outer space, or as a fireplace warms us in a cold room.
- ☐ *Convecting* Convection warms the air around you, either by its being blown at you from the place it was warmed up, or by passing over warmed pipes. In spite of its name, a radiator works by convection.

What kind of circulation system do you want for the heat?

- ☐ *Hot air* Heated air is sent through ducts to registers in each room and returned to the furnace through one or more additional registers.
- ☐ *Hot water* This is sent in pipes along baseboards, or in radiant surfaces like floors and ceilings.
- ☐ *Electric* This uses resistance wires to heat up wall or ceiling panels.

What kind of fuel will you use?

- ☐ *Gas*
- ☐ *Oil*
- ☐ *Electricity*
- ☐ *Other* These days the decision about fuel has strong ecological overtones, but there is no clear winner. The cheapest fuel, in most areas, is oil or gas. Oil must be stored in tanks; gas is not always available. Gas produces little pollution; finer oils pollute less than heavier ones—which often contain sulphur—but cost more. Electricity is expensive, though its initial costs are slightly less; it is clean at your house, but open to the charge that its manufacturer is polluting air or water somewhere. You can hear the arguments from your local utilities and weigh them against costs in your area.

Do you want a constant temperature everywhere, or variations?

- ☐ *Constant temperature* The advent of central heating and air conditioning has made it possible to have 70° everywhere at all times, with all the comfort—and monotony—that that implies.
- ☐ *Desirable variations* The advent of central heating has not destroyed the possibility of varying temperatures from room to room. One of the devices for mapping dwellings has been the patterns of heat and cold, especially in the winter. Fireplaces have been focal points; even the tapestries on palatial stone walls have been there as much to provide a warmer surface and a softer one, for sound control, as for their decorative effect. Some places have been made comfortable to sit on cold nights, others only comfortable to walk through. Japanese housebuilders, on islands with extremes of temperature, have framed their architecture with a mind to the soggy summer, and they handle the winters altogether sketchily; the occupants huddle under quilts and light charcoal braziers, the better to pursue some aesthetic goals. In our houses the sun in our faces feels much better when we're a little chilly. But note that there can be variations in temperature which you don't want, like chilly air blowing down from a cold window to where you want to sit, or hot air in summer rising to unventilated high pockets where perhaps you want to be.

What filters the air?

- ☐ *Windows*
- ☐ *Screens*
- ☐ *Bars*
- ☐ *Mosquito nets*
- ☐ *Other filters* Filtering can happen at any scale, through openings large enough to admit people, but not horses, or small enough to admit air, but not pollen. Windows augmented

by grills can be arranged to admit breezes while they exclude intruders; provided with screens, they can exclude flying insects while they admit air. Mosquito nets around sleeping places, for instance, can provide another line of defense against the insects which bypass the first filter. Sophisticated three-dimensional filters can be installed as part of your ventilation system, even using electrostatic pressure to trap pollution or dirt or moisture. Every exclusion, of course, impedes the desirable flow of air and to some extent the amount of air movement you seek.

What kind of windows do you want?

- ☐ *Glass or plastic* Glass is by far the most usual choice, but transparent or translucent plastic is sometimes used where glass would be particularly likely to break.
- ☐ *Single or double glazing* Double glazing is often used in rigorous climates, with a sealed space between the two sheets to inhibit condensation and improve insulation.
- ☐ *Wood or metal frames* Steel is strong, but must be painted, and the paint often flakes off. Aluminum can be anodized to a dark gray or bronze color. Metal frames in cold climates can allow moisture to condense. Wood cannot.

How do you want the windows to admit air?

- ☐ *Sliding horizontally* This is generally the most economical, since the frame doesn't have to be so strong, and indeed the 6'8" high by 8' wide sliding glass door with an aluminum frame usually provides the largest window for the least money. Smaller sliding windows are similarly economical.
- ☐ *Sliding vertically* Double-hung windows, which slide vertically, are almost as economical as windows that slide horizontally. They generally come with spring-loaded reels for keeping the sash at the desired height.
- ☐ *Swinging from the side* As casements, which can swing out to catch air coming from an angle.
- ☐ *Swinging from the top* As awnings. Both types of swinging windows require sturdy frames, in case they are caught by a sudden gust of wind.
- ☐ *Vertical pivoting windows*
- ☐ *Horizontal pivoting windows* Both types balance more easily than swinging windows, but they pose almost insoluble problems of insect screening.
- ☐ *Fixed glass* Some architects have made a point of separating the glass—for seeing through—from the opening for air, which comes then through separate louvers. This aids in excluding rainstorms and burglars and allows you to look out through glass unmarred by insect screening. But it inserts a curious denial, making it impossible to open up directly to the outdoors and its breath of air.
- ☐ *Storm windows* A casualty of the development of sealed double glass panes has been storm windows, which in some places used to replace insect screening for the winter months. Though their installation was an annual pain, the ceremonial marking of the passage of the seasons, the change which came with the added brightness when the screens were removed, and—sometimes—the extra pattern of another set of mullions provided another device for enlivening the act of habitation. Indeed, in some instances, the space between the inner and the outer glass is carefully formed and takes on a life of its own, as in a window greenhouse or Alvar Aalto's Vuoksenniska Church in Imatra, Finland. (2)

☆ Easy to clean the outside from the inside

How do you want to filter the sound that goes with the air?

- ☐ *Compromise* Most of the sounds that surround us and drive us wild are airborne, though some are telegraphed through structures, or drummed through solid walls. The best way to keep a wall from allowing sound to pass is to make it heavy. The best way to block airborne noise is to block the air. Even a keyhole or the crack around a door lets some sound through. Since stopping the sound is in conflict with many of the demands for comfort based on the passage of warm or cool air, the conflict has to be resolved by careful compro-



2. Vuoksen

mise. Remember that sounds are made not only by loved ones, but as well by cars, trucks, and airplanes outside. The acousticians' concept of "white sound" or "acoustical perfume" is worth noting here: you might well want to drown out unwanted sounds with, say, a fountain or a fan, rather than trying against all odds to exclude them.

Paper

For most of us, the path of paper coming into and out of our houses is at flood tide. Mountains of mail (important and junk), magazines, daily newspapers, wrappings, boxes, cartons, all conspire to swamp us. The fight to identify survivors in the flood (licenses, letters, lists) occasions an almost daily crisis in most houses. You must plan to keep this flood within its banks, to establish a path along which paper will travel, rescue points, storage arrangements, and an easy way out for the waste. The reservoirs for storage have to be large enough to let the paper pile up during periods when there is no time to sort it. The following places should be seen as points on a path. Again, economy suggests a simple and clear passage.

How does the paper come in?

- ☐ *Newspapers delivered*
- ☐ *Mail delivered*
- ☒ *Carried in by you*

What do you do with it, and where?

- ☐ *Sort it*
- ☐ *Read it*
- ☐ *File it*
- ☐ *Write on more paper in response to the message on the incoming paper*
- ☐ *Display it*
- ☐ *Throw it away* The sorting and reading areas may be of special importance to some people, who should consider these places for comfort, adequacy, and even view. The display of anything important, like the children's drawings, gives added point to the whole process. The throwing away may have to be dramatized with a giant mouth or a chrome waste can to speed the paper's departure.

For the paper that goes away, how does it go?

- ☐ *Mailing*
- ☐ *Recycling*
- ☒ *Disposing* A trash bin is essential, and a fireplace or incinerator can be helpful.

Who takes it away? From where? To where?

- ☒ *You*
- ☐ *Municipal garbage service*
- ☒ *Private garbage service* In our country the surest sign of housing for poor people, or of poor housing for middle-income people, is the uncontrolled accumulation of paper and trash. Figuring out what to do with yours to avoid frustration from children, dogs, raccoons, and the sheer hopelessness of trying to cram too much stuff into too little space deserves high priority in planning your house.

Food

The tides of foodstuffs into our houses and out again are generally under considerably closer control than the tides of papers. For one thing, we pay for the food, so we are careful. But the food bulks large, and sacks of it are heavy. So a clear path affects economies of effort here, too.

Where does the food come from?

- ☐ *Carried by you from up the street to where it will be stored.*
- ☒ *Carried by you from your car to where it will be stored.*
- ☐ *Delivered by someone who may arrive when you are not at home.*

Where in the house does it go?

- ☒ *Somewhere to be sorted* Foods which need refrigeration can then be given it quickly, and

Definitely a "mail" room

other foods can go where they belong. The need for economy on this path will manifest itself to you every time you come home from the supermarket. For most of us it is the trip from the automobile to the kitchen counter which should be most carefully mapped.

Where will it be stored?

- ☒ *A refrigerator* Provides space for short-term cold storage, and some for long-term storage in the freezer compartment. Refrigerators can stand upright, or they can be bought to fit under a 36″-high counter. They are usually 25″ deep, and their widths vary with their capacity, from about 24″ up.
- ☐ *A freezer* Freezers have traditionally come as chests opened from the top, but that type is giving way to freezers shaped like a refrigerator, with doors on the front. These lose their cold air more quickly when you open them, but are more economical of space. They come, too, with a variety of devices for making, storing, and even tumbling out ice cubes.
- ☐ *Shelves* The standard kitchen format restricts these food storage areas to the space under the counter (2′-deep shelves which must be burrowed into from a kneeling or crouching position) and, better, the shelves above the counter, usually at about 55″ and 67″, with one at 79″ available to tall people. These are standardly shallower than the shelves below the counter, about 15″ deep, so they are more convenient, but there are usually too few of them.
- ☐ *Bins* Useful for storing loose foods, such as potatoes or onions.
- ☐ *Canisters* Useful for storing sugar, flour, coffee, and the like.
- ☐ *Spice racks*
- ☒ *Pantry storage* Shelves not deeper than 12″ can go from floor to head height or above, so that the items stored will be visible. This type of storage provides a useful and accommodating arrangement for boxes and sacks and cans of food. The shelves can be fronted with cabinet doors; or for less money, with ordinary doors to the floor; or even less expensively, they can be left open, to give householders so inclined the chance to arrange the containers as a changing display of color and shapes.
- ☐ *Liquor and wine storage* Special provision must be made for bottles of liquor, and especially of wine, which should be on its side in a cool place. Here, perhaps, a little distance strengthens the ritual of choosing a bottle.

Where will food be opened and prepared?

- ☒ *A counter* Food has to be taken out of the refrigerator or freezer or off the shelf, put somewhere while you collect your thoughts, then opened, or washed, or whatever it requires. This probably will happen on a counter near the sink and, preferably, near the refrigerator, too. This counter is the place for any machines meant to change the shape of food by beating, chopping, mixing, pureeing, or liquefying it. And it is the place as well to discard the packages in which the food has come. Standard height is 36″ above the floor, higher if you are tall, lower if you are short. If you want to sit down for this part of the food preparation, you can have a surface at desk height—28″ or 29″—with a place for your knees beneath. Alternatively, of course, you can have a high stool.

How will food be heated up?

- ☐ *Gas*
- ☒ *Electricity*

What kind of burners do you prefer?

- ☐ *Ones combined with one or two ovens to make a standard stove*
- ☐ *Ones mounted in the counter*

What kind of oven or ovens do you prefer?

- ☐ *One or two in a standard stove*
- ☐ *One or two mounted under or above the counter* The advantage of separate ovens lies in the chance to put them high enough so they can be looked into and their contents removed

or put in without stooping. Ovens under burners are harder to stoop down for, but they save space, and generally cost less. Some one-piece stoves come with an eye-level oven above and another oven below.

What other cooking devices do you want?

- ☒ *Toaster*
- ☒ *Coffee pot*
- ☒ *Electric frying pan*
- ☐ *Fondue pot*
- ☒ *Other* There is a vast assortment of cooking devices for specific purposes, and these can be located with considerable flexibility, though almost all of them require electricity. They can even be at the place where the food will be eaten.

Where is the food eaten?

- ☐ *Where it is prepared* When speed or effortlessness dictates, this can be done by people standing or sitting or perched on high stools.
- ☒ *A special place for eating* This should be close to where the food is warmed; if this place is used for breakfast and lunch, most people would prefer it to be in the sun, hopefully with a pleasant outlook. More extended dining, on the other hand, falls into the realm of onstage ritual or improvisation in a room. Ritual here carries images of a table big enough for everyone, with at least 2' of perimeter per person to be served, enough space to get there and maneuver a chair, as well as a place for serving. The conditions of this space can be carefully set: is the view—if you want one—visible after sunset? Can the lights be controlled? Improvisation also suggests the chance to eat where the mood allows, outdoors, or by the television, or in the greenhouse, or in bed; it requires encouragement or suggestion: tables outdoors, for instance, can increase the likelihood of people's eating there.

What is the fate of what remains?

- ☒ *Restorage of usable leftovers*
- ☒ *Removal of unusable leftovers by a garbage disposer in the sink* Only certain remains can be gotten rid of here.
- ☒ *Trash cans for the rest of the unusable leftovers*
- ☒ *Trash compactors for the rest of the unusable leftovers* Here again our path intersects with the monumental trash problem. We have excess food, and the armatures it comes on (bones and corn cobs and the like) and the often wet and gooey paper and plastic and metal it came in. The food in many houses is ground up in a disposal mechanism in the sink and washed away, but the armatures and packings stay as trash. Trash compressors, still rare and expensive, are now on the market to squeeze down this problem. But usually an easy, convenient, and sanitary path, with storage reservoirs enroute, must be found to get the garbage, with a minimum of odor and mess, away from the cooking area and out of the house, to a place where it can safely be given to someone else—a garbage collector, not dogs or rats or children.

Dishes and other cooking utensils

A path closely related to that of the food is that of the vessels it is prepared in or served on. These vessels, as well as glasses, flatware, and utensils of silver, pewter, copper, and glass are, for some, of great importance, made with great care, and cherished. Others prefer to eat from paper plates. Dishes arrive in the house infrequently enough to let us assume that they are already there. But there is nevertheless their storage to consider.

Where will you store dishes, flatware, cooking utensils, vases, and ashtrays?

- ☒ *On shelves where they can be seen by visitors and by you* These might be in the main rooms of your house or in the area where the food is going to be put on them. They might be on open shelves or behind glass.
- ☐ *In cabinets where they are not on display* The main concern, then, is for convenience to

the point where they will be used and to the point where they will be washed.

- ☒ *Hanging from pegs or racks* This is favored by some for pots and pans.
- ☐ *Divided among the locations where they will be used* This division should occur if there is a separate bar or service kitchen or dishwashing area, or if you are anxious to separate vessels destined for special occasions from those you use everyday.
- ☐ *In, or out of, reach of children* So they can help; or so dishes can be safe from them.

Where will you use the dishes?

- ☒ *On a counter or table near the sink* For preparing food and serving it.
- ☒ *On buffets, tables, counters or laps*
- ☒ *At bars, at the bedside, at coffee tables*

Where will you wash the dishes?

- ☒ *At sinks or dishwashers* Here the dishes cross the path of the water.

Then how will you conveniently store the dishes again?

- ☒ *Proximate* You should be able to replace them on their shelves or hooks without a walk with each dish.
- ☐ *Collected for storage* If you want to store dishes far from where they are going to be washed, a tea tray, a dumbwaiter, or even a simple tray might be used. If it is a tray, there must be a place to put it—loaded—at each end of its trip. If it is a tea tray, with wheels, there must be maneuvering room for it and storage space.

Clothing and linen

Next to food and water, perhaps the most familiar elements of domesticity are the pieces of cloth which we use to clothe us, or to surround us, in bed or out, or to dry our bodies or other objects. Though pieces of cloth qualify sometimes as light control at windows, sometimes as purely decorative objects, and even occasionally as art, a characteristic of most of the cloth in our houses is that it is generally collected, washed and dried, put away, and used again, and so it describes a chartable path through the house.

What happens to clothing when it first enters the house?

- ☒ *It's taken off* A place to put outer garments when you enter is required in most climates. In cold climates, the garments can be very bulky and require extensive space on hooks or in a closet. The coats may be dripping with rain or snow and require provision for the water to drain off, and they may be accompanied by hats and umbrellas, also soaking wet. In some climates the snow or rain you bring in may be mixed with mud, especially on your outer footwear, suggesting the provision of a special "mud room" with a waterproof floor and a place to sit down and remove the offending garments.
- ☐ *It is stored temporarily* If you patronize a commercial laundry, then packages of clean clothes and garments on hangers may be one of the most frequent deliveries at your house. If you want provision for deliveries to be made when you are not at home, you should plan for that.

Where does the clothing go for longer-term storage?

- ☒ *Into closets* Some clothes hang on hangers, others more easily lie on shelves or in drawers. To be really precise about sizes you should measure your own garments, folded or hung as you like them. The rule of thumb is that closets accommodating garments on hangers must be at least 2′ deep. The standard provision is for a pole about 5′6″ above the floor, which should accommodate your longest garments, though it leaves considerable wasted space below shorter ones, like jackets or shirts, and some wasted space above as well. One simple economy is to put a rod as

Well organized closets no space with single bar—please I'll give blueprints of how closet & storage areas should be

high as you can comfortably reach, then put a rod for part of its length below it, so that shorter garments can be doubled up. You should also consider alternative ways of hanging up clothes—slits, rods, or clips for storing trousers, skirts, and other pieces of clothing which do not have to be on hangers. Many articles of clothing can be folded and kept in drawers or, even more simply, on shelves. These drawers or shelves do not normally need to be more than 18" deep, so space is lost if they are mixed with the hanging space, but still other items, such as shoes, hats, purses, and umbrellas, might be fitted into the still empty space above and below the hanging clothes. The issue of closure for the closets also stirs debate. One recourse is to leave them open. Another is regular swinging doors, but these require space in the adjoining room. Sliding doors hide half the closet at any one time. Bi-fold doors are convenient and fairly inexpensive, but to some they look it. Curtains flap into the way. The old-fashioned walk-in closet, entered through a single door, provides a surprisingly effective combination of enclosure and ease of access to the contents. But it takes more space than any other alternative. Your decisions should include what kind of closet you need and how big; you can best judge by measuring what you have and adding a factor for growth.

- ☐ *Wardrobes*
- ☐ *Chests of drawers*

Where should the closets be?

- ☒ *In or near sleeping areas*
- ☒ *In or near bathing areas* This is a question of your habits—whether, for instance, you bathe just before you dress—and of your preferences—whether, for instance, you would like to have your sleeping area free of clothes or separate so where you sleep can be cold and where you dress can be warm.

Where does the soiled clothing go?

- ☐ *Out of the house to a commercial laundry* In this case you'll want convenient stations for collecting it and perhaps a chute or cart to take it to a central place.
- ☒ *To be washed on the premises* The washing can be near the places where the dirty clothes collect or at the end of a chute from those places.

How is it dried?

- ☒ *In a dryer* They come gas or electric.
- ☐ *By hanging indoors* Permanent-press garments, especially, need to drip-dry from hangers. There needs to be a place for the hangers and something underneath which will not be damaged by water dripping onto it.
- ☐ *By hanging outdoors* A nuisance, but there is not yet a replacement for the sweet smell of cloth which has dried in the sun and breeze.

How does it get ironed?

- ☒ *On an ironing board* It can be built in or portable, in the kitchen or laundry room or just about anywhere else you want.
- ☒ *By being hand-blocked* As sweaters should be.
- ☒ *Not at all* By being permanent-press fabric.

How do you prefer to get it back?

- ☒ *With least effort, by washing and drying it nearby*
- ☐ *In a cart or dumbwaiter* Laundry is heavy and carrying it can be difficult.

Another great part of household cloth is bed linen, sheets, and pillow cases of smooth fabric. The current sleeping practice in the United States, as in much of the rest of the world, requires soft horizontal surfaces, mattresses, generally made with foam rubber or plastic, or of coiled metal springs padded with cotton, supported a few inches above the floor on a hard slab or on metal springs, flat or coiled. Mattresses come in standard sizes. Mattress pads are available, to keep the mattress clean,

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for every size. So are sheets, either flat and big enough to tuck in around or "contour," so that they fit neatly over either two or four corners of the mattress. On top of two sheets are piled blankets or quilts or comforters, sometimes electrically warmed, though the trend to unchanging room temperatures may hasten the retirement of some of these. Pillows of feathers or of foam rubber or of Dacron are generally added, covered with sheeting fashioned into a pillowcase. Great care used to be lavished on the embellishment of sheets and pillowcases with tatting, crochet, or embroidery. That embellishment is infrequent now, but a wide variety of available colors and patterns has replaced it.

The main problem today is that the rather elaborate layering of bedclothes, and the attendant assumption that not making the bed is in some way reprehensible, leaves us with a daily chore less and less appropriate to the mood of machine-aided carefree living prized by almost all of us. Perhaps handsome washable sleeping bags will free us from the daily chore, as well as the attachment to all those specific mattress sizes.

What size beds do you want? How many of each?

- ☐ *Cot 30" x 74"*
- ☐ *Single bed 36" x 74"*
- ☐ *Twin bed 39" x 74"*
- ☐ *Three-quarter bed 48" x 74"*
- ☐ *Double bed 54" x 74"*

Each of the above is available long, usually 76"; also available are:

- ☒ *Queen size 60" x 76"*
- ☐ *King size 78" x 76"*

Where will you store your bed linen?

- ☒ *In the bedroom closet*
- ☐ *In a linen closet*
- ☐ *In the laundry room*
- ☐ *Elsewhere*

How will you get your bed linen to where it will be washed?

- ☒ *Carry it*
- ☐ *Put it down a chute*
- ☐ *Cart it*

How will you return it to its storage place?

- ☒ *Carry it*
- ☐ *Send it up in a dumbwaiter*
- ☐ *Cart it*

Elaborate table linen has accompanied elaborate bed linen into limbo. Not very long ago tablecloths and napkins, like sheets and pillowcases, provided the excuse for the lavishing of prenuptial care. Now, not only the embroidery has departed, but the tablecloths often have, too, replaced by paper place mats and even napkins. To the extent that either of these have become paper, they follow the route of the paper flood tide. Those which remain cloth describe a tributary to the flow of other cloth through the house.

Where will you store the table linen?

- ☐ *In the cooking area*
- ☒ *Near the eating area*

How will you take it to the area where it can be washed?

- ☒ *Carry it*
- ☐ *Put it down a chute*
- ☐ *Cart it*

How will you wash and iron it?

- ☐ *Send to commercial laundry*
- ☐ *Wash and dry and iron it at home*
- ☒ *Stick to permanent press*

How will you bring it back to where it is stored?

- ☒ *Carry it, since there is little enough*
- ☐ *Put it in a dumbwaiter*
- ☐ *Cart it*

Another branch of the cloth flow still very much with us is the provision of towels for the sinks and the baths. These run the gamut from the fingertip towels (which are meant to look destroyed after one using and which unaccountably persist in powder rooms) to the enveloping terry towels (bath sheets) and robes which add pleasure to drying off after bathing. What they all have in common is their need, after one or a few uses, to be washed and dried.

Where are they stored?

- ☒ *At the bathing areas*
- ☐ *Where they are washed*
- ☐ *Elsewhere*

Where are they used?

- ☒ *At sinks*
- ☒ *At bathing areas* Since they are often used repeatedly, they must be hung on racks so they may dry out between wettings. Pipes make useful racks; some are even heated, by running hot water through them, to hasten the drying of towels on them and to make the towels themselves more pleasant to the touch.

How do they get to point of washing?

- ☒ *Carried*
- ☐ *Carted*
- ☐ *Chuted*
- ☐ *Dumbwaitered*

Similarly, you should trace the path of kitchen towels and any other pieces of regularly washable cloth you plan on having in your house. Once more, making the path clearer has its own special virtues at least equal to the day-by-day practical advantages you gain from not having dirty laundry lying all around. But remember, the laundry for the average household still weighs a great deal, and you should not condemn yourself, by a lack of planning, to a lifetime of lugging it.

Electricity

No charting of paths would be complete without following the route of the electricity whose passage animates your house. Its influence is felt well beyond its own path, since electricity broadcasts itself in artificial light, heat, recorded sound, and a host of other ways. Unlike water, it doesn't show up unannounced: you have to make a deal with your utility company, or manufacture it yourself.

In the United States two strengths of electricity are generally available: 110 volts, for most household uses, and 220 volts, for such heavy appliances as electric stoves and some air-conditioning systems. In the case of the 110 volts, the voltage comes in two wires, and the appliance connected to them completes the circuit and turns on. The 220 volts come normally with three wires, and again the appliance completes the circuit. In an analogy with water, the volts are electrical *pressure*. Amps, or amperes, are the *amount* of electricity, and watts, which are volts multiplied by amps, represent the total flow. Each appliance carries a rating in watts, and you are billed for the number of watts, or kilowatts (1000 watts) you use in a month. The electricity coursing through your house is broken, for convenience and safety, into separate circuits, normally of about 15 amps each, each of which allows 110 volts times 15 amps, or 1650 watts. If you plug in appliances with more watts than that, you overload the circuit, and a circuit breaker snaps off the current to avert catastrophe. Some circuits are heavier, to

accommodate the appliances which need more electricity (220 volts, for instance, times 20 amps is 4400 watts, more than enough for an electric stove).

Electric wire is quite cheap and nowadays is generally concealed, so it can be argued that its mere presence is more important than the formal clarity of its path. The same is true for other wiring systems, telephone and television, for instance. Nevertheless, the opportunity remains, if you want it, to make the paths the wires trace through your house a visual and conceptual statement. The old-fashioned knob-and-tube system, in which insulated wires ran exposed, held away from wood surfaces and from each other by white porcelain fittings, has been outlawed by most codes, and wiring is required in most places to be run in a flexible conduit of metal or plastic or in rigid metal pipes, so it is the conduit, fixtures, and junction boxes, not the wire inside, whose path you will make visible.

Many electric light fixtures are in about the state of visual development reached by the automobile in 1902, when the imitation of the horse-drawn carriage was still ardently attempted. Present-day light fixtures often try to imitate candles (in which case the bright point sources can give pain to the eyes), or they imitate lanterns or hurricane lamps (in which case the light source, presumably located so the wind won't blow it out, can be so deeply concealed that it affords little illumination). The best hope seems to lie in light sources large and dim enough to avoid hurting the eyes, and in indirect or shielded sources bright and efficient enough to perform their tasks. Interestingly, the simple table lamp with a translucent shade performs both of the functions admirably.

The possibilities in the design of fixtures and, especially, of the light they cast are almost unlimited. As we've noted, modern design has not yet bestowed on light those subtleties attendant on change of brightness and quality and direction which natural light affords. But artificial light does have the power to create a mood (albeit a relatively unchanging one), to bring focus to a space or suggest motion through it. The present technician-led tendency is to demand a level of light that is high and uniform, like the 70° temperature of the house, except that the illuminating industry seems annually to raise the required brightness level.

Where is the electricity to come from?

☒ *A public power source* Almost certainly.
☐ *Your own generator* If you live in the boondocks.

How will it arrive?

☐ *On overhead wires* These are usually regarded, justifiably, as environmental blight. But if there aren't too many, and if the landscape allows, they can have an expressive function attesting the entry of power, an electric attachment, to the rest of the world. An early scheme of ours introduced a pylon to receive the wires from overhead electricity and telephone systems. If the wiring in the street is overhead, you face a choice whether to have it enter the house overhead from the pole, or to go underground from the pole to the house. The latter, of course, costs more, but bypasses visual blight.
☒ *Underground* If the public supply is underground, then of course your house can be supplied underground too, for electric and telephone wires.

Where does it arrive?

☐ *At a meter box* It must be available to the person who reads the meter.
☐ *Then at the main panel board* It must

be readily accessible to you when an overload trips the circuit breakers.

Where does the system go?

- ☑ *To light sources* Describe the places where you want light.
- ☑ *To convenience outlets* The code will usually demand that you have a double convenience outlet centered on every 12′ of wall. Remember to provide not only for lamps and fixed appliances, but for movable ones, such as a vacuum cleaner, as well.
- ☒ *To switches* Include three-way and four-way switches when you want the capacity to turn lights off from a place different from where you turned them on. Insist that switches be conveniently located and easy to find. You can, if you'd like, install a bank of switches, perhaps by your bed, to turn on lights all over the house to detect or scare prowlers. You may also be interested in low-voltage systems, either for switches or for auxiliary lighting outside. A low-voltage system requires transformers, but then operates on voltage pressure low enough to allow, for instance, direct burial of wires without danger of short circuits or fire.
- ☐ *To dimmers* The most obvious chance for varying artificial light over a period of time.
- ☐ *To doorbells and thermostats* These use low-voltage wires.

What other systems of wires are there?

- ☐ *Telephone* With wires to all the places where a telephone might be desired or its long cord might be plugged in.
- ☐ *TV and FM antennas or cable television*
- ☐ *Sound systems* For music in whatever rooms you desire it. Don't forget storage of tapes and/or records.
- ☒ *Lightning rods*

Dirt

A path maker as compulsory as water, but far less desired, is dirt. It blows in or is tracked into your house, then periodically has to be removed. Virtue consists in preventing accumulation and facilitating removal.

How may dirt be kept out in the first place?

- ☐ *By filtering outside air* Instead of letting it blow in naturally.
- ☑ *By providing mats, vestibules or mud rooms* To intercept dirt being tracked in.

How may it be controlled?

- ☐ *By providing smooth surfaces*
- ☐ *By minimizing objects to be dusted* You may well deduce that having soft surfaces or objects you enjoy around you is more important than minimum dusting.

How may it be removed?

- ☑ *With dust cloths or dusters*
- ☑ *With mops*
- ☐ *With brooms*
- ☐ *With carpet sweeper*
- ☑ *With vacuum cleaner* Where will it be? Together with its accessory parts and a dustpan it should be stored near to the places where it will be used. Or the vacuum cleaner can be expanded, at some cost, into a system built into the walls which pulls the vacuumed dirt to a central place.

Where will the dirt be taken?

- ☐ *Washed down a sink* From a wet mop. Do you want a special sink?
- ☒ *Removed with the trash* If trash receptacles can take sweepings.
- ☒ *Specially taken to the disposal area* When vacuum cleaner bag is emptied, or a filter removed.

Again, paths planned in advance will save hours later.

Automobiles

By far the widest path on your premises (after the bulldozers have come and gone) will be made by your car, or cars. They are much less flexible in their maneuvering than are people on foot: they do not readily go upstairs or make right-angle turns; and they are big. The main question about their presence is your attitude toward them: do you love your cars and want them near you? Or do you hate them and seek to mask their presence? The unacknowledged ambivalence has confused and deadened many an American suburban house.

How will the cars arrive at your house?

- ☐ *Never* If you really hate them, you can stop them somewhere short of the house and walk in.
- ☑ *On a driveway* It must be straight enough to move a car along it, and not too steep: 10% slope should be maximum, though where there is no snow 15% is accepted by the brave. The driveway can be narrow, no more than 10′ wide if you will not meet cars head-on or have to back out of it. A circle with a diameter of 60′ is needed to avoid backing and filling.

Where will they arrive at your house?

- ☐ *At an entrance courtyard* Which might be partly surrounded by the house and will give onto main and service entrances.
- ☐ *At a garage* What will visitors do if they can't fit in the garage?
- ☑ *At a service entrance* How will visitors get to where you want them?

Where will you store your car or cars?

- ☐ *Outside* Cars are built to stand it, but deep snow fallen on them may be a nuisance.
- ☐ *Outside under cover* Now only drifting snow can trap them, and they can be entered under cover during a rain storm.
- ☐ *In a garage* Here they can be dry, and even warm, if you want to pay for that. A space at least 12′ x 22′ should be provided for each car, so a double garage could be the largest room in your house. Does that fit your priorities? Or might it, if you used the garage sometimes for other uses? Remember that the car is about as continent as a large puppy, and grease drips from its underside.

How will you get from car to your house?

- ☒ *Through a service entrance*
- ☐ *Through a main entrance*
- ☐ *Along a passage* This can put the cars at arm's length, without sending you into the rain.

Other objects

The possibilities for other objects to chart a path to or through your house are just about endless. We note five classes of objects which may deserve your special consideration: we shall ask whether you have them, then leave it to you to chart their paths.

Some objects are sufficiently large to merit special attention: skis, a lawn mower, bicycles, a grand piano, a set of drums, all move their ways rather bulkily into the house, requiring thought about their paths in and out and to the place they are kept. What large items must you accommodate? What paths do they take? Where will they be kept?

Some other objects require special attention because they are treasured, and extra care must be exercised to prevent their being marred or broken or mislaid or stolen. Collections might lie in this category. What treasures will you accommodate? What paths will they take? Where will they be kept? How will they be secured?

Some objects deserve special attention because they are of special interest to you,

or you have a large number of them, even if they're not terribly fragile or valuable. If you have a collection of books, for example, you may want to keep them in a special order. What objects of special interest will you accommodate? What paths will they take? Where will they be kept?

Other objects may get special attention because their unattractive qualities earn them a wide berth. Gym clothes after they have been worn are eligible, or perhaps your child collects snakes. What objects in your house need isolation? What paths will they take? Where will they be confined?

A fifth class of objects requires the concealment which dirty books used to get, and may again. A bottle of blond hair rinse, for instance, or a sack of marijuana may require a special place safe from the children or the cleaning lady or your nosier friends. What objects in your house need concealment? Along what paths will you hustle them into concealment? How will you furtively retrieve them?

Adults

So far we have described only the paths of *things*, and if we have been complete, have mapped along these paths the machines and machine realms of your house. What has only been hinted at so far are the rooms, the empty stages which now require your interpretation of what your actions will be, and how you intend to occupy the stages. What you need is to note carefully your preferences for the kinds of places you want to be in. Doing this will bring up such issues as: whether you will move widely (*sweep* down the stairs), tightly (*squeeze* into a niche), or not at all (be in repose); whether you will be formally dressed, informally dressed, or undressed; therefore whether you will be in the mood for display or seeking shelter from view; alone, with another, or in a group; indoors or out, or at the edge; in a large or a small space; served by machines or left to make it on your own; surrounded by objects you care for or free of them; quiet or tuned in to the sound of others; warm or cool or even hot or cold.

Then go through days you'd like to spend, and ones you are likely to spend, noting in terms similar to those above how you would like to be in each room. Let's take, for example, the circumstances of a bath, for two very different people.

One would like to:

1. sweep into the bath
2. be undressed
3. seek shelter from view
4. but be with another
5. be indoors, but at the edge of a terrace
6. be in a large space
7. be in a bright and open space with afternoon sun
8. be served by a giant tub surrounded by warm walls of wood
9. be tuned in to the sounds of others
10. and be hot.

Another might prefer to:

1. squeeze into a tub
2. be undressed
3. seek shelter from view
4. be alone
5. be indoors
6. be in a small space
7. be in a sheltered space
8. be served by a bathtub free of objects
9. be quiet
10. and be hot.

This ten-point description should be recorded for each action of the day (where you'd like to be when you get up, go to the toilet, dress, cook breakfast, eat breakfast,

wash the dog, fix the lawn mower, have a glass of sherry, entertain a friend, forget lunch, snooze, undress, sunbathe, bathe, fix dinner, welcome friends, mix drinks, relax on the terrace, eat dinner, talk to the friends by the fire, bid them good-night, leave the dishes, go to bed). It should be repeated to describe the actions of each adult member of the family. Then it will be helpful to make similar lists for the children in the family, for guests, service people, and pets. (We shall shortly note some special circumstances for some of these groups.) Next the lists must be added together, the redundancies removed, and the conflicts adjusted. You and your spouse, for instance, don't need separate fireplaces to sit in front of together; but if you and your beloved want to sleep together, one in a large sunny room and the other in a dark cozy room, there will have to be a compromise or someone's clear-cut victory.

We keep this choreography abstract because we want to avoid casting your actions too quickly into stereotypes—for instance, a living room, which would almost inevitably be compared with Mrs. Jones's altogether admirable living room nearby, or a family room which would be okay because family rooms are in, or a morning room which would not be okay because morning rooms are out. The abstraction is also a help, we reason, because some of the spaces in the typical suburban house are neither pleasant nor useful, and it would be helpful to bypass them altogether, to save money for spaces which might be inhabited with more pleasure.

All the lists you will have made will not give you enough information to determine a single solution for your house. But you should, with your lists and their combination, be able to judge the number of separate rooms you need, and what they might be like. Then you can decide on the machine domains you need, and organize them as we have described, subjecting them to the test of the lists, amending the scheme (or discarding it, and developing another) until you have something that works. Keep trying. It is meant to be enjoyable, and as one of Le Corbusier's last books notes in its title, "Creation is a patient search."

Children

The children in your family need special lists made for them (or by them, if they are old enough). Children, remember, start out life smaller than adults, in a far smaller world, limited at first to their cribs, then expanding as their mobility increases. Experiences of space and light and motion and the opportunity for things to happen are all new in their lives. Teachers of children in slum areas note that environmental deprivation, the absence of experiences with the world around them, is as crippling a limitation as the lack of food and formal education. That this sensual deprivation is not limited to childhood or to poverty can be attested to by adults who frequent Holiday Inns. But the rewards for giving children the chance to open up their senses should be evident.

It is worth adding, too, that many children grow big before they grow well coordinated, and asking them to mince around in small spaces hemmed in by delicate objects may just be unreasonable. It is also true that childhood is a period of rapid change, and it doesn't do to plan too precisely for the requirements of a nine-year-old in a house he may not move into until he is ten.

Invited guests

Still other choreographies are required for each category of invited guests (your children's, or your own, for play or drinks or





bridge or dinner or a political meeting). It is striking, as people describe their requirements to their architects, what high priority they generally put on how they entertain —however infrequent those social occasions are: "Just two or three couples for dinner," or "Sixty for an occasional cocktail party." What it amounts to, of course, is that an important function of the house is *display* of yourselves, and it is generally the invited guests to whom the display is being made. As you chart the movements of your guests in the ten-part choreography, consider how they move, what they see (and what you hide from them), what they do, and how you want them to react to your display.

The Japanese tea ceremony was a celebrated instance of a highly ritualized development of the relation between host and guest, controlled in time and space from entry through a garden over carefully placed stepping stones to a pavilion from which all undesired clues had been banished (3) so the display could be focused on behavior, and on a few accessories of great worth. Rooms in the Victorian house (4) served similarly as a stage for display and for ritualized behavior, with a rather larger number of demonstrable objects used to tip the guests off to one's status and concerns.

In our own deritualized lives, the clues in the living room display may seem like—and they in fact may be, consciously or unconsciously—false, store-bought for uncertain purpose, as impersonal as the furniture in the last motel room you stayed in. If you mean to keep your guests at arm's length, this resolutely unrevealing anonymity may have real appeal. If you want to display your concerns more particularly, but on a stage apart from your family's lives, then, of course, if you can afford the space, you have that option. But the setting should be complete, because if, for instance, your guests seek the toilet, you might be embarrassed to let them backstage. On the other hand you may want the life you live and the life you share with your guests to merge. In this way you can show them what you cherish and let their own patterns coincide with yours, maybe even when you cook or when you bathe. One of the chief issues as you choreograph your guests' patterns is how closely they really do coincide with your own. How open with them do you want to be? How open with your possessions and your own patterns of life?

Service people

With service people, if you ever have any, as with guests, an important issue is the intimacy, the congruence, of their movements with your own. Old houses often had back stairs to provide a circulation route for the servants. Also the routes of food and garbage, of dishes, of cloth, and of paper wastes which used to be presided over by servants were kept separate from the owner's paths. This may be why these routes still receive such scant attention. Try the ten-point choreography on your service people, and see if it modifies the patterns of your house.

The uninvited

A rather special group, to which you need not apply the whole ten-point test, is the uninvited; the burglars and marauders and vandals. The main issue here is how extensively you want to guard against them. The available devices include walls, locks, bars, and electrified systems which either ring a bell or phone the police or both when an intruder (or anyone else) forces a window or enters an area rendered sensitive. The price you pay is in money (several hundred dollars for a complete system) and in

nuisance (most acutely experienced when you inadvertently set off the alarm yourself). The payoff, of course, is a sense of security. Other warning devices, to detect fire or smoke or a malfunctioning furnace or power supply, may in some situations seem more to the point than protection against burglars. And if you are primarily worried about your possessions, adequate insurance may provide more security than any system of sirens or bells.

Pets

One last special group to be choreographed is your pets: do you have dogs, cats, horses, rabbits, mice, goats, or other animals about the house? Will you limit their paths with fences or cages or pens or leashes or screen doors? Or can they be trained so that physical restraints become unnecessary? Where will their paths cross the paths of food and dishes? Where will their waste join the path of waste, water-borne or otherwise? When will their paths coincide with those of family members? How will they be sheltered from the elements?

Images

When you have charted all the paths of water, air, paper, food, dishes and other cooking utensils, clothing and linen, electricity, dirt, cars, and other objects, then have choreographed the paths of adults, children, guests, service people, pets and the uninvited, and have sought the patterns in the intersections of all of them, you are left with the task of overlaying on all this the cast of your dreams. Then you can make a house which not only works but is in the mood you want it to be. This is to say not only that the rooms and machine domains are the right ones for you and at the right places, but that they feed your fantasies as well and make you feel at home (or however you want to feel).

Thus complete is the method we proffer for making a house you can care for: chart the paths of the things that go through your house, and of the people who will live in it; decide how many rooms and machine domains will accommodate all those, then squeeze and combine and pare until the place seems about as big as you can afford. Try the ways the rooms can fit together (there aren't very many), the ways they relate to the machine domains, and the way the whole fits the site; then when your try doesn't seem quite right, try again, not forgetting to honor your own images. Finally, it should feel right, able to receive you and to feed your enthusiasms. If when you have done all this you feel unsure about your capacity to realize your scheme in technical terms, seek someone with the expertise to help you—but don't let him stifle your dreams.

Hooper Residence

Yours

Please read this and check the answer blocks. Please feel free to make a note by any question that is an exception or special feature.
Scott

Now it is time to establish a kind of check list to identify the choices which you must make if you are to invest your house with the care which will bring it alive as the center of your world.

There are many excellent books which describe in detail the techniques for building a house and keeping it strong and weathertight, and we shall not attempt to repeat those descriptions here. Instead, we will describe only those choices which require a value judgment from you.

Care is the natural enemy of stereotype, and stereotype of care. So we must make whatever detours are necessary to avoid even such stereotypes as "living room," lest somebody ask, "What do you *do* there?" and you find yourself having to say, "Live."

To identify the components of your house, the facts which restrict or aid choice, the choices you actually have, their importance to you, and their intersection with other choices, we have organized the lists to follow certain paths. These are the paths made through your house by water, air, paper, food, dishes, clothing and linen, electricity, cars, and other objects. Then we list the paths made (and departed from) by adults and children in your household, by others you invite, by service people, by burglars, by pets. Finally, we describe the paths along which the mind and the mind's eye are enticed. Each of the paths can be labeled, and their intersections noted.

The answers you make will not define a "plan" for your house. They will serve instead as a test to check against the ways there are of assembling rooms and machine domains and fitting them to the site. Inevitably there will be conflicts, which you can resolve in favor of whatever is more important to you. There will also be ambiguities, which you can cherish if you are of a mind to. But don't cheat on the choices, or take shortcuts. The fruit of shortcuts is stereotype.

The paths of things and of people and of the mind's eye, then, we shall list as:

Water
Air
Paper
Food
Dishes and other cooking utensils
Clothing and linen

Electricity
Dirt
Cars
Other Objects
Adults (you should note them separately)
Children (you should note them separately)
Invited guests
Service people
The uninvited
Pets
Images

The first lists include, after a description of each element, a set of choices *(in italics)* with room for you to check your decision and to note its importance to you. With most of the choices we note the difficulties, limits, special opportunities, standard equipment, or standard dimensions relevant to that choice.

Water

Water falls onto your house from the sky, and drains away on or under the ground. It also enters in pipes and bottles, is used up or mixed with pollutants, and is then swept away. You're in for the falling water, unless you live in an apartment or a desert, and if you are within the reach of sanitary inspectors, you are in for piped water, too. The bottled is optional.

Not optional is the gravity which will cause the water to run inexorably downhill, or the changes water will cause in almost any material it touches, from silver-gray weathering and warping and staining and causing fungus on wood, to streaks on stucco and concrete, to rust on iron, to corrosion on aluminum, to the beautiful green patina on copper. Thus, decisions have to be made about every surface along the water's path, so that it can be impervious (like glass, marble, glazed tile, or Formica) or even changed for the better (like copper) or be worth the continuing trouble (as some say oiled wood or a butcher block is).

How will the water from the sky get off the roof?

☐ *Uncontrolled* This is the cheapest, but may be forbidden by local building codes, and it can mess up the garden or splatter against the foundation of the house.

☒ *Through gutters and downspouts* They are relatively expensive and can clog with leaves or look bad. storage tank

☐ *Through spouts or gargoyles* These can look fine, but might splash onto some vulnerable surface.

What do you want to do with the water when it hits the ground?

☐ *Let it soak in* Okay if the soil is gravelly or sandy enough to absorb it.

☐ *Get rid of it underground* Like gutters and downspouts, this method can be expensive.

☐ *Run it in visible channels* Can be handsome and, if it fits your garden scheme, can take water to plants.

Where will your household water come from?

☐ *A well* Necessary in the country and usually available.

☐ *A tank* Necessary in the country where a well cannot be dug.

☒ *The city's pipes* Always available in town and cheaper than a well or tank.

How will you heat some of it?

☐ *Oil*

☐ *Gas*

☒ *Electricity*

☐ *Other* The answer to this set of choices, if it depends on cost, can be obtained by contacting each utility supplier.

Where will the heater be and how many of them?

☒ *Near the machines it serves* This is the cheap-

est and most efficient, but won't work if all the machines aren't close together.

☐ *One, serving machines spread apart* Less convenient since taps will take longer to warm up, but more economical.

☐ *Several, serving separate groups of machines* More convenient; less economical.

Where do you want water outside?

☒ *Near plants that need watering* Garden hoses are cheapest; underground and automated systems are available.

☐ *To form a pool or pond*

Inside, what do you want to wash your food in?

☐ *Single or double sink of porcelain or stainless steel* Sinks are usually mounted in counters; the standard counter height is 36", but if you are tall or short you may want to vary this. Standard counter depth is 25".

What do you want to wash your dishes in?

☐ *The sink* Economical; tolerably convenient.

☒ *A dishwasher* This can be built under a counter beside the sink, with a front opening—in which case you will face the issue of whether it should be right or left of the sink—or in a portable machine which hooks to the sink's water supply and generally opens from the top.

Where do you want to wash your food and dishes?

☐ *In a secluded area* Offers privacy and insulation for the rest of the house, from the noise of your dishwasher if you have one. It also offers you privacy, if you want it, from other adults and children.

☒ *In a more open area adjoining a room or an outdoor space* Depends on whether or not you have someone else wash your food and on whether or not you like to be with others if you do it yourself.

☒ *With a view, whether from an open or a secluded area* Can be pleasant and useful for keeping an eye on your family.

Where do you like to mix drinks?

☐ *By the sink*

☒ *At a separate secluded bar* Water can be piped in for mixing drinks and washing glasses; or it can be brought in, in a pitcher, and the glasses taken back to the main sink.

☐ *At a separate bar in a public place* Has the advantage of being close to the activities it serves, indoors or out.

Where do you wash your clothes?

☐ *At a commercial laundry*

☒ *At home* This is done in a washer, about 30" wide x 30" deep x 36" high, loaded from top or front. The washer is generally accompanied by a dryer of about the same size. Smaller versions of each, about 24" x 24" x 36", can be bought, and these can be stacked. A tub is favored by some.

If you wash your clothes at home, where?

☐ *Near where clothes and linen collect and where people sleep and dress*

☐ *Near where the person who runs the machines would like to be*

☒ *Isolated in the basement* Inconvenient, but favored by those who live in terror of the machines flooding.

Where will people wash their faces and hands?

☐ *In the kitchen sink* Not very glamorous and provides little privacy, but it's there anyway.

☐ *In a sink near public spaces* Extra expense, but useful, especially for guests.

☒ *In a sink in a private space* It is almost essential to have a place for washing and grooming near sleeping areas.

☐ *In an isolated sink near a private space* Provides visual and acoustical privacy, if you want it, and the advantages of the sink in a private space.

What kind of sink do you want?

☐ *Mounted on the wall*

☒ *Mounted in a counter*

What size sink do you want?

- [x] *Standard height*
- [ ] *Higher*
- [ ] *Lower* Sinks are generally 32" or 33" high, which can seem uncomfortably low if you are above medium height. Counters are generally 18" to 24" deep.

What color sink do you want?

- [ ] *White*
- [x] *Other* The variety of sinks is wide and can be seen at a plumbing showroom.

What kind of accessories do you want near the sink?

- [ ] *Mirrors over it*
- [x] *Mirrors with lights* Almost essential; the lights should be either above the mirror or on both sides, not just one side, of the mirror.
- [ ] *A full-length mirror nearby*
- [ ] *Small, movable mirrors* Helpful to see the side and back of your head.
- [x] *Shelves or cabinets* Useful for ointments, medicines, toothpaste, and shaving cream.
- [ ] *Holders for soap*
- [ ] *Holders for toothbrushes*
- [ ] *Holders for razors*
- [ ] *Holders for towels*
- [ ] *Holders for facial tissue*
- [x] *Convenience outlets for razors, toothbrushes, and the like*
- [x] *Storage for towels*
- [x] *Storage for household cleaners*

Do you want many sinks or few? How many can you afford?

- [ ] *One or more near various public areas for individual use*
- [x] *One near each sleeping area*
- [ ] *One or more shared near sleeping areas*

Where will people wash their whole bodies?

- [x] *Near sleeping or dressing areas*
- [ ] *Near more-public areas* As situated, for example, in Charles Moore's house in Orinda.
- [ ] *Somewhere else* For example, an outdoor shower, if you have a pool or pond or are near the ocean.

What will people wash their bodies in?

- [x] *Bathtub* This is the most common device, a receptacle usually 5' long—though 4'6", 5'6", and 6'0" lengths are also available—by about 2'8" wide, and about 15" high. These stand on the floor, or they can, for rather more money, be sunk into it. They are meant to be sat in, though modern ones are not deep enough to contain enough water to cover the recumbent bather. Therefore they are generally combined unsatisfactorily with a spray head built into the wall above.
- [ ] *Bathtub with shower and shower curtain* Bathtubs thus extended generally are combined with a spray head built into the wall above or fixed at the end of a flexible cable to make a shower. Refinements are available to widen the realm of possible sprays, or to reduce the likelihood of sudden changes in water temperature while you are under it. Some of the spray can be kept in the tub and off the floor by a curtain which will flap around you.
- [ ] *Bathtub with shower and glass doors* Sliding glass or plastic doors do a better job of keeping the spray in the tub, but they render half of the tub inaccessible.
- [ ] *Fiberglass tubs with shower* These are obtainable as one-piece units with shower enclosures. They are cheap and easy to install, except in old houses where there may be no doorway large enough to get them through.
- [x] *Tiled stall shower* If a stall is large enough (at least 3' square) it provides a more comfortable shower than one in a tub, though not the possibility of sitting down or soaking. Glass or plastic doors work much better here than on a tub, though curtains are often used for economy. Tile showers look good, are permanent and are easy to clean, except for the joints. They are also relatively expensive.
- [ ] *Plastic laminate stall shower* Relatively cheap, though corner joints can leak.

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☐ *Metal stall shower* Cheap, and looks it. Rusts, except for stainless steel, which looks nice, is not cheap, and can water spot.

☐ *One-piece fiberglass stall shower* Seamless, and so doesn't leak; easy to install in new houses, often difficult in old houses because of its size.

☒ *Sauna* This choice, like the ones which follow below, depends upon the assumption that bathing be an aspect of relaxation. A sauna is a wood-lined room which can be heated to over 200° to induce perspiration which is then meant to be washed off in a cold shower or plunge, though the Finns sometimes roll in the snow.

☒ *Steam bath* Similar to a sauna, but based on steam rather than dry heat.

☒ *Japanese bath* This is a large tub of very hot water for relaxing in after washing.

☐ *Swimming pool or plunge, indoors or out* A more usual alternative to bathing as an aspect of relaxation, it too is generally augmented by a tub or shower, and most often is kept at room temperature or just above. For a plunge, any size larger than a 6'-diameter is acceptable. For serious swimming at least a 40'-length is usually sought. Construction can be of poured or sprayed-on concrete or aluminum or fiberglass, sometimes lined with plastic, above or below the ground.

☐ *Relaxation after the bath* Benches, hammocks, mats, *chaise longues*, deck chairs.

What is your attitude toward privacy in the bath?

☐ *Complete privacy* Offers the security of a small space, and the sense that you cannot be seen.

☒ *A bath with a view* Offers openness to a large indoor space or to the outdoors.

☒ *A bath large enough for more than one person* Affords the company of your family and friends.

What accessories do you need for your bath?

☒ *Places for sponges, soap, shampoo, bath oils, brushes*

☒ *Places to hang towels and washcloths*

☒ *Places to store towels*

Do you want many baths or few?

☒ *One near every sleeping and dressing area*

☐ *One or more shared between sleeping and dressing areas*

☐ *One or more near public areas*

What kind of toilets do you want?

☒ *Standing on the floor* In the United States toilets are designed as basins meant to be sat on at a height of about 14". A space of 30" wide and at least 48" long is required for their use, and to clean around them. Behind the bowl is a tank which holds water, which is released into the bowl after its use, usually with a spinning motion which aids in the washing away of wastes into a continuation of the water system.

☐ *Hung from the wall* More expensive to install, but easier to clean around. It is also more flexible, since it allows the toilet seat to be higher than standard, for ease of rising, or lower, for improved elimination, according to some hygienists. Those who favor lowering it approve of the system used in some countries —notably in Asia—which puts the receptacle even with the floor. Enough Americans are panicked by this idea to restrict the use of such a fixture here.

☐ *Special types* The method of flushing also includes a number of options, from eliminating the tank in favor of a special valve—usually restricted to larger buildings than a house—to various alternatives which reduce odor and noise. Our experience has been that few fancy toilets work so well as the standard, inexpensive ones.

What do you want to combine the toilets with?

☐ *Nothing* Almost always in our society privacy is desired for elimination; if you prefer complete privacy, even from washing and bathing, then your toilet should be kept separate.



☒ *Washing* Can be an economical combination, especially when providing these facilities near public areas.

☐ *Washing and bathing* The standard way, economical of space.

What do you want near the toilets?

☒ *Toilet paper* It should be carefully located, generally low on a nearby wall.

☒ *Reading material* Favored by some.

☐ *Toilet cleansers* Can be conveniently stored near the toilets where they are needed; the storage space can also accommodate extra toilet paper.

What other water sources do you need?

☐ *Drinking fountains*

☒ *Sinks for hobbies* Photography or flower potting, for example.

☒ *Sinks for household cleaning*

☐ *Hose bibbs* For washing cars and windows and watering plants.

What kind of waste disposal facilities will you use?

☒ *Municipal sewers* The waste from each of these fixtures will have to flow away from them—downhill—in pipes standardly 4" in diameter, much larger than the pipes which brought the water. If the municipal sewer can be found only above the house, then sewage must be pumped up to it. The pumps are expensive—several hundred dollars—but available. The municipal authorities will also be concerned about ground or storm water which will have to be led in trenches or channels or gravel-filled trenches—called French drains—or across sloping ground to where it can proceed downhill from your property without endangering neighboring land.

☐ *Septic tanks* These are large, sunken, concrete boxes where bacteria consume the solid waste. The liquid then flows into a system of perforated pipes, or a series of underground chambers from which it leaches into the soil. The appropriate experts or officials must test your soil to determine its capacity to absorb the liquid. Again, if suitable ground for leaching can only be found above the house, then liquid sewage must be pumped up to it.

It is helpful to note that all this delivery and use of water and the disposal of water-born waste forms a continuous system, downhill all the way, except when pumps raise it. If you are of a visual frame of mind, it should be helpful to make a linear diagram which shows the continuousness of this system and pinpoints the places where it intersects the other continuous systems we shall describe, such as the one which brings in food and takes out garbage. As you imagine these continuous systems, you can consider the economic and intellectual advantages of shortening and clarifying them. The Patio of the Orange Trees adjoining the cathedral at Seville presents a famous instance where the path of the water being led to the orange trees forms the basis for the visual order of the design. (1) The internal water distributing system of a house, hidden largely in pipes, is unlikely to produce that much visual drama, but the chance to make it clearer to the mind (as well as cheaper) remains.

Air

Another system of paths, even less visible than the water in its pipes and channels, is made by the air as it drifts through our houses, or is warmed or cooled by machines and then blown through.

The visible evidence of air moving through houses, especially in the heat of the summer, has been a source of pleasure for a long time. Thin curtains blowing at the windows, a fan in the ceiling gently turning, the airborne sound of buzzing bees, the scent of lilacs drifting in the open window—all enrich our enjoyment and deepen our comfort, while, for centuries, the source of

warmth radiated from an open fire has been almost synonymous with the concept of "home." By now, the temperature and even the amount of air, cooled or heated, which is delivered to us through ducts or pipes (and for our present purposes we will consider piped water in heating and cooling systems as part of the air paths) is far more precisely controlled, and the rich overtones are gone.

Also included with the paths of air are the filters and stops which control sun and sound and smell and exclude airborne insects. The controls with the longest histories, like screened porches, awnings, shutters, and chimneys, conjure up images of their own, not yet—for most of us—marked by ducts and dampers, though an aesthetic of ducts and conduits does animate some modern architecture, notably that of a British group called Archigram.

How do you want to capture cooling breezes?

☒ *Orienting the openings* The difficulties of capturing an errant breeze are compensated for by the delicious reward of the breeze itself. If you want to capture breezes, you should discover which way they are likely to come from, then make use of the Venturi principle. Orient small openings to windward, so the breezes can build up and rush in. Place larger openings to leeward through which the air can flow, speeded up as it joins breezes blown over the top of the building.

☐ *Other techniques* For hot desert climates especially, there is a whole tradition of ways to lead the dry air past pools or plants, so that evaporation from them will cool the breeze.

What kind of cooling system do you want?

☒ *Central air conditioning* To create eternal spring. Especially in very hot or muggy climates, or in densely populated or dirty or noisy places, this has the approval of almost everyone. Air can be cleaned before it gets in the house, and unwanted noises and burglars are readily excluded. The temperature is chosen, not chanced on, and air circulation can be closely controlled. These units can be combined with the furnace and share its ducts or pipes. In central air-conditioning systems there is a condenser, generally about 3′ in diameter, with a fan blowing up, which must be put outside or on the roof. It is connected through pipes preferably under 50′ long with the chiller unit. The pipes, or especially the ducts, describe another path through the house. Again, economy, with its conceptual as well as monetary justifications, occurs when the pattern is clear and spare.

☐ *Room air conditioners* These fit into windows or, if you prefer not to lose the light and view, into a wall. They are relatively inexpensive.

☒ *Windows* Old-fashioned; often very pleasant; inexpensive.

☐ *Some of each* An option is to count on the breezes until they give out, then turn on the air conditioning as a last resort, so you prepare yourself either way.

If you want to capture the winter sun, how?

☒ *South-facing and partially enclosed spaces outdoors* In most climates, the fickle winter sun is the cold-weather counterpart of summer's breezes. The warmth of it on your face in a sheltered space outdoors is delicious and the chance to sit in it to read or nap is much to be prized.

☐ *South-facing windows* The warming rays of the sun come through glass—though its ultraviolet rays which provide a suntan come only through special glass—and are undeterred by the insulating glass which helps keep the warm air inside. Its presence can markedly reduce winter fuel bills and add to the pleasures of winter habitation. Note, however, that in the summertime, south-facing windows will admit more sun and therefore more heat than you probably want. There are several ways to cope with this problem. One, obviously, is to install movable awnings. Another depends

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upon the fact that in the winter the sun is low in the sky and in summer it is high; so permanent sunscreens or eaves can be placed above windows in a way that allows the sun to enter during the winter months, but to be blocked in the summer. Still another way—perhaps the most natural and pleasant of all—is to plant deciduous trees outside south-facing windows.

What kind of heating system do you want?

☐ *Radiant* Radiation sends heat from a warmer surface to a cooler one—you. It is independent of the intervening air temperature, even as the sun warms us through the absolute cold of outer space, or as a fireplace warms us in a cold room.

☒ *Convecting* Convection warms the air around you, either by its being blown at you from the place it was warmed up, or by passing over warmed pipes. In spite of its name, a radiator works by convection.

What kind of circulation system do you want for the heat?

☒ *Hot air* Heated air is sent through ducts to registers in each room and returned to the furnace through one or more additional registers.

☐ *Hot water* This is sent in pipes along baseboards, or in radiant surfaces like floors and ceilings.

☐ *Electric* This uses resistance wires to heat up wall or ceiling panels.

What kind of fuel will you use?

☒ *Gas*

☐ *Oil*

☐ *Electricity*

☐ *Other* These days the decision about fuel has strong ecological overtones, but there is no clear winner. The cheapest fuel, in most areas, is oil or gas. Oil must be stored in tanks; gas is not always available. Gas produces little pollution; finer oils pollute less than heavier ones—which often contain sulphur—but cost more. Electricity is expensive, though its initial costs are slightly less; it is clean at your house, but open to the charge that its manufacturer is polluting air or water somewhere. You can hear the arguments from your local utilities and weigh them against costs in your area.

Do you want a constant temperature everywhere, or variations?

☐ *Constant temperature* The advent of central heating and air conditioning has made it possible to have 70° everywhere at all times, with all the comfort—and monotony—that that implies.

☒ *Desirable variations* The advent of central heating has not destroyed the possibility of varying temperatures from room to room. One of the devices for mapping dwellings has been the patterns of heat and cold, especially in the winter. Fireplaces have been focal points; even the tapestries on palatial stone walls have been there as much to provide a warmer surface and a softer one, for sound control, as for their decorative effect. Some places have been made comfortable to sit on cold nights, others only comfortable to walk through. Japanese housebuilders, on islands with extremes of temperature, have framed their architecture with a mind to the soggy summer, and they handle the winters altogether sketchily; the occupants huddle under quilts and light charcoal braziers, the better to pursue some aesthetic goals. In our houses the sun in our faces feels much better when we're a little chilly. But note that there can be variations in temperature which you don't want, like chilly air blowing down from a cold window to where you want to sit, or hot air in summer rising to unventilated high pockets where perhaps you want to be.

What filters the air?

☐ *Windows*

☐ *Screens*

☐ *Bars*

☐ *Mosquito nets*

☒ *Other filters* Filtering can happen at any scale, through openings large enough to admit people, but not horses, or small enough to admit air, but not pollen. Windows augmented

by grills can be arranged to admit breezes while they exclude intruders; provided with screens, they can exclude flying insects while they admit air. Mosquito nets around sleeping places, for instance, can provide another line of defense against the insects which bypass the first filter. Sophisticated three-dimensional filters can be installed as part of your ventilation system, even using electrostatic pressure to trap pollution or dirt or moisture. Every exclusion, of course, impedes the desirable flow of air and to some extent the amount of air movement you seek.

What kind of windows do you want?

☐ *Glass or plastic* Glass is by far the most usual choice, but transparent or translucent plastic is sometimes used where glass would be particularly likely to break.

☐ *Single or double glazing* Double glazing is often used in rigorous climates, with a sealed space between the two sheets to inhibit condensation and improve insulation.

☐ *Wood or metal frames* Steel is strong, but must be painted, and the paint often flakes off. Aluminum can be anodized to a dark gray or bronze color. Metal frames in cold climates can allow moisture to condense. Wood cannot.

How do you want the windows to admit air?

☐ *Sliding horizontally* This is generally the most economical, since the frame doesn't have to be so strong, and indeed the 6'8" high by 8' wide sliding glass door with an aluminum frame usually provides the largest window for the least money. Smaller sliding windows are similarly economical.

☐ *Sliding vertically* Double-hung windows, which slide vertically, are almost as economical as windows that slide horizontally. They generally come with spring-loaded reels for keeping the sash at the desired height.

☒ *Swinging from the side* As casements, which can swing out to catch air coming from an angle.

☐ *Swinging from the top* As awnings. Both types of swinging windows require sturdy frames, in case they are caught by a sudden gust of wind.

☐ *Vertical pivoting windows*

☐ *Horizontal pivoting windows* Both types balance more easily than swinging windows, but they pose almost insoluble problems of insect screening.

☐ *Fixed glass* Some architects have made a point of separating the glass—for seeing through—from the opening for air, which comes then through separate louvers. This aids in excluding rainstorms and burglars and allows you to look out through glass unmarred by insect screening. But it inserts a curious denial, making it impossible to open up directly to the outdoors and its breath of air.

☐ *Storm windows* A casualty of the development of sealed double glass panes has been storm windows, which in some places used to replace insect screening for the winter months. Though their installation was an annual pain, the ceremonial marking of the passage of the seasons, the change which came with the added brightness when the screens were removed, and—sometimes—the extra pattern of another set of mullions provided another device for enlivening the act of habitation. Indeed, in some instances, the space between the inner and the outer glass is carefully formed and takes on a life of its own, as in a window greenhouse or Alvar Aalto's Vuoksenniska Church in Imatra, Finland. (2)

How do you want to filter the sound that goes with the air?

☒ *Compromise* Most of the sounds that surround us and drive us wild are airborne, though some are telegraphed through structures, or drummed through solid walls. The best way to keep a wall from allowing sound to pass is to make it heavy. The best way to block airborne noise is to block the air. Even a keyhole or the crack around a door lets some sound through. Since stopping the sound is in conflict with many of the demands for comfort based on the passage of warm or cool air, the conflict has to be resolved by careful compro-



2. Vuokse

mise. Remember that sounds are made not only by loved ones, but as well by cars, trucks, and airplanes outside. The acousticians' concept of "white sound" or "acoustical perfume" is worth noting here: you might well want to drown out unwanted sounds with, say, a fountain or a fan, rather than trying against all odds to exclude them.

Paper

For most of us, the path of paper coming into and out of our houses is at flood tide. Mountains of mail (important and junk), magazines, daily newspapers, wrappings, boxes, cartons, all conspire to swamp us. The fight to identify survivors in the flood (licenses, letters, lists) occasions an almost daily crisis in most houses. You must plan to keep this flood within its banks, to establish a path along which paper will travel, rescue points, storage arrangements, and an easy way out for the waste. The reservoirs for storage have to be large enough to let the paper pile up during periods when there is no time to sort it. The following places should be seen as points on a path. Again, economy suggests a simple and clear passage.

How does the paper come in?

- [x] *Newspapers delivered*
- [ ] *Mail delivered*
- [ ] *Carried in by you*

What do you do with it, and where?

- [ ] *Sort it*
- [x] *Read it*
- [ ] *File it*
- [ ] *Write on more paper in response to the message on the incoming paper*
- [ ] *Display it*
- [ ] *Throw it away* The sorting and reading areas may be of special importance to some people, who should consider these places for comfort, adequacy, and even view. The display of anything important, like the children's drawings, gives added point to the whole process. The throwing away may have to be dramatized with a giant mouth or a chrome waste can to speed the paper's departure.

For the paper that goes away, how does it go?

- [ ] *Mailing*
- [ ] *Recycling*
- [x] *Disposing* A trash bin is essential, and a fireplace or incinerator can be helpful.

Who takes it away? From where? To where?

- [x] *You*
- [ ] *Municipal garbage service*
- [ ] *Private garbage service* In our country the surest sign of housing for poor people, or of poor housing for middle-income people, is the uncontrolled accumulation of paper and trash. Figuring out what to do with yours to avoid frustration from children, dogs, raccoons, and the sheer hopelessness of trying to cram too much stuff into too little space deserves high priority in planning your house.

Food

The tides of foodstuffs into our houses and out again are generally under considerably closer control than the tides of papers. For one thing, we pay for the food, so we are careful. But the food bulks large, and sacks of it are heavy. So a clear path affects economies of effort here, too.

Where does the food come from?

- [ ] *Carried by you from up the street to where it will be stored.*
- [x] *Carried by you from your car to where it will be stored.*
- [ ] *Delivered by someone who may arrive when you are not at home.*

Where in the house does it go?

- [x] *Somewhere to be sorted* Foods which need refrigeration can then be given it quickly, and

other foods can go where they belong. The need for economy on this path will manifest itself to you every time you come home from the supermarket. For most of us it is the trip from the automobile to the kitchen counter which should be most carefully mapped.

Where will it be stored?

☒ *A refrigerator* Provides space for short-term cold storage, and some for long-term storage in the freezer compartment. Refrigerators can stand upright, or they can be bought to fit under a 36″-high counter. They are usually 25″ deep, and their widths vary with their capacity, from about 24″ up.

☒ *A freezer* Freezers have traditionally come as chests opened from the top, but that type is giving way to freezers shaped like a refrigerator, with doors on the front. These lose their cold air more quickly when you open them, but are more economical of space. They come, too, with a variety of devices for making, storing, and even tumbling out ice cubes.

☒ *Shelves* The standard kitchen format restricts these food storage areas to the space under the counter (2′-deep shelves which must be burrowed into from a kneeling or crouching position) and, better, the shelves above the counter, usually at about 55″ and 67″, with one at 79″ available to tall people. These are standardly shallower than the shelves below the counter, about 15″ deep, so they are more convenient, but there are usually too few of them.

☒ *Bins* Useful for storing loose foods, such as potatoes or onions.

☒ *Canisters* Useful for storing sugar, flour, coffee, and the like.

☒ *Spice racks*

☒ *Pantry storage* Shelves not deeper than 12″ can go from floor to head height or above, so that the items stored will be visible. This type of storage provides a useful and accommodating arrangement for boxes and sacks and cans of food. The shelves can be fronted with cabinet doors; or for less money, with ordinary doors to the floor; or even less expensively, they can be left open, to give householders so inclined the chance to arrange the containers as a changing display of color and shapes.

☒ *Liquor and wine storage* Special provision must be made for bottles of liquor, and especially of wine, which should be on its side in a cool place. Here, perhaps, a little distance strengthens the ritual of choosing a bottle.

Where will food be opened and prepared?

☐ *A counter* Food has to be taken out of the refrigerator or freezer or off the shelf, put somewhere while you collect your thoughts, then opened, or washed, or whatever it requires. This probably will happen on a counter near the sink and, preferably, near the refrigerator, too. This counter is the place for any machines meant to change the shape of food by beating, chopping, mixing, pureeing, or liquefying it. And it is the place as well to discard the packages in which the food has come. Standard height is 36″ above the floor, higher if you are tall, lower if you are short. If you want to sit down for this part of the food preparation, you can have a surface at desk height—28″ or 29″—with a place for your knees beneath. Alternatively, of course, you can have a high stool.

How will food be heated up?

☐ *Gas*

☒ *Electricity*

What kind of burners do you prefer?

☐ *Ones combined with one or two ovens to make a standard stove*

☒ *Ones mounted in the counter*

What kind of oven or ovens do you prefer?

☐ *One or two in a standard stove*

☒ *One or two mounted under or above the counter* The advantage of separate ovens lies in the chance to put them high enough so they can be looked into and their contents removed

or put in without stooping. Ovens under burners are harder to stoop down for, but they save space, and generally cost less. Some one-piece stoves come with an eye-level oven above and another oven below.

What other cooking devices do you want?

☒ *Toaster*
☒ *Coffee pot*
☒ *Electric frying pan*
☐ *Fondue pot*
☒ *Other* There is a vast assortment of cooking devices for specific purposes, and these can be located with considerable flexibility, though almost all of them require electricity. They can even be at the place where the food will be eaten.

Where is the food eaten?

☐ *Where it is prepared* When speed or effortlessness dictates, this can be done by people standing or sitting or perched on high stools.
☒ *A special place for eating* This should be close to where the food is warmed; if this place is used for breakfast and lunch, most people would prefer it to be in the sun, hopefully with a pleasant outlook. More extended dining, on the other hand, falls into the realm of onstage ritual or improvisation in a room. Ritual here carries images of a table big enough for everyone, with at least 2' of perimeter per person to be served, enough space to get there and maneuver a chair, as well as a place for serving. The conditions of this space can be carefully set: is the view—if you want one—visible after sunset? Can the lights be controlled? Improvisation also suggests the chance to eat where the mood allows, outdoors, or by the television, or in the greenhouse, or in bed; it requires encouragement or suggestion: tables outdoors, for instance, can increase the likelihood of people's eating there.

What is the fate of what remains?

☒ *Restorage of usable leftovers*
☒ *Removal of unusable leftovers by a garbage disposer in the sink* Only certain remains can be gotten rid of here.
☒ *Trash cans for the rest of the unusable leftovers*
☐ *Trash compactors for the rest of the unusable leftovers* Here again our path intersects with the monumental trash problem. We have excess food, and the armatures it comes on (bones and corn cobs and the like) and the often wet and gooey paper and plastic and metal it came in. The food in many houses is ground up in a disposal mechanism in the sink and washed away, but the armatures and packings stay as trash. Trash compressors, still rare and expensive, are now on the market to squeeze down this problem. But usually an easy, convenient, and sanitary path, with storage reservoirs enroute, must be found to get the garbage, with a minimum of odor and mess, away from the cooking area and out of the house, to a place where it can safely be given to someone else—a garbage collector, not dogs or rats or children.

Dishes and other cooking utensils

A path closely related to that of the food is that of the vessels it is prepared in or served on. These vessels, as well as glasses, flatware, and utensils of silver, pewter, copper, and glass are, for some, of great importance, made with great care, and cherished. Others prefer to eat from paper plates. Dishes arrive in the house infrequently enough to let us assume that they are already there. But there is nevertheless their storage to consider.

Where will you store dishes, flatware, cooking utensils, vases, and ashtrays?

☐ *On shelves where they can be seen by visitors and by you* These might be in the main rooms of your house or in the area where the food is going to be put on them. They might be on open shelves or behind glass.
☒ *In cabinets where they are not on display* The main concern, then, is for convenience to

the point where they will be used and to the point where they will be washed.

☐ *Hanging from pegs or racks* This is favored by some for pots and pans.

☒ *Divided among the locations where they will be used* This division should occur if there is a separate bar or service kitchen or dishwashing area, or if you are anxious to separate vessels destined for special occasions from those you use everyday.

☐ *In, or out of, reach of children* So they can help; or so dishes can be safe from them.

Where will you use the dishes?

☒ *On a counter or table near the sink* For preparing food and serving it.

☒ *On buffets, tables, counters or laps*

☐ *At bars, at the bedside, at coffee tables*

Where will you wash the dishes?

☒ *At sinks or dishwashers* Here the dishes cross the path of the water.

Then how will you conveniently store the dishes again?

☒ *Proximate* You should be able to replace them on their shelves or hooks without a walk with each dish.

☐ *Collected for storage* If you want to store dishes far from where they are going to be washed, a tea tray, a dumbwaiter, or even a simple tray might be used. If it is a tray, there must be a place to put it—loaded—at each end of its trip. If it is a tea tray, with wheels, there must be maneuvering room for it and storage space.

Clothing and linen

Next to food and water, perhaps the most familiar elements of domesticity are the pieces of cloth which we use to clothe us, or to surround us, in bed or out, or to dry our bodies or other objects. Though pieces of cloth qualify sometimes as light control at windows, sometimes as purely decorative objects, and even occasionally as art, a characteristic of most of the cloth in our houses is that it is generally collected, washed and dried, put away, and used again, and so it describes a chartable path through the house.

What happens to clothing when it first enters the house?

☒ *It's taken off* A place to put outer garments when you enter is required in most climates. In cold climates, the garments can be very bulky and require extensive space on hooks or in a closet. The coats may be dripping with rain or snow and require provision for the water to drain off, and they may be accompanied by hats and umbrellas, also soaking wet. In some climates the snow or rain you bring in may be mixed with mud, especially on your outer footwear, suggesting the provision of a special "mud room" with a waterproof floor and a place to sit down and remove the offending garments.

☐ *It is stored temporarily* If you patronize a commercial laundry, then packages of clean clothes and garments on hangers may be one of the most frequent deliveries at your house. If you want provision for deliveries to be made when you are not at home, you should plan for that.

Where does the clothing go for longer-term storage?

☒ *Into closets* Some clothes hang on hangers, others more easily lie on shelves or in drawers. To be really precise about sizes you should measure your own garments, folded or hung as you like them. The rule of thumb is that closets accommodating garments on hangers must be at least 2′ deep. The standard provision is for a pole about 5′6″ above the floor, which should accommodate your longest garments, though it leaves considerable wasted space below shorter ones, like jackets or shirts, and some wasted space above as well. One simple economy is to put a rod as

high as you can comfortably reach, then put a rod for part of its length below it, so that shorter garments can be doubled up. You should also consider alternative ways of hanging up clothes—slits, rods, or clips for storing trousers, skirts, and other pieces of clothing which do not have to be on hangers. Many articles of clothing can be folded and kept in drawers or, even more simply, on shelves. These drawers or shelves do not normally need to be more than 18" deep, so space is lost if they are mixed with the hanging space, but still other items, such as shoes, hats, purses, and umbrellas, might be fitted into the still empty space above and below the hanging clothes. The issue of closure for the closets also stirs debate. One recourse is to leave them open. Another is regular swinging doors, but these require space in the adjoining room. Sliding doors hide half the closet at any one time. Bi-fold doors are convenient and fairly inexpensive, but to some they look it. Curtains flap into the way. The old-fashioned walk-in closet, entered through a single door, provides a surprisingly effective combination of enclosure and ease of access to the contents. But it takes more space than any other alternative. Your decisions should include what kind of closet you need and how big; you can best judge by measuring what you have and adding a factor for growth.

☐ *Wardrobes*

☒ *Chests of drawers*

Where should the closets be?

☒ *In or near sleeping areas*

☐ *In or near bathing areas* This is a question of your habits—whether, for instance, you bathe just before you dress—and of your preferences—whether, for instance, you would like to have your sleeping area free of clothes or separate so where you sleep can be cold and where you dress can be warm.

Where does the soiled clothing go?

☐ *Out of the house to a commercial laundry* In this case you'll want convenient stations for collecting it and perhaps a chute or cart to take it to a central place.

☒ *To be washed on the premises* The washing can be near the places where the dirty clothes collect or at the end of a chute from those places.

How is it dried?

☒ *In a dryer* They come gas or electric.

☐ *By hanging indoors* Permanent-press garments, especially, need to drip-dry from hangers. There needs to be a place for the hangers and something underneath which will not be damaged by water dripping onto it.

☒ *By hanging outdoors* A nuisance, but there is not yet a replacement for the sweet smell of cloth which has dried in the sun and breeze.

How does it get ironed?

☒ *On an ironing board* It can be built in or portable, in the kitchen or laundry room or just about anywhere else you want.

☐ *By being hand-blocked* As sweaters should be.

☐ *Not at all* By being permanent-press fabric.

How do you prefer to get it back?

☒ *With least effort, by washing and drying it nearby*

☐ *In a cart or dumbwaiter* Laundry is heavy and carrying it can be difficult.

Another great part of household cloth is bed linen, sheets, and pillow cases of smooth fabric. The current sleeping practice in the United States, as in much of the rest of the world, requires soft horizontal surfaces, mattresses, generally made with foam rubber or plastic, or of coiled metal springs padded with cotton, supported a few inches above the floor on a hard slab or on metal springs, flat or coiled. Mattresses come in standard sizes. Mattress pads are available, to keep the mattress clean,

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for every size. So are sheets, either flat and big enough to tuck in around or "contour," so that they fit neatly over either two or four corners of the mattress. On top of two sheets are piled blankets or quilts or comforters, sometimes electrically warmed, though the trend to unchanging room temperatures may hasten the retirement of some of these. Pillows of feathers or of foam rubber or of Dacron are generally added, covered with sheeting fashioned into a pillowcase. Great care used to be lavished on the embellishment of sheets and pillowcases with tatting, crochet, or embroidery. That embellishment is infrequent now, but a wide variety of available colors and patterns has replaced it.

The main problem today is that the rather elaborate layering of bedclothes, and the attendant assumption that not making the bed is in some way reprehensible, leaves us with a daily chore less and less appropriate to the mood of machine-aided carefree living prized by almost all of us. Perhaps handsome washable sleeping bags will free us from the daily chore, as well as the attachment to all those specific mattress sizes.

What size beds do you want? How many of each?

- ☐ *Cot 30" x 74"*
- ☐ *Single bed 36" x 74"*
- ☐ *Twin bed 39" x 74"*
- ☐ *Three-quarter bed 48" x 74"*
- ☒ *Double bed 54" x 74"*

Each of the above is available long, usually 76"; also available are:

- ☐ *Queen size 60" x 76"*
- ☒ *King size 78" x 76"*

Where will you store your bed linen?

- ☐ *In the bedroom closet*
- ☒ *In a linen closet*
- ☐ *In the laundry room*
- ☐ *Elsewhere*

How will you get your bed linen to where it will be washed?

- ☒ *Carry it*
- ☒ *Put it down a chute*
- ☐ *Cart it*

How will you return it to its storage place?

- ☒ *Carry it*
- ☐ *Send it up in a dumbwaiter*
- ☐ *Cart it*

Elaborate table linen has accompanied elaborate bed linen into limbo. Not very long ago tablecloths and napkins, like sheets and pillowcases, provided the excuse for the lavishing of prenuptial care. Now, not only the embroidery has departed, but the tablecloths often have, too, replaced by paper place mats and even napkins. To the extent that either of these have become paper, they follow the route of the paper flood tide. Those which remain cloth describe a tributary to the flow of other cloth through the house.

Where will you store the table linen?

- ☐ *In the cooking area*
- ☒ *Near the eating area*

How will you take it to the area where it can be washed?

- ☒ *Carry it*
- ☐ *Put it down a chute*
- ☐ *Cart it*

How will you wash and iron it?

- ☐ *Send to commercial laundry*
- ☒ *Wash and dry and iron it at home*
- ☐ *Stick to permanent press*

How will you bring it back to where it is stored?

- [x] *Carry it, since there is little enough*
- [ ] *Put it in a dumbwaiter*
- [ ] *Cart it*

Another branch of the cloth flow still very much with us is the provision of towels for the sinks and the baths. These run the gamut from the fingertip towels (which are meant to look destroyed after one using and which unaccountably persist in powder rooms) to the enveloping terry towels (bath sheets) and robes which add pleasure to drying off after bathing. What they all have in common is their need, after one or a few uses, to be washed and dried.

Where are they stored?

- [x] *At the bathing areas*
- [ ] *Where they are washed*
- [ ] *Elsewhere*

Where are they used?

- [ ] *At sinks*
- [x] *At bathing areas* Since they are often used repeatedly, they must be hung on racks so they may dry out between wettings. Pipes make useful racks; some are even heated, by running hot water through them, to hasten the drying of towels on them and to make the towels themselves more pleasant to the touch.

How do they get to point of washing?

- [x] *Carried*
- [ ] *Carted*
- [x] *Chuted*
- [ ] *Dumbwaitered*

Similarly, you should trace the path of kitchen towels and any other pieces of regularly washable cloth you plan on having in your house. Once more, making the path clearer has its own special virtues at least equal to the day-by-day practical advantages you gain from not having dirty laundry lying all around. But remember, the laundry for the average household still weighs a great deal, and you should not condemn yourself, by a lack of planning, to a lifetime of lugging it.

Electricity

No charting of paths would be complete without following the route of the electricity whose passage animates your house. Its influence is felt well beyond its own path, since electricity broadcasts itself in artificial light, heat, recorded sound, and a host of other ways. Unlike water, it doesn't show up unannounced: you have to make a deal with your utility company, or manufacture it yourself.

In the United States two strengths of electricity are generally available: 110 volts, for most household uses, and 220 volts, for such heavy appliances as electric stoves and some air-conditioning systems. In the case of the 110 volts, the voltage comes in two wires, and the appliance connected to them completes the circuit and turns on. The 220 volts come normally with three wires, and again the appliance completes the circuit. In an analogy with water, the volts are electrical *pressure*. Amps, or amperes, are the *amount* of electricity, and watts, which are volts multiplied by amps, represent the total flow. Each appliance carries a rating in watts, and you are billed for the number of watts, or kilowatts (1000 watts) you use in a month. The electricity coursing through your house is broken, for convenience and safety, into separate circuits, normally of about 15 amps each, each of which allows 110 volts times 15 amps, or 1650 watts. If you plug in appliances with more watts than that, you overload the circuit, and a circuit breaker snaps off the current to avert catastrophe. Some circuits are heavier, to

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accommodate the appliances which need more electricity (220 volts, for instance, times 20 amps is 4400 watts, more than enough for an electric stove).

Electric wire is quite cheap and nowadays is generally concealed, so it can be argued that its mere presence is more important than the formal clarity of its path. The same is true for other wiring systems, telephone and television, for instance. Nevertheless, the opportunity remains, if you want it, to make the paths the wires trace through your house a visual and conceptual statement. The old-fashioned knob-and-tube system, in which insulated wires ran exposed, held away from wood surfaces and from each other by white porcelain fittings, has been outlawed by most codes, and wiring is required in most places to be run in a flexible conduit of metal or plastic or in rigid metal pipes, so it is the conduit, fixtures, and junction boxes, not the wire inside, whose path you will make visible.

Many electric light fixtures are in about the state of visual development reached by the automobile in 1902, when the imitation of the horse-drawn carriage was still ardently attempted. Present-day light fixtures often try to imitate candles (in which case the bright point sources can give pain to the eyes), or they imitate lanterns or hurricane lamps (in which case the light source, presumably located so the wind won't blow it out, can be so deeply concealed that it affords little illumination). The best hope seems to lie in light sources large and dim enough to avoid hurting the eyes, and in indirect or shielded sources bright and efficient enough to perform their tasks. Interestingly, the simple table lamp with a translucent shade performs both of the functions admirably.

The possibilities in the design of fixtures and, especially, of the light they cast are almost unlimited. As we've noted, modern design has not yet bestowed on light those subtleties attendant on change of brightness and quality and direction which natural light affords. But artificial light does have the power to create a mood (albeit a relatively unchanging one), to bring focus to a space or suggest motion through it. The present technician-led tendency is to demand a level of light that is high and uniform, like the 70° temperature of the house, except that the illuminating industry seems annually to raise the required brightness level.

Where is the electricity to come from?

☒ *A public power source* Almost certainly.
☐ *Your own generator* If you live in the boondocks.

How will it arrive?

☐ *On overhead wires* These are usually regarded, justifiably, as environmental blight. But if there aren't too many, and if the landscape allows, they can have an expressive function attesting the entry of power, an electric attachment, to the rest of the world. An early scheme of ours introduced a pylon to receive the wires from overhead electricity and telephone systems. If the wiring in the street is overhead, you face a choice whether to have it enter the house overhead from the pole, or to go underground from the pole to the house. The latter, of course, costs more, but bypasses visual blight.
☒ *Underground* If the public supply is underground, then of course your house can be supplied underground too, for electric and telephone wires.

Where does it arrive?

☐ *At a meter box* It must be available to the person who reads the meter.
☒ *Then at the main panel board* It must

be readily accessible to you when an overload trips the circuit breakers.

Where does the system go?

- ☒ *To light sources* Describe the places where you want light.
- ☒ *To convenience outlets* The code will usually demand that you have a double convenience outlet centered on every 12′ of wall. Remember to provide not only for lamps and fixed appliances, but for movable ones, such as a vacuum cleaner, as well.
- ☒ *To switches* Include three-way and four-way switches when you want the capacity to turn lights off from a place different from where you turned them on. Insist that switches be conveniently located and easy to find. You can, if you'd like, install a bank of switches, perhaps by your bed, to turn on lights all over the house to detect or scare prowlers. You may also be interested in low-voltage systems, either for switches or for auxiliary lighting outside. A low-voltage system requires transformers, but then operates on voltage pressure low enough to allow, for instance, direct burial of wires without danger of short circuits or fire.
- ☒ *To dimmers* The most obvious chance for varying artificial light over a period of time.
- ☒ *To doorbells and thermostats* These use low-voltage wires.

What other systems of wires are there?

- ☒ *Telephone* With wires to all the places where a telephone might be desired or its long cord might be plugged in.
- ☒ *TV and FM antennas or cable television*
- ☒ *Sound systems* For music in whatever rooms you desire it. Don't forget storage of tapes and/or records.
- ☐ *Lightning rods*

Dirt

A path maker as compulsory as water, but far less desired, is dirt. It blows in or is tracked into your house, then periodically has to be removed. Virtue consists in preventing accumulation and facilitating removal.

How may dirt be kept out in the first place?

- ☒ *By filtering outside air* Instead of letting it blow in naturally.
- ☒ *By providing mats, vestibules or mud rooms* To intercept dirt being tracked in.

How may it be controlled?

- ☐ *By providing smooth surfaces*
- ☒ *By minimizing objects to be dusted* You may well deduce that having soft surfaces or objects you enjoy around you is more important than minimum dusting.

How may it be removed?

- ☒ *With dust cloths or dusters*
- ☒ *With mops*
- ☒ *With brooms*
- ☒ *With carpet sweeper*
- ☒ *With vacuum cleaner* Where will it be? Together with its accessory parts and a dustpan it should be stored near to the places where it will be used. Or the vacuum cleaner can be expanded, at some cost, into a system built into the walls which pulls the vacuumed dirt to a central place.

Where will the dirt be taken?

- ☒ *Washed down a sink* From a wet mop. Do you want a special sink?
- ☒ *Removed with the trash* If trash receptacles can take sweepings.
- ☒ *Specially taken to the disposal area* When vacuum cleaner bag is emptied, or a filter removed.

Again, paths planned in advance will save hours later.

Automobiles

By far the widest path on your premises (after the bulldozers have come and gone) will be made by your car, or cars. They are much less flexible in their maneuvering than are people on foot: they do not readily go upstairs or make right-angle turns; and they are big. The main question about their presence is your attitude toward them: do you love your cars and want them near you? Or do you hate them and seek to mask their presence? The unacknowledged ambivalence has confused and deadened many an American suburban house.

How will the cars arrive at your house?

- ☐ *Never* If you really hate them, you can stop them somewhere short of the house and walk in.
- ☒ *On a driveway* It must be straight enough to move a car along it, and not too steep: 10% slope should be maximum, though where there is no snow 15% is accepted by the brave. The driveway can be narrow, no more than 10′ wide if you will not meet cars head-on or have to back out of it. A circle with a diameter of 60′ is needed to avoid backing and filling.

Where will they arrive at your house?

- ☐ *At an entrance courtyard* Which might be partly surrounded by the house and will give onto main and service entrances.
- ☒ *At a garage* What will visitors do if they can't fit in the garage?
- ☐ *At a service entrance* How will visitors get to where you want them?

Where will you store your car or cars?

- ☐ *Outside* Cars are built to stand it, but deep snow fallen on them may be a nuisance.
- ☐ *Outside under cover* Now only drifting snow can trap them, and they can be entered under cover during a rain storm.
- ☒ *In a garage* Here they can be dry, and even warm, if you want to pay for that. A space at least 12′ x 22′ should be provided for each car, so a double garage could be the largest room in your house. Does that fit your priorities? Or might it, if you used the garage sometimes for other uses? Remember that the car is about as continent as a large puppy, and grease drips from its underside.

How will you get from car to your house?

- ☐ *Through a service entrance*
- ☒ *Through a main entrance*
- ☒ *Along a passage* This can put the cars at arm's length, without sending you into the rain.

Other objects

The possibilities for other objects to chart a path to or through your house are just about endless. We note five classes of objects which may deserve your special consideration: we shall ask whether you have them, then leave it to you to chart their paths.

Some objects are sufficiently large to merit special attention: skis, a lawn mower, bicycles, a grand piano, a set of drums, all move their ways rather bulkily into the house, requiring thought about their paths in and out and to the place they are kept. What large items must you accommodate? What paths do they take? Where will they be kept?

Some other objects require special attention because they are treasured, and extra care must be exercised to prevent their being marred or broken or mislaid or stolen. Collections might lie in this category. What treasures will you accommodate? What paths will they take? Where will they be kept? How will they be secured?

Some objects deserve special attention because they are of special interest to you,

or you have a large number of them, even if they're not terribly fragile or valuable. If you have a collection of books, for example, you may want to keep them in a special order. What objects of special interest will you accommodate? What paths will they take? Where will they be kept?

Other objects may get special attention because their unattractive qualities earn them a wide berth. Gym clothes after they have been worn are eligible, or perhaps your child collects snakes. What objects in your house need isolation? What paths will they take? Where will they be confined?

A fifth class of objects requires the concealment which dirty books used to get, and may again. A bottle of blond hair rinse, for instance, or a sack of marijuana may require a special place safe from the children or the cleaning lady or your nosier friends. What objects in your house need concealment? Along what paths will you hustle them into concealment? How will you furtively retrieve them?

Adults

So far we have described only the paths of *things*, and if we have been complete, have mapped along these paths the machines and machine realms of your house. What has only been hinted at so far are the rooms, the empty stages which now require your interpretation of what your actions will be, and how you intend to occupy the stages. What you need is to note carefully your preferences for the kinds of places you want to be in. Doing this will bring up such issues as: whether you will move widely (*sweep* down the stairs), tightly (*squeeze* into a niche), or not at all (be in repose); whether you will be formally dressed, informally dressed, or undressed; therefore whether you will be in the mood for display or seeking shelter from view; alone, with another, or in a group; indoors or out, or at the edge; in a large or a small space; served by machines or left to make it on your own; surrounded by objects you care for or free of them; quiet or tuned in to the sound of others; warm or cool or even hot or cold.

Then go through days you'd like to spend, and ones you are likely to spend, noting in terms similar to those above how you would like to be in each room. Let's take, for example, the circumstances of a bath, for two very different people.

One would like to:

1. sweep into the bath
2. be undressed
3. seek shelter from view
4. but be with another
5. be indoors, but at the edge of a terrace
6. be in a large space
7. be in a bright and open space with afternoon sun
8. be served by a giant tub surrounded by warm walls of wood
9. be tuned in to the sounds of others
10. and be hot.

Another might prefer to:

1. squeeze into a tub
2. be undressed
3. seek shelter from view
4. be alone
5. be indoors
6. be in a small space
7. be in a sheltered space
8. be served by a bathtub free of objects
9. be quiet
10. and be hot.

This ten-point description should be recorded for each action of the day (where you'd like to be when you get up, go to the toilet, dress, cook breakfast, eat breakfast,

wash the dog, fix the lawn mower, have a glass of sherry, entertain a friend, forget lunch, snooze, undress, sunbathe, bathe, fix dinner, welcome friends, mix drinks, relax on the terrace, eat dinner, talk to the friends by the fire, bid them good-night, leave the dishes, go to bed). It should be repeated to describe the actions of each adult member of the family. Then it will be helpful to make similar lists for the children in the family, for guests, service people, and pets. (We shall shortly note some special circumstances for some of these groups.) Next the lists must be added together, the redundancies removed, and the conflicts adjusted. You and your spouse, for instance, don't need separate fireplaces to sit in front of together; but if you and your beloved want to sleep together, one in a large sunny room and the other in a dark cozy room, there will have to be a compromise or someone's clear-cut victory.

We keep this choreography abstract because we want to avoid casting your actions too quickly into stereotypes—for instance, a living room, which would almost inevitably be compared with Mrs. Jones's altogether admirable living room nearby, or a family room which would be okay because family rooms are in, or a morning room which would not be okay because morning rooms are out. The abstraction is also a help, we reason, because some of the spaces in the typical suburban house are neither pleasant nor useful, and it would be helpful to bypass them altogether, to save money for spaces which might be inhabited with more pleasure.

All the lists you will have made will not give you enough information to determine a single solution for your house. But you should, with your lists and their combination, be able to judge the number of separate rooms you need, and what they might be like. Then you can decide on the machine domains you need, and organize them as we have described, subjecting them to the test of the lists, amending the scheme (or discarding it, and developing another) until you have something that works. Keep trying. It is meant to be enjoyable, and as one of Le Corbusier's last books notes in its title, "Creation is a patient search."

Children

The children in your family need special lists made for them (or by them, if they are old enough). Children, remember, start out life smaller than adults, in a far smaller world, limited at first to their cribs, then expanding as their mobility increases. Experiences of space and light and motion and the opportunity for things to happen are all new in their lives. Teachers of children in slum areas note that environmental deprivation, the absence of experiences with the world around them, is as crippling a limitation as the lack of food and formal education. That this sensual deprivation is not limited to childhood or to poverty can be attested to by adults who frequent Holiday Inns. But the rewards for giving children the chance to open up their senses should be evident.

It is worth adding, too, that many children grow big before they grow well coordinated, and asking them to mince around in small spaces hemmed in by delicate objects may just be unreasonable. It is also true that childhood is a period of rapid change, and it doesn't do to plan too precisely for the requirements of a nine-year-old in a house he may not move into until he is ten.

Invited guests

Still other choreographies are required for each category of invited guests (your children's, or your own, for play or drinks or



bridge or dinner or a political meeting). It is striking, as people describe their requirements to their architects, what high priority they generally put on how they entertain —however infrequent those social occasions are: "Just two or three couples for dinner," or "Sixty for an occasional cocktail party." What it amounts to, of course, is that an important function of the house is *display* of yourselves, and it is generally the invited guests to whom the display is being made. As you chart the movements of your guests in the ten-part choreography, consider how they move, what they see (and what you hide from them), what they do, and how you want them to react to your display.

The Japanese tea ceremony was a celebrated instance of a highly ritualized development of the relation between host and guest, controlled in time and space from entry through a garden over carefully placed stepping stones to a pavilion from which all undesired clues had been banished (3) so the display could be focused on behavior, and on a few accessories of great worth. Rooms in the Victorian house (4) served similarly as a stage for display and for ritualized behavior, with a rather larger number of demonstrable objects used to tip the guests off to one's status and concerns.

In our own deritualized lives, the clues in the living room display may seem like— and they in fact may be, consciously or unconsciously—false, store-bought for uncertain purpose, as impersonal as the furniture in the last motel room you stayed in. If you mean to keep your guests at arm's length, this resolutely unrevealing anonymity may have real appeal. If you want to display your concerns more particularly, but on a stage apart from your family's lives, then, of course, if you can afford the space, you have that option. But the setting should be complete, because if, for instance, your guests seek the toilet, you might be embarrassed to let them backstage. On the other hand you may want the life you live and the life you share with your guests to merge. In this way you can show them what you cherish and let their own patterns coincide with yours, maybe even when you cook or when you bathe. One of the chief issues as you choreograph your guests' patterns is how closely they really do coincide with your own. How open with them do you want to be? How open with your possessions and your own patterns of life?

Service people

With service people, if you ever have any, as with guests, an important issue is the intimacy, the congruence, of their movements with your own. Old houses often had back stairs to provide a circulation route for the servants. Also the routes of food and garbage, of dishes, of cloth, and of paper wastes which used to be presided over by servants were kept separate from the owner's paths. This may be why these routes still receive such scant attention. Try the ten-point choreography on your service people, and see if it modifies the patterns of your house.

The uninvited

A rather special group, to which you need not apply the whole ten-point test, is the uninvited; the burglars and marauders and vandals. The main issue here is how extensively you want to guard against them. The available devices include walls, locks, bars, and electrified systems which either ring a bell or phone the police or both when an intruder (or anyone else) forces a window or enters an area rendered sensitive. The price you pay is in money (several hundred dollars for a complete system) and in

nuisance (most acutely experienced when you inadvertently set off the alarm yourself). The payoff, of course, is a sense of security. Other warning devices, to detect fire or smoke or a malfunctioning furnace or power supply, may in some situations seem more to the point than protection against burglars. And if you are primarily worried about your possessions, adequate insurance may provide more security than any system of sirens or bells.

Pets

One last special group to be choreographed is your pets: do you have dogs, cats, horses, rabbits, mice, goats, or other animals about the house? Will you limit their paths with fences or cages or pens or leashes or screen doors? Or can they be trained so that physical restraints become unnecessary? Where will their paths cross the paths of food and dishes? Where will their waste join the path of waste, water-borne or otherwise? When will their paths coincide with those of family members? How will they be sheltered from the elements?

Images

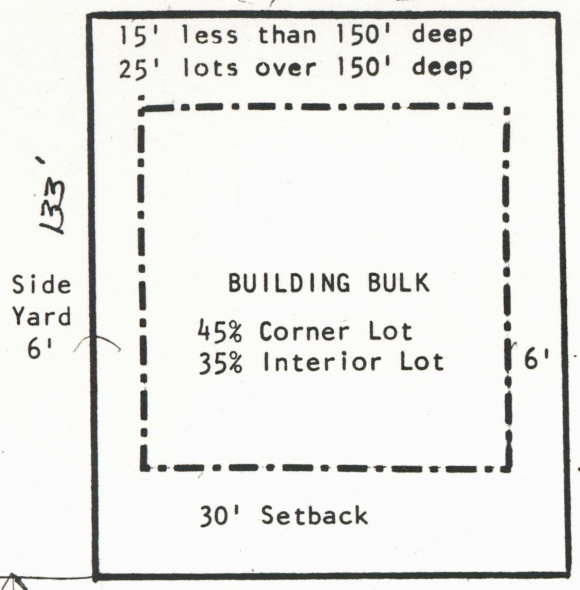
When you have charted all the paths of water, air, paper, food, dishes and other cooking utensils, clothing and linen, electricity, dirt, cars, and other objects, then have choreographed the paths of adults, children, guests, service people, pets and the uninvited, and have sought the patterns in the intersections of all of them, you are left with the task of overlaying on all this the cast of your dreams. Then you can make a house which not only works but is in the mood you want it to be. This is to say not only that the rooms and machine domains are the right ones for you and at the right places, but that they feed your fantasies as well and make you feel at home (or however you want to feel).

Thus complete is the method we proffer for making a house you can care for: chart the paths of the things that go through your house, and of the people who will live in it; decide how many rooms and machine domains will accommodate all those, then squeeze and combine and pare until the place seems about as big as you can afford. Try the ways the rooms can fit together (there aren't very many), the ways they relate to the machine domains, and the way the whole fits the site; then when your try doesn't seem quite right, try again, not forgetting to honor your own images. Finally, it should feel right, able to receive you and to feed your enthusiasms. If when you have done all this you feel unsure about your capacity to realize your scheme in technical terms, seek someone with the expertise to help you—but don't let him stifle your dreams.

AREA DISTRICTS

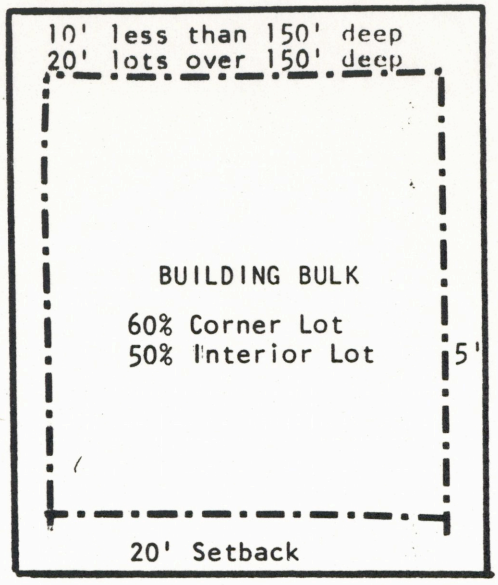
Hooper Residence / Great Falls

A



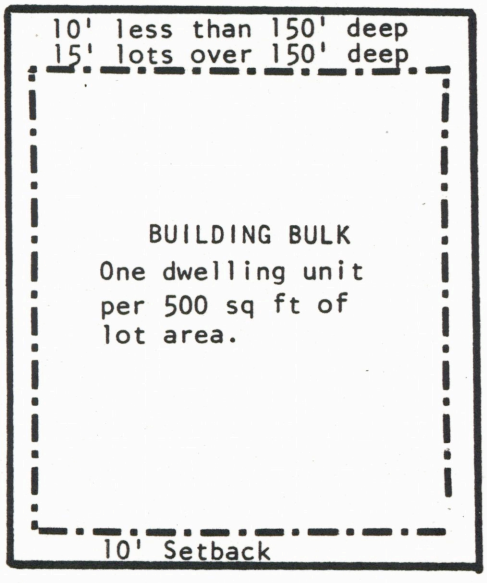
A garage less than 1000 sq ft and 40' back from the front property line may have its outer wall not closer than 2' to the side property line.

B



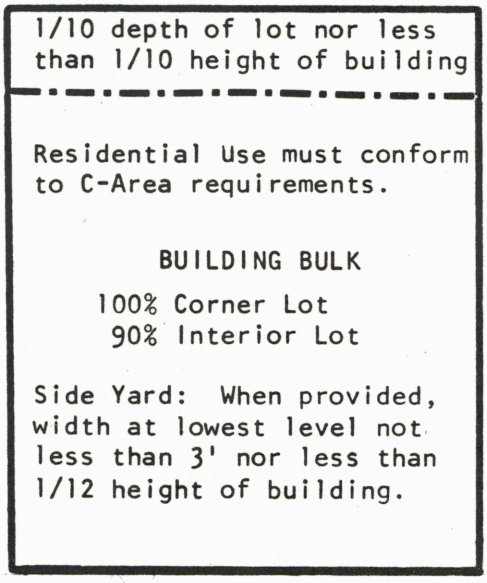
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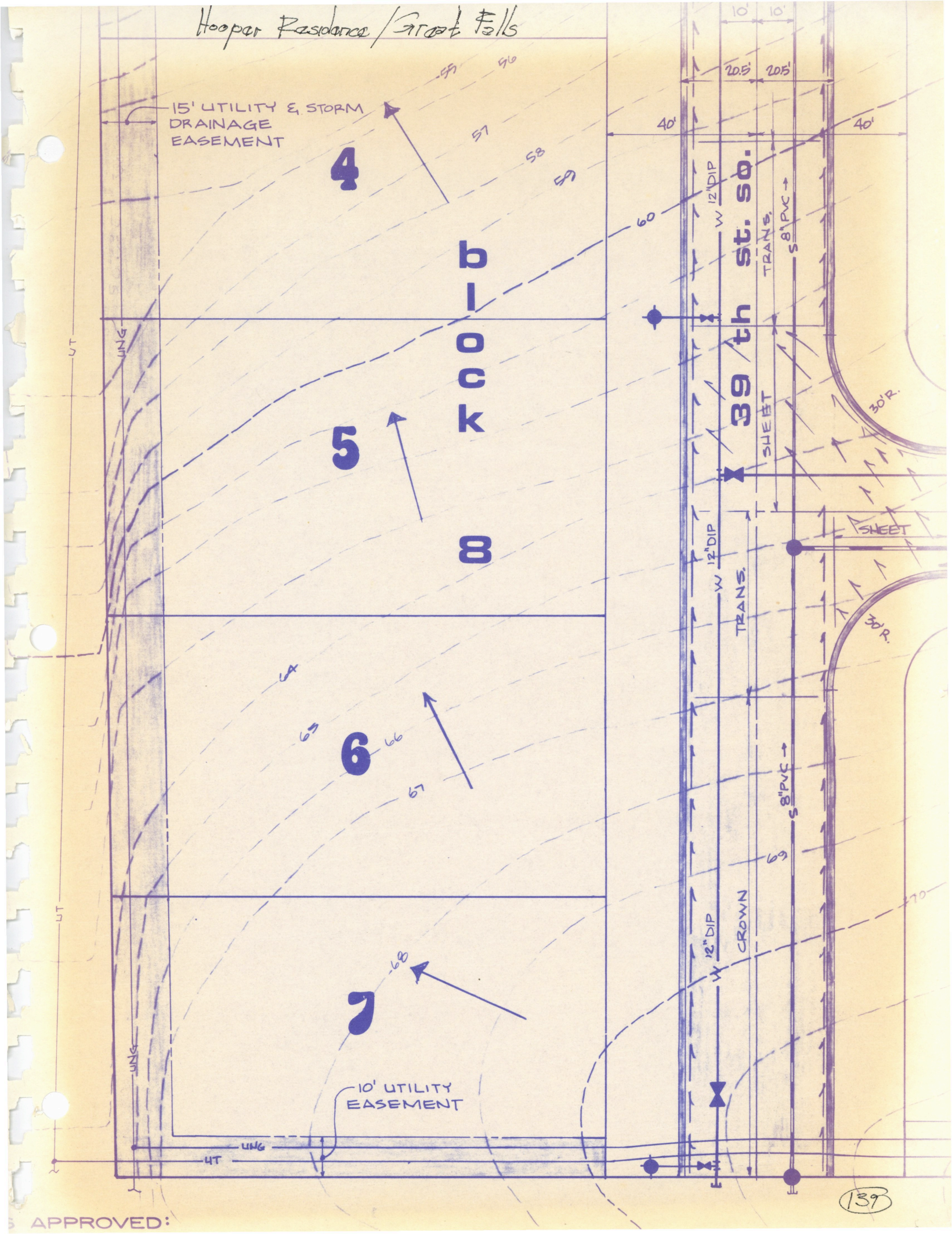
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A garage less than 1000 sq ft and 20' back from the front property line may have its outer wall not closer than 2' to the side property line.

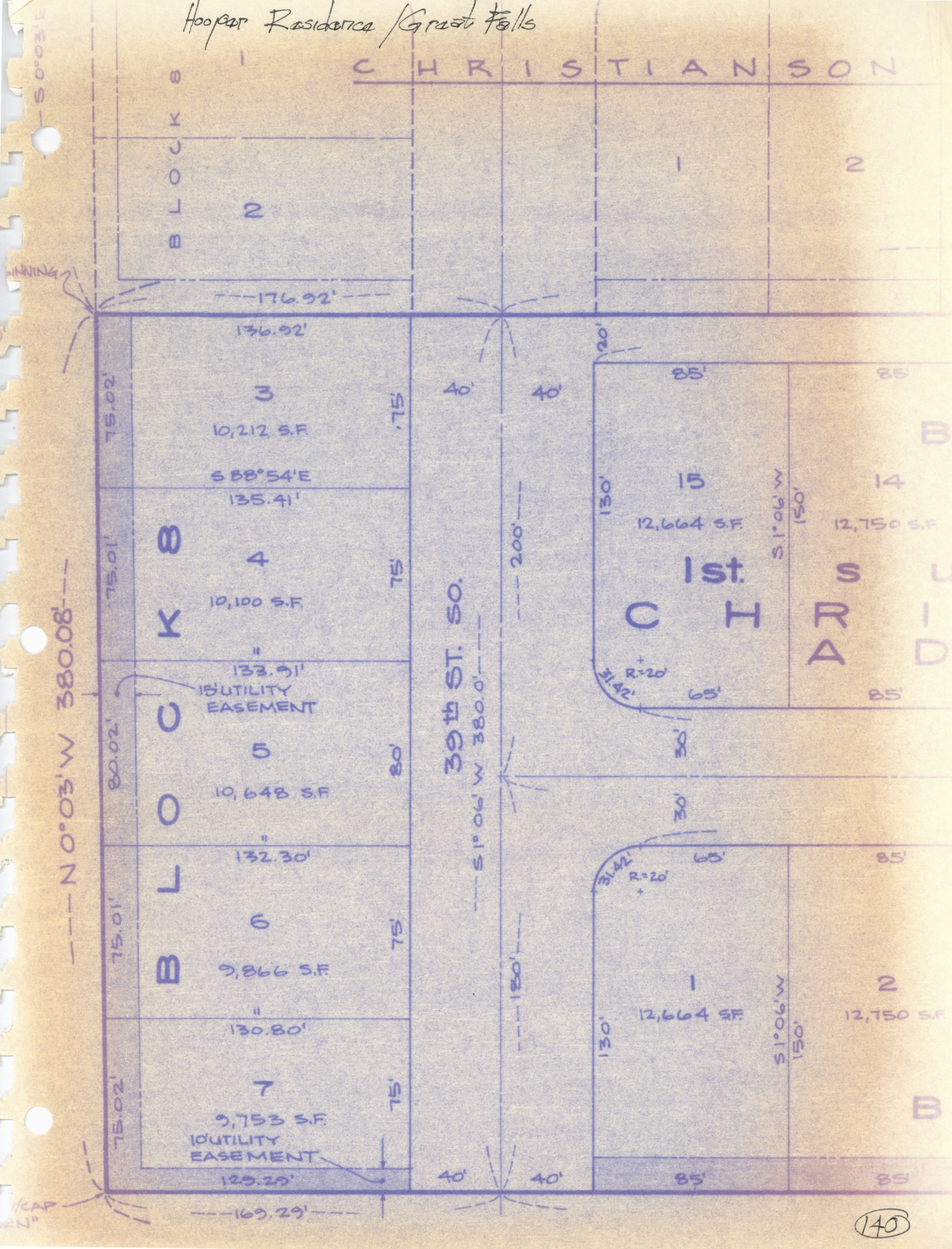
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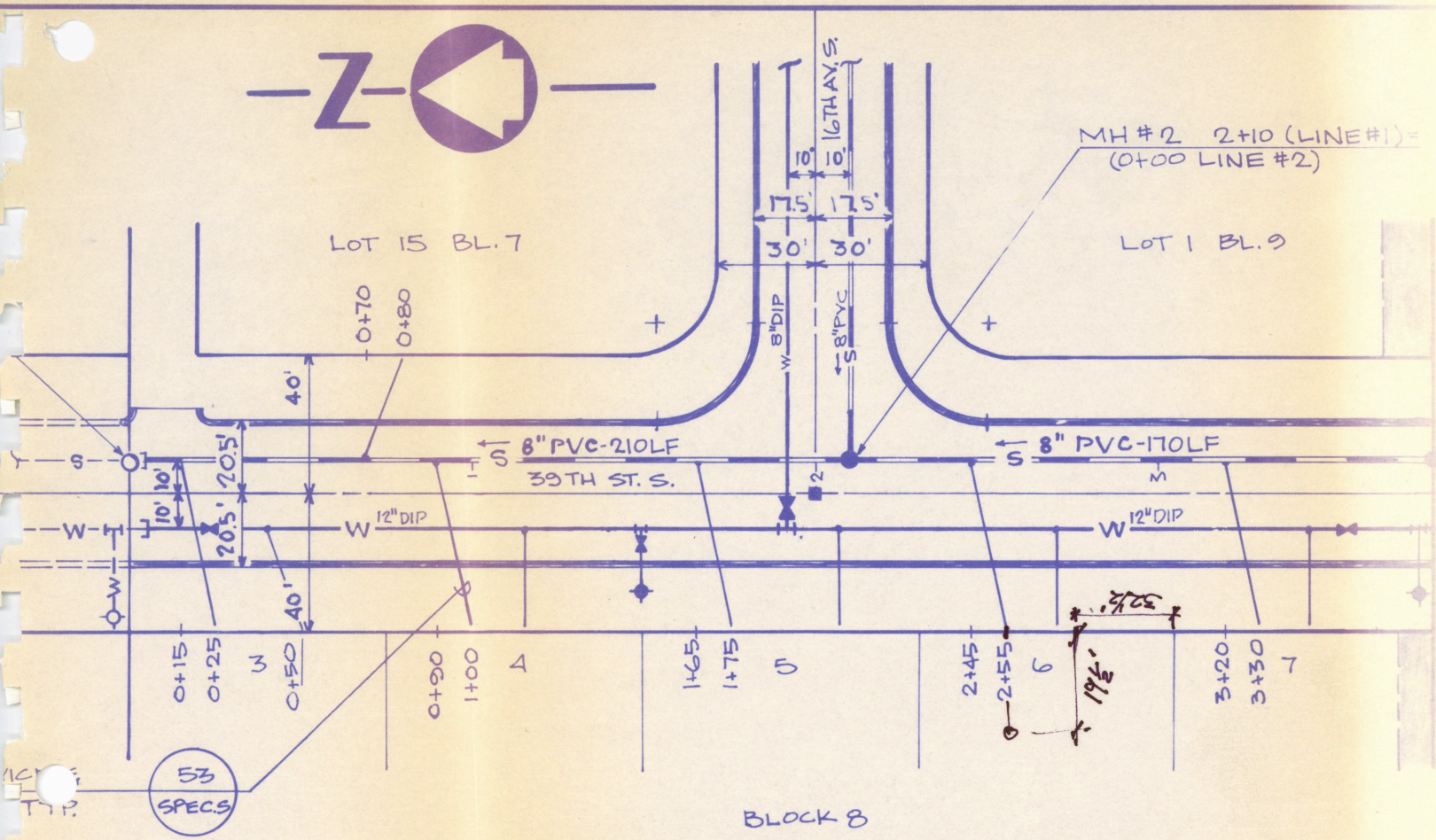



Hooper Residence / Great Falls
15' UTILITY & STORM DRAINAGE EASEMENT
4
5
6
7
block 8
39th st. so.
10'
10'
20.5'
20.5'
40'
40'
W 12"DIP
TRANS.
S 8"PVC
SHEET
30'R.
12"DIP
CROWN
10' UTILITY EASEMENT
UNG
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APPROVED:

Hooper Residence / Great Falls

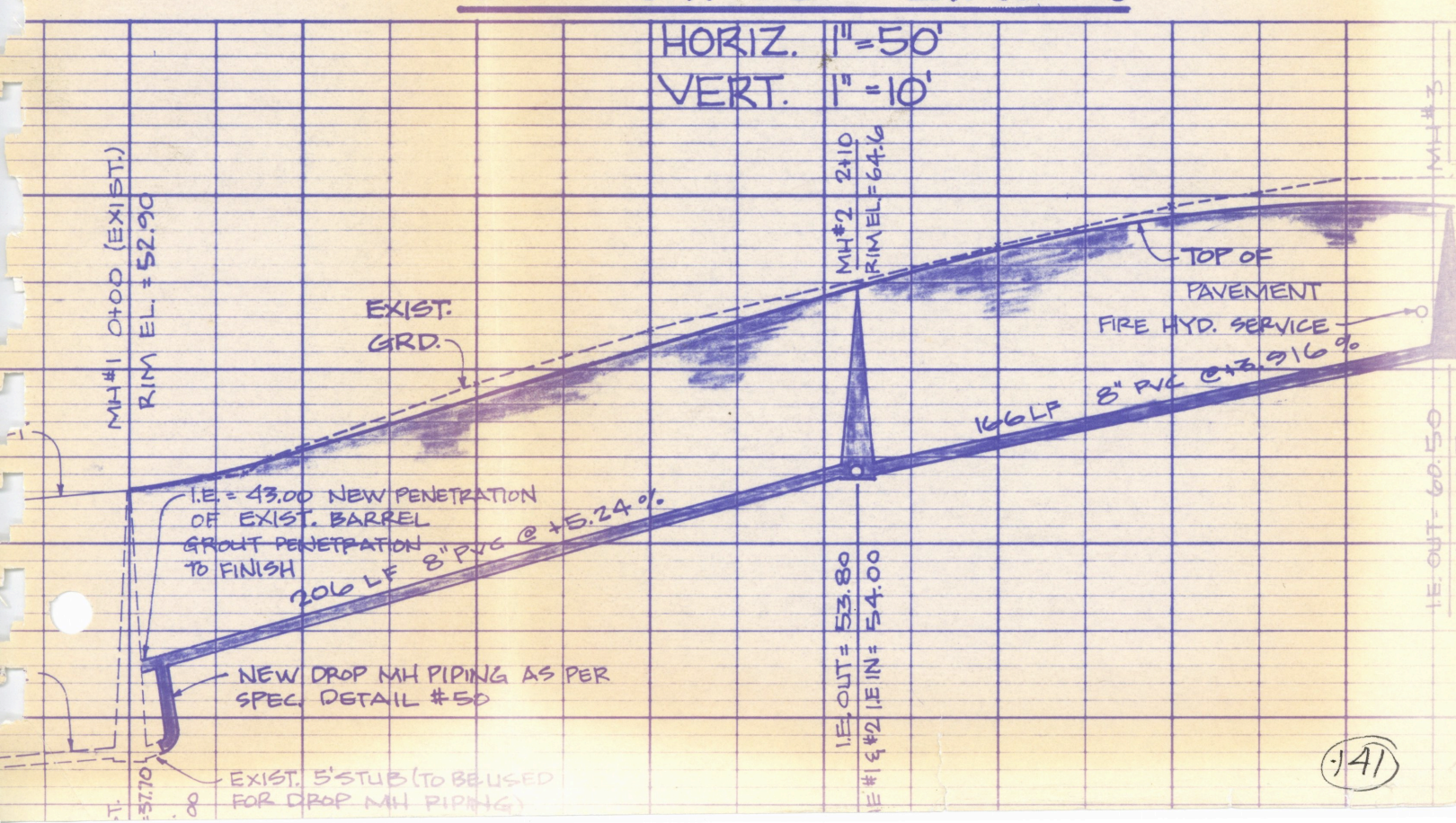




BLOCK 8

39TH ST. SO. - LINE #1

HORIZ. 1" = 50'
VERT. 1" = 10'



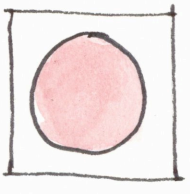
Estimate Sheet

Hommas residence

1st floor	1872 sq. ft	× $60.00	=	$112,320.00
2nd floor	1404 sq. ft	× $60.00	=	$84,240.00
Basement	1296 sq. ft	× $25.00	=	$32,400.00
	Total		=	$228,960.00

Hooper residence

1st floor	988 sq. ft	× $50.00	=	$49,400.00
2nd floor	420 sq. ft	× $50.00	=	$21,000.00
Basement	988 sq. ft	× $25.00	=	$24,700.00
Garage	768 sq. ft	× $30.00	=	$23,040.00
	Total		=	$118,140.00



Renaissance Theories

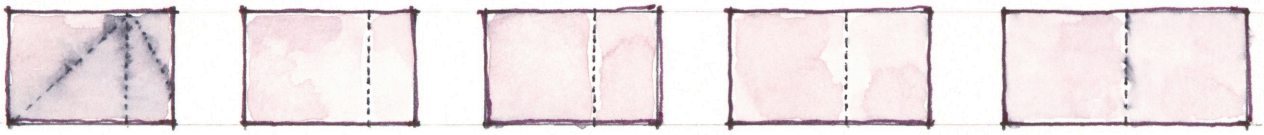
Renaissance architects believed their buildings belonged to a higher order of science and that all their interiors as well as exteriors had to be derived from the same system of Greek Mathmatical proportions.



Circle

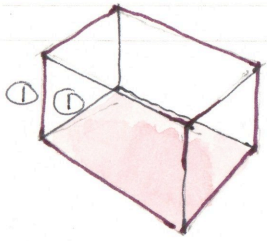


Square

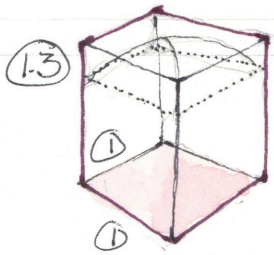


1:√2 3:4 2:3 3:5 1:2

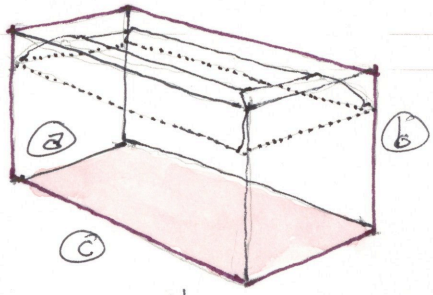
7 Ideal Plan Shapes (Andrea Palladio)



Rectangle w/flat ceiling (Arithmetic)



Square w/vault ceiling (Geometric)

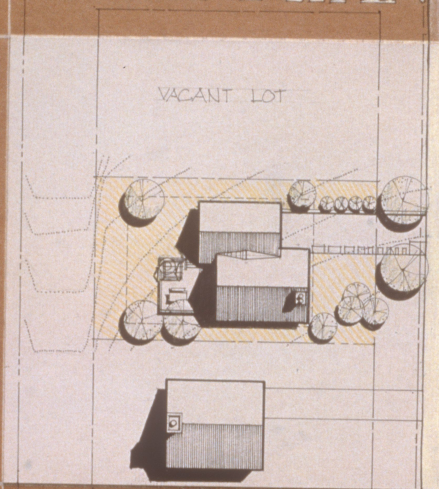


Other (Harmonic)

Determining Heights of Rooms

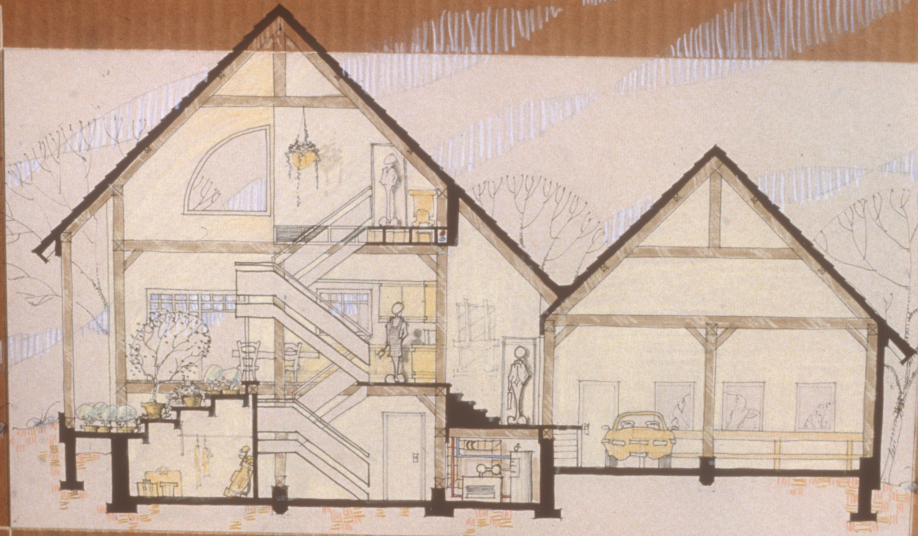
NOTEBOOK

SITE PLAN



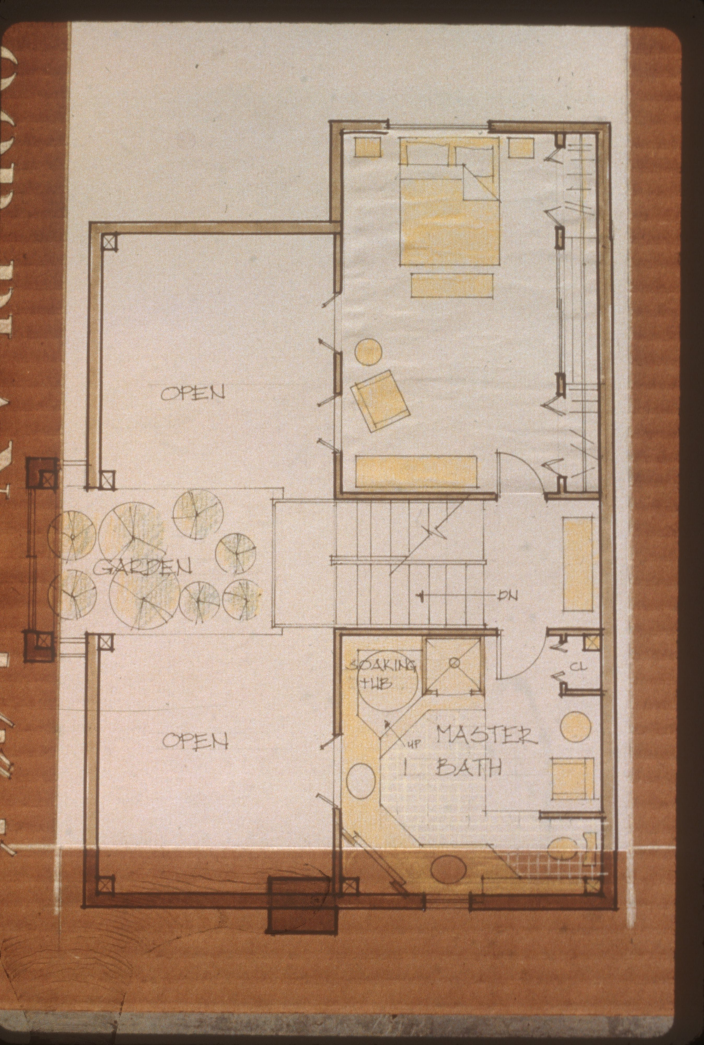
SCALE: 1"=30'

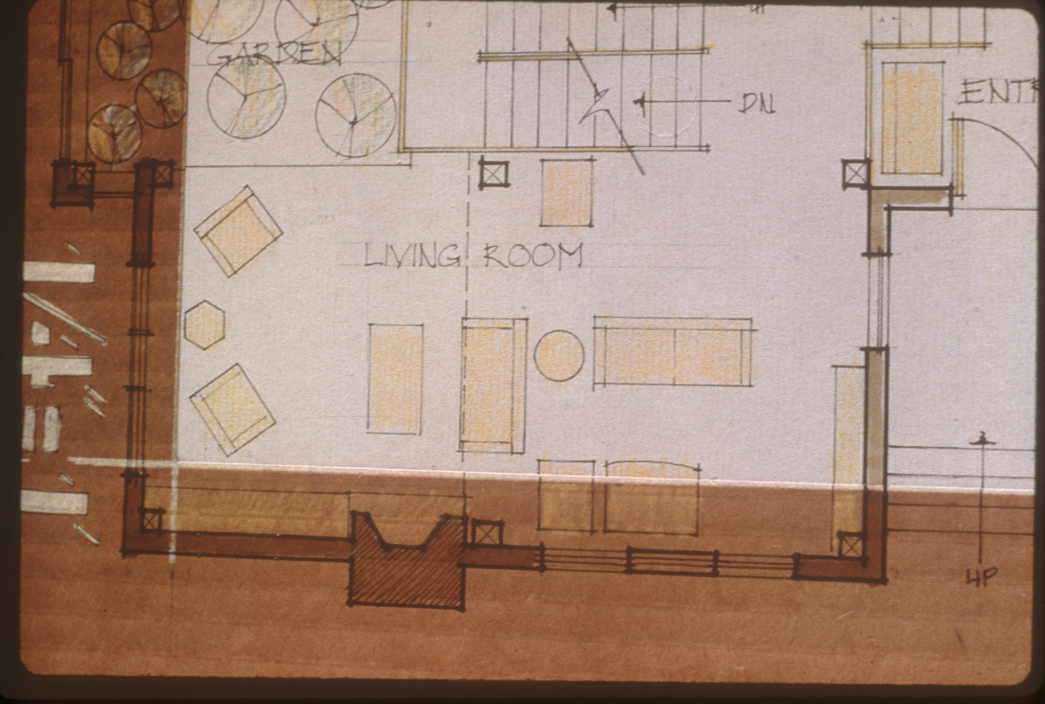


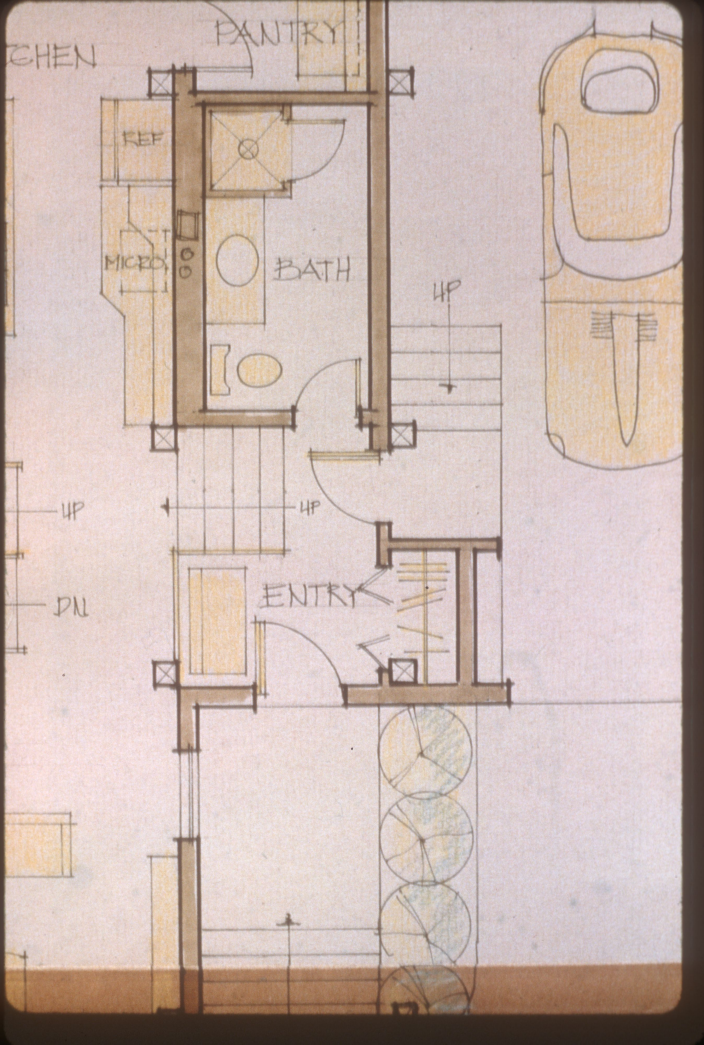


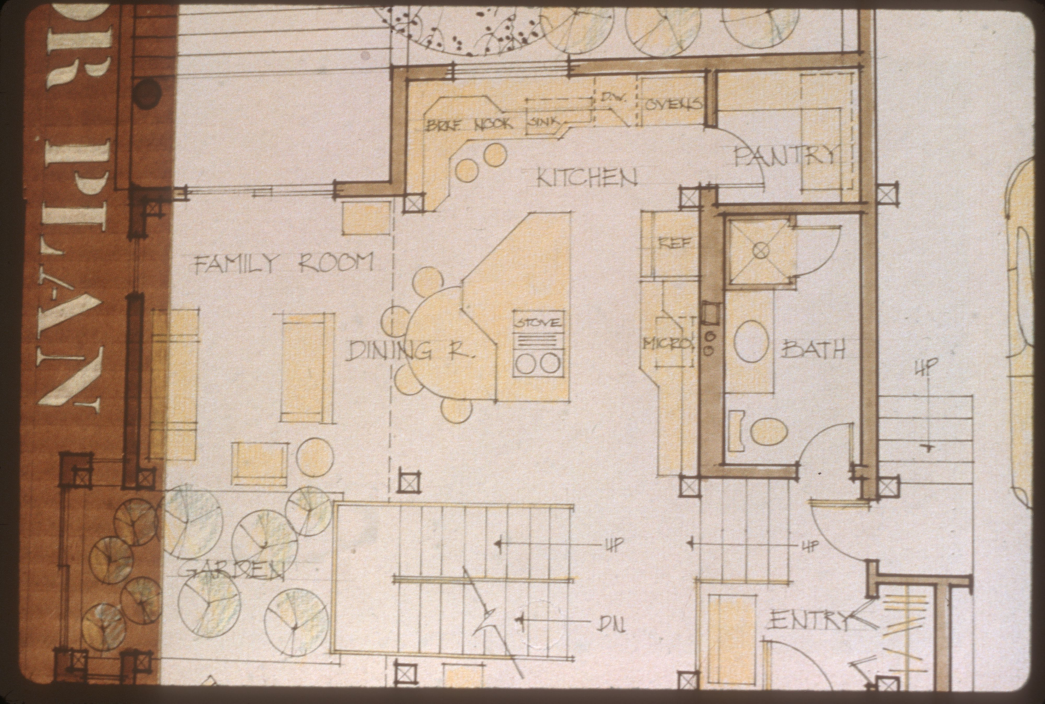
SECTION AA SCALE: 1/4" = 1'

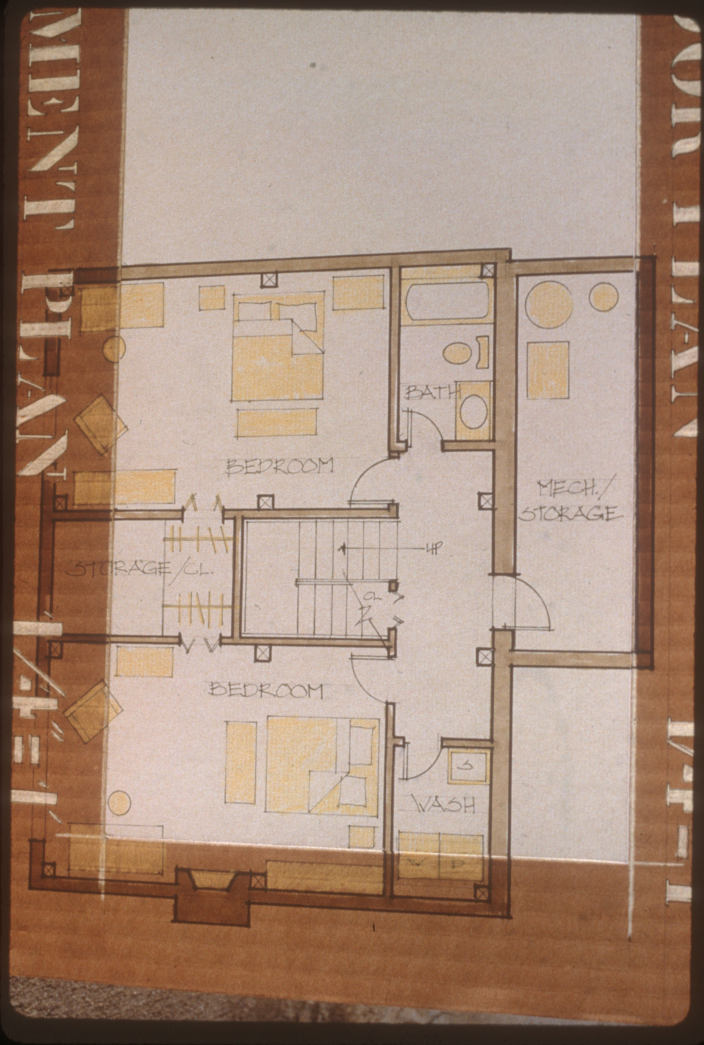



OPEN
GARDEN
OPEN
DN
SOAKING TUB
CL
MASTER BATH


GARDEN
DN
ENT
LIVING ROOM
HP


CHEN
PANTRY
REF
MICRO
BATH
UP
UP
UP
DN
ENTRY


R PLAN
BRKF. NOOK
SINK
DW.
OVENS
KITCHEN
PANTRY
FAMILY ROOM
REF.
STOVE
DINING R.
MICRO.
BATH
UP
GARDEN
UP
UP
DN
ENTRY


BEDROOM
BATH
MECH./
STORAGE
UP
STORAGE/CL.
BEDROOM
WASH

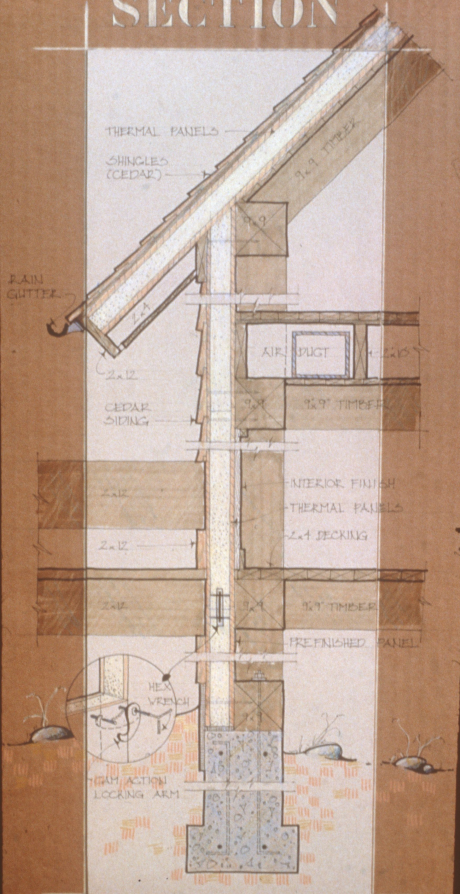






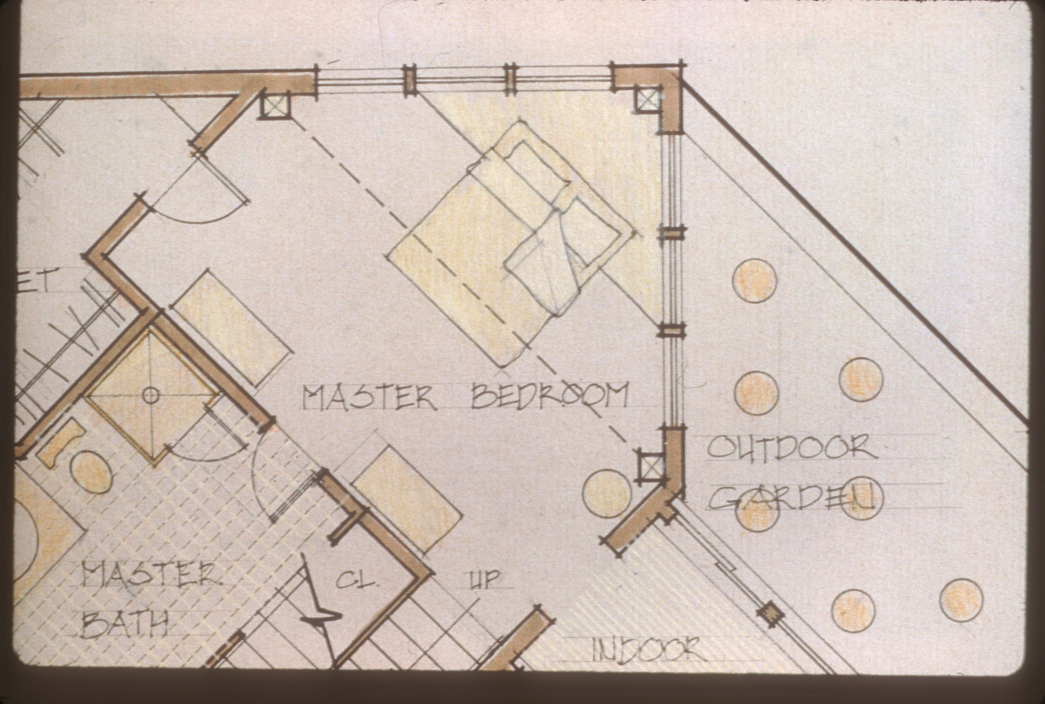


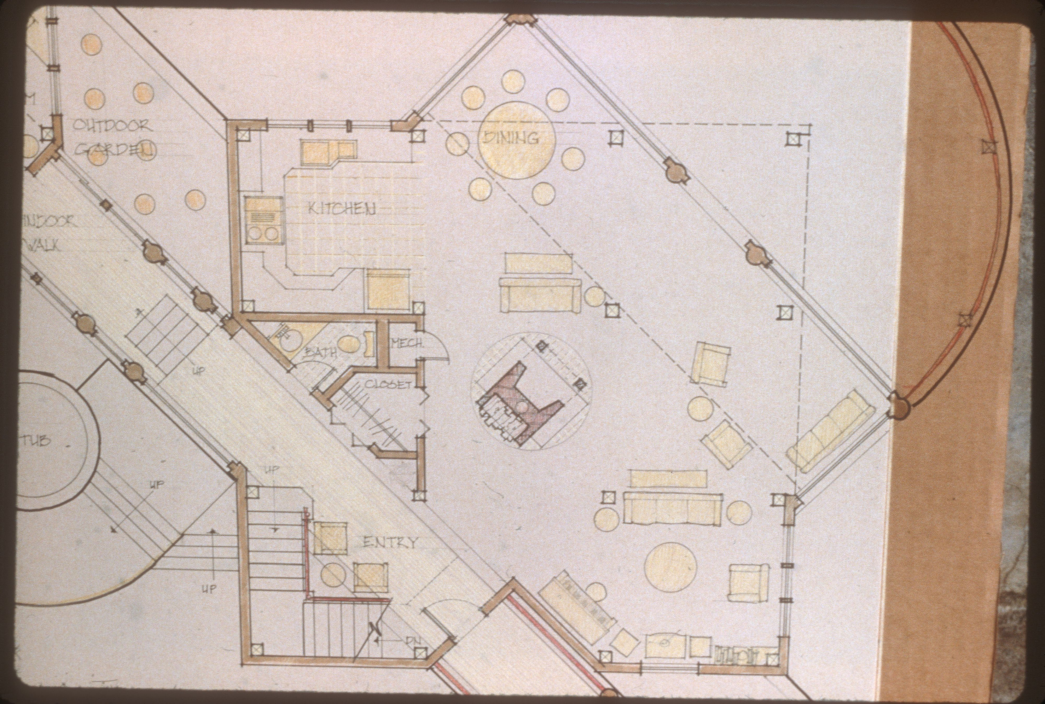
SECTION



SCALE: 1"=1.5'




MASTER BEDROOM
OUTDOOR
GARDEN
MASTER
BATH
CL.
UP
INDOOR


OUTDOOR
GARDEN
KITCHEN
DINING
BATH
MECH.
CLOSET
UP
UP
UP
UP
ENTRY
DN
TUB

OFFICE \ DEN

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