Domestic Surface: a framework for advancement

by

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Domestic Surface: a framework for advancement

by **Jason Wilbur Hart**

Submitted to the Department of Architecture on January 16, 2004 in partial fulfillment of the requirements for the degree of Master of Architecture

ABSTRACT

The residential building sector currently makes up one-half of the total U.S. building industry; yet less than five percent of residential construction involves architectural services. This irrelevancy has only further distanced the already unfamiliar role of American architects from their clientele.

Domestic spaces in production homes are defined by continuous generic surfaces. This thesis recognizes the latent architectural opportunities that current domestic surfaces provide. The thesis aims to establish a framework of design methods and building strategies for creatively engaging common domestic surfaces. Using laminate as a case study, the project advocates that such methods and strategies may be implemented to advance the seen value of architectural design in the American home.

The framework supports sustaining these methods by weaving material working processes with industry trades and manufacturers. The thesis should be viewed as a generative seed in which future research and innovation may be continued with a similar focus.

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CONTENTS

PREMISE

In 2003 the construction industry made up 8% of the U.S. Gross Domestic Product at $852 billion: $141 billion in Corporate, $290 billion in Government and Institutional, and $421 billion in Residential; making the residential construction industry a huge force in the U.S. economy (Harris, 2003). Yet, less than 5% of all single-family home construction involves the services of an Architect (Brown, 2002). This small percentage is primarily the top end of the market; while the other 93% has been left to builders and developers. The larger impact here has been the irrelevancy of architectural services in the residential sector. This irrelevancy has only further distanced the already unfamiliar role of American architects from their clientele.

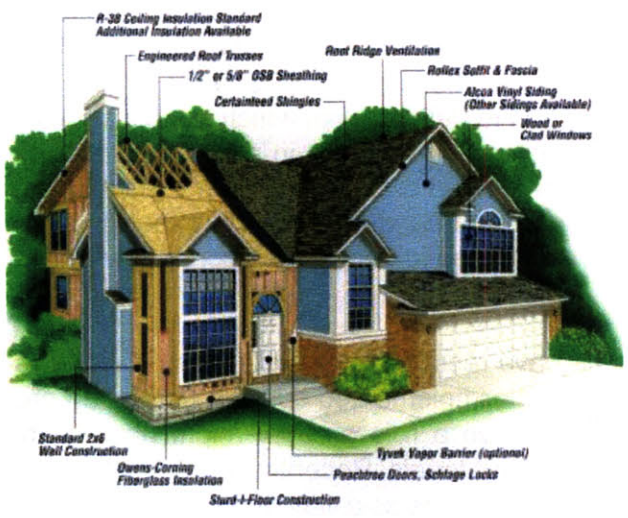
Cultural norms are strongly influenced by local environments. If this physical environment is dominated by speculative developed homes, it raises questions about the perceived value of architectural design in American culture. The American home aesthetic has progressed little in the last 50 years compared to the advantageous pace of more contemporary American products: such as cars, computers, and even house-wares. Architectural services are viewed in the general public, and even the larger industry, as a luxury - a non-necessity to building. Builders provide umbrella services to clients from conception to delivery; removing the client from construction based hassles and confusing fee structures, but providing a very limited set of design options.

07-1. suburban growth

Despite American Architects' attempts in the last 50 years to redefine the larger home building industry, the hundreds of case study houses produced from Wright to Eisenman remain unrealized prototypes. These prototypes failed to take into consideration the process from conception to delivery with which the construction industry is entrenched; they were conceived as redesigns in a top down fashion. The normative construction industry is organized around the larger execution of a process rather than individual attention to a final product. The fact that this runs counter to the way in which architects are trained to think underscores the need for investigation.

Most transformations in today's home have resulted from the advent of new systems and economy in engineered materials implemented through bottom up processes. Architects have not played as active a role as they might have in the creation and design of these systems and materials. Recently, there has been an architectural move to engage fabrication processes as a way of reusing and misusing traditional materials; as well as exploring possibilities in the plethora of new materials and technologies available. By doing this the architect must build more intimate relationships with fabricators, suppliers, and contractors.

Much of today's domestic environment is made up of expansive flat surfaces. These generic looking surface materials are the result of material scientists in efforts to develop material durability and increase material life-span. Materials



08-1: domestic materials & products

such as veneers and laminates have become common place in today's builder homes. These materials exhibit a certain fakeness and falsehood which is beginning to challenge assumptions about tectonics and authenticity.

This thesis recognizes the latent architectural opportunities that current domestic surfaces provide. They are systems which encompass and define the current process with which the industry is entrenched. They have achieved a certain cultural acceptance by economic default. Using laminate as a case study, this thesis aims to establish design methods and building strategies for creatively engaging common domestic surface systems and processes in this critical yet largely unexamined sector of the building industry. The architectural examination and transformation of domestic surfaces has the potential to restore the relevancy of architectural value in the American home by creating richer and more viable environments. In doing so, new design related relationships are strengthened and formed between industry providers. This in turn produces a heightened public awareness as to the value of architectural design; such precedent exists in Dutch and Japanese cultures.

