

ABSTRACT

Title of Thesis: PERFECTIBLE HOUSING

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Master of Architecture Post
Professional, 2004

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Housing is the basic problem of architecture. It is connected with its origin: the primitive shack.

Following the tradition of prefabrication, it is possible to think about new and alternative systems of construction, trying to generate rich and flexible spaces, which answer the changes and requirements of flexibility and adaptability in our society.

The project is about an exploration of the contrast between the possibilities of the prefabricated systems and the variety and changeability of our ways of life.

New technical solutions allow these new conceptions, creating a system capable of producing from single family houses to multiple story buildings, and attending different kind of aesthetic criteria.

PERFECTIBLE HOUSING

By

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Thesis submitted to the Faculty of the Graduate School of
the University of Maryland, College Park, in partial
fulfillment of the requirements for the degree of
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(Post Professional)
2004

Advisory Committee:
Professor Ralph Bennett, Chair
Professor Isabelle Gournay
Professor Amy Gardner

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PREFACE

- This project is about an exploration of the contrast between the possibilities of the prefabricated systems and the variety and changeability of our ways of life.
- This project is also a critique on the American Housing, which is nostalgic, decorated and complicated to excess.
- It is an objective social necessity to create better places to live. Looking to the traditional Mediterranean cities, this is a contradiction with continuous changes in the actual American way of life. My proposal is SIMPLE, and simply about FLEXIBILITY and ADAPTABILITY, looking for a PERFECTIBLE dwelling, which allows the house to be another living part of the group.
- The common elements of the system are: the prefabricated concrete structure and the vertical mechanical services. Circulations are possibilities of adaptation to different sites.
- The individual elements are the necessary for the definition of the private space and the mechanical services supporting it under the floor.

- The rest are options... It is possible to use the system in a mass market environment or in an experimental way.

DEDICATION

To my family.

ACKNOWLEDGEMENTS

To the Fundación Pedro Barrié de la Maza and the A Coruña School of Architecture for the opportunity of coming here.

TABLE OF CONTENTS

PREFACE	ii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
01 ARCHITECTURE, DWELL AND THE PRIMITIVE SHACK	01
01.01 ARCHITECTURE	02
01.02 THE DWELL AND THE PRIMITIVE SHACK	02
02 "MODERN" HOUSES. PRECEDENTS AND EXAMPLES	06
02.01 MODERN HOMES	14
02.02 AMERICAN SYSTEM BUILT HOUSES	20
02.03 THE GROWING HOUSE	22
02.04 THE PACKAGED HOUSE	24
02.05 VILLIGER HOUSE	31
02.06 SYSTEM "PORTIQUE"	33
02.07 CASE STUDY HOUSE #8	36
02.08 QUARTIERS MODERNES FRUGES, QMF	39
02.09 THE ELASTIC STANDARDISATION OF ALVAR AALTO	42
02.10 VARELA HOUSE	46
02.11 AH HOUSES	49
02.12 MODULI 225	55
03 WHAT IS FLEXIBILITY?	62
03.01 50 BY 50 HOUSE	68
03.02 EXPERIMENTAL HOUSE	69
03.03 GASPAR HOUSE	70
03.04 HAUS GELLER II	71
03.05 HOUSE OVER THE BROOK	72
03.06 MAGNEY HOUSE	73
03.07 MOORE HOUSE	74
03.08 ROTHMAN APARTMENT	75
03.09 STUDIO	76
03.10 VILLA WAVI	77
04 NEW REALITIES	77
04.01 PROGRAMATIC ASPECTS	78
04.02 PROJECT AND TECHNIQUE	80
05 PERFECTIBLE DWELLING	84
06 FURNITURE HOUSE	89
06.01 REFERENCES	89

07	PROPOSAL	95
07.01	THE COMMON COMPONENTS	95
07.02	THE SUPPORT OF THE RAISED FLOOR	96
07.03	THE DEFINITION OF THE PRIVATE SPACE	97
07.04	THE POSSIBILITIES	98
08	GRAPHIC DOCUMENTATION	
	BASIC COMPONENTS	99
	STRUCTURAL COMPONENTS	100
	CIRCULATIONS	101
	INTERIOR COMPONENTS	102
	TRANSVERSAL SECTION	103
	PLANS	104
	PLANS	105
	PLANS	106
	VARIABILITY. ELEVATION	107
	ROW HOUSES 3	108
	ROW HOUSES 2	109
	ROW HOUSES 1	110
	SINGLE FAMILY HOUSE	111
	PARKING	112
	VIEWS	
	BETHESDA PARK. ROCKVILLE. MD	113
	BETHESDA PARK v01	114
	BETHESDA PARK v02	115
	BETHESDA PARK v03	116
	BETHESDA PARK v04	117
	A MARINA. A CORUÑA. SPAIN	118
	STREET IN MOROCCO	119
	STREET IN VIETNAM	120
	EXTERNAL CORRIDOR	121
	TOWNHOUSES. BETHESDA. MD	122
09	BIBLIOGRAPHY	123

1.1 ARCHITECTURE

The men are on the earth to dwell it. The philosopher Martin Heidegger says: "*The way in which you are and I am, the manner in which we humans are on the earth, is baun, dwelling. To be a human being means to be on the earth as a mortal. It means to dwell*"¹.

The earth in natural state is not dweller. The men need a second skin to make a protection. A place where they can be comfortable, safe and which give them the pleasure of life. The second skin is the Architecture.

Architecture is a word with different meanings. Architect comes to Greece arkhitékton, árkho "I am the first" and tékton "builder". The first builder is then one of the meanings of the architecture. But this meaning is not very near to today's reality. The architect projects, invents and in some cases makes and idealization. Other meaning is the reference of a product. The reference to an architect or style on the way of project or on the way of

¹ Basic writings. *Building Dwelling Thinking*. Martin Heidegger, Harper and Row N.Y., p. 325.

build is called architecture also (Wright architecture, Mies architecture). The last meaning is the knowledge, social and historic to thing, to project and to build spaces (the Greek architecture, the North American architecture in the 1900s) The historic time and place are necessary for the architecture.

The word architecture has three different meanings: Architecture: the discipline, the art of think, project and build spaces.

Architecture: the activity or way to do the buildings.

Architecture: the product, both, a building or group of buildings.

Today, there are more different meanings like "the computer architecture" or the way in which writers and poets use the word.

1.2 THE DWELL AND THE PRIMITIVE SHACK

The men was been defined like builder of objects. S.Freud said "*the first cultural facts (made for the men) were the tools use, the fire and the rooms constructions*"²

² S. Freud, *El malestar en la cultura..* Alianza editorial, p. 34.

The relation between men and object which habit is a complex relation. The men use the architectonical space on the only possible way using them. The house is like the men who use it, with their frustrations, their habits and their dreams. The house is a joint with order of materials, volumes, holes and surfaces.

The primitive shack is an invention built with branch. Constructions which satisfy the necessity of refuge, and which form do not have other objective more than this.

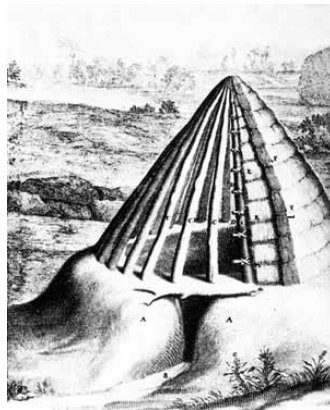
The primitive shack is the first example of technical form. The structure supports the rustically form of elements which satisfy the function of support. Then, the technical form of the construction, the form of the shack, is that which finds its reason only in the fact of built and finish in this fact.

The next three examples show different ways of understand the primitive shack:



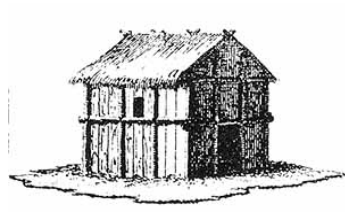
The architecture
personification and the
primitive hut. Laugier
1753.

The necessity of refuge.
The position of the branch
is the primordial meaning
in the Laugier primitive
hut. The origin that
Laugier represents is more
the origin of the
construction than the
origin of the architecture.
It seems impossible to
habit in his primitive
shack.



The primitive shack by
Claude Perrault following
Vitruvius's description.

Vitruvius primitive hut
shows the building process
and it is possible to image
the final result.



The primitive hut and the
order originated by
Milizia.

The finished building in
which you can suppose the
process of construction is
showed by Milizia

2 "MODERN" HOUSES. PRECEDENTS AND EXAMPLES.

Historically, a consistent pattern of socio-cultural and climatic demands has emerged, for which solutions to the problem of housing have been realized. The rationalization of the building process can be found in any situation where, for whatever reasons, flexibility in component parts, ease of transportation and economic optimization are desired.

The importance of these considerations can be historically and internationally applied, as the recent discovery of complete prefabricated Roman stonework system elements -described by Pliny- on shipwreck off the North African coast shows³. There are other examples: accommodation imported by European settlers to the new world, tropical houses in the colonial age, kit houses for earthquake zones...and some exquisite examples from the architects of the Modern Movement.

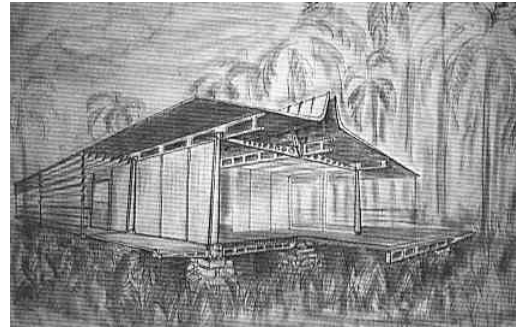
However, these examples remain within the realm of experiment and often led to nothing more than a prototype.

Long before "named" architects were interested with these topics, the manufacturing world had utilized the potential of industrialized production to establish a range of standardized houses.

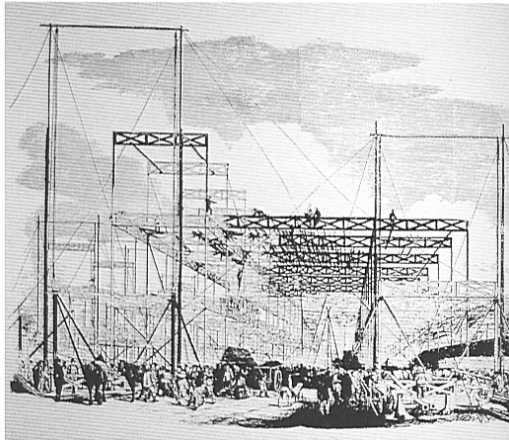
³ Stiller, A. *La casa como artículo. El camino hacia la producción.* A+T 10, p.34. A+T Ediciones. Vitoria. Spain. 1997



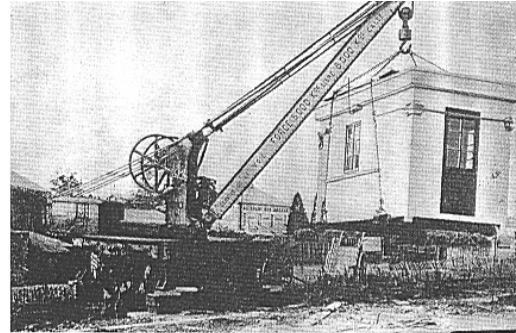
Demountable timber house in the tropics 19th century.



Maison tropicale. Jean Prouvé 1949. The volume-weight relationship was conceived for air transport.



Crystal Palace, London 1851. Montage process.



The unloading of a Hennebique-house. 1896

The most important steps were made at the beginning of the 19th century in the leading industrial nations: Great Britain, France and the USA. The social changes and the miserable living conditions in the cities, caused by industrialization, provided the intellectual material for the Modern Movement architects.

There were only a few attempts at industrial construction methods in timber, based in "pre-cut systems", consisting of a limited range of finished sections which are offered in packets for individual house types. An example is the firm Skillings and Flint. In 1861, they applied for a patent for a system of kit-houses built from standard panels and interchangeable components.

There were also experimental advance in concrete construction methods. In 1886, Hennebique built complete prefabricated houses. In contrast to other attempts, the cement industry limited itself to the production of components while the traditions in construction were retained. Peter Behrens had an experience about large format concrete blocks for a residential project for an AEG housing project. He said "...has already begun, with the industrialization of the building components must be tackled far more extensively..."⁴

Walter Gropius, who one of his major preoccupations was with the ideal of the prefabricated house, probably formulated his thoughts while working in Behren's office. He presented a "Programme for the Foundation of a Company

⁴ Behrens P. P./de Fries, H.: Vom Sparsamen Bauen, Berlin 1918 p.59

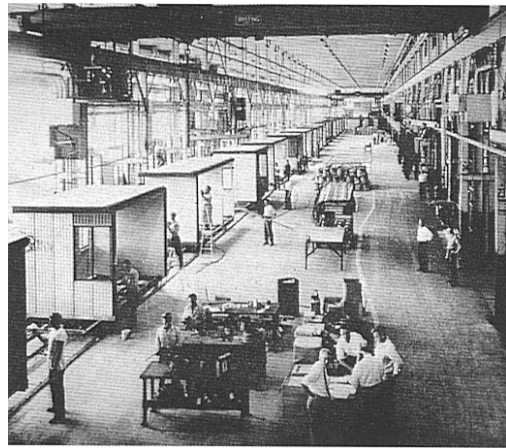
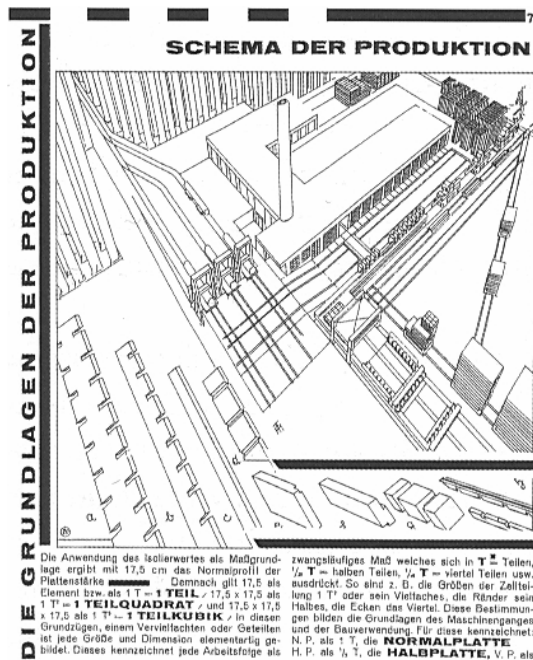
for Prefabricated Building Elements"⁵ The influence of Americanism [Taylor and Ford] can not be disregarded⁶

In common with Gropius' ideas, the Tyrolian architect Hans Fritz, in his Mathmah Building System, solved some of these contradictions. The system is a Mathematically ordered, Machine-produced, Hollow building element system was envisaged as a part of a large scale building block system. It was described by Fritz: "The Mathmah System is a machine-made building method, typified by the materials and the building work, but consistent in its construction form and therefore its individuality. Uninterrupted construction would be possible, and savings of up 50 per cent could result, -compared to building in brickwork".⁷

⁵ Wohnungswirtschaft, Heft 19, Berlin 1924.

⁶ Nerdinger, W.: Walter Gropius. De L'americanisme au nouveau monde. In J.L. Cohen/H.Damisch.: Americanisme et modernite: Flammarion, Paris. 1993 p.152

⁷ Fritz, H. Mahatma Bausystem, advertising brochure. The system was displayed in the catalogue of the Werkbundaussstellung in Stuttgart in 1927.



Advertising brochure for the Mathmah Bausystem.⁸ View of a production line.⁹

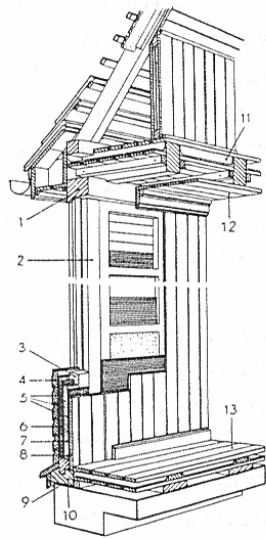
In Germany, the work of the firm Christoph and Unmack, was another one influence. They began as manufacturers of prefabricated wall elements¹⁰, and went on to become the largest in the European timber house industry. The named of the architect Konrad Wachsmann gave them fame¹¹.

⁸ Sources of illustrations: A+T 10, p.37-39. A+T Ediciones. Vitoria. Spain. 1997

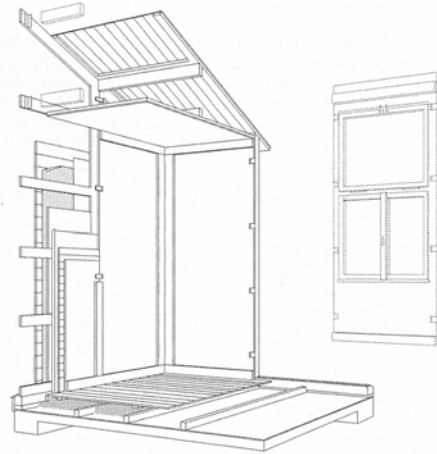
⁹ Ibid..

¹⁰ These firm won the first prize in the first international competition for prefabricated building in 1885, the Lazarettbaracken, with a prefabricated system. The competition was sponsored by the Red Cross.

¹¹ K. Wachsmann was employed as a draughtsman by Christoph and Unmack at the recommendation of Poelzig, and quickly became head architect (1926-29). His later proposals for the General Panel Corp. are based in his experience with the company.



Catalogue house construction, Christoph and Unmack.¹²



K. Wachsmann, head architect at Christoph & Unmack, improved panel construction.¹³

In Austria, between the war times, some anonymous standard house types were produced by Böhler, Vogel and Noot, in steel and Kawafag and Wenzl Hartl, in timber.

After the European experiences, the interest spread to the USA. As a consequence of the war and the economical situation, the movement in the Forties was expanded exponentially. The California Gold Rush passed and the necessities were different. Remember that Sears, Aladdin, and other similar companies in the United States were enjoying moderate success with the sales of their kit

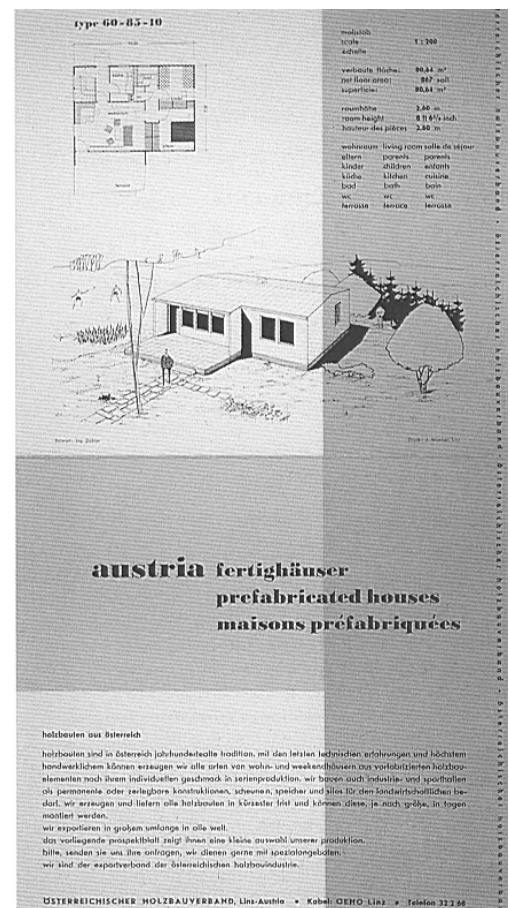
¹² Ibíd..7

¹³ Ibíd..7

houses and saw no reason to embrace the industrial aesthetic of the internationalist. They didn't have to. Prefabrication was steadily making its way into the larger popular consciousness and culture. Buster Keaton, for example, starred in a short film about building a prefab house. In *One Week* (1921), he and his new bride proudly set about the business of building their dream house -a prefabricated house with puzzling instructions. The Federal Housing Administration supported the movement by imposing new standards and regulations, assessing new products in report form and by offering consumers a guarantee for minimum quality as well as basis for comparison. Day by day, the demand increased, and in 1948, there were 280 manufacturers, and the 25 percent of houses built were prefabricated.



The movement, due to the American military presence, was influence in Europe -especially Germany and Austria-. There were expositions, publications, associations... but despite marketing and information campaigns there were no successful break-through for the "kit house product". Even today, this success appears modest.¹⁵



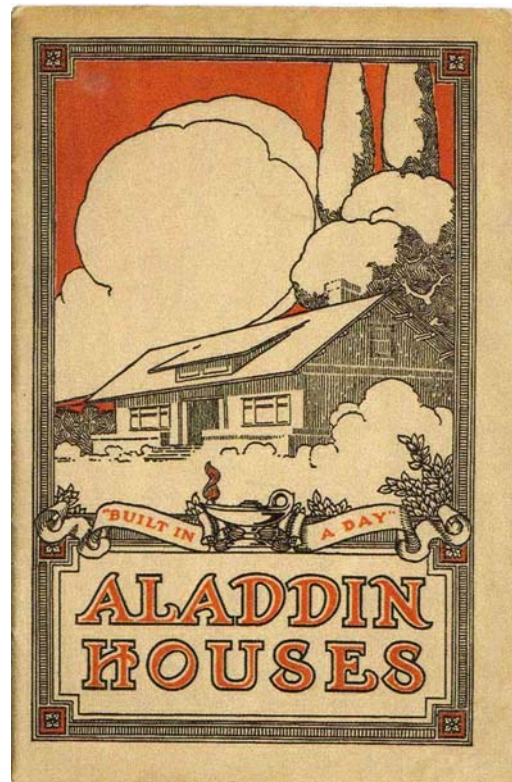
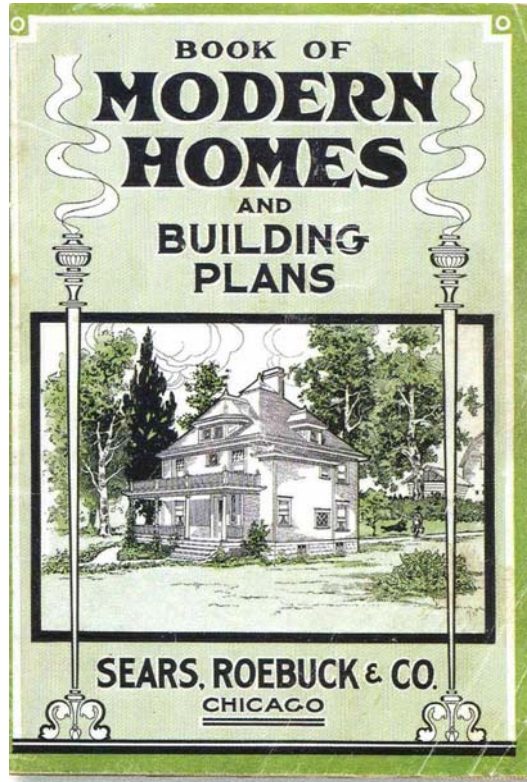
Austrian's book and magazine.
Around 1950.¹⁶

¹⁵ Siller, A. *La casa como artículo. El camino hacia la producción*. A+T 10 1997, p.34. A+T Ediciones. Vitoria España.

¹⁶ Ibíd., p.39

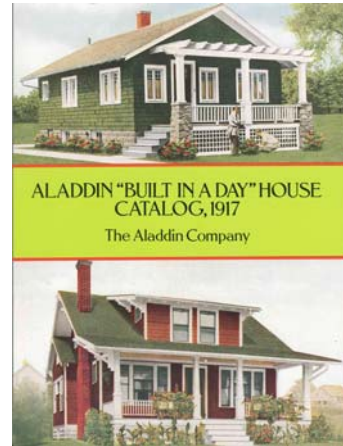
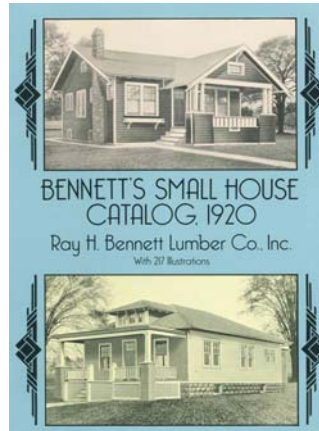
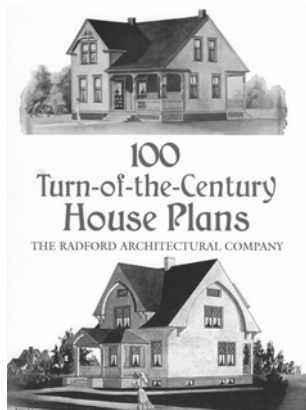
The house as article. Some representative examples to this aspect of architectural history follow:

2.1 "MODERN HOMES" Sears, Roebuck & Co, Aladdin Houses,...
The term "Modern Home" was part of the vernacular in the early 1900s. It was a descriptive term indicating that a house had modern amenities (that we take for granted today), such as a primitive centralized heating system, electricity..."¹⁷



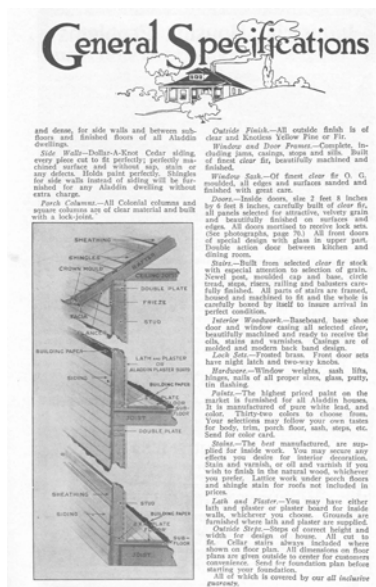
Sears, Roebuck & Co, and Aladdin, were probably the most important companies.

¹⁷ Thornton, R. *The Houses that Sears Built*, p.6 Gentle Beam Publications, Alton Illinois. 2002



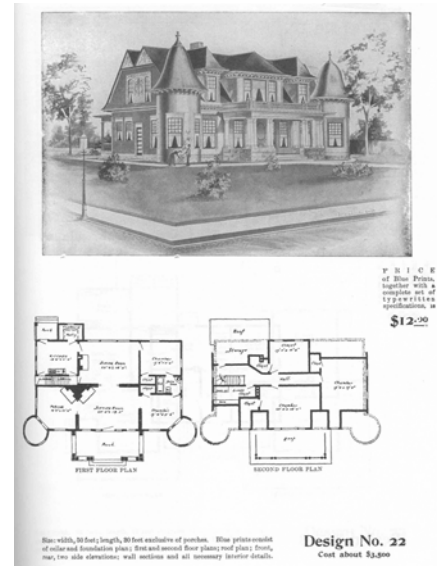
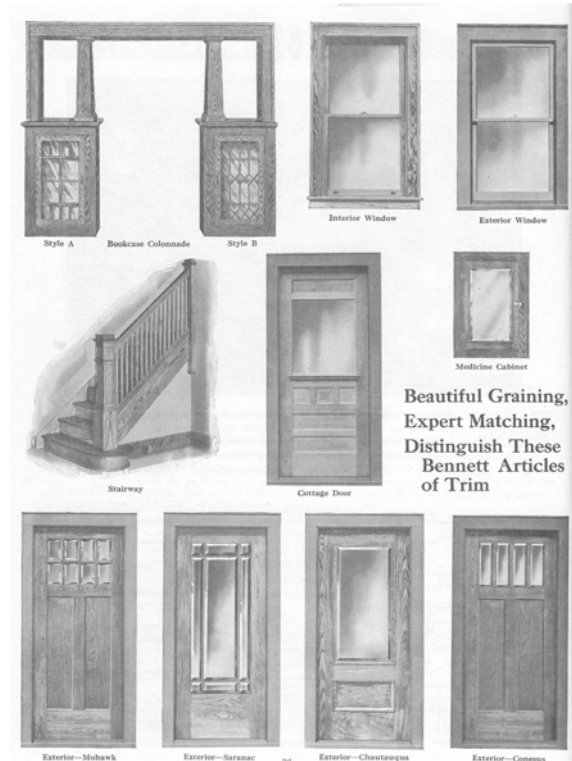
Other catalogues

The concept of "owing a home" was everyone's dream at the turn of the century, but financially, that dream was out of reach for many families. Houses by mail, was a brilliant idea which let hundreds of thousands of Americans buy a house, being the process affordable and attainable for the masses. (do-it-yourself factor, "easy pay" mortgages and "fog a mirror" loan qualification process)¹⁸



¹⁸ Ibid., p. 7

General specifications.¹⁹ 20



Specifications²¹

example

The process was very simple, because the buyer could "hang his saw on a nail all day", which was the hardest work in a non pre-cut system. (for example, the lumber list for Sear's Modern Home #111 was 380 20-foot 2x4s)²², and the "by mail house" was finish in a half carpentry hours than a traditional house, because "you only need a hammer and nails to put up the framework of your house"

It is obvious that these kind of manufactured houses did not introduced new aesthetic concepts, but they developed

¹⁹ The Aladin Company. *Aladin "Built in a Day" House. Catalog, 1917*, Dover Publications, NY, 1995. p.13

²⁰ Ray H. Bennet Lumber Co., Inc. *Bennet's Small House Catalog, 1920*. Dover Publications. NY 1993. p.07

²¹ Ray H. Bennet Lumber Co., Inc. *Bennet's Small House Catalog, 1920*. Dover Publications. NY 1993. p.36

²² *Ibíd.*, p. 7

a new concept of living, taking in consideration the new Americans necessities and wishes: "... compact, simple, affordable home and they welcomed the opportunity to build their own small comfortable home on the lot of their choice"²³



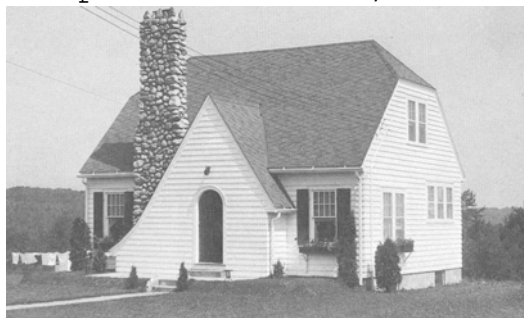
Page of the catalogue and photograph of the real construction.²⁴

²³ Ibid., p.9

²⁴ Stevenson and Ward, *Houses by mail*, Wiley and Sons. NY. 1986. p.13,185



Example. Takoma Park, MD²⁵



Example. The Dover.
Kiamesha Ln. NY²⁶



The Aterboro St. College
Park, MD²⁷

²⁵ Stevenson and Ward, *Houses by mail*, Wiley and Sons. NY. 1986. p.8

²⁶ *Ibíd.*, p. 11



The Westly. Washington DC²⁸



The Maywood. Washington DC²⁹

catalog.

A GLIMPSE OF OUR SHOWS HOW MASS PRODUCTION



Modern machinery is used on every operation in the preparation of your modern home.

THE buzzing of giant electric machines, the screech of electric spoke-like lumber carriers with four run tracks wending their way through the plant around millions of feet of sawed lumber, the whistle of electric cranes as they raise an entire load of lumber from storage sheds to waiting automobile trucks.

That, briefly, tells the story of our factory activities. If you could walk through our great factories, you would see this picture many times. You would see many trained men working with the most modern machinery to produce the maximum result with the minimum amount of labor.

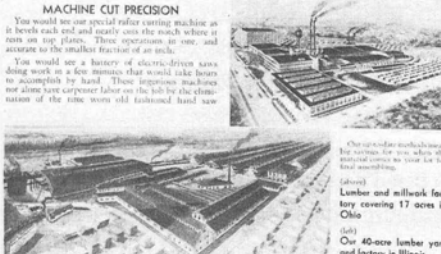
MACHINE CUT PRECISION

You would see our special roller cutting machine as it bevels each end and neatly cuts the notch where it runs on trestle plates. These operations are done, and accurate to the smallest fraction of an inch.

You would see a battery of electric-driven saws doing work in a few minutes that would take hours to accomplish by hand. These important machines not alone save carpenter labor on the job by the elimination of the time worn old fashioned hand saw method, but there is a saving of about 10 percent in wasted lumber.

In one factory alone, you would see the lumber carriers, each capable of picking up four tons of lumber, haul it away at a speed of about twenty miles an hour and place it where needed.

This is the age of modern efficiency. No longer can human hands compete with machine precision and production. Speed with accuracy is the watchword in our department of our great factories.



Our complete modernization has carried us far into the present century so you can find the most modern.

(above)
Lumber and millwork factory covering 17 acres in Ohio

(left)
Our 40-acre lumber yard and factory in Illinois

OWN FACTORIES SAVES YOU TIME AND MONEY



NO OTHER home dealer can begin to show you the facilities which are ours. No other concern can afford to season lumber as we do. You "own the value of "top to grade," well-seasoned lumber against "green." You know the investment it would represent to more millions of feet of well-seasoned lumber is ready—really ready for use.

AS LARGE AS 70 LUMBER YARDS

In one building at our 40-acre plant at Port Newark, N. J., a giant dirigible balloon could safely be housed. Our total yard capacity is over 14,000,000 feet of lumber—as much as would ordinarily be carried by seventy retail yards.

In every detail, our large buying power and factory efficiency economies which lower the cost to you. We send you material that is unsurpassed anywhere. We guarantee quality and quantity. Compare our facilities and our quality with any concern in the world then compare the savings we offer you.



Our largest exclusive Home factory, located at Port Newark, N. J.

Page of the Calalogue. Mass production process, saves time and money.³⁰

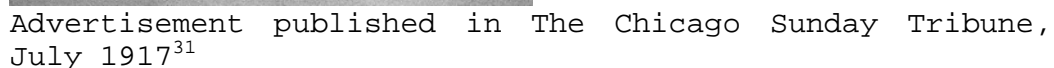
²⁷ Ibid., p. 14

²⁸ Ibid., p.41

²⁹ Ibid., p.42

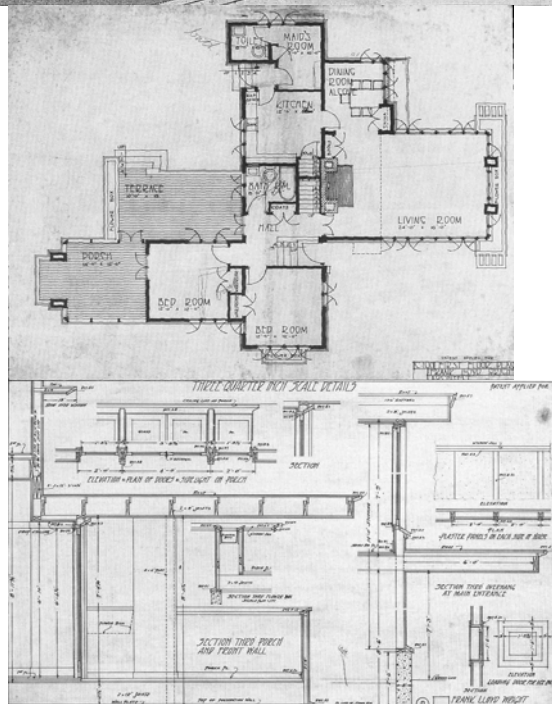
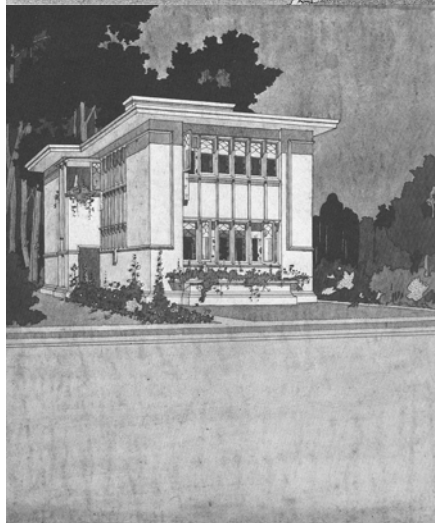
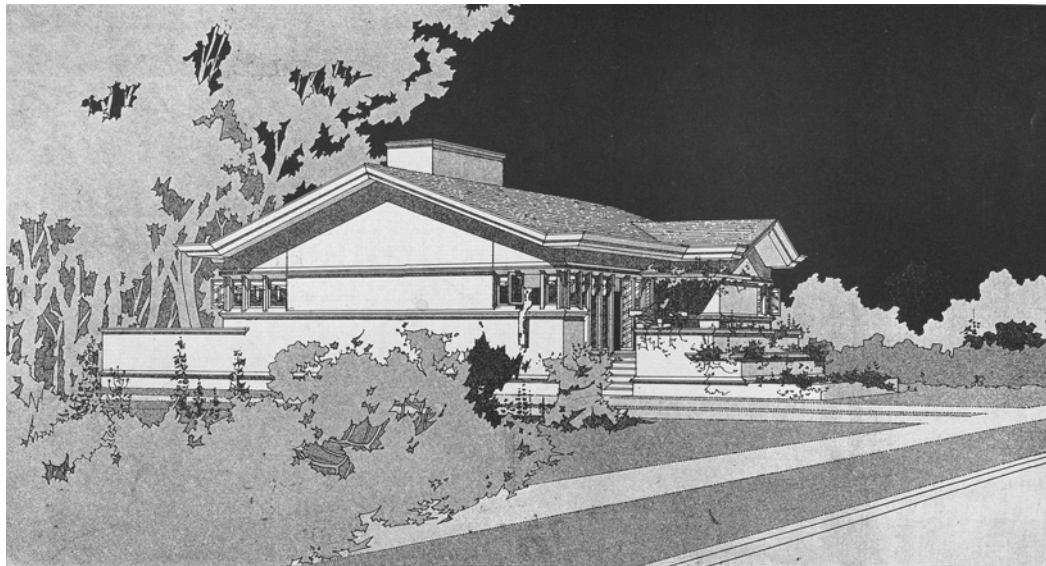
³⁰ Ibid., p.21

Thoughts that the lower budget end of housing in the USA could be realized through the use of industrialization and prefabrication were tangibly pursued by Frank Lloyd Wright from 1911 until 1917. The significance he attached to his explorations - commissioned by the firm of one of his clients, Arthur L. Richards- can be guessed at from the nine hundred drawings that exist. It is the largest collection, with an enormous number of variations developed.



20

Frank Lloyd Wright's idea was not to design a home that would be reproduced countless times, in rows of repetitive boxes, but to make such a variety as was possible by the aid of the machine. Independent of size, floor plan schematic or elevations, all prefabricated elements were so conceived to fulfill the conditions of all developed "type variations".

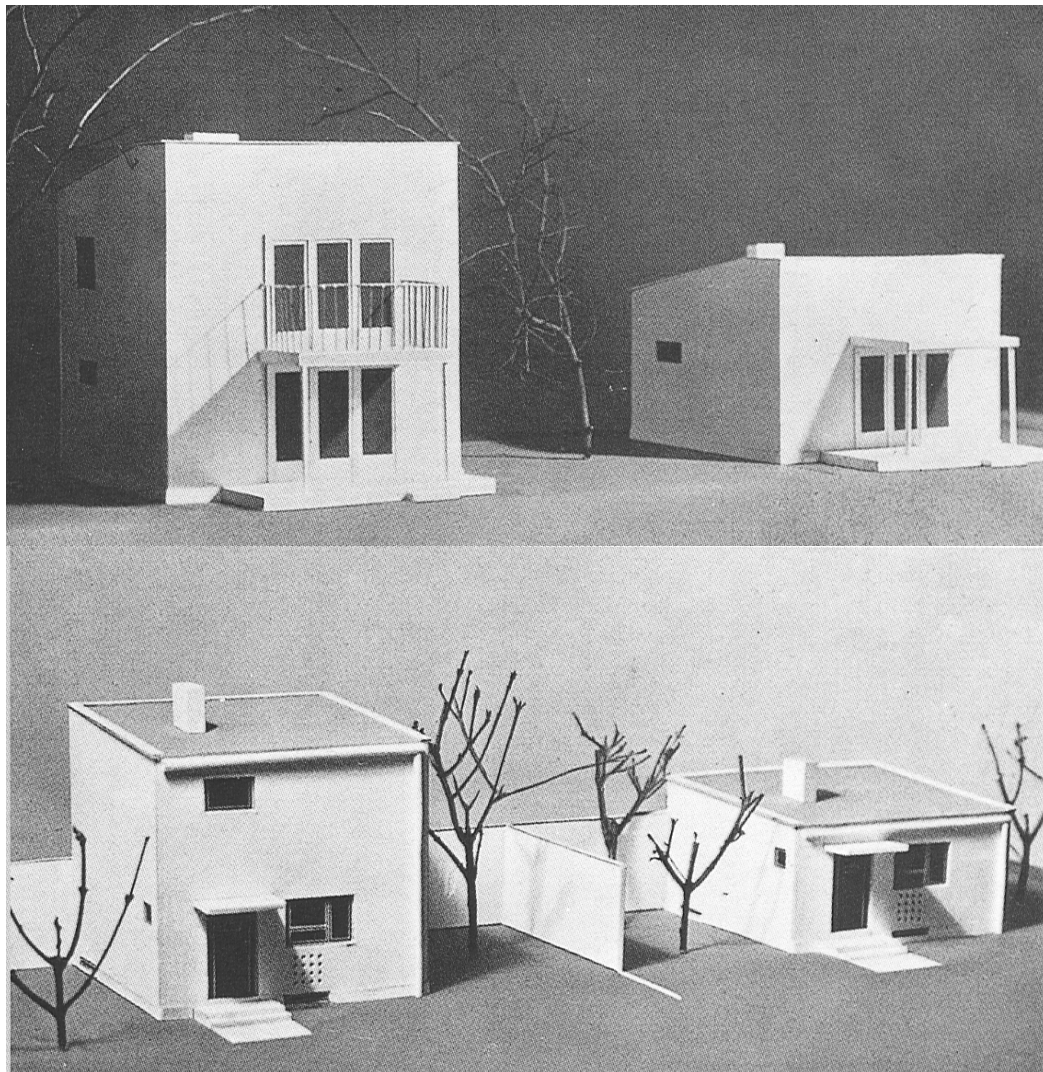


Renderings, plan and details.³²

2.3 "THE GROWING HOUSE". Competition Berlin and Vienna

1932. Sharoun, Hoffmann, Haerdtl

After the drastic Black Friday in 1929, the worsening of the economic situation, and the resulting crisis, various attempts were undertaken to set the construction industry in swing again as an economic drive, and at the same time to deal with the still grave housing shortage.



Photographs of the model. Hans Sharoun 1927³³

³² Frank Lloyd Wright Monograph.1914-1923 p.92. ADA Edita Tokio Co. Ltd. 1985

³³ Blundell, P. Hans Sharoun. Phaidon. London 1995, p.46

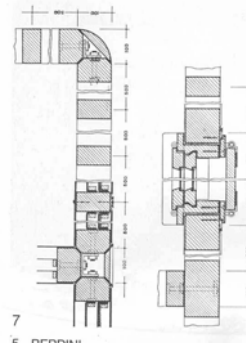
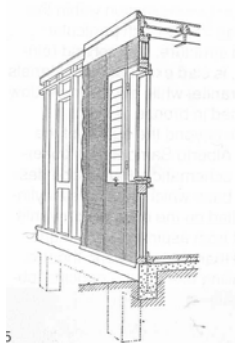
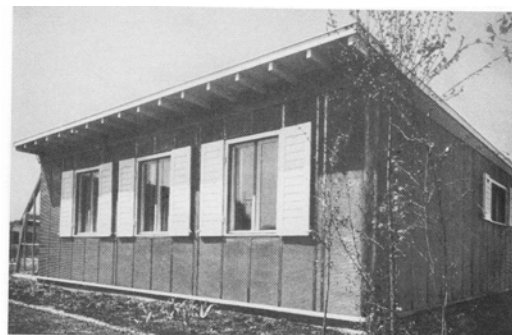
In this context, the competition *"The Growing House"*, organized in 1932, was the first one in Germany and Austria under the same name. The results were presented to the public in Berlin at the Funkturm exhibition centre under the title *"Sun, Air and House for Everyone"*, and in Vienna at the Viennese Spring Trade Fair in 1932. The brief indicates that *"...the production of the growing house should be planned that... the greater part of the building work can be carried out in the workshop"*.³⁴ Among the architects who participated were Gropius, Häring, Hilberseimer, Mendelsohn, Poelzig, Scharoun, Bruno Taut, Haerdtl, Hoffmann, and so on. Timber frame was chosen because of the abundance of native timber and compliance with the competition brief.

³⁴ A+T 10, a+t Ediciones. Vitoria. Spain. 1997, p.41

2.4 THE PACKAGED HOUSE. 1942-1952 K. Wachsmann and W. Gropius.

"The idea of industrializing house construction can be realized by repetition of the same component parts in every building project. By this means the mass production can be made both profitable for the manufacturer and cheap for the customer"

*"The possibilities of assembly of these interchangeable parts satisfies the public desire for a home with an individual appearance"*³⁵



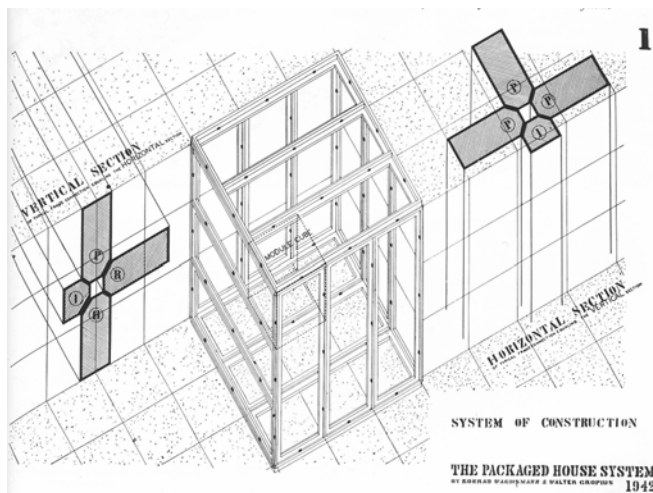
Houses with copper cladding for the Hirsch Kupfer und Messingwerke factory, Finow, Berlin. 1931 ³⁶ ³⁷

³⁵ Gropius, W. 1909

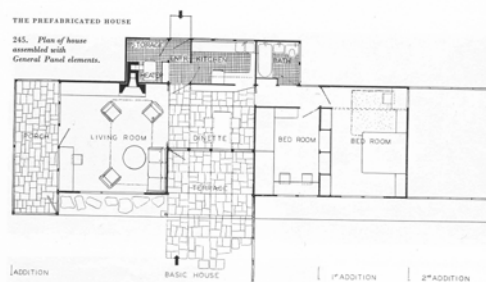
³⁶ Berdini, P. *Walter Gropius Works and Projects*. GG. Barcelona 1994, p. 129

³⁷ *The Walter Gropius Archive*. The Busch-Reisinger Museum. Harvard University. p.237, p.237

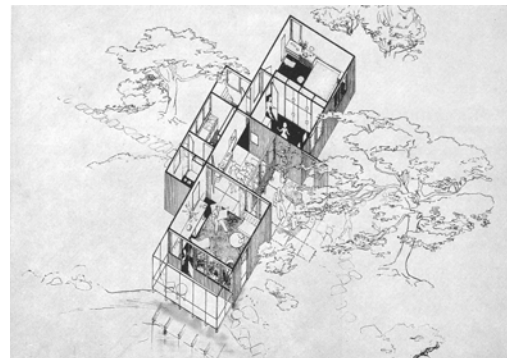
The technique developed by Wachsmann, a standardized join for four panels in one point, revolutionized the possibilities of a modular system. In its geometry, this version was its final stage in development, with the exception of a few amendments. The illustration of the fictitious cube shows the spatial positioning of the metal connectors, always at a fixed distance from the corners of the panels. The corners are redundant, but these simplify the production process and allow the dimensions of the frame profile to be reduced.



Isometric perspective showing the basic module or the Pakaged House System ³⁸



Plan. House assembled with General Panel elements.



Isometric perspective of a General Panel house

³⁸ Giedion, S. Walter Gropius. Dover Publications. NY. 1992. p. 193

The vertical panels are calculated to withstand vertical loading and torsion, and require no additional structural support for buildings up to two storeys in height. The horizontal panels are supported by an under construction integral to the system reducing the span of the panels to counteract flexion.



Finishes panels
leave the factory ³⁹

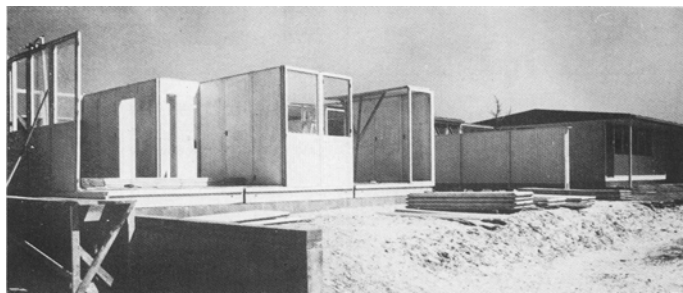


Panels for a family house ⁴⁰



Floor panels in place for erection ⁴¹

The width of the panels is the same as the system's smallest module (3'4''=1.1016m). This dimension reflects considerations and criteria such as standards for building usage -door widths, bed sizes,...-, transportability, ease of assembly (the panels can be handled by two men) and structural limitations.

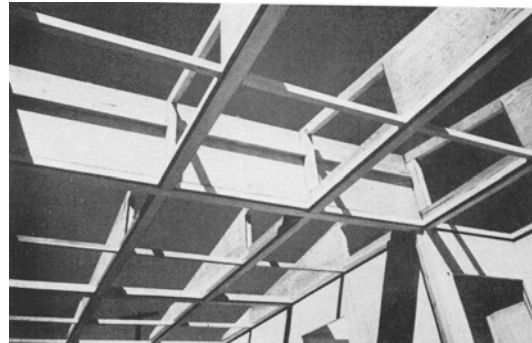
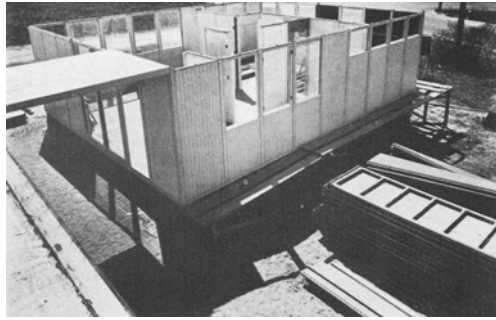


Walls erected ⁴²

³⁹ Ibíd. 198

⁴⁰ Ibíd. 198

⁴¹ Ibíd. 198



House ready for finishing panels Roof construction

There are six different panel types: window panels, door panels, wall panels, floor panels, ceiling panels and roof panels.

It is possible to complete a house in a day without the help of machines and within minimum site workers.

Walter Gropius developed two house types in detail: House Type A and B.



General Panel Houses. In the 1940 and 1950s, both avant-garde architects and mass-market homebuilders were interested in new technologies and techniques of production. An example is the prefabricated "Packaged

⁴² Ibíd. 199

House" (later known as General Panel House) developed by Walter Gropius and Konrad Wachsmann for the General Panel Corporation in 1942 ⁴³



Gropius and Wachsmann visiting a construction site ⁴⁴



General Panel Corp ⁴⁵



⁴³ Arief, A and Burkhart, B. PREFAB. Gibbs Smith Publisher. Salt Lake City. 2002, p. 20

⁴⁴ http://www.axxio.net/waxman/content/General_Panel/General-Panel.htm

⁴⁵ Ibid.

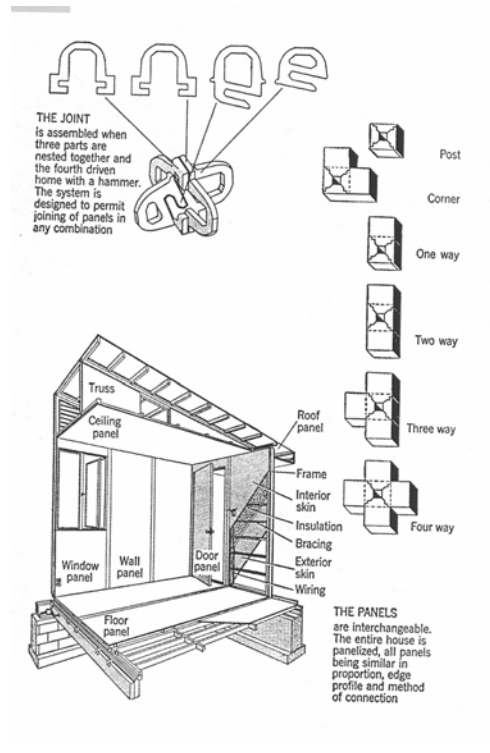
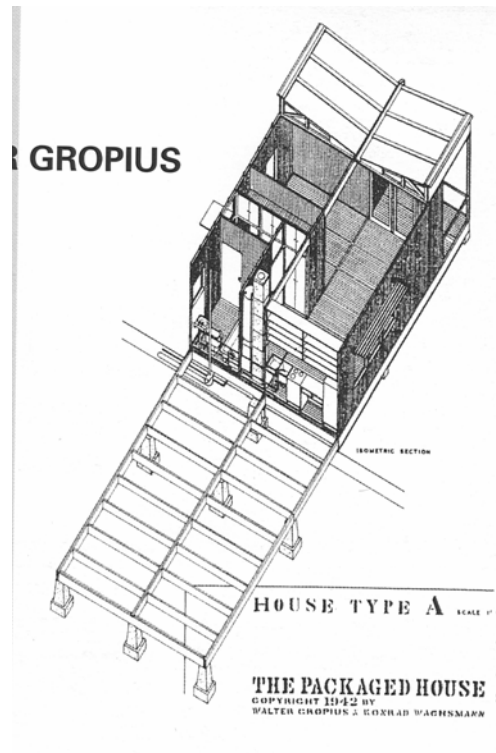


General Panel Corp ⁴⁶

Although during the war around 200,000 prefabricated houses were erected in the USA by other firms, there was just one prototype from Packaged House. Only after the war were the patent rights bought by a company and two test houses were erected. Some famous architects, including Richard Neutra, produced designs using the General Panel System. Around 1948, there were only fifteen houses completed.

This poor result brought further financing problems that stagnated production. As the company went bankrupt, only between 150 and 200 houses had been produced.

⁴⁶ Ibíd.

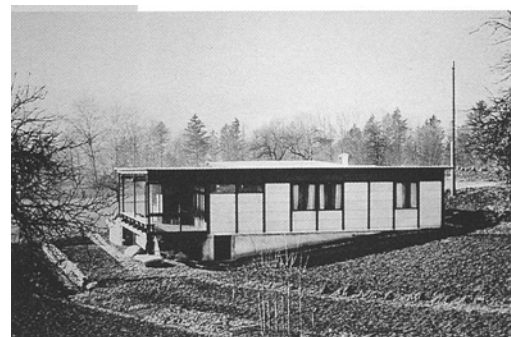
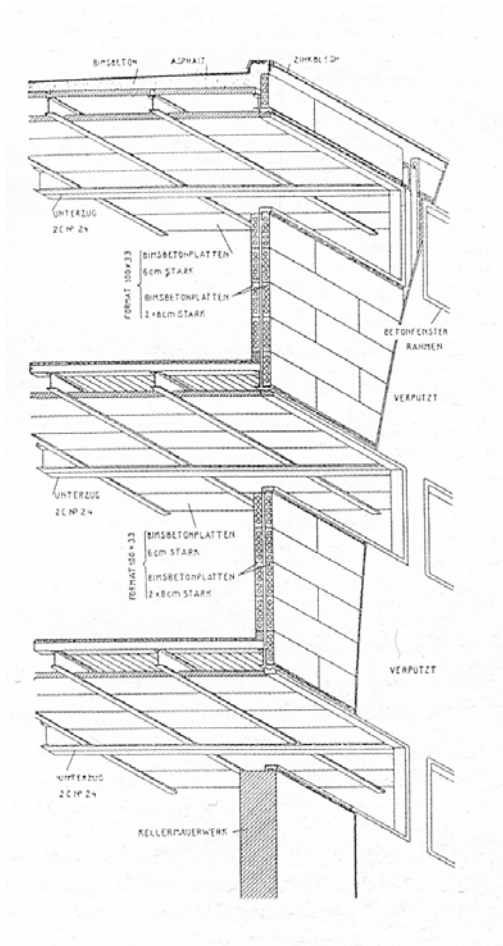


General Panel Corp ⁴⁷

⁴⁷ Ibid.

2.5 VILLIGER HOUSE. Bremgarten. Aargau. Swiss. 1942. Max Bill

This small dwelling house is a good example of how a high-quality architectural solution can be attained using standardised and apparently inflexible building components. It is built with the use of Durisol insulation panels.



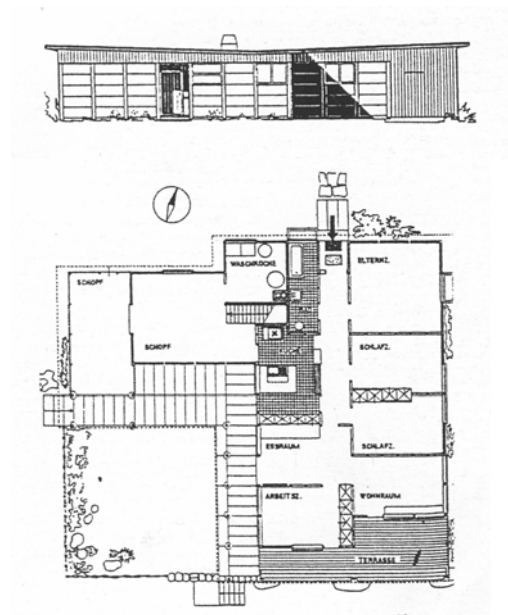
Dry joint construction

The grid in floor plan and elevation is determined by the component's unit dimensions (50x141cm), allows freedom in spatial and architectural organisation throughout. This free treatment of the imposed programme manifests itself mainly in the varied plastic exterior. Differing deep loggias, projecting sections of the facade, panels of latting, columns set in gravel give the house intimacy and so lend it a specific individuality.

The structural framework consists of timber studwork on the component grid, with beams and other timber members in the roof space providing longitudinal bracing.

The final finish is a result of the production process.

It is "dry" construction. The timber frame and infill panels are joined without mortar.⁴⁸

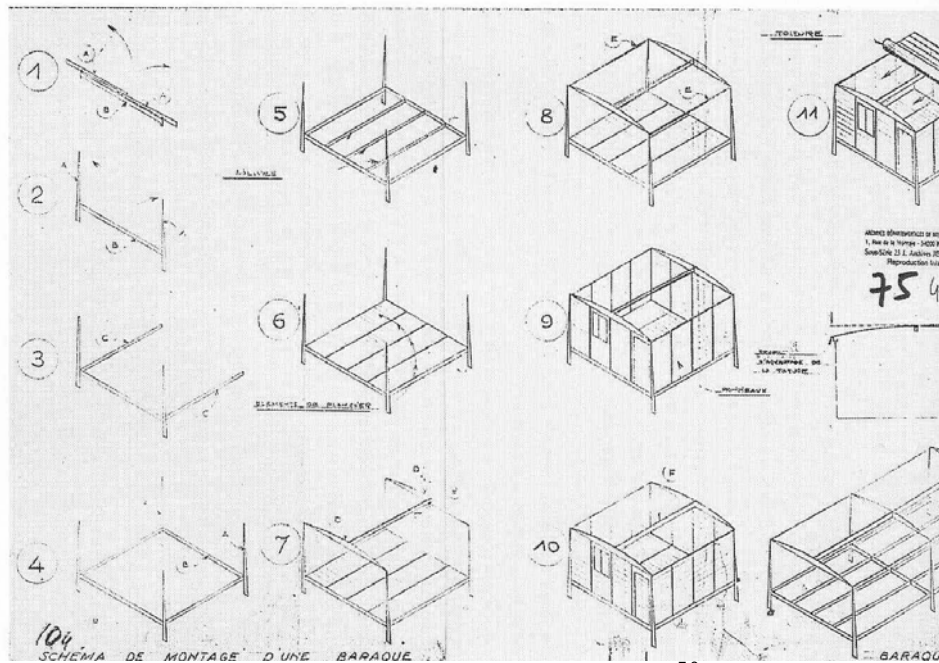
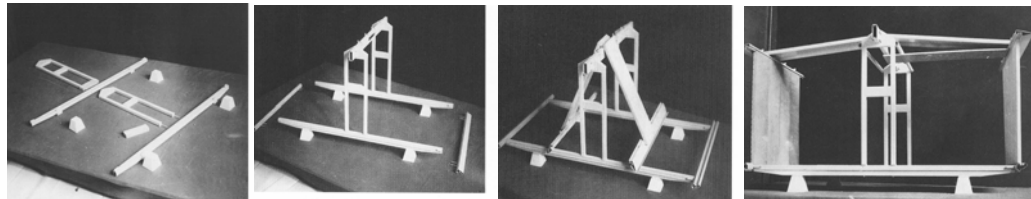


Plan and elevation ⁴⁹

⁴⁸ Gimmi, K. Max Hill and Simple Architecture 1942-1996. *Catalogue of the XIX Trienal de Milano 1996*. Swiss section. Lars Müller Publishers. Baden. 1996

2.6 SYSTEM PORTIQUE. 1939 Jean Prouvé.

As early as 1930, Jean Prouvé was working on attempts to produce a building "serially and in large number". Within the context of the "holidays for everyone" slogan, small and transportable, weekend and holiday homes capable of being mass produced were developed by Prouvé as constructor, and Beadouin and Lods as architects. As a consequence, the "portique" principle was crystallized, a topic which was to preoccupy him from 1939 till 1964.



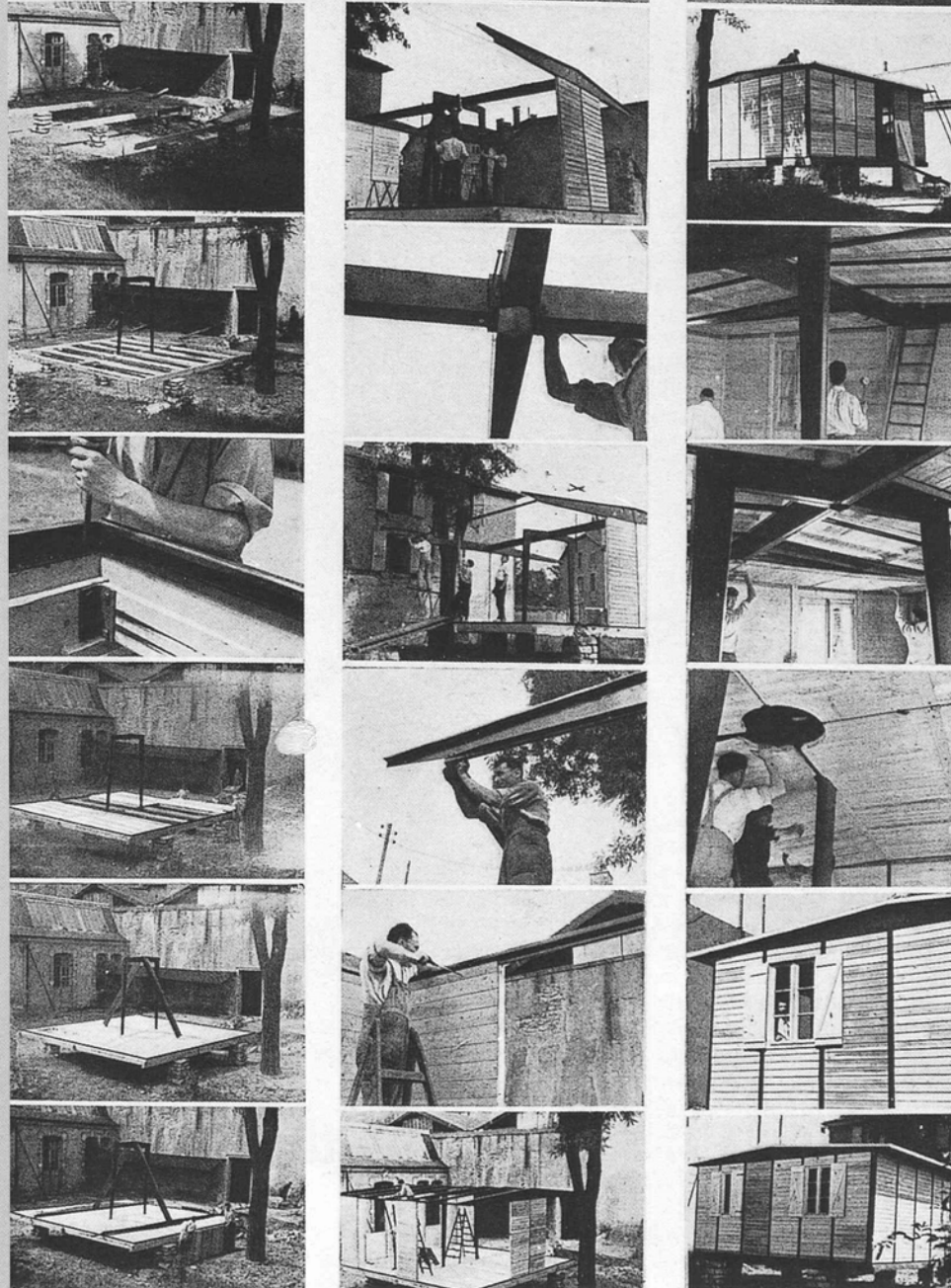
Design for demo and assembling detail ⁵⁰

⁴⁹ Von Moos, S. *Minimal Tradition: Max Bill and Simple Architecture*. Lars Müller Publishers. Baden. 1996

⁵⁰ Sulzer, P. *Jean Prouvé. Opera Complete. Volume 2: 1934-44*. Birkhauser. Basel. 2000

PAVILLON 6×6

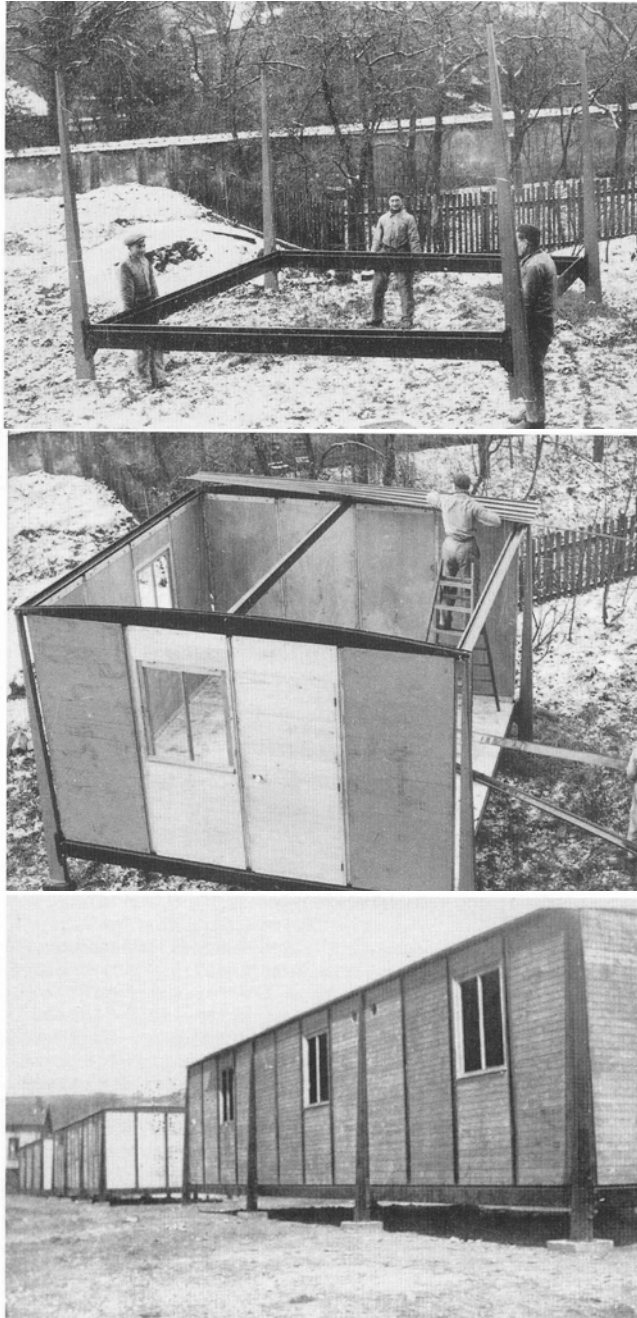
FABRIQUÉ EN SÉRIE
POUR LE MINISTÈRE
DE LA RECONSTRUCTION
PAR JEAN PROUVE, Constructeur



Sequence of construction ⁵¹

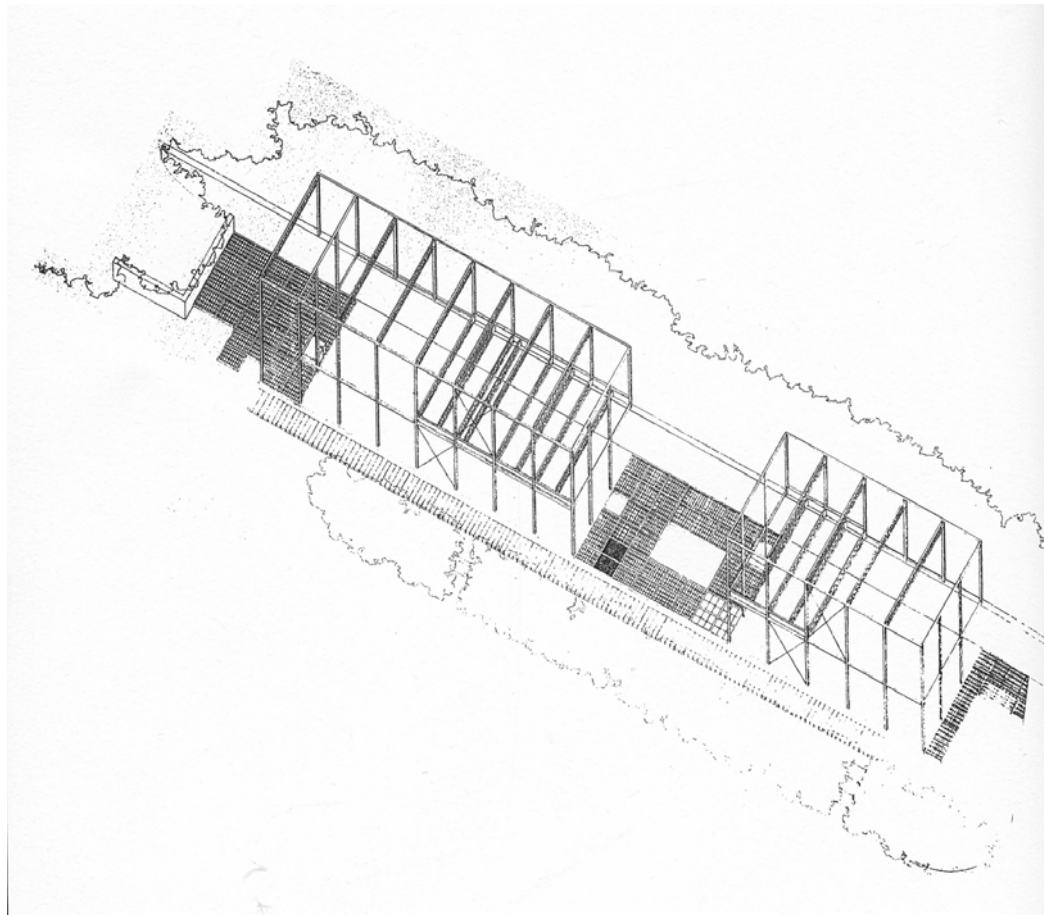
⁵¹ A+T 10 1997. A+T Ediciones. Vitoria España.

Basically, Prouvé attempted to fulfil the new requirements of transportability, and speed of assembly, disassembly and re-assembly, that will become constant in later projects. Showing the assembly process in sequences Prouvé expresses these concerns.



2.7 CASE STUDY HOUSE #8. Los Angeles 1945. Charles and Ray Eames.

From 1945 until 1962, the Californian architecture magazine "Arts and Architecture", under the editorship of John Entenza, organized a programme of model houses, the so-called "Case Study Houses".



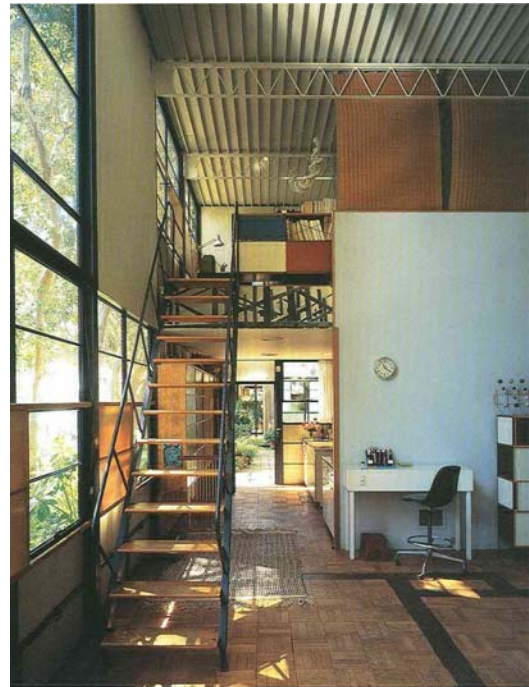
Axonometric view ⁵²

Among others, architects like E. Saarinen, R. Neutra, R. Soriano, C. Ellwood and P. Koenig were invited. Charles Eames described his own house as follows:

⁵² Smith, A. *Case Study Houses*. CSH #8. Eames House, Taschen. London. 2001, p.90



Interior views



Images and references ⁵³

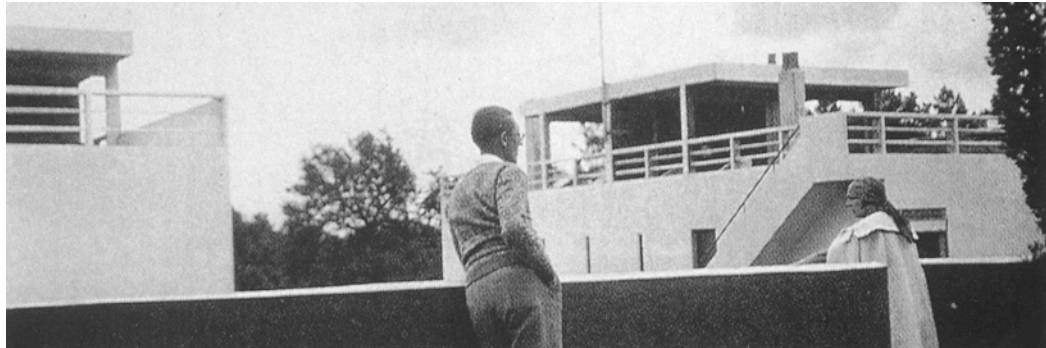
"Most materials and techniques which have been used here are standard to the building industry, but in many cases not standard to residential architecture. In the structural system that evolved from these materials and techniques, it was not difficult to house a pleasant

⁵³ Steele, James. Eames House. Architecture in Detail. Phaidon. 1995
 Blueprints for Modern Living. History and Legacy of the Case Study Houses. The Museum of Contemporary Art. Los Angeles. CA 2002

space for living and working. The structural approach became an expansive one in that it encouraged use of space, as such, beyond the optimum requirements of living. However the actual plan within the system is personal, and whether or not it solves the particular requirements of many families is not important as a Case Study. Case Study wise it is interesting to consider how the rigidity of the system was responsible for the free use of space and to see how the most matter-of-fact structure resulted in pattern and texture... Most of the qualities that proved satisfying were inherent in the materials themselves -the texture of the ceiling, the metal joists, the repetition of the standard sash, the change of glazing from transparent to translucent -the surprise of seeing the plane in space by the wire glass in the studio-"⁵⁴

⁵⁴ Arts and Architecture. Los Angeles. May 1949.

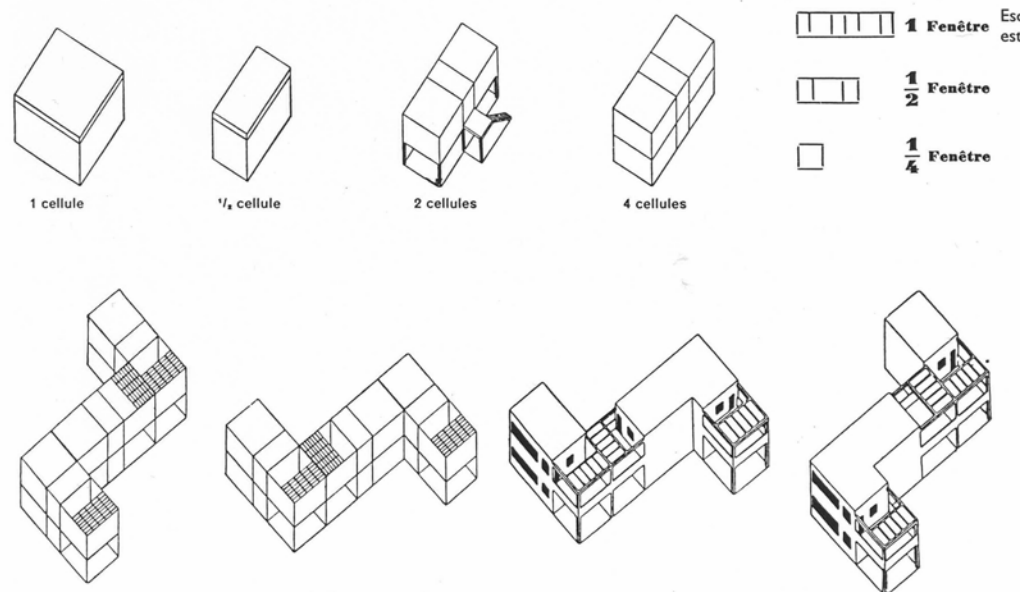
2.8 QUARTIERS MODERNES FRUGES, QMF. Pesac 1927. Le
Corbusier



In 1927, Henry Fruges carried out his idea of building homes for his workers because, in this way he would have them permanently near their place of work and his seasonal workers would not move to another part of the region. He was an enlightened man and through the L'Esprit Nouveau magazine became familiar with the writings of an "unknown" architect called Le Corbusier. He did not hesitate in entrusting him with the Quartiers Modernes Fruges, in Pessac, near Bordeaux. The ideas of Fruges regarding standardisation and variations on models were quite clear: *"The diversity which I (Henry Fruges) would like to attain would have to be reconciled with the need to manufacture in series; the only formula which allowed an appreciable decrease in building cost"* In Pessac, standardisation is the result of an ideology rather than a system or assembly of elements. That ideology searched for individuality above everything else. Otherwise, there was a variation of the series. Le

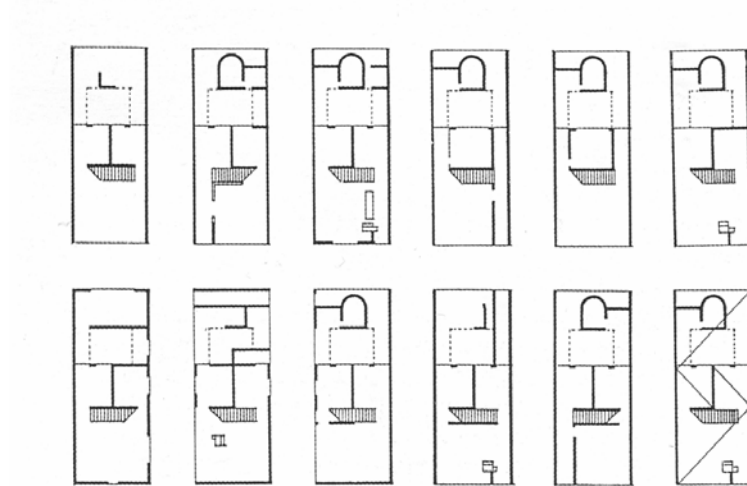
Corbusier sensed that the entire theory which was being based on the connection between the industrial world and architecture might collapse. This can be seen in an issue of L'Esprit Nouveau, in 1926. "Indeed, it is the breakdown of standardisation. (...) If we do not pay very special attention to each house, we will begin to take in water and the series and the standard will sink, because the house will not be well inhabited. Standards are letters . With these letters it is necessary to write in a sense, the names of your proprietors (of Frugés)

In Pessac, Le Corbusier tried to attain variety and individuality with a combination of identical elements placed in different positions according to a subjective geometrical game.

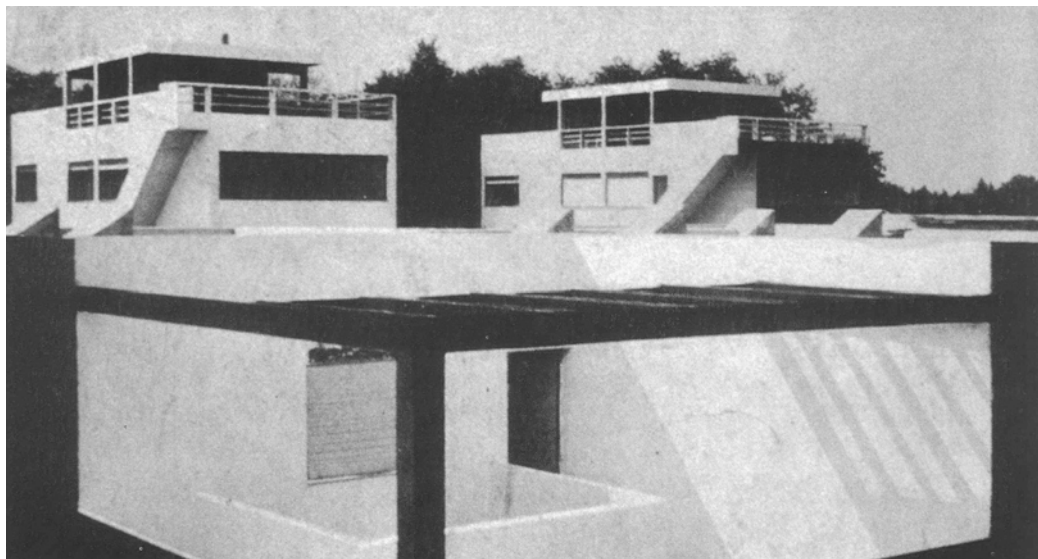


"(...)at Pessac we worked with the same standard elements: the same window on all the sides., the same staircase,

the same door, the same heating, the same concrete cell of 5x5m. and of 2.5x5m, the same kitchen equipment, the same wash-basin, the same toilet" L'Corbusier.



Different variations made by the users to the original plan. The standard plan is shown as an open work which allows the personalization of the space



Photograph ⁵⁵

⁵⁵ Images and references: *Le Corbusier. Viaxe ó mundo dun creador a través de vintecinco arquitecturas*. Fundación Pedro Barrié de la Maza. A Coruña. 1997, p.70-77

2.09 THE ELASTIC STANDARDISATION of Alvar Aalto

In the summer of 1929, Alvar Aalto began to use an ink stamp on his drawings with the word "standard".

The influence of the CIAM (International Modern Architecture Conferences) came into his head adopting the creed of the mass production. Nevertheless, his singular personality would find it impossible to suffer a rigid rationalism and changed course in his comprehension of the idea of "flexible"⁵⁶ standardisation, adding the adjective "elastic"⁵⁷

"But it is possible to use standardization and rationalization in the interests of man. The question is what we should standardize or rationalize. We could create standards which would raise the level not only of living but also of the spirit. It is very important for us to create elastic standardization which would not control us but which we would control... We could try for what would offer man more. It is a matter of indifference how far electric cables and car wheels are standardized. But when we come into the human home, to things which are close to us, the problem is quite different -it is a

⁵⁶ Alvar Aalto, *Between Humanism and Materialism*. The Museum of Modern Art. New York.. 1998

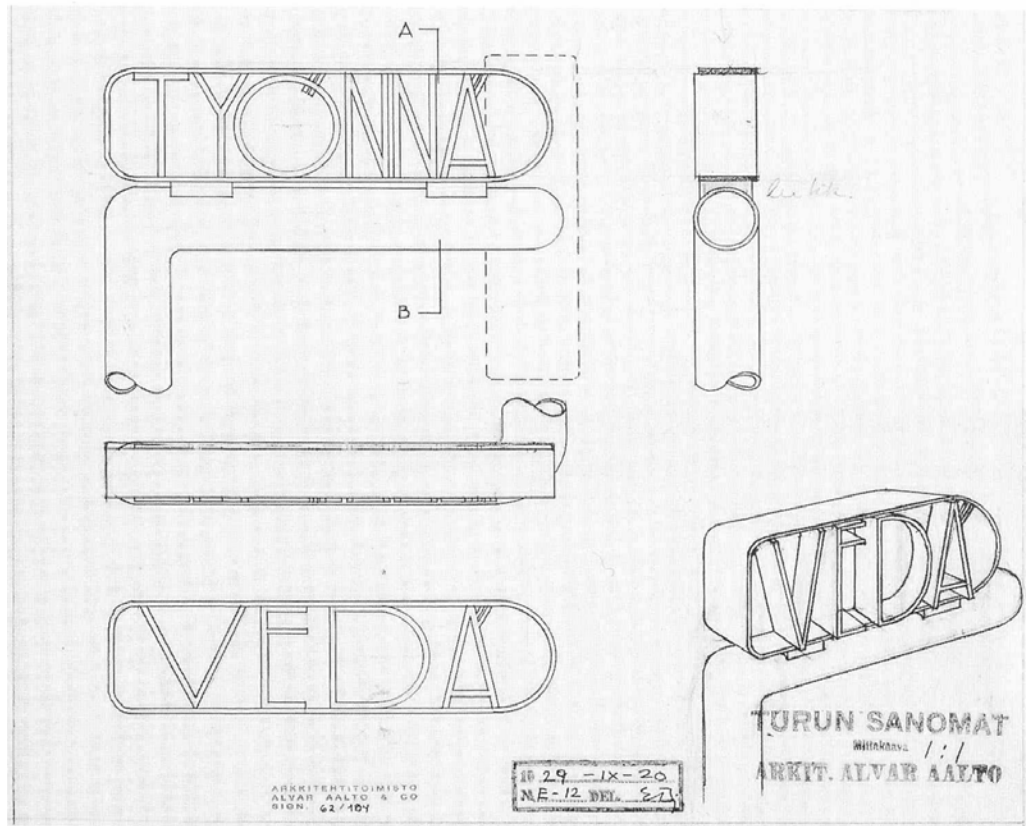
⁵⁷ Standertskjöld, Elina. *Alvar Aalto and standardisation*. Acanthus. 1992. The art of standards. Museum of Finnish Architecture.

question of the spirit, of the soul, a question of what is intellectual in standardization".⁵⁸

"Whereas the course of development in relation to the automobile is for more and more effort to be made to concentrate on just a few types, the task of the architectural production process is exactly the opposite. By all feeling and common sense, it should no be centralized standardization. In architecture, the role of standardization is thus not to aim at a type, but on the contrary to create viable variety and richness which in an ideal situation is comparable to nature's infinite capacity of nuance"⁵⁹

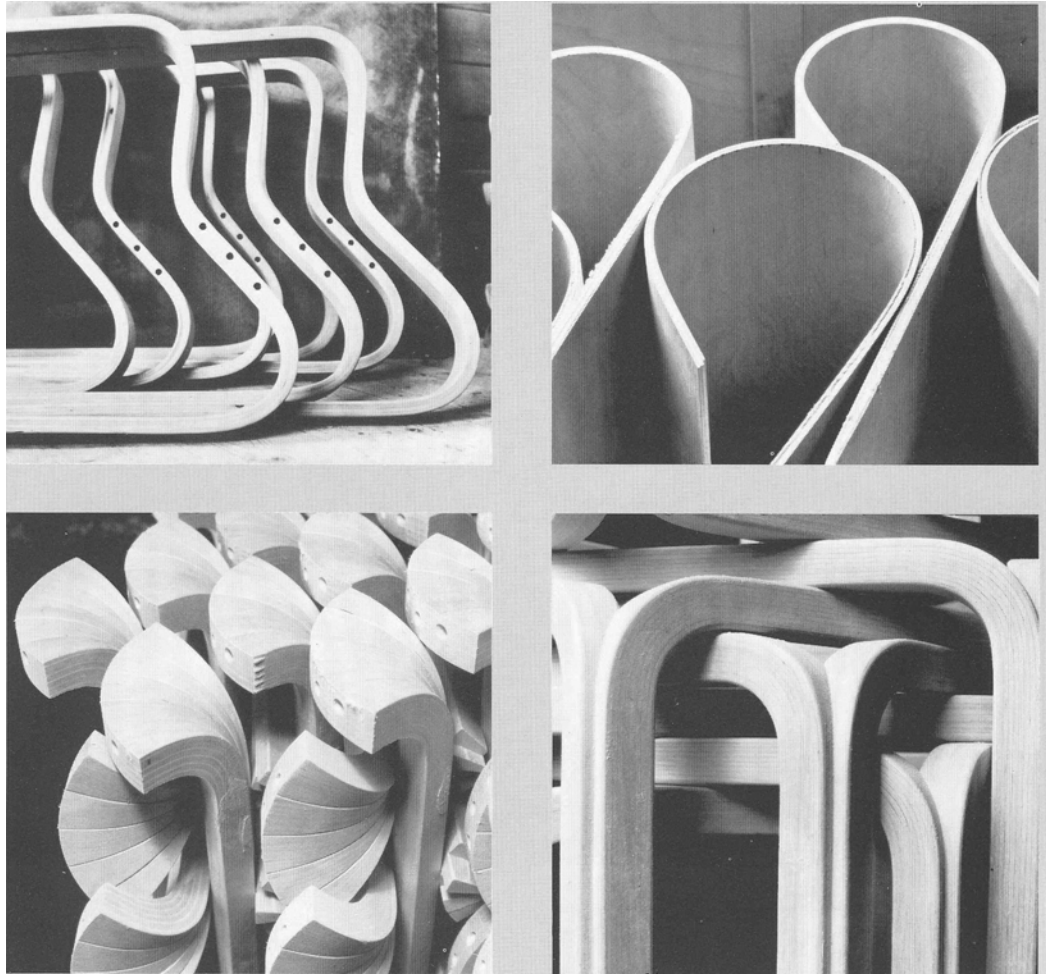
⁵⁸ Alvar Aalto, "Fighting Architecture", in *Ibid.*, p.142

⁵⁹ Aalto, "Rationalism and Man"; quoted in Ruusuvuori and Pallasmaa, Alvar Aalto, p.141



Standard door handles for Turun Sanomat building, Turku. Finland 1928-30⁶⁰

⁶⁰ *The idea of Flexible Standardization.* Alvar Aalto. Between Humanism and Materialism. The Museum of Modern Art, New York. The handles are labelled: työnnä (push) and vedä (pull)



Store of bent pieces for furniture ⁶¹

⁶¹ *The Alvar Aalto Furniture*. p.102. The Museum of Finish Architecture. Finish Society of Crafts and design. Artek. Ed. Juhani Pallasmaa.1984

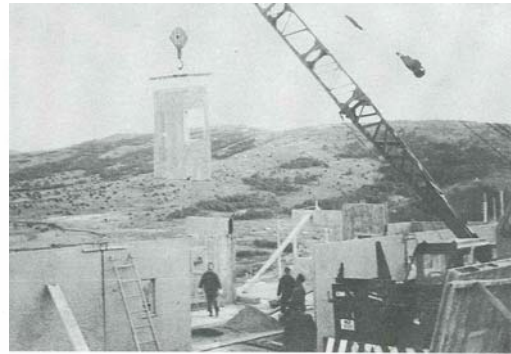
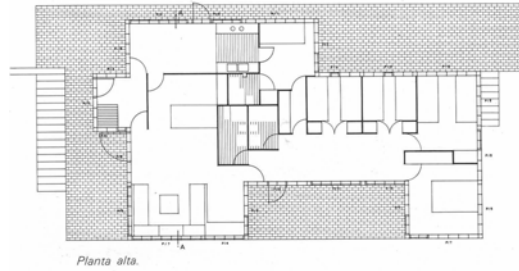
2.10 ARELA HOUSE. Villalba. Madrid. 1964. Alejandro de la Sota.



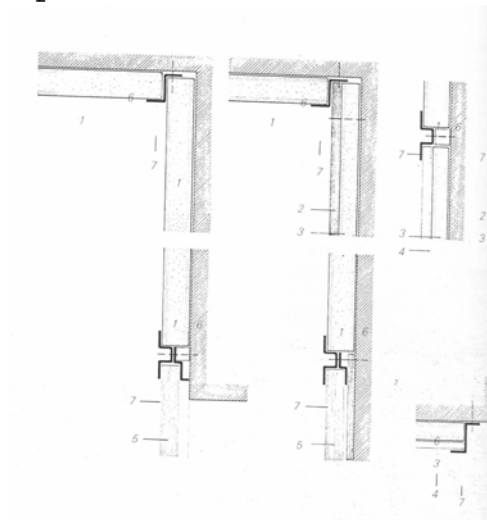
Exterior view

"It was usual to develop constructions with concrete panels for bigger works. This could be considered a case study house with 115 m². It was easy to accommodate 14 beds and litters without oppression. Interior finishes were TAFISA boards in leather colour fixed with metallic profiles and linoleum in the same colour. It was a very good study for important works, where the simplicity is basic. The previous studies of hundreds of constructive

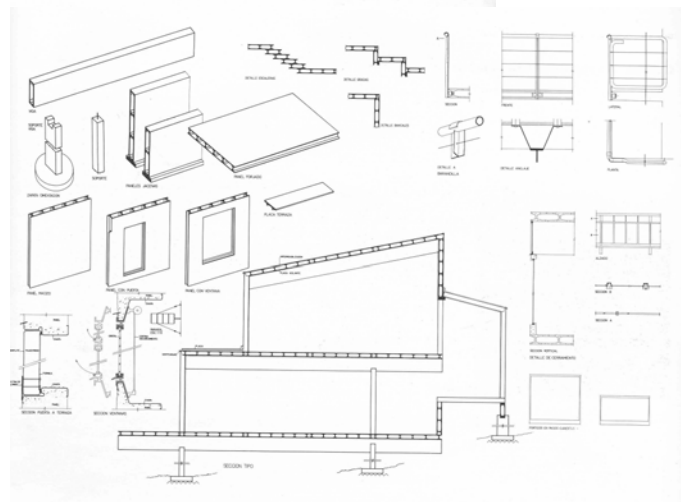
details help with the future application to repetitive buildings”⁶²



Plan and construction process ⁶³



Detail



The future application:
Colegio-Residencia
Caja de Ahorros
Provincial de
Ourense. 1967 ⁶⁴

⁶² Sota, A. de la. Vivienda Unifamiliar Sr. Varela, Collado Mediano, Villalba, Madrid 1964. Alejandro de la Sota. Ediciones Pronaos. Madrid 1989.

⁶³ Ibíd.. images and photographs, p.97,99

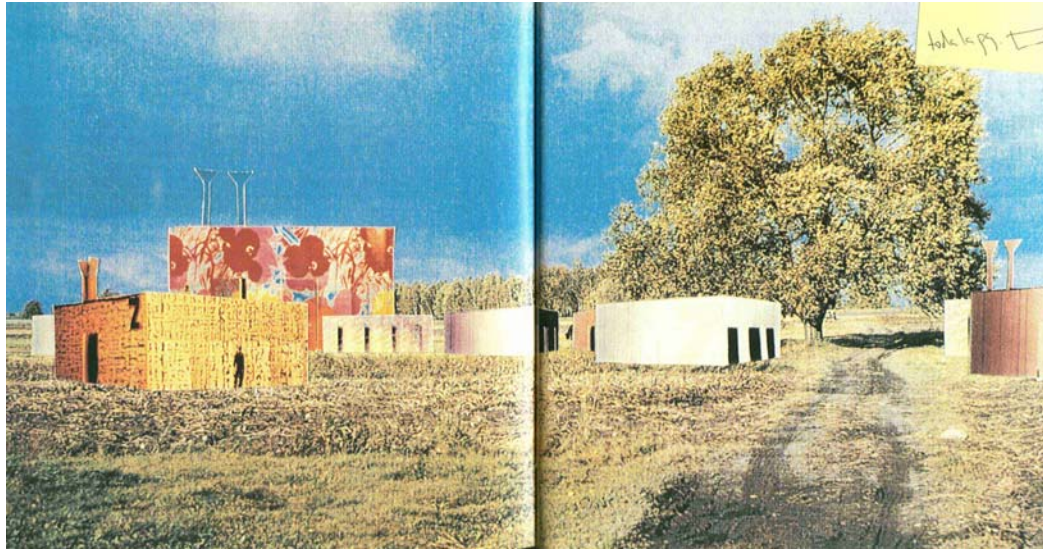
⁶⁴ Ibíd.. p.115

*"The modern house is a dry construction; it is an industrial product and, a work of specialists: economists, aesthetic technicians, hygienists, climatologist, company's Scientifics, technicians of normalization, installations, (...) and the architect? (...) this used to be an artist and became to be a specialist in management"*⁶⁵

⁶⁵ Meyer, H. in Bauhaus, 1928, cuadern 4, p.12,13 from Rodríguez Cheda, J.B., Alejandro de la Sota, Construcción, Idea y Arquitectura, p.266. COAG. Santiago de Compostela. Spain. 1994.

2.11 AH HOUSES. Industrial Prototypes 1994-96. Iñaki

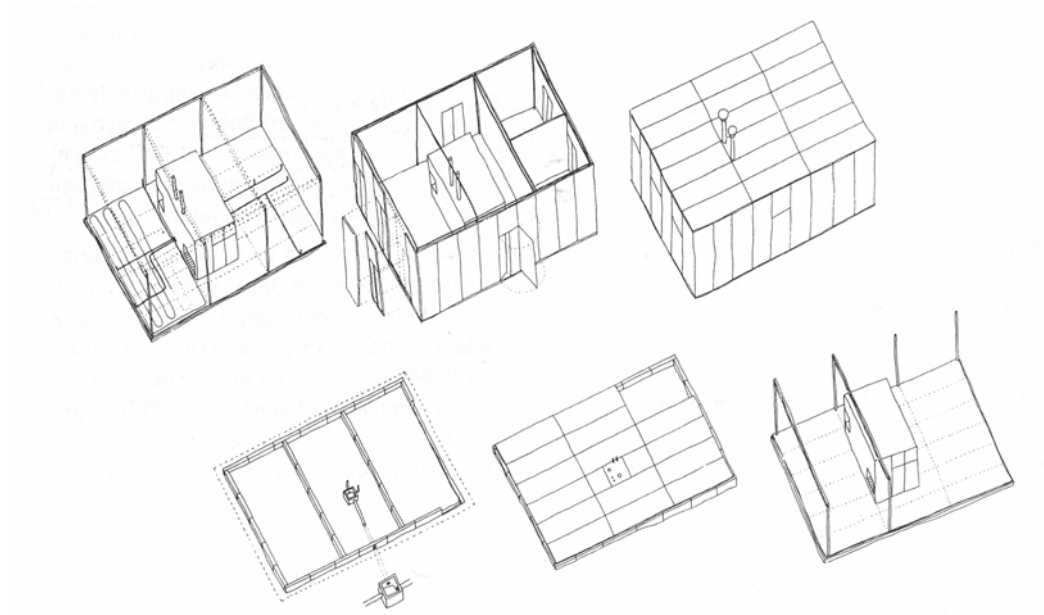
Ábalos and Juan Herreros.



It is a practical case based in ten basic points the architects describe in their monograph "Ábalos & Herreros. Areas of Impunity".

- *Consultation carried out for a group of businessmen interested in producing a line of industrialized housing aimed in principle at an extremely wide market: public housing, holiday homes, young people, civil defence... The assignment posed a double problem: how to differentiate itself from similar things on offer -and to make these dwellings also capable of competing with conventional housing-, and how to think of the house as total abstraction, without a context, with no other parameter than a generic and universal efficiency.*

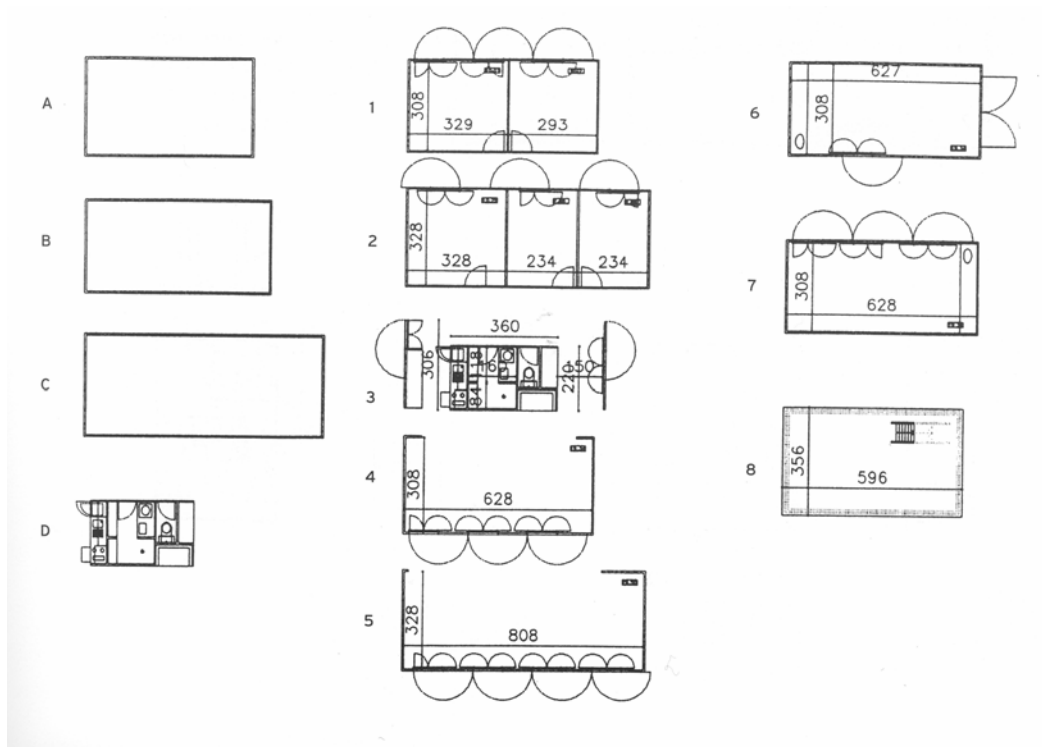
- *The basic criterion adopted then, is the systematization of reduction: of variables, construction complexity, surface, glazed areas, particularities, of operations in situ... a reduction from which one endeavours to extract a poetics in syntony with the rationalization and simplification implicit in industrialization (and equally to avoid a badly understood and restrictive moralizing severity: here to reduce is, or aspires to be, to intensify, to lend intensity to the work and to the experience of living in these houses)*
- *The spatial and constructional systems come together in an organization of the accommodation with a fixed and independent nucleus that is installed baricentrically on a homogeneous surface limited by a fragile skin. In this way the distributive features are simplified to the maximum -a daytime area, a night time area and a service area- maintaining a high level of indeterminacy which facilitates the criteria of orientation and positioning of the house as well as the implementation. The latter is basically reduced to two operations, one with two-dimensional elements for the mounting of the skin and the other with a three-dimensional element which contains all the auxiliary services of the house.*



Schemes of assembling and of the basic components ⁶⁶

- *Special strategies for the qualification of the interior and exterior have been adopted. Height of 360cm (usually 250), with an increased spatial density, improving their performance in hot weather and bringing to the areas a certain traditional quality which contradicts the narrowly economist vision associated with such buildings.*

⁶⁶ Quaderns 210. COAC. Barcelona 1993, p. 177



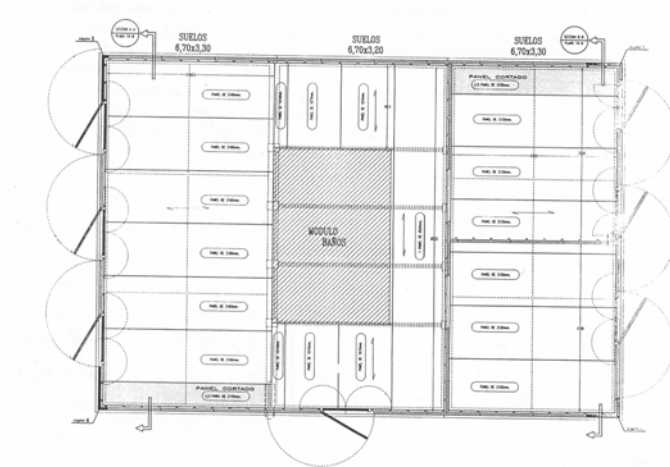
Prefabricated and spatial units ⁶⁷

- *The exterior image renounces to bring it into line with a traditional house. An extrapolation of those guidelines to the exterior lacks meaning since neither the scale nor the form the materials maintain a relation with traditional figuration (it fails, reinforcing rather than eliminating the image of poverty). The proposed strategy is to switch the associations toward two aesthetic references –the "magic box" and the "techno artefact" in seeking positive generic accords with the landscape and with the idea of living.*

⁶⁷ Ibid.

- *It is a techno artefact - a tractor, tank wagon- without entering in competition with the landscape. It does not accept the aesthetic judgment incumbent on conventional buildings and architectonic figures. The principle of the magic box is based in the almost infantile attraction projected onto boxes with an inside, the coffer, trunk or Christmas calendars: this means introducing mechanisms which would allow identifying the techno box with that universe close to the domestic.*
- *Both references come together in maximizing the neutrality of the volume, reducing its codification as architecture, and proposing a universal system of window recesses capable of being effaced by means of shutters, which are resolved as elements of the façade endowed with movement. Image and protection are solved.*
- *Equally, in developing superficial finishes of extreme density and colouring, the artificial character of the object is reinforced and its constructional presence neutralized. A chart has been arrived at, then, of a distinct finishes, realized though a mixing of colour and figures. The material -PVF2- is capable of taking impression of a serigraphic kind or similar, and to differentiate*

the product from prefabricated houses of wood and from the caravans/mobile homes on offer. It is an alternative image with another potential market.

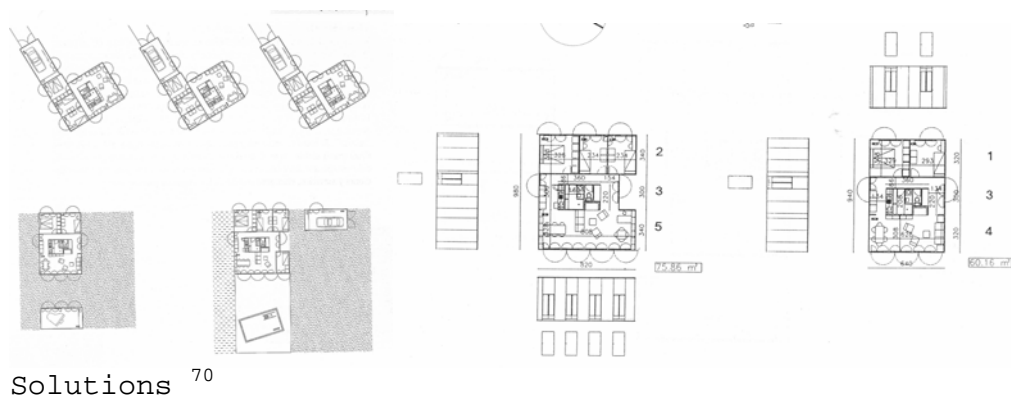


Plan in detail ⁶⁸

- *The system also includes a series of optional extras which make personalization of the house possible, based no so much on precise modifications as in the offer of annexes -garage, tower of shadows, guest room,...- facilitating greater accord with the topographic conditions pertaining to each case.*
- *AH houses are to the traditional house what the Swatch is to the pendulum clock: not only a technological change as the verification of a change in habits, of the way of relating oneself to things. It is a product of contemporary material culture. And based on a modification of the concept of*

⁶⁸ Ábalos & Herreros. *Areas of Impunity*. Actar. Barcelona. 1997, p.138

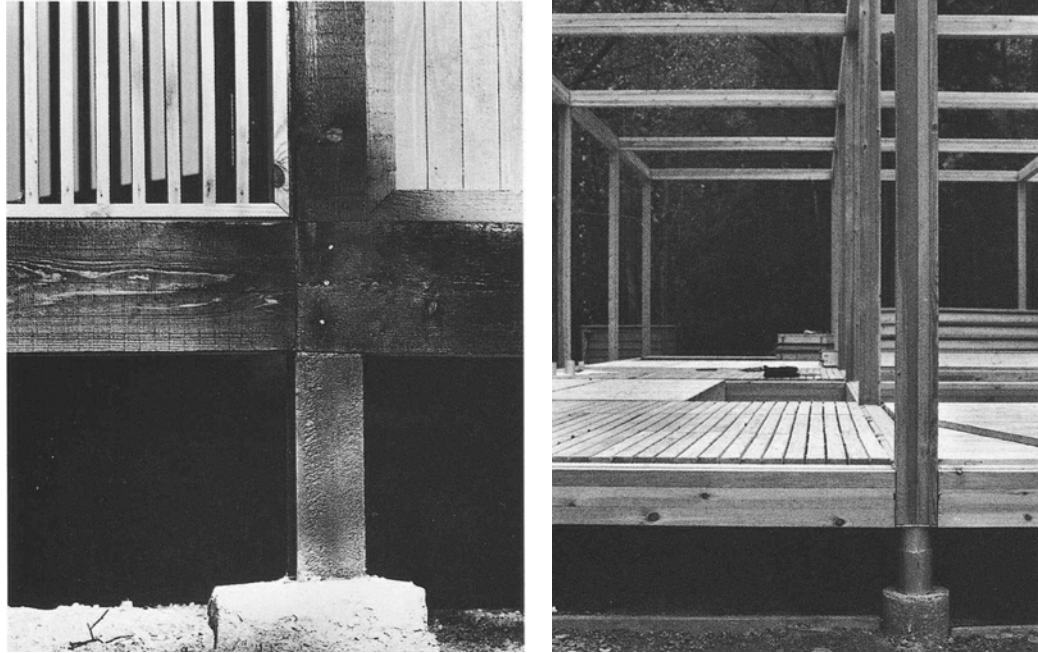
durability associated with that of economy in industrial production: the introduction of a product invested with cultural trustworthiness in the logic of consumerism. Yet this does not entail masking 'bad technology' or augmenting obsolescence. In reality it is as much, or more, technological than many sensible products with a 'scientific' image, and its durability is at least equal to that of the best buildings today, because it is constructed with the same components and systems. This means offering a product that in its concerns, character and qualities is better adapted to -that is to say, more identified with- the decreasing stability and increasing fugacity of man's life and the things that surround him; with a new conception of time associated with the home and the contemporary subject.⁶⁹



⁶⁹ Abalos, I. La buena vida. Visita guiada a las casas de la modernidad. GG. Barcelona 2000

⁷⁰ Ibíd, 137

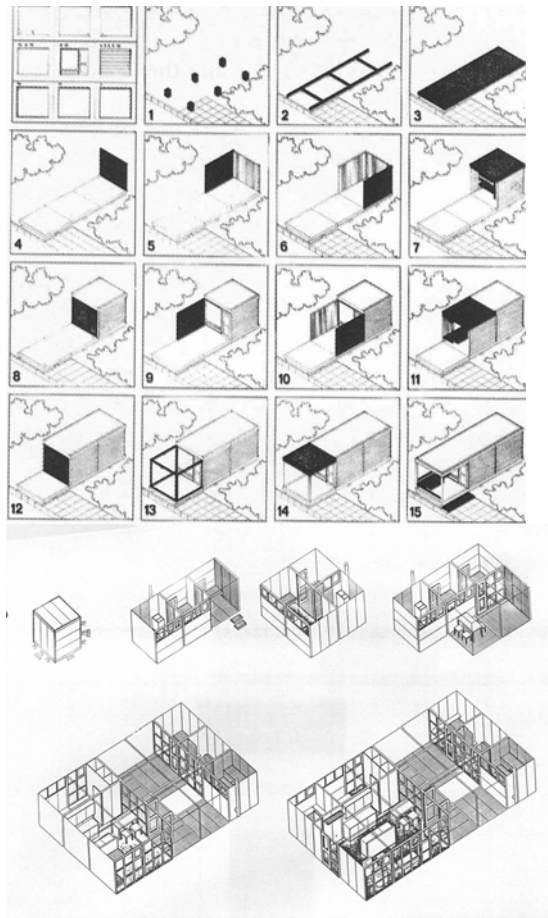
2.12 MODULI 225. Finland. 1970. K. Gullichsen and J.
Pallasmaa.



Traditional finish construction and Moduli 225 under construction ⁷¹

The moduli system is composed of cubic frames. The
desired lay-out of the house is obtained by combining a
sufficient number of these.

⁷¹ Puusta, R. Timber Construction in Finland, P.174 Finish Timber
Council. Museum of Finish Architecture. 1996, p.168



Axonometric viewS. Process ⁷²

The cubic frames are formed by connecting the prefabricated timber columns and beams to each other. The inside dimensions of the squares of the frame are 225x225cm. Each square is filled by three elements measuring 75x225cm.

⁷² Gili Galfeti, G. Private Retreats. GG. Barcelona. 1995, p.32-33



Panels prepared to be mounted ⁷³

When the top bays of the frame are filled with roof elements, the bottom bays with floor elements, and the side bays with either solid panels, windows or doors, an enclosed space is formed, composed of one or several cubes. This space can be subdivided by partitions into smaller rooms measuring multiples of 75cms. The floor-to-ceiling height is 225 cm.

The horizontal roof is covered by a water-proof sheet and the rain is conveyed to the ground by gargoyles. A layer of snow actually improves the thermal insulation of the roof and the structure is designed to withstand extreme snow loads.

⁷³ Puusta, R. Timber Construction in Finland, P.174 Finish Timber Council. Museum of Finish Architecture. 1996, p.162

The elevations can be formed in different ways by combining solid panels, windows or doors, assembled in either vertical or horizontal positions.

The moduli system is conceived for both cold and temperate climates. The glazing is double or single according to choice.

The moduli house is supported by aluminium tubes adjusted to the variations in ground level. The tubes are connected by steel bolts to concrete foundations or directly into the bedrock.

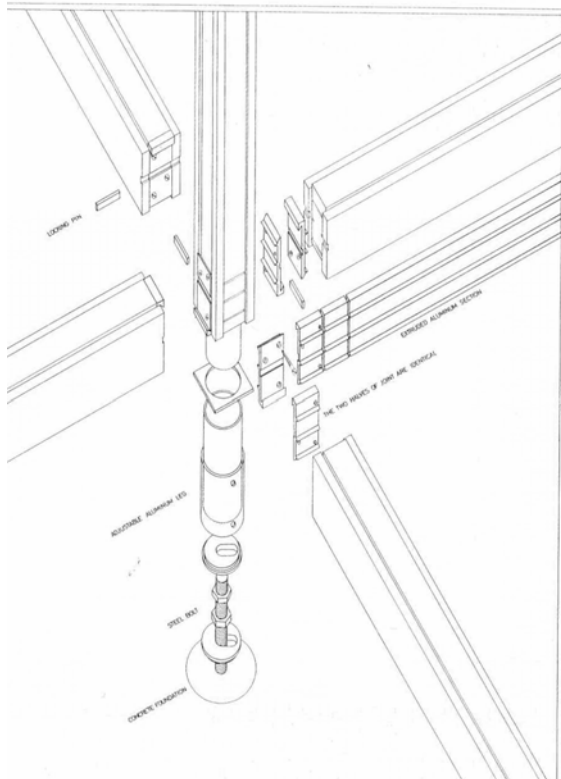
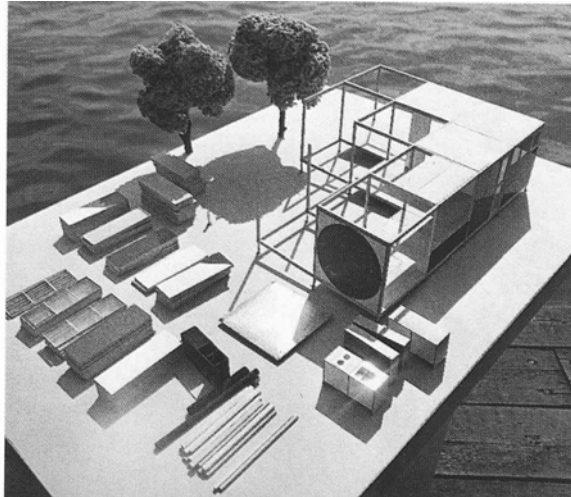
All components of the moduli system are prefinished and ready for assembly. The columns and the beams are pressur-impregnated pinewood. The wall panels are faced with timber boarding or with preprimed fibreboard.

Handling of components is made easy since the heaviest component of the moduli system weighs only 50kg.

Four men can perform construction at a rate of about one square meter per hour.

A few projects were realised using Module 225, including K. Gullichsen's own holiday home (Nuuksio, 1970)⁷⁴

⁷⁴ Puusta, R. Timber Construction in Finland, P.174 Finish Timber Council. Museum of Finish Architecture. 1996





Holiday house Gullichsen. Nuuksio, 1970 ⁷⁵

⁷⁵ Ibid., P 169

3 WHAT IS FLEXIBILITY?

The permanence of buildings was, until modern times, one of the main obsessions of the world of architecture. Nowadays, the speed of technological change and urban mobility force a reappraisal of the validity of this principle. Permanence and in consequence, immutability, are terms which do not often appear in contemporary architectural discourse. Concepts such as flexibility, adaptability and the possibility to transform are of much greater interest.

Talking about housing, we come across additional problems when putting these ideas of mutation into practice, at least in the sense we have understood them until now. The difficulty is to obtain flexibility in an environment such as architecture, which is, by nature, inflexible. In many cases, the task of the architect is to work on the envelope and establish spatial relationships as freely as possible with the aid of mobile and modular constructive systems.

But flexibility is not only the equivalent of designing plug-in components with variable elements, to obtain connectable buildings, which can grow according to the user's wishes. It is that too, but in practice it has been shown that buildings that are technologically advanced for their times, such as the Pompidou Centre, are much more complicated to transform and modernise than

the traditional stone and brick container of the nineteenth century.

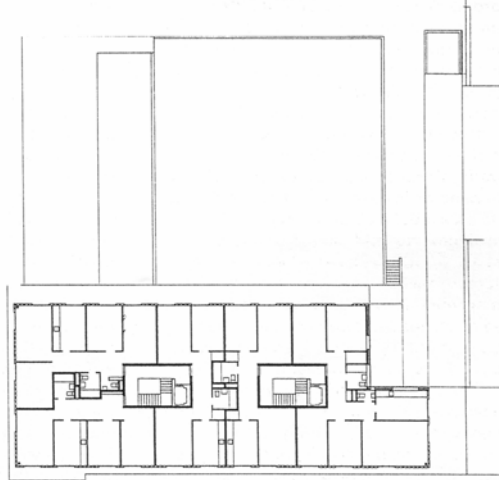
Why should we worry about constructing flexible buildings with new technologies if their full potential does not remain constant throughout their lifetime? Buildings which have shown they to be more adaptable are those which, in principle, were not conceived to be flexible. For that reason, it is possible to look back at a neutral architecture with high ceilings, with an ordered serialisation of openings and with an unpretentious structure. Another problem is the usual interest of the promoter and the architect in delivering a completely finished building. This occurs especially in the social housing architecture without knowing how the user is going to use the space.

Some architects, like the Dutch J. Habraken argued in favour of the participation of the user during the process of construction of his home. This is a benefit of the concept do-it-yourself your prefabricated house.

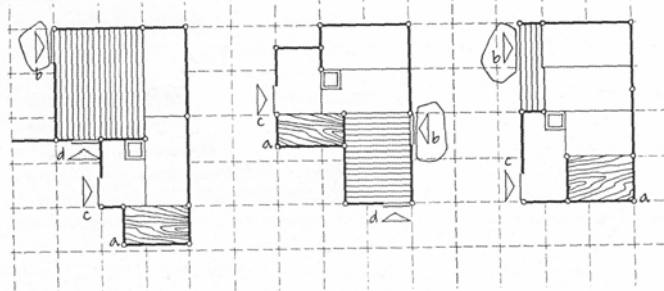
The architect Peter Allison, explains that *"despite assertions to the contrary, there is a fundamental problem in seeking to achieve flexibility in architecture in that construction is a medium which is inherently inflexible"*⁷⁶ He shows there are two paradoxically ways to

⁷⁶ Allison, P. *The flexibility of modular and movable systems*. A+T 12, p.110. A+T Ediciones. Vitoria. Spain. 1998

achieve the flexibility, either by providing open and free-flowing spaces or by making a number of similar sized spaces that can be used in a variety of ways.



Morger and Degelo, social housing. Basel, 1993⁷⁷



Floor plans of standard tea rooms with distinct floor pattern.⁷⁸

I understand it is possible to find the flexibility through actual techniques creating well define and useful spaces for users.

It is a simple concept: think about users and their necessities and their lives: *"Homeliness is not tidiness. If this were so, everyone would live in the sterile and impersonal homes that can be seen in interior decorating*

⁷⁷ Allison, P. *The flexibility of modular and movable systems*. A+T 12, p.111. A+T Ediciones. Vitoria. Spain. 1998

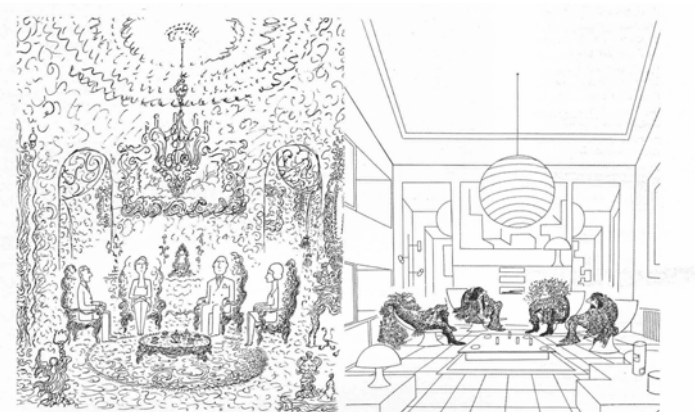
⁷⁸ *Ibíd.* p. 112

and architectural design magazines. What is lacking in these immaculate rooms, or what the photographers have taken great pains to eliminate, is any sign that these are inhabited by human beings. In spite of the artistically placed vases and art books, seemingly placed at random, there is no indication that these rooms are inhabited. I find these pristine interiors both fascinating and repellent. Can people really live without being untidy? How is it possible to prevent the tubes of toothpaste and half-used bars of soap in their bathrooms? Where is the debris generated in their daily lives?"⁷⁹. It is the time where traditionally forgot uses became supports of the house assuming their own function and the function of structural supports.

It is not a concept of style, or it is a concept of style of users, their look of architecture⁸⁰. It is possible to imagine architecture without architect, made it with prefabricated components which are capable to assume different situations in different social, economic, politic, cultural, environmental... contexts.

⁷⁹ Rybczynski, W. *Home, a short history of an idea*. Viking Penguin. 1986, in A+T 13, p.5. A+T Ediciones. Vitoria. Spain. 1999

⁸⁰ Rybczynski, W. *The look of Architecture*. Oxford University Press, 2001



Sempe's drawings showing the contradiction that, for cultural motives and social prejudice, exists between domestic space and people's lifestyles.⁸¹

⁸¹ La descrizione dell'ambiente. Editori Laterza. Rome. 1975. p.104-105.

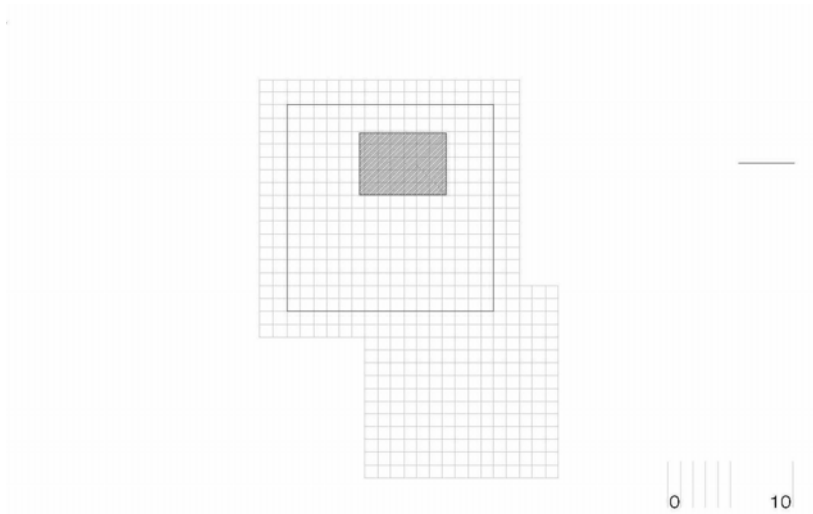
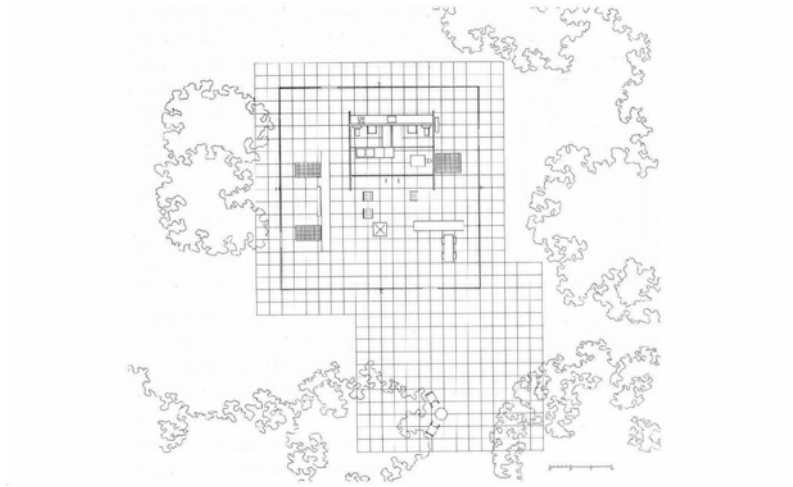
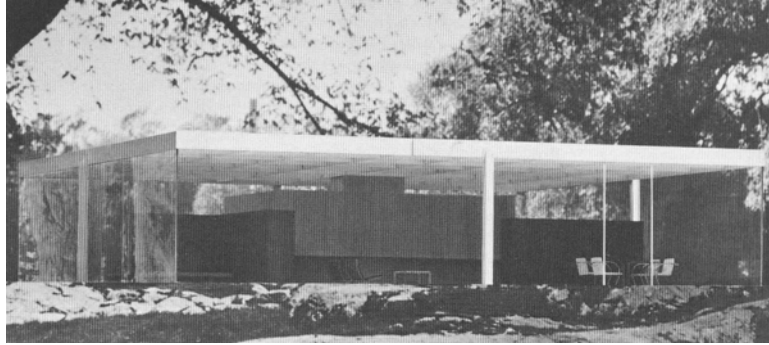
3.1 COMPARATIVE

This is a random selection of 10 contemporary houses.

It is possible to think about them taking in consideration the different types of furniture elements which are **necessary** and **essential** for a real and complete life in a house.

50 BY 50 HOUSE
Mies van der Rohe⁸²

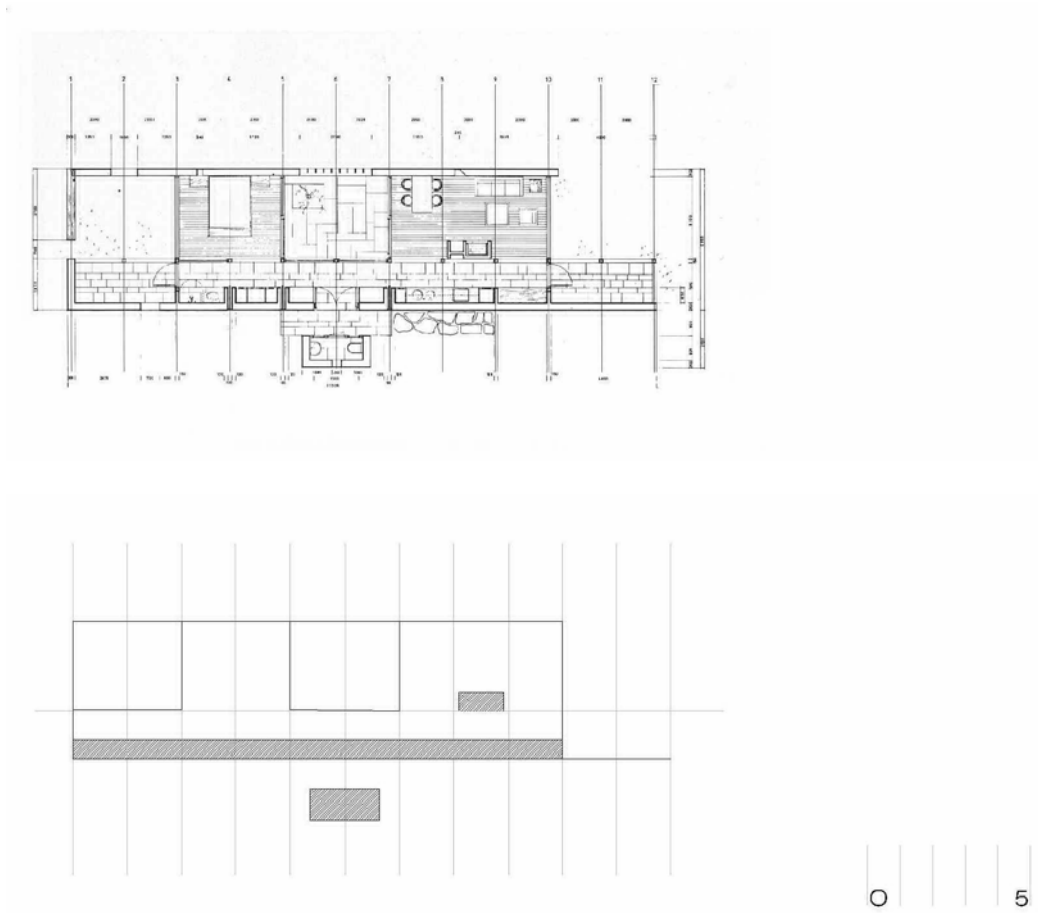
Project 1950-51



⁸² Schulze, F. *Mies van der Rohe. Leben und Werk.* Ernst & Sohn, 1986. p.268-269

EXPERIMENTAL HOUSE
Sverre Fehn⁸³

Mauritzberg Manor, Sweden
1992

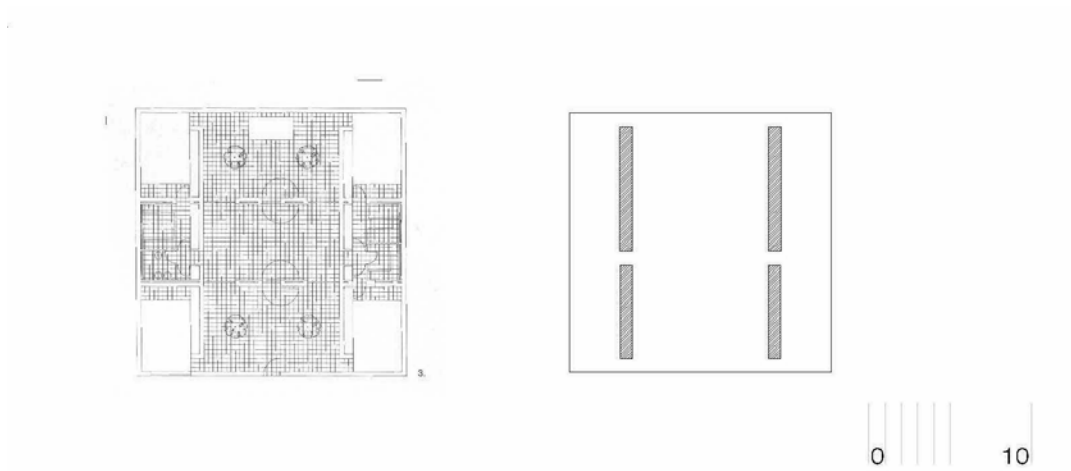


⁸³ Gili Galfeti, G. *Private Retreats*, GG. Barcelona 1995, p.54-59

GASPAR HOUSE

Alberto Campo Baeza⁸⁴

Zahora, Cádiz 1992

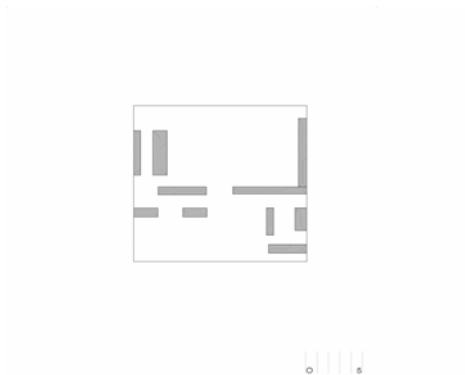


⁸⁴ Alberto Campo Baeza, Editorial Munilla-Lería. Madrid 1996, p. 22-29

HAUS GELLER II

Long Island, NY 1969

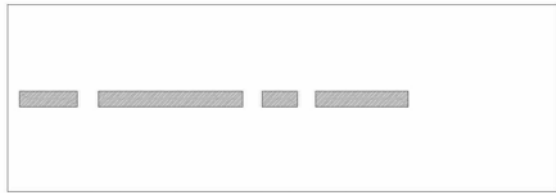
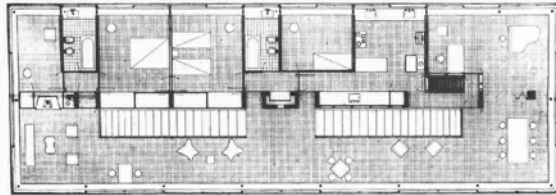
Marcel Breuer and H. Beckhard⁸⁵



⁸⁵ Masello, D. *Marcel Breuer und Herbert Beckhard. Die Landhäuser 1945-1984* Birkhauser, Basel 1996, p.109-115

HOUSE OVER THE BROOK
Amancio Williams⁸⁶

Mar del Plata. Argentina
1946

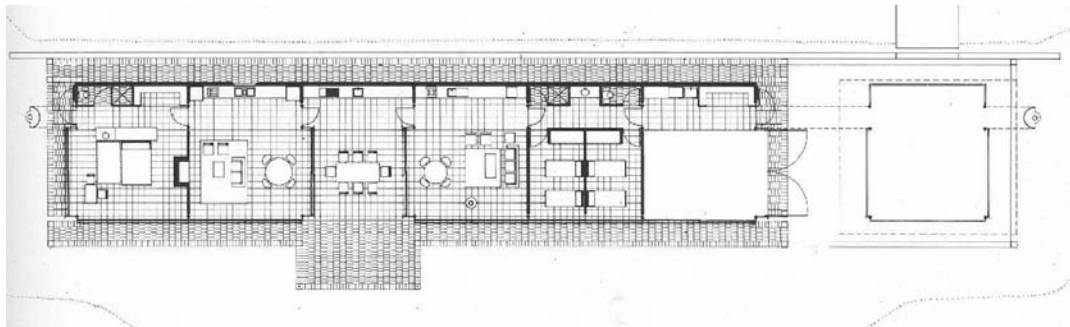
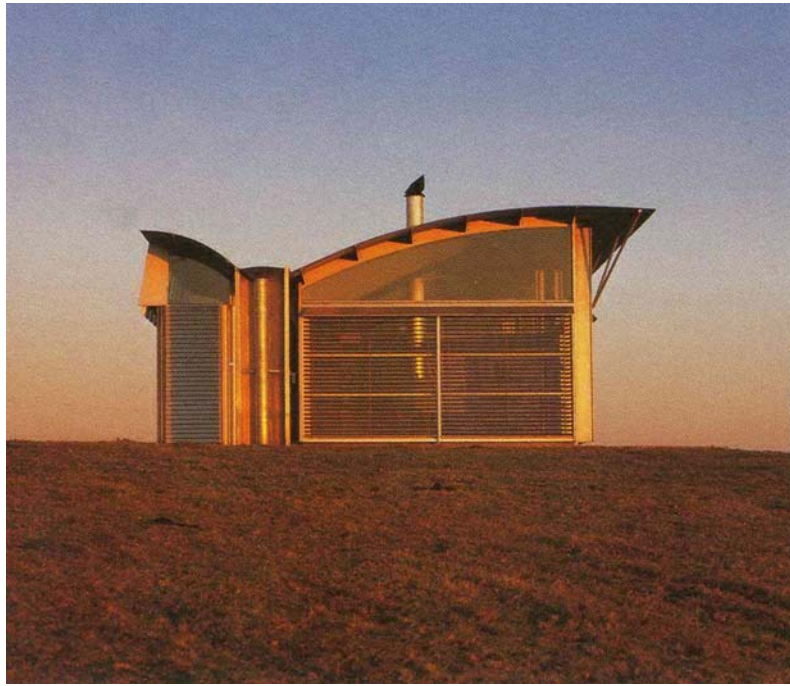


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⁸⁶ *Quaderns 204. Mensules*. COAC 1994, p.48-54

MAGNEY HOUSE
Glenn Murcutt⁸⁷

New South Wales 1982-84

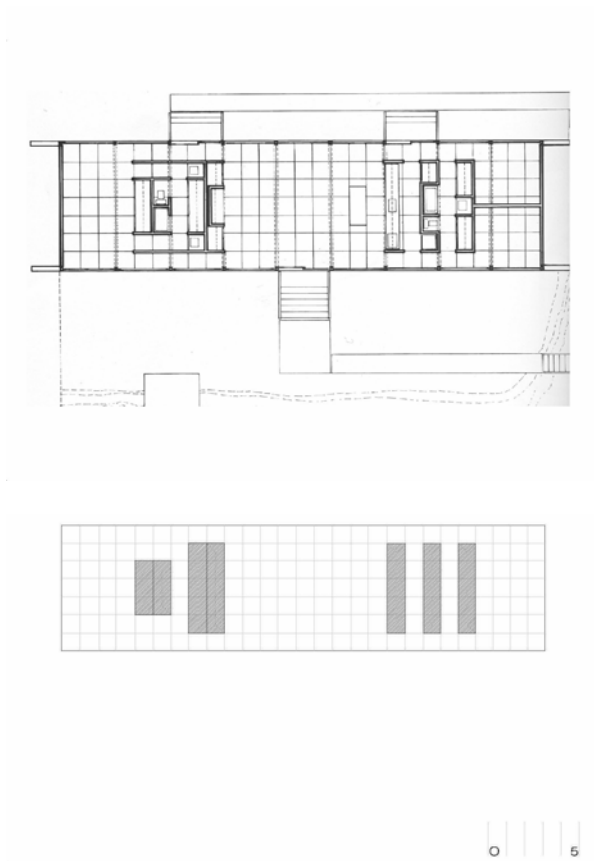


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⁸⁷ Fromonot, F. *Glenn Murcutt, works and projects*. Thames and Hudson. NY 1995, p.96-101

MOORE HOUSE
Craig Ellwood⁸⁸

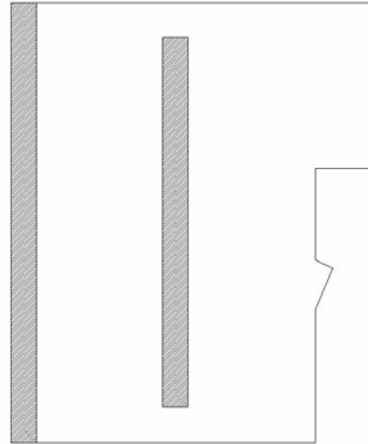
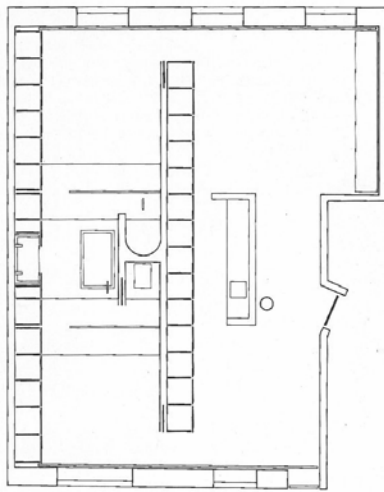
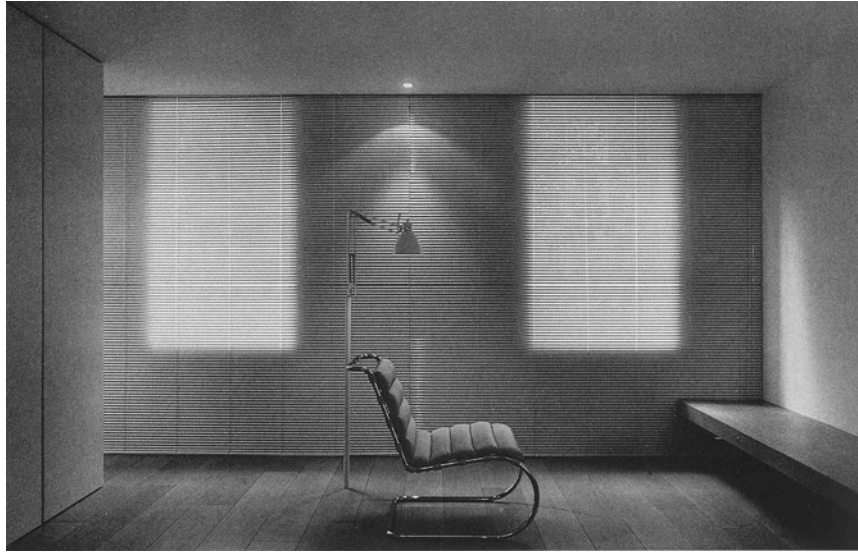
Hollywood Hills. LA, CA
1964



⁸⁸ 2G n.12 *Craig Ellwood 15 Casas*. Barcelona 1999, p.104-117

ROTHMAN APARTMENT
John Pawson⁸⁹

London 1990



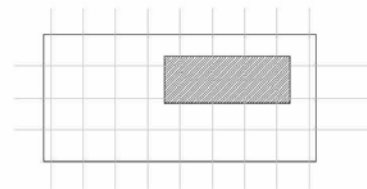
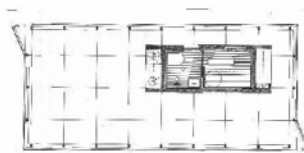
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⁸⁹ Chatwin, B. *John Pawson*, GG. Barcelona 1992, p.48-55

STUDIO

Kaalo, Laine, and others⁹⁰

Espoo. Finlnad. 1992



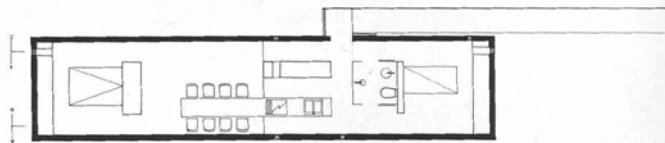
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⁹⁰ Riley, T. Light Construction. Transparencia y ligereza en la arquitectura de los 90. GG, MACBA. Barcelona 1996, p.82-85

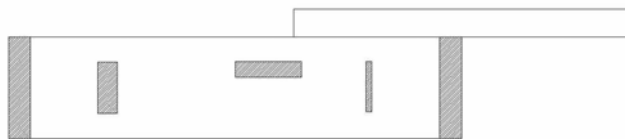
VILLA WAVI

Rune, Claesson and Koivisto⁹¹

Stockholm 1994



Planta baja / Ground level plan



0 5

⁹¹ Villa Wavi, Stockokmen Omeleten. *Diseño Interior n.44*. Globus Comunicación. Madrid 1995, p. 19-23

4 NEW REALITIES

4.1 PROGRAMATIC ASPECTS

The new alternatives of a house are related with the aspect which affecting the house. These are changes in the society, evolution living, diversity in systems of life because of quick changes in the relationship between the members of the family. Smaller family units (fewer children and old people living with the family). Unstable couples (which give rise to a greater number of people living alone), working women with less prominent roles as housewives. The development of new computer technology applied to the production and work. New concepts of the kitchen and bathroom, no longer marginalised areas but as places of a high technological level converted into areas of recreation and leisure. The house as a place for weekend recreation.



There are two aspects that result from all of these society changes:

- Project-Programme, the result of requirements made by new emergent lifestyles, and
- the Construction as a determining technological act with the capacity to incorporate new instruments and systems which would foster the ever-necessary

optimisation of costs and economy of means also
other point to analyzed could be the intersection
into the idea of the City.

Building therefore cedes its leading role to
infrastructures. The construction of housing and houses
thus operates in edge situations: edges of networks and
edges of cities. Edges, which need a new urban image, as
a reply to the new situation.

Posing the subject of housing and houses in this new
context means rejecting nostalgic attitudes which would
attempt to transfer the values of the nineteenth-century
city to the edges.

There are still certain differences between America and
Europe. In America the home is never amortized because it
is changeable, temporary. Throughout a lifetime homes are
adapted to the needs of each moment in an eternal
leasing. In Europe we're still rooted to the idea of
property; we need a house able to survive our whole
family history, because our house is our castle.

We mustn't forget that the house life is limited,
structure 50 years, facades 20 years and the lifestyles
last ten, five, and their duration is decreasing.

The market is becoming more plural and we can no
longer conceive of a type of dwelling which responds to a
standard program. The reply must be therefore to achieve

greater isotropy, greater versatility, in order to function in a world of changing logic.

We are around the concept of flexibility. But the ideal of the empty space also needs **spaces of accumulation**, ladders or furniture converted, for example, into thick partitions or partition-cupboards, **accumulators**.

But in any case, a dwelling must above all be exciting. The occupier must feel proud to inhabit a space.⁹²

4.2 PROJECT AND TECHNIQUE.

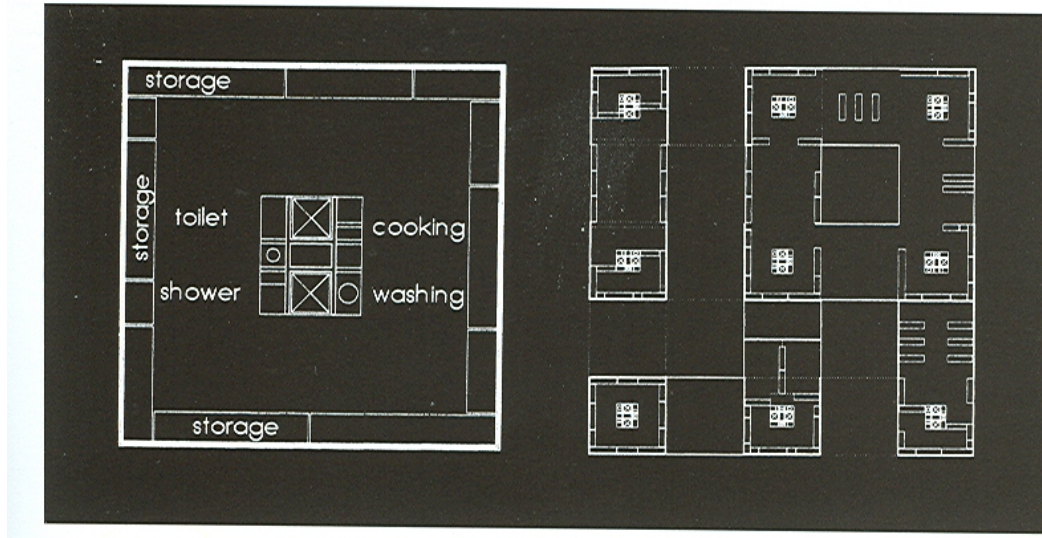
It is possible to find answers to the previous changes, and necessities. Flexibility can be the answer.

Flexibility can also not mean size. There are probably others ways to approach the issue of flexibility, far more reasonable an independent of size (size means cost), which would be a "flexibility-abstraction-serialisation-repetition". Consequently "non-specialisation".

Indeed, none of us believe in classifications based on specific functions any more. These functions are varied, diversified, changeable, increasingly less typifiable, in the same way that compartmentalisation and size based on function tend more and more towards error. This leads me to introduce the idea of furniture. When we speak of compartmentalisation we always refer to a single type of

⁹² Housing: New Alternatives. Quaderns #210.p50-75.

compartmentalisation and forget the possibilities of furniture as a mechanism which can secure increasing potential.



S. Gansel. House for Nomads (1993-1994). Basic unit and combinations. ⁹³

The ideal of the empty space also needs spaces of accumulation, larders or furniture. ⁹⁴

The flexibility of the houses can also be a good answer of the actual diversity programs and a lot of other considerations that advise a flexibility house like

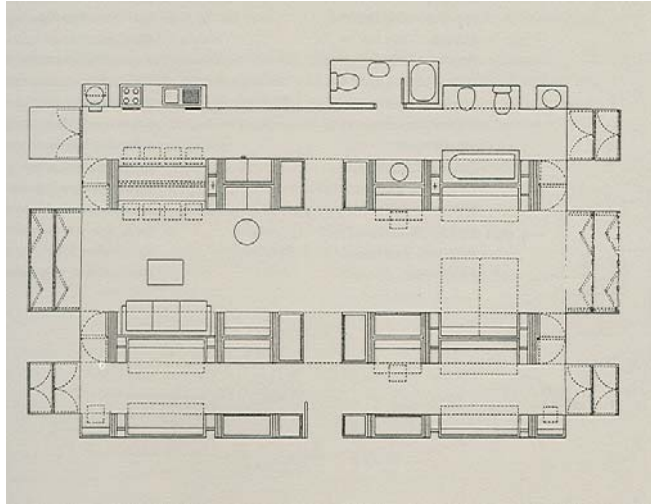
- the necessity of a unknown house that could be correct for a concrete occupation
- the evolution of the occupation
- the periodic changes of life ways

⁹³ Housing: New Alternatives. Quaderns 210, p. 67

⁹⁴ Ibid.

- the necessity of development more than one activity in the spaces .

The sizes are important but exist other ways to find a flexibility space without a big size.



General plan of typical dwelling unit. Project for 180 dwellings in Venta Berri. Maria J. Aranguren & J. González Gallegos ⁹⁵

- An ambiguous division that admit a polyvalent use, with out the transformation necessity. (a room that could be used like offices, dining room, bedroom).
- The lack of interior divisions, that could made two small bedrooms or one big bedroom.
- The incorporation of mobile walls can joint and separate the spaces. This solution has a fail in correct noise isolation.

⁹⁵ Ibíd.

- Double circulation to go from one to other place, It is made that the rooms have more capacity to absorb different functions.
- The modification of the house limits. It is possible in some house but really difficult in housing.

In general all the houses have a relatively flexibility. This flexibility is bigger with a clear structure, and with order and equilibrium in the divisions.⁹⁶

⁹⁶ Paricio, Sust. *La vivienda contemporánea. Programa y tecnología*. Institut de Tecnologia de la Construcció de Catalunya- ITeC . 1998. p25-26

5 PERFECTIBLE DWELLING

In *Construmat 2001*⁹⁷ arise, the **Barcelona House**, a proposal for the house of the XXI century. It is an initiative with five basic components -floor, walls, windows, kitchen and bathroom, which permit redefine the rules of the domestic space with more liberty.

The intention is the **flexibility** of the new houses, with different types of life and with cheaper modifications.

Floor: the traversable surface must be adequate to the needs of the dwelling and its occupants, and able to cover electrical wiring and plumbing elements, all at a cost that is reasonable for an average dwelling.

Wall or partition: the internal compartmentalization of a dwelling must be carried out with dry, non-masonry partition systems that are easily taken apart, moved, shifted or folded, as well as alterable in degree of transparency.

Windows or façade: the product to design is a perfectible window, with a frame equipped to incorporate improvements in quality or the technical innovations that exigencies of comfort and industry's offers are continuously giving rise to, whether in solar protection or air conditioning.

Kitchen: dry modules that can be added and taken away as desired, so that the kitchen is not definitive. Furniture

⁹⁷ Spanish biannual fair of construction in Barcelona

pieces such that any part of the house can be turned into a kitchen.

Bathroom: with sanitary furniture that can be transferred or replaced by new elements as easily as furniture or conventional electric appliances.

Several international architects made de design of the different elements. Dominique Perrault expressed interest in the kitchen, Clotet-Paricio in the floor project;

David Chipperfield designed the bathroom, the window Duct Ben van Berkel and the internal divisions Toyo Ito.⁹⁸

The objective was to conceive of furniture- with a minimum of elements- through which to be able to turn any part of the house into a "kitchen"



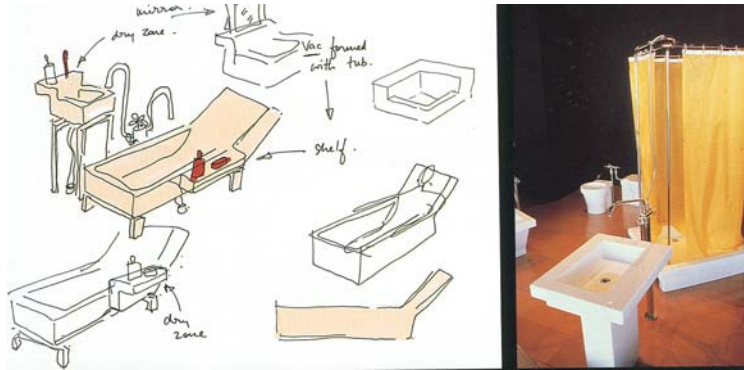
The Modular Kitchen. Dominique Perrault.⁹⁹

⁹⁸ Arquitectura viva 77. Mill museos. Los lugares comunes del arte. Barcelona house or the domestic future. Arquitectura Viva S.L.2001, p. 99

AV Monographs. Housing in Detail #86. Arquitectura Viva S.L. 2000. p10-24

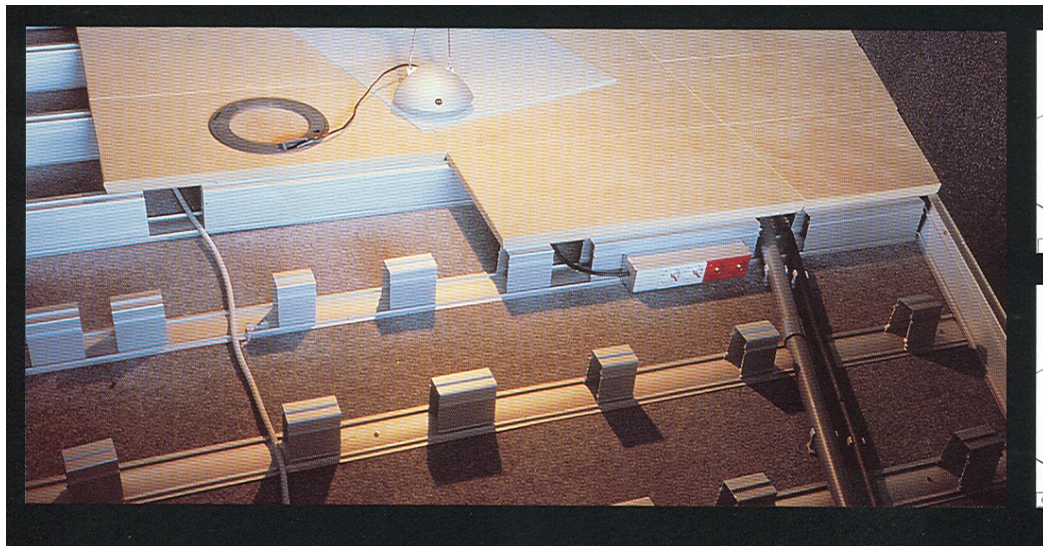
⁹⁹ AV Monographs, 86. Housing in Detail. Arquitectura Viva S.L. 2000. p. 21

A turret similar to the urban hydrants supplies by means of flexible tubes the sanitary fixtures, whose location can be freely chosen thanks to a pump system for the ejection of water like that of washing machines.



Sanitary Furniture. David Chipperfield ¹⁰⁰

The raised floor adjusts the elevated paving common to office buildings to the housing space, proposing an alternative to the traditional system of installations layout by way of chases within walls.



The Raised Floor. Clotet & Paricio

¹⁰⁰ AV Monographs. Housing in Detail 86. Arquitectura Viva S.L. 2000. p22

The improvable window can be inserted in both massive facades and in curtain walls, starting from a low-cost window frame to which a second frame, solar filters and controlled ventilation and airing systems are added.



The improvable Window. Ben van Berkel ¹⁰¹

Capable of adjust its transparency with a flow of electricity. Private glass is the basic component of a partition system whose fixing through pressure allows varying its position with no significant alterations.



The Mobile Partition. Toyo Ito ¹⁰²

In the underlying coordinated effort to make a diverse, changing and perfectible dwelling possible, the products

¹⁰¹ Ibíd. p15

¹⁰² Ibíd.. p.18

of the Barcelona House constitute an invaluable project
for developers, architects, builders and industrialists.

103

¹⁰³ Arquitectura viva #77. Mill museos. Los lugares comunes del arte.
Barcelona house or the domestic future. Arquitectura Viva
S.L.2001.p99.
AV Monographs. Housing in Detail, 86. Arquitectura Viva S.L. 2000,
p10-24

6 FURNITURE HOUSE

6.1 REFERENCES

6.1.1 FURNITURE HOUSES. CASE STUDY HOUSES. Shigeru Ban.

(ex.#4). 1995

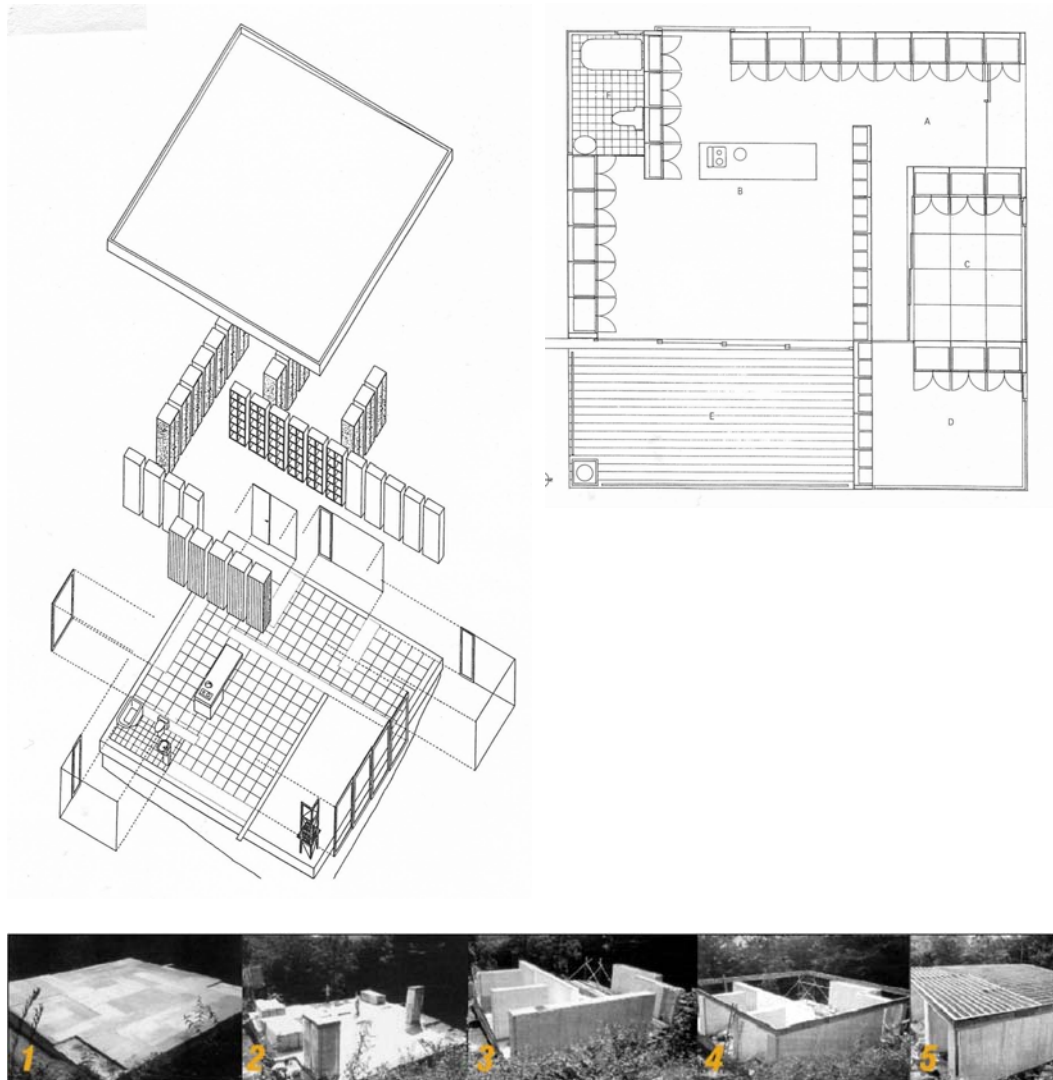
Floor-to-ceiling shelves function not only as an element of space composition but also as the main structural element of the house.

The furniture is not movable, but it is the structure of the house. It is possible to enlarge the concept.



Unit dimensions: 240(high)x90(wide)x70cm(deep). 176 pounds.

These units, painted by furniture builders in a factory, were assembled at the site and joined to each other by a wood girder placed on their upper surfaces. Simple, preciseness and lower cost construction.



Plan, axonometric concept and construction sequence ¹⁰⁴

Furniture is not movable

¹⁰⁴ References and images. Arief, A and Burkhart, B. PREFAB. Gibbs Smith Publisher. Salt Lake City. 2002, p. 121

6.1.2 HOUSE AT SAGAPONAC. Shigeru Ban and Dean Maltz.
Under Construction.

The concept is founded on the early-twentieth-century explorations of standardization and mass production as efficient means of achieving a highly engineered product. Furniture units are structural support, spatial division and storage (closets, book-cases, cabinetry, lighting and packaged HVAC units).



Basic unit



Plan, from model ¹⁰⁵

Pieces are made in the factory, so no skilled people are necessary on site.

Two people can move, position and install each piece.

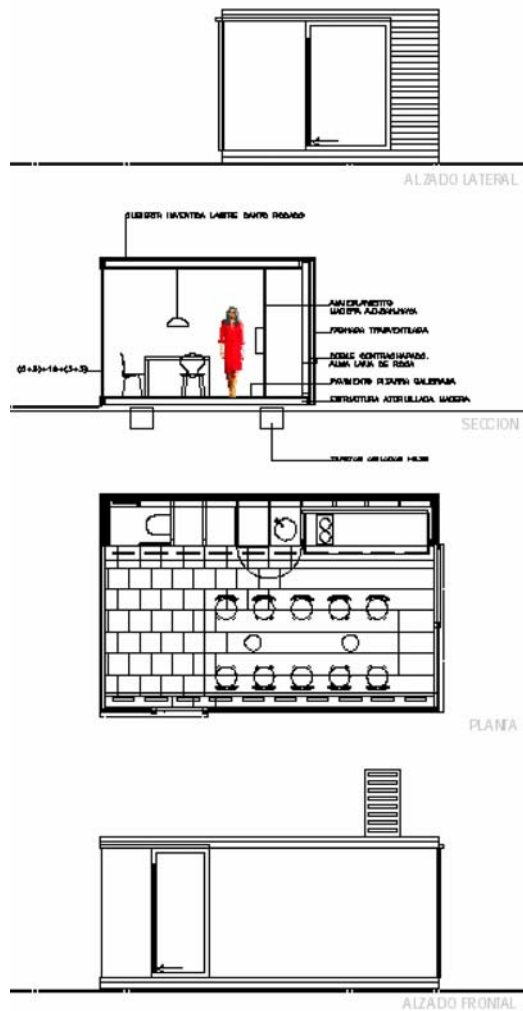
Cabinets -units- are not movable elements and structure of the house.

¹⁰⁵ References and images: Brown, C. *American Dream, Houses of Sagaponac*, Modern Living in the Hamptons. Rizzoli, NY. 2003. p. 44-47

6.1.3 GARDEN PAVILION. Property: José Balado Placer.
 Miño. A Coruña. Spain.
 Patricia Sabín + Enrique M. Blanco, architects.
 2001/02. Realized.

The piece of furniture supports functions, installations and structure. Carpentries in glass perimeter works like pillars.

Apparently is a construction without structure.



7 PROPOSAL

The proposal of perfectible housing (capable of becoming or being made perfect) I have developed during my studies in the United States, can not be a single solution for an enormous variety of problems. It necessarily has to be an open concept capable to adapt to different situations. Because of that, the description of the system is an exhibition of opportunities, not a specific solution, because the intervention of the inhabitant is necessary for a complete dwelling.

COMPONENTS

7.1 THE COMMON COMPONENTS

- Structural façade units. Dimensions: 1,20m x 3,35m. (4'x12'1'') The developed solution is in precast concrete. Nevertheless, due to the relationship vertical-loads/unit, is possible to consider other solutions like laminated wood, steel, or indeed investigate with glass, translucent concrete, plastics or metacrilate.
- Structural horizontal structures with precast overhead slabs for a maximum span of 12meters (39 feet) because of transport conditions and interior light. It is possible think about alternative materials like

steel or commercial prefabricated wood slabs formed by wood beams and plywood¹⁰⁶.

- Communication components. Different options and opportunities to adaptation. External corridor joining vertical communications, interior stairs, individual stairs or interior private stairs¹⁰⁷.
- Vertical mechanical services. Associated to the structural façade units are completely accessible for maintenance and replacement.

7.2 THE SUPPORT OF THE RAISED FLOOR

The necessity of adaptability, described in previous chapters, is supported by a raised technical floor which is connected to the vertical mechanical systems. It is possible to plug every kind of machines wherever the inhabitant wants every day during the use of the house.

It is based in usual technologies of office buildings, with pedestals and horizontal 1' x 2' cellular panels.

It is possible to use this space for storage space and/or creating non-flat interior geographies.

The definition of spaces will take in consideration this element.

¹⁰⁶ Frequently used in Europe

¹⁰⁷ These two options are private elements.

7.3 THE DEFINITION OF THE PRIVATE SPACE.

The buyer is the only person who defines the "quantity" of space he needs. At this moment, it is the time of the physical construction of it.

It is necessary to combine under and upper floor elements solving acoustics and fire requirements. Concrete blocks are the best solution under the floor and between it and the ceiling panelizing systems and/or furniture elements could be used.

The third component is the façade. Non substructures are necessary; fixing to the interior and exterior sides of the unit it is possible to respond to different climate condition. The concept is the inhabitant/s of the house can change all these elements, so the façade will show the image of the users of the building. The building will be what the users want it be.

7.4 THE POSSIBILITIES

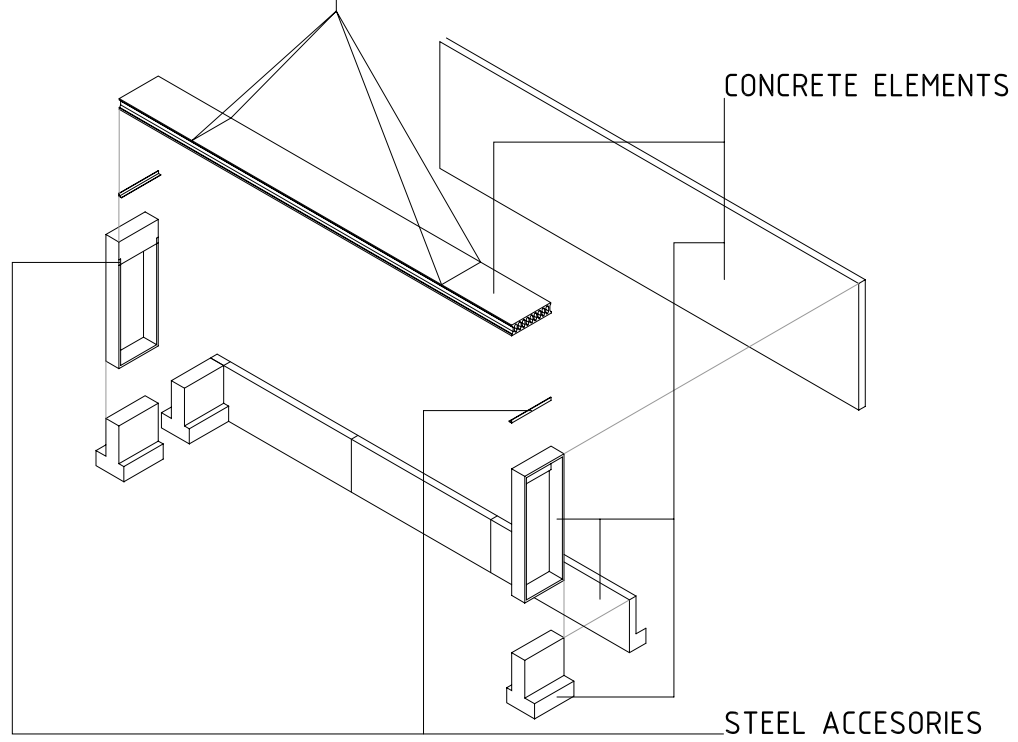
Once the boundaries of the dwelling are define, and the position of the elements into it are absolutely free, the work is done. Each house/apartment/dwelling will perfectible respond to the necessities of the users because of it enormous capacity of adaptation.

Each element should be considered FURNITURE; from partitions, glasses, doors... to shelves, storage, showers, baths, beds, kitchens... All are movable and pluggable in a different place. Different options are shown. From commercial elements to alternative ones which define an own private space for a determined use.

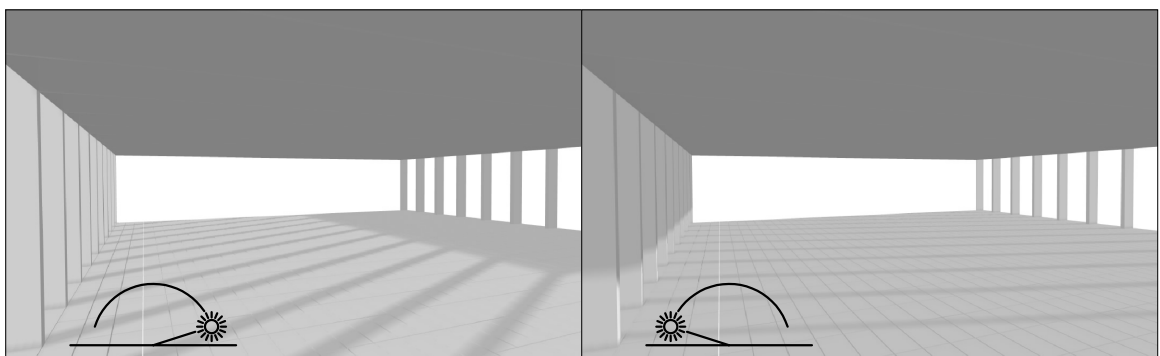
Joints and unions among furniture elements are not permanent and are not hidden.

COMPONENTS

BASIC

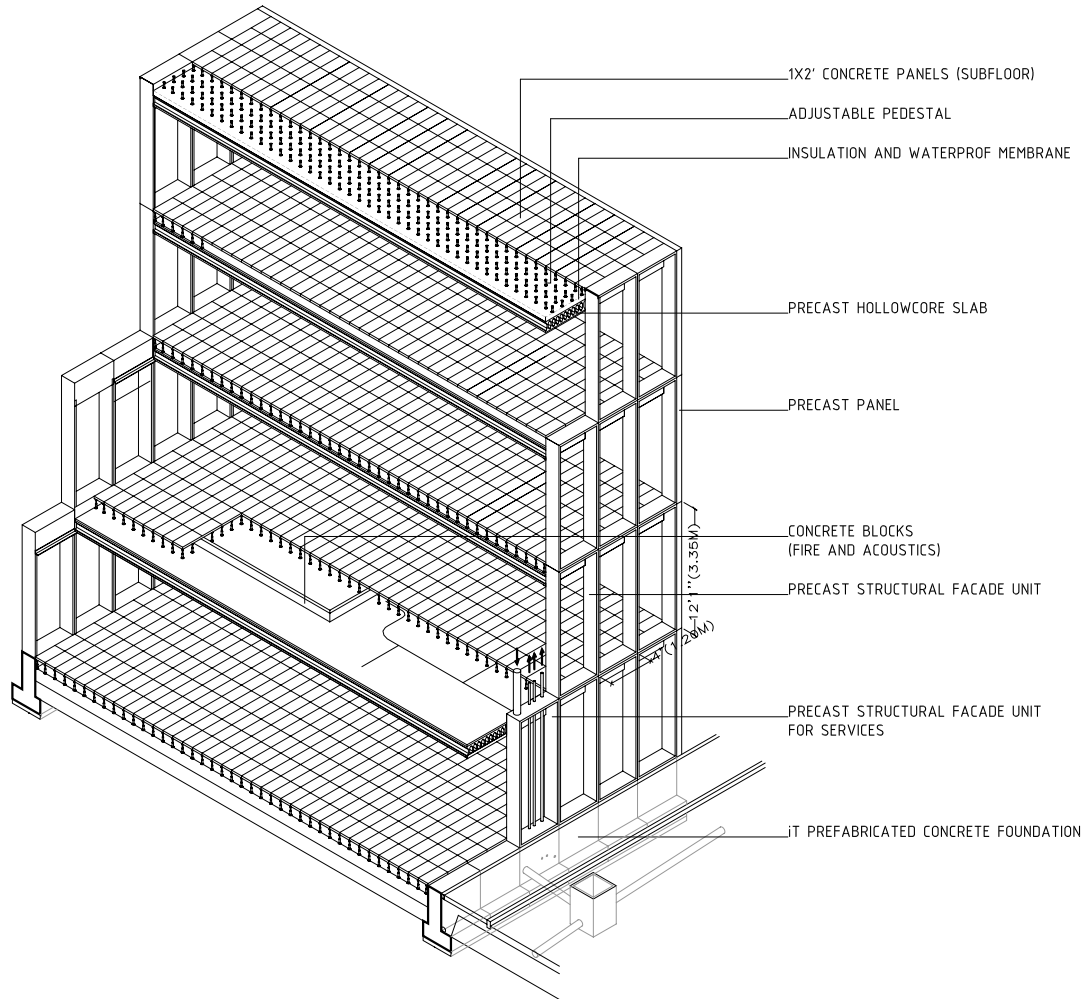


dawn-nighfall

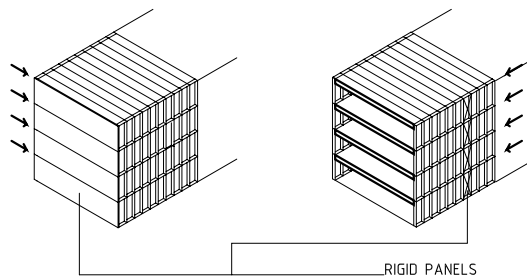


COMPONENTS

STRUCTURE

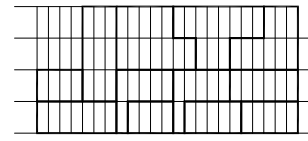


6M
18'

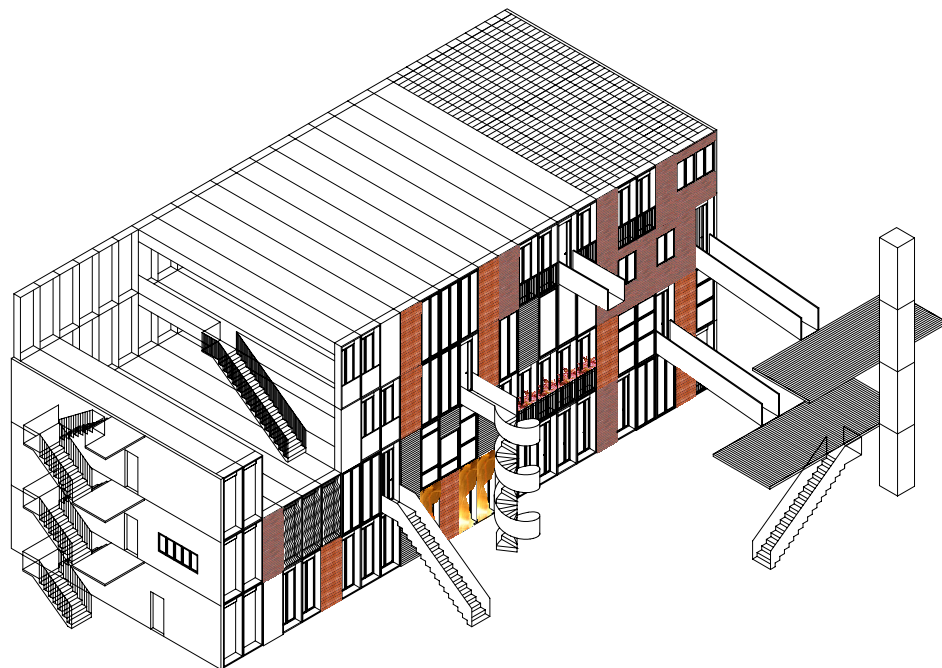


CIRCULATIONS

POSSIBILITIES



ELEVATION



int. STAIRS





























ind. STAIRS

col. STAIRS

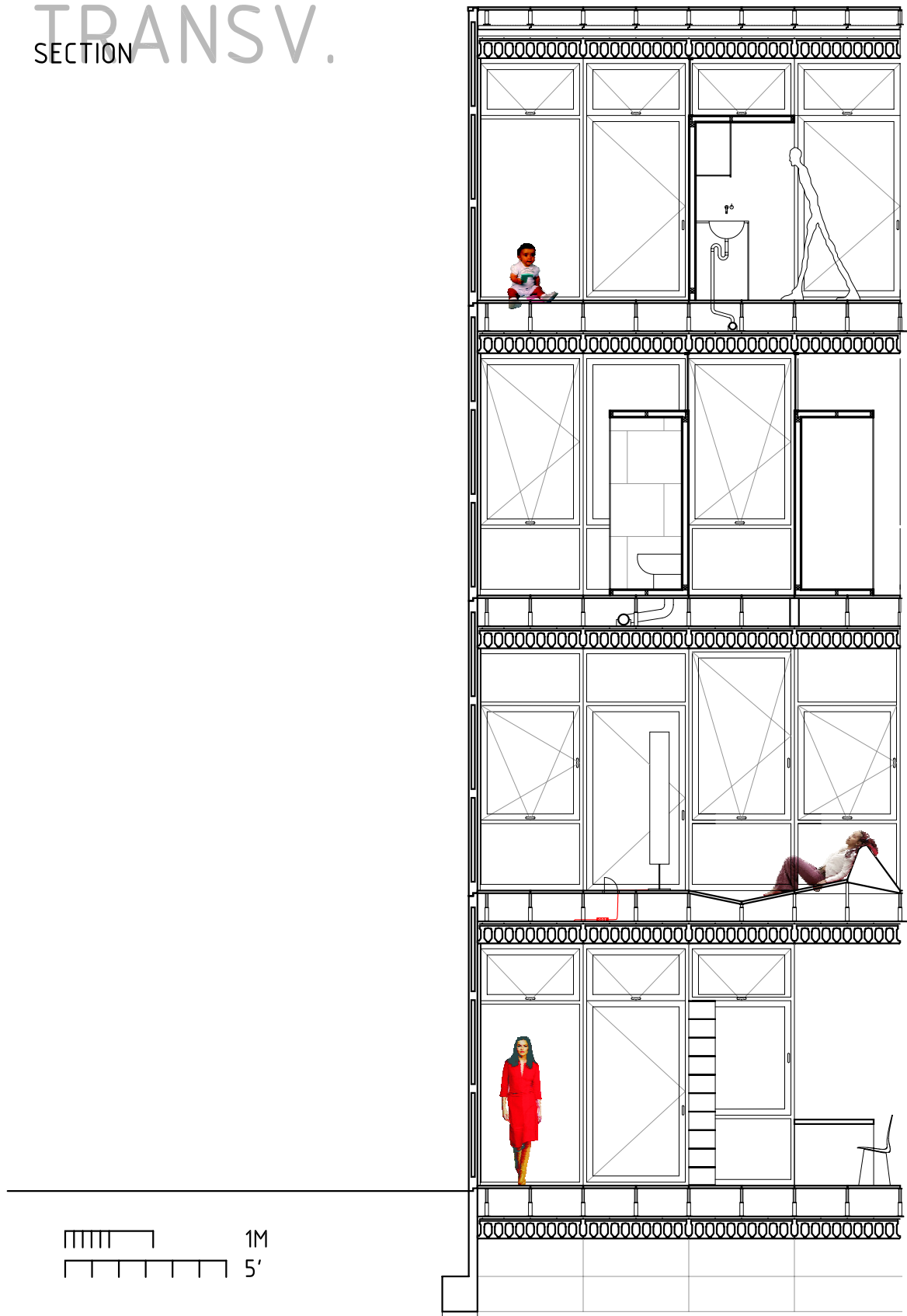
ELEVATOR

COMPONENTS

INTERIOR

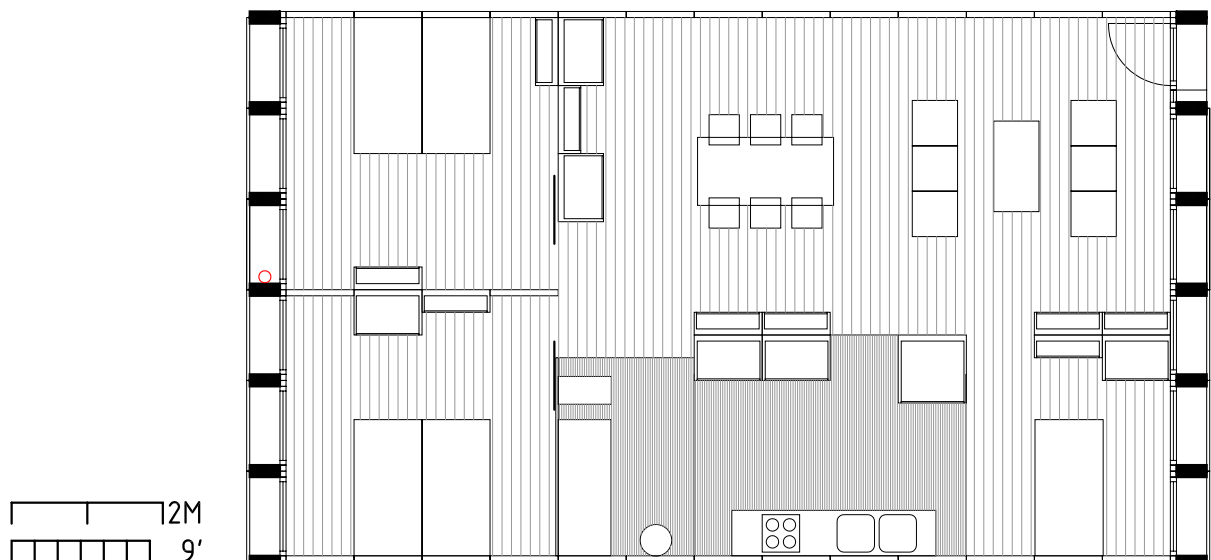
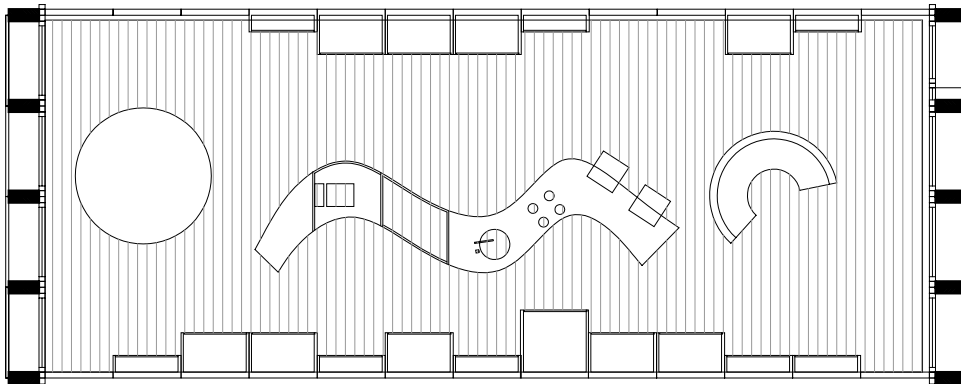
	ELEMENT	ALTERNATIVES	ELECTRICAL	PLUMBING	SANITARY	COMM.	VENT.	
SHOWER				<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	DOORS
BATH				<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	GLASSES
SAUNA			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	PANELS
JACUZZI			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
LAVATORY				<input type="checkbox"/>	<input type="checkbox"/>			
TOILET, BIDET	 			<input type="checkbox"/>	<input type="checkbox"/>			
MIRROR								
SINK	 		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
DISHWASHER			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
KITCHEN			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
OWEN			<input type="checkbox"/>					
REFRIGERATOR	 		<input type="checkbox"/>		<input type="checkbox"/>			
BED			<input type="checkbox"/>					
TABLE...		 	<input type="checkbox"/>					
PLAYING			<input type="checkbox"/>					
AUARIUM-BIRDHOUSE			<input type="checkbox"/>					
MEDITATION ROOM			<input type="checkbox"/>					
MEDITATION ROOM			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

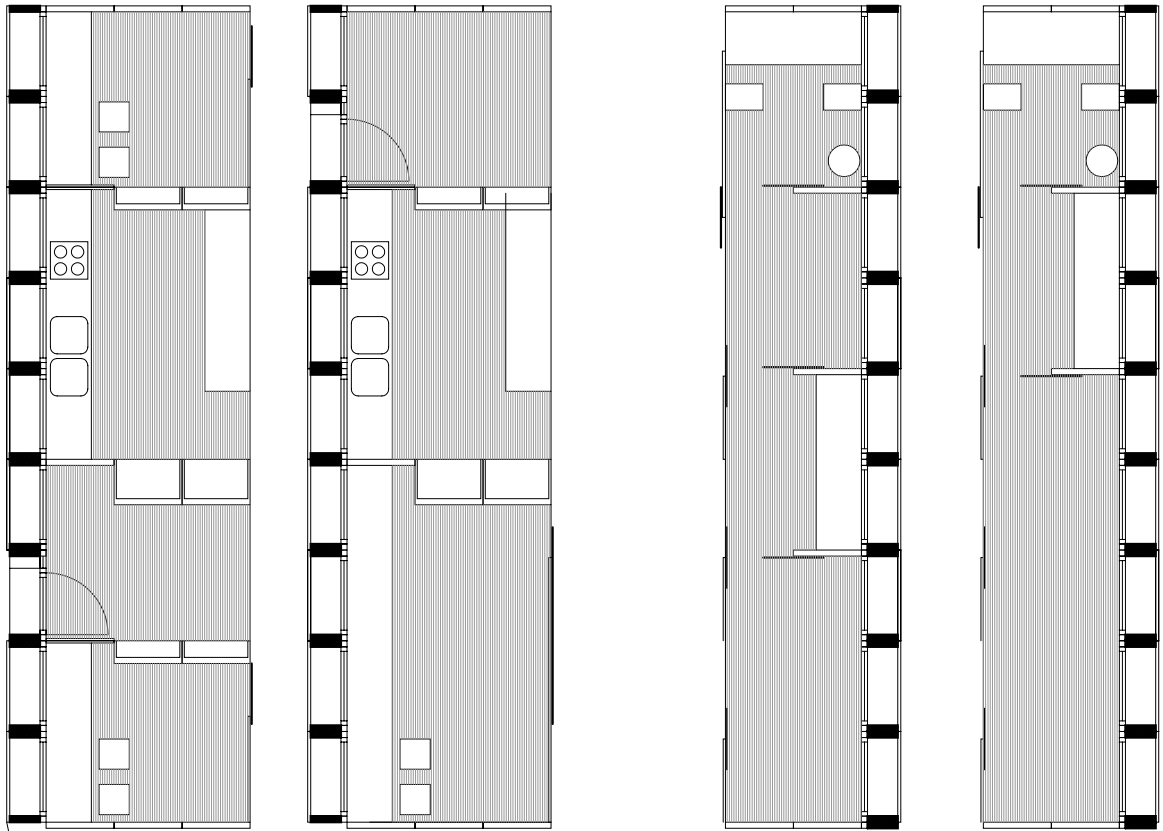
TRANSV. SECTION



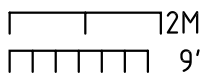
DIVERSITY

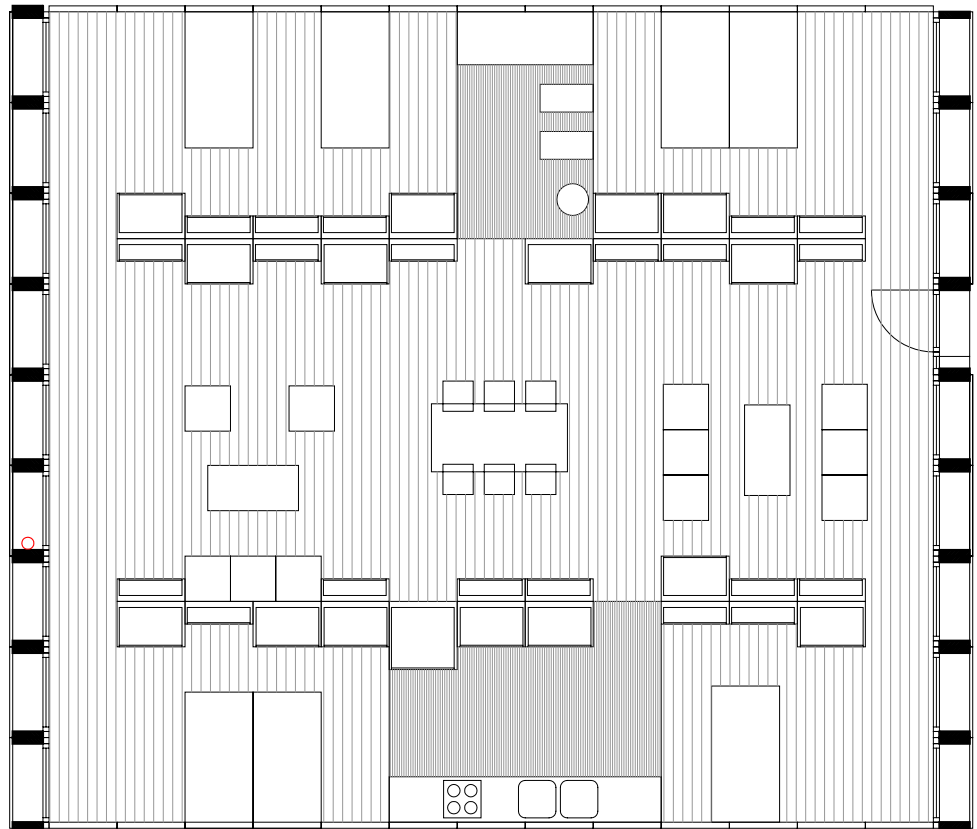
PLANS



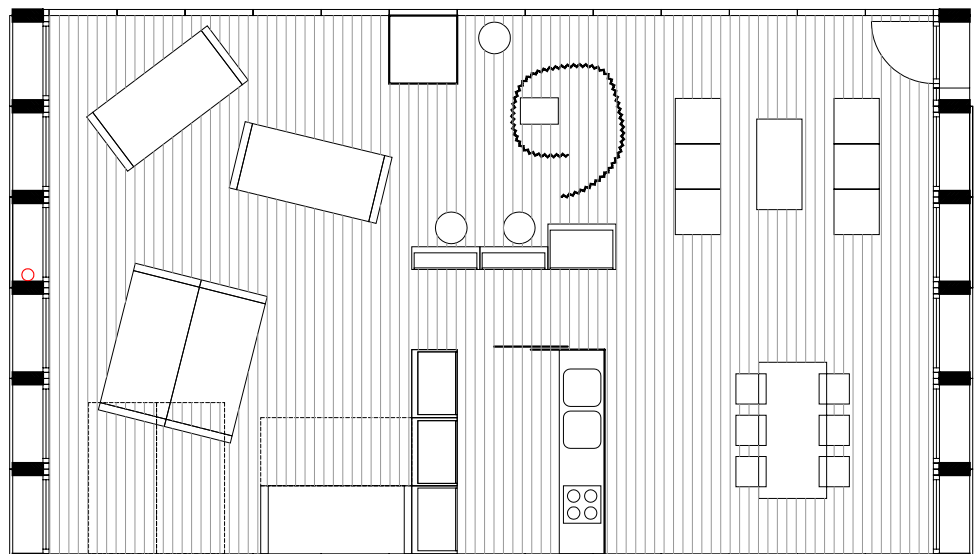


FILTERS





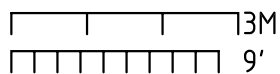
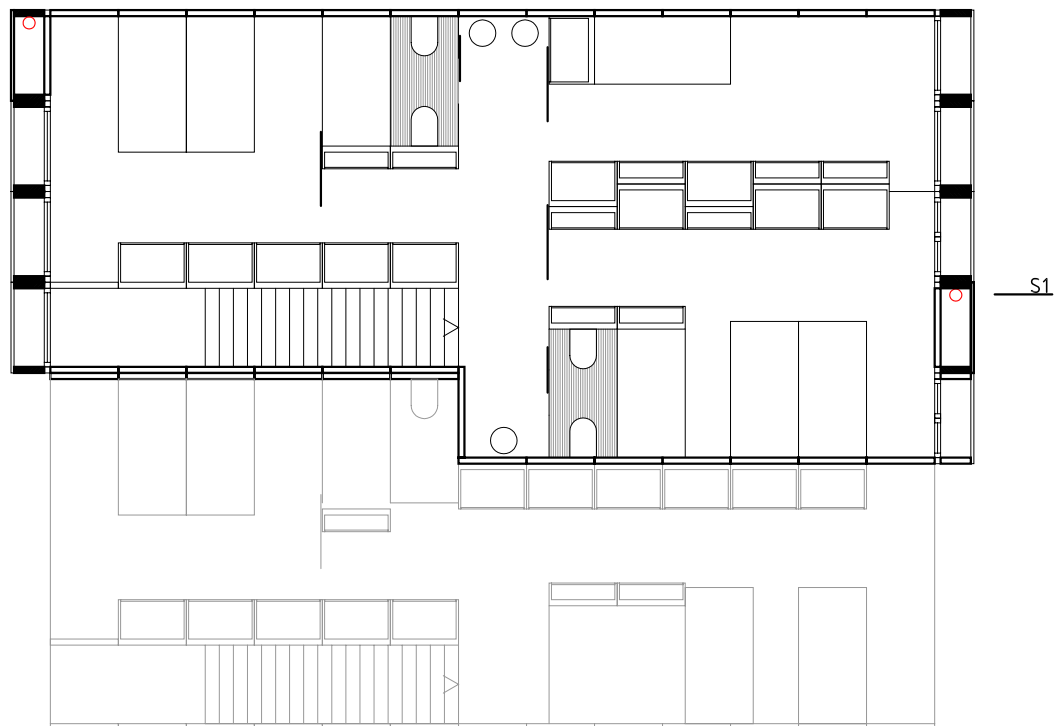
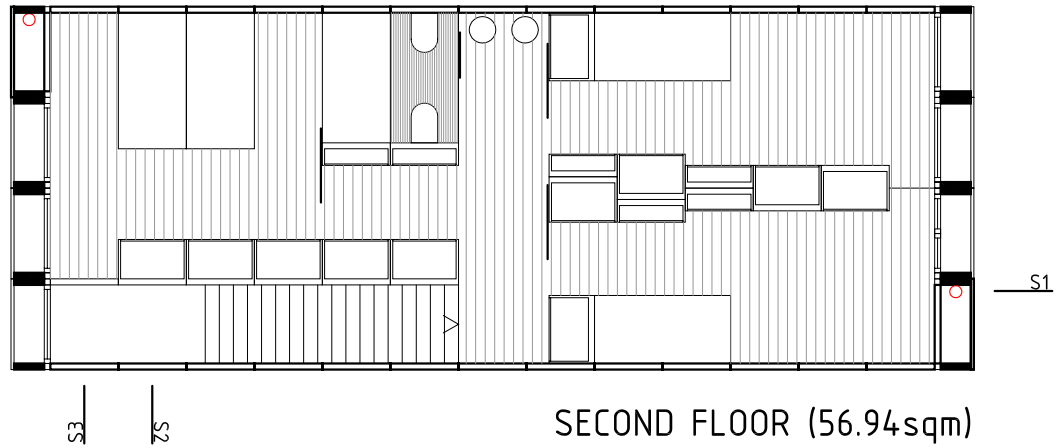
CROSSING LIGHT



12M
9'

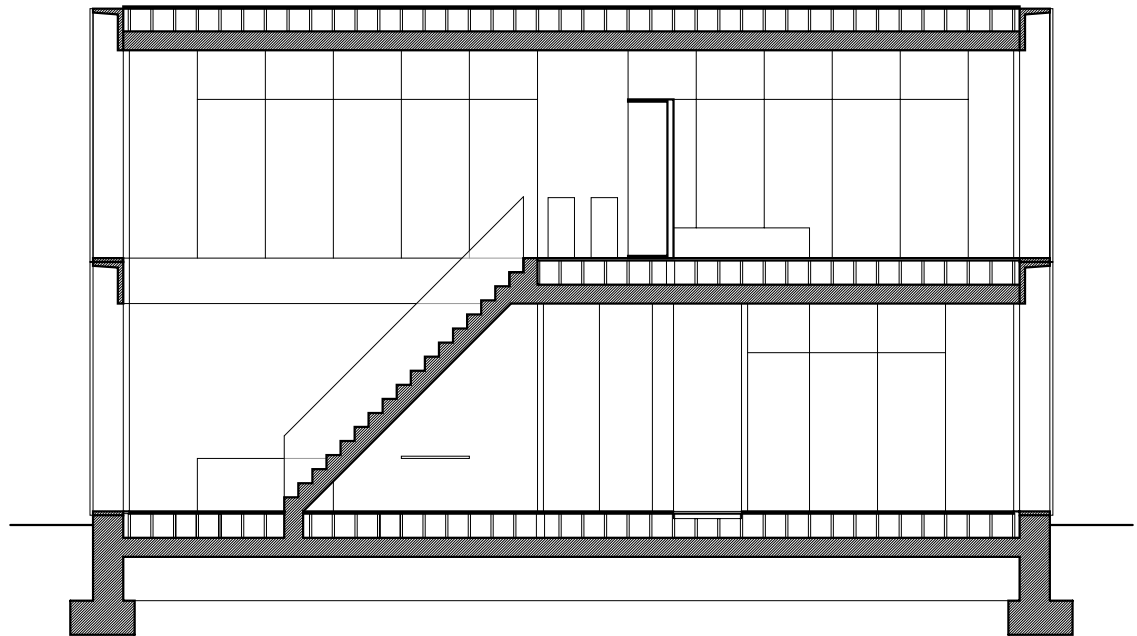
ROW HOUSES 1

SECTION

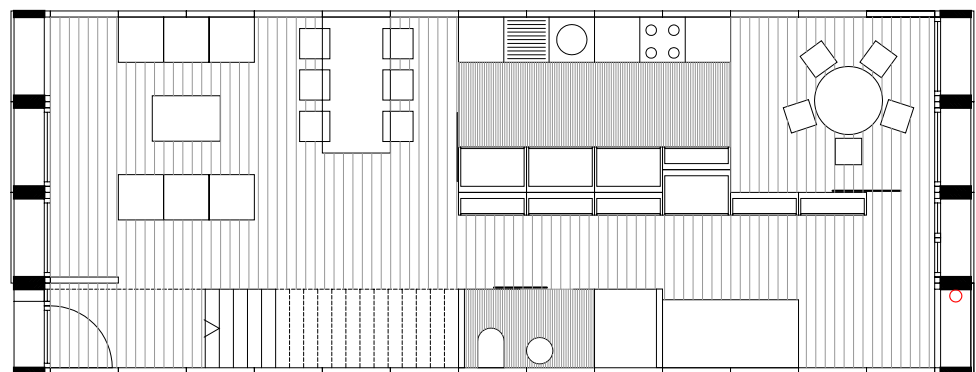


ROW HOUSES 2

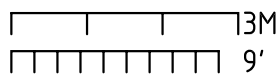
SECTION



LONGITUDINAL SECTION

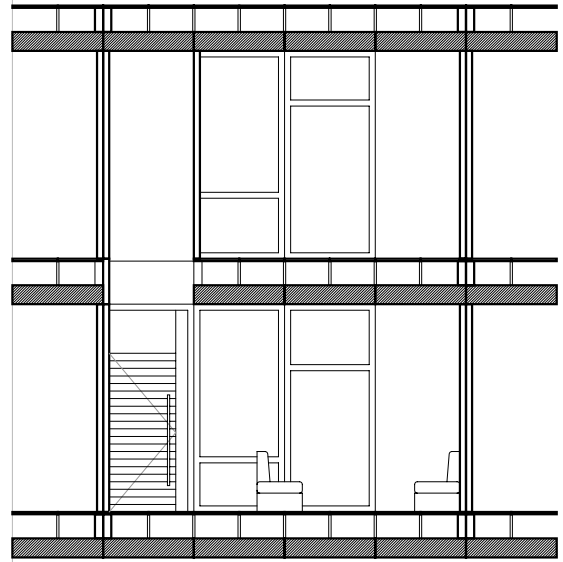
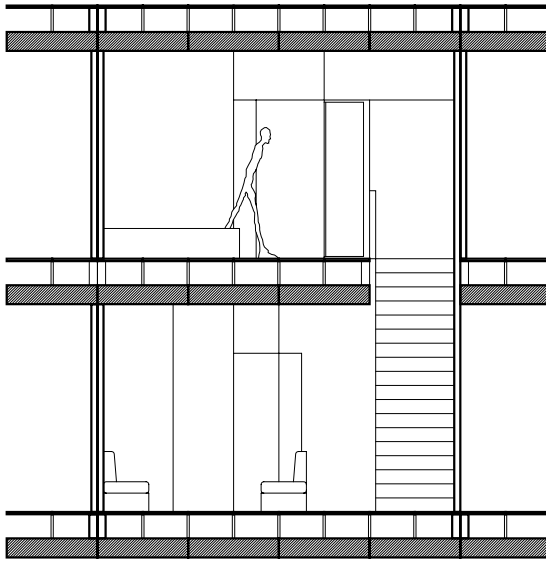


FIRST FLOOR (56.94sqm)



ROW HOUSES 3

SECTION

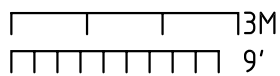


CROSS SECTION 1

CROSS SECTION 2

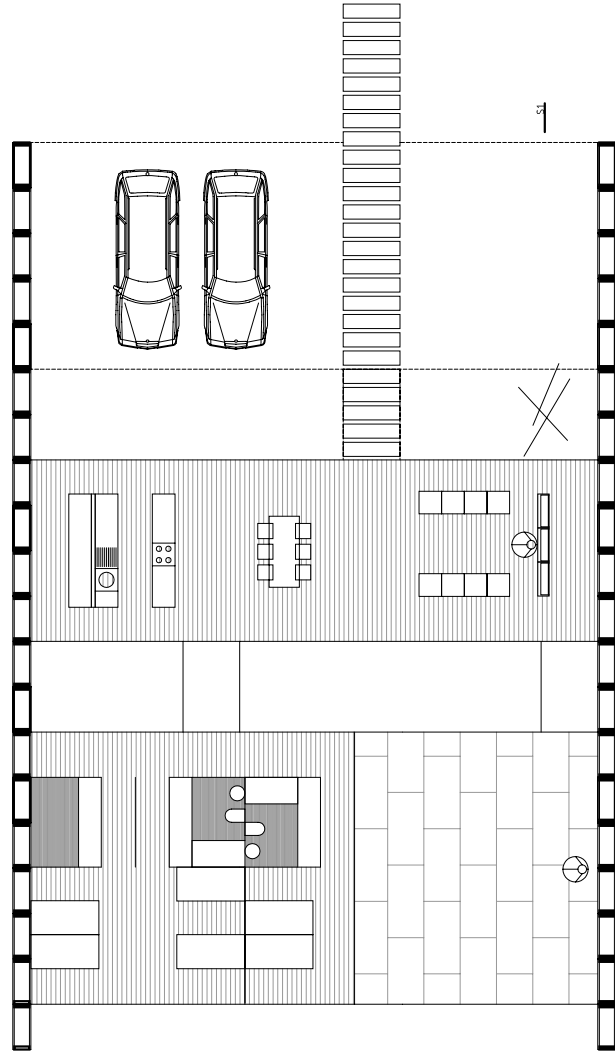
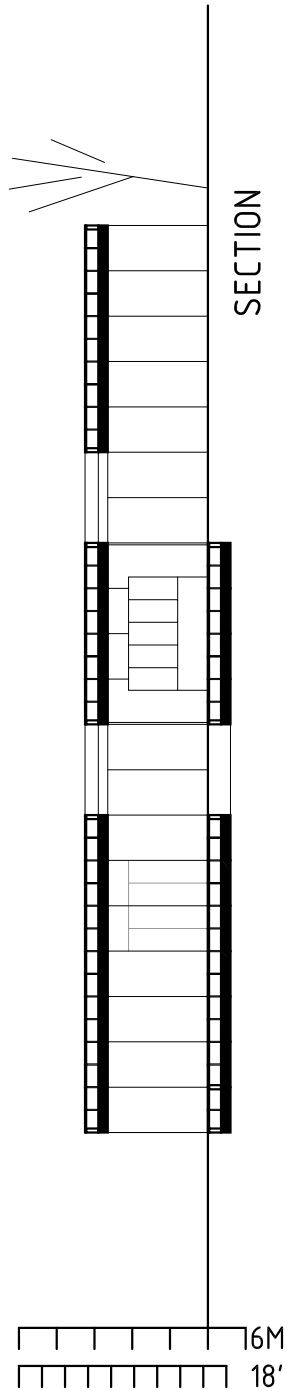


ELEVATION

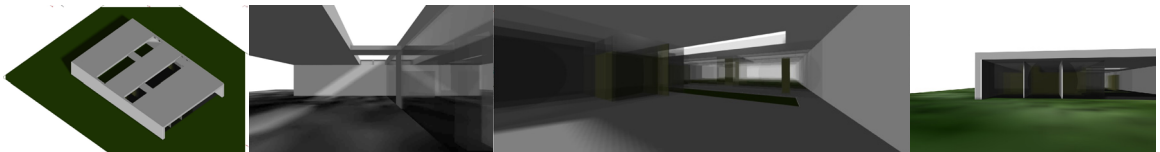


SINGLE

FAMILY HOUSE

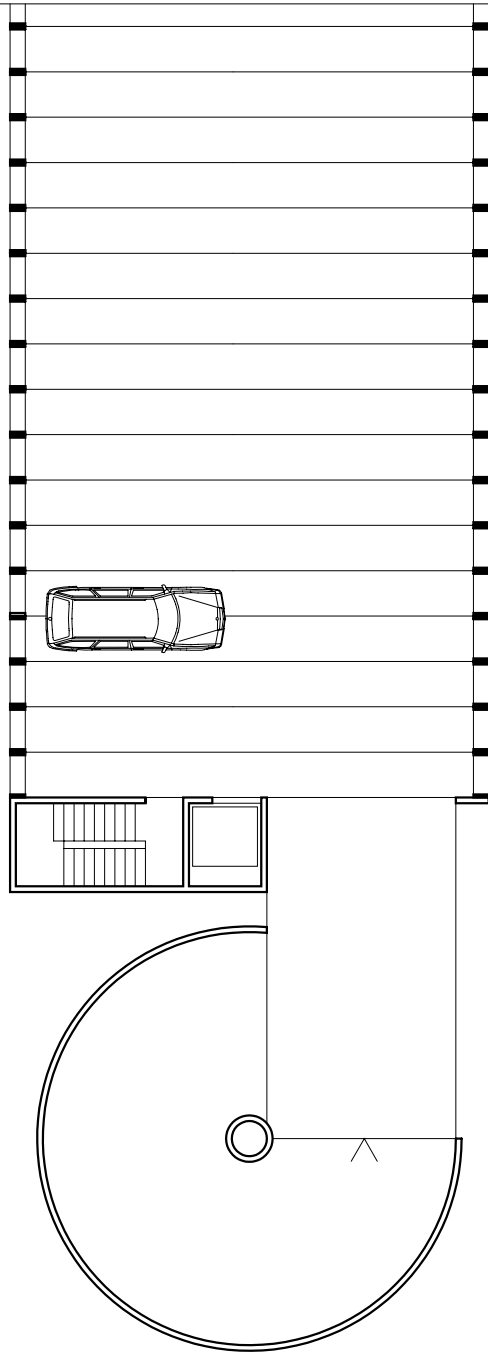


FIRST FLOOR 136sqm (interior) 296sqm(covered)



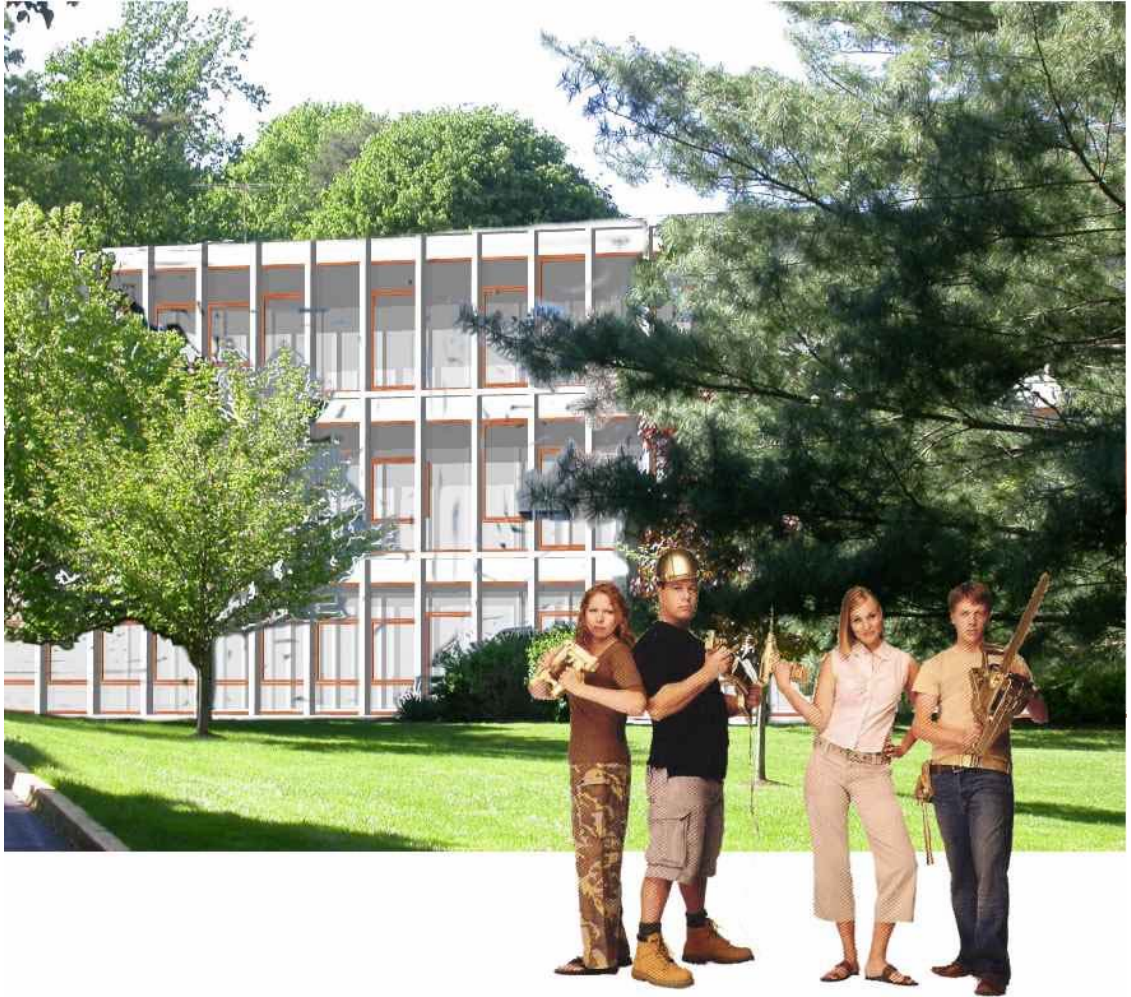
PARKING

+ POSSIBILITIES

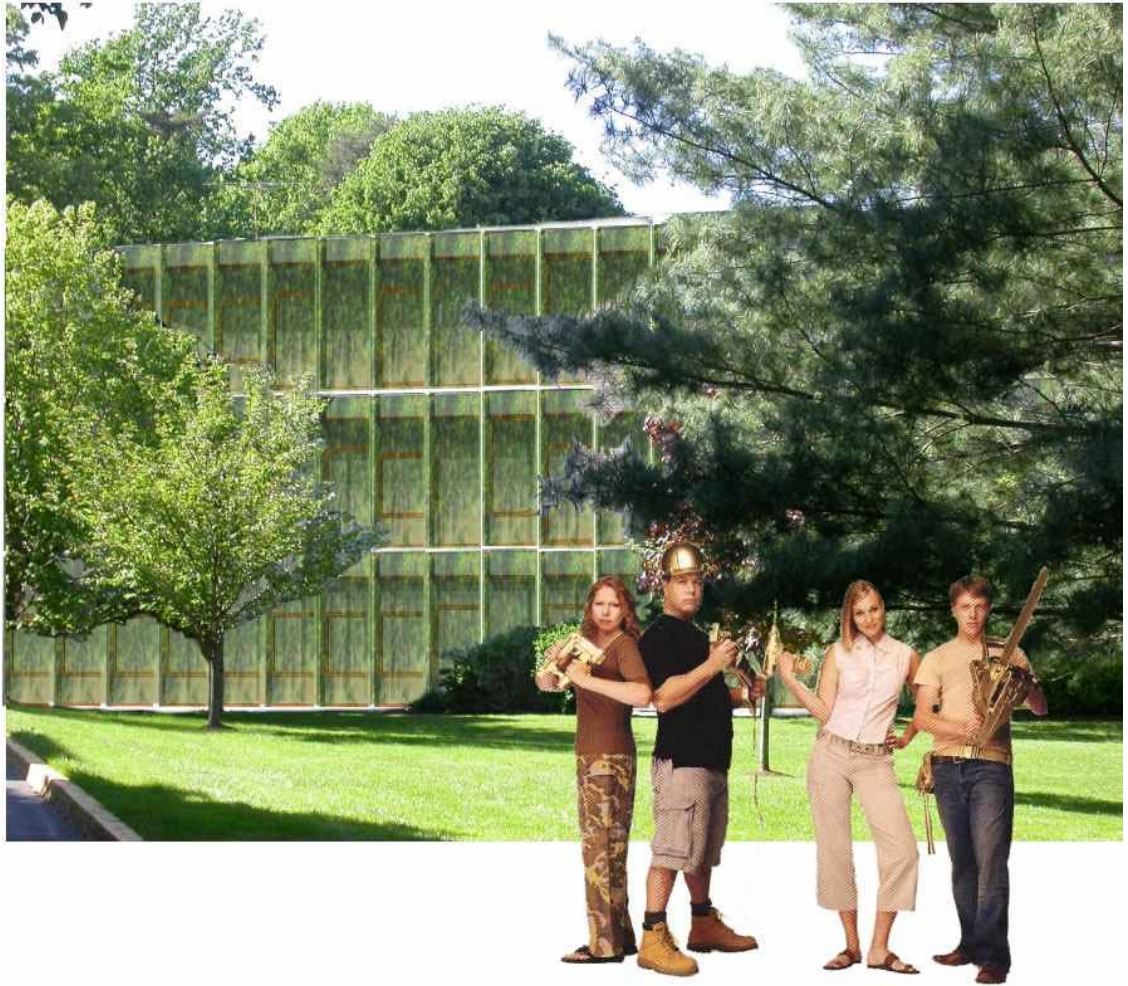




Bethesda Park. Rockville. MD



Bethesda Park v01



Bethesda Park v02



Bethesda Park v03



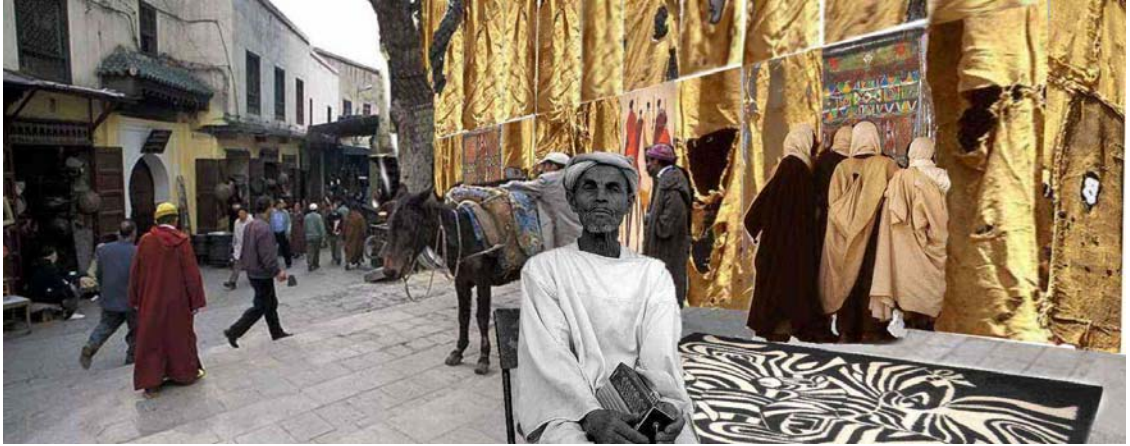
Bethesda Park v04



A Marina. A Coruña. Spain



A Marina. A Coruña. Spain 2



Street in Morocco



Street in Vietnam



External corridor



Townhouses. Bethesda. MD

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