1. Harris, Hank (2003) MIT Lecture, FMI, Consultants to the Construction Industry
2. Brown, John (2002) International Journal for Housing Science, Vol. 26,
No. 4, pp. 311-320.

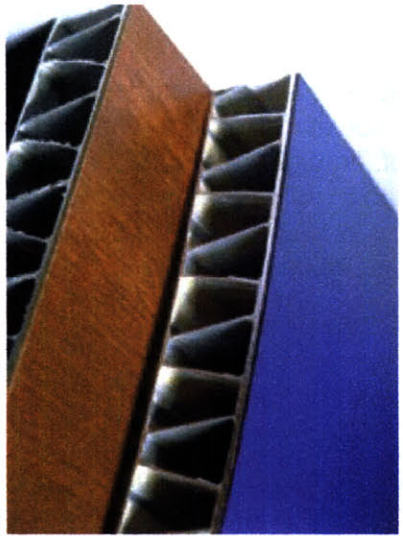
INTRODUCTION

WHY SURFACE?

Surface is what we see. Homes consist of many systems: structural, electrical, plumbing, HVAC, insulation, foundations, but the only part we actually see is the surface. These surfaces are generally expansive in coverage from floor to roof. Though these surfaces may all have very different material properties, they are all applied to substrates and structure in the same manner: full area coverage, seamless, and often non-descript. This thesis recognizes the individual latent properties of these domestic surface materials, and seeks to uncover their individual possibilities.

WHAT IS CONSIDERED A DOMESTIC SURFACE?

Domestic surfaces are common residential construction surfacing materials. They include but are not limited to: carpets and padding, gypsum wall board, laminates, paints, stones, vinyl, wood, building paper, shingles, stucco, ceramics, veneers, and substrates such as oriented strained board (OSB), medium density fiberboard (MDF), plywood, and particle board. These are common materials found in almost all builder homes. Each of these materials has unique properties and characteristics which make it suitable for its common use. These surfaces do not necessarily need to be thought of as interior, exterior, or substrates; a vision for application may extend or bridge multiple areas.



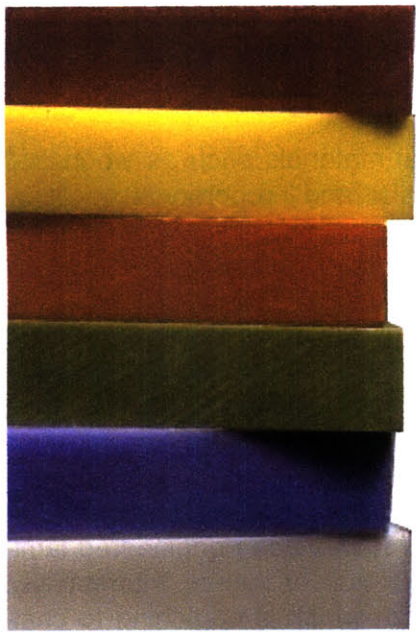
10-1: metal core

THE CURRENT STATE OF DOMESTIC SURFACES:

There is a current trend to build high-end housing by adding expensive finishes. These finishes are added at a fraction of the overall cost yielding higher returns. Owners are charged more for the house based on finish types.[1] So value is measured by the perceived material quality; a value that has both economic and social status.

Aesthetically:
Domestic surfaces are normally treated as generic tablua rasa surfaces. This often yields banal, mono-tone, blank, and placeless surfaces; with a question of material authenticity. For example, vinyl siding is a material with superior qualities and economic value, but it often acts as an imposter for wood siding.

Why might this be? The homes banality and similarity from coast to coast has established a status quo of non-offensive, generic, and the perception of middle class normalcy. Such generic treatment of surfaces may allow anyone from anywhere to move-in. I would argue that this non-offensive plainness is a polar extreme to the point that it lacks any possible adeptness to individuality in its furnished state. The American home is a social status symbol: measured by material finish quality, size, number of garage doors, and the number of roof peaks.



11-1: corian samples

Structurally:
Common domestic surfaces are usually completely dependent on substrates or other stiffening systems.

Why might this be? Surfaces may not have been conceived as being able to have structural independence. It allows building trades to remain independent in the scope of on-site work. This is a symptom of the residential industries' fragmented relationships.

Spatially:
Domestic surfaces are almost always flat and two-dimensional despite architectural innovations. They are often seamless and graphic, having a lack of depth and are non-integral with other surfaces.

Why might this be? Applying materials horizontally or vertically flat easily maintains simple cubic volumes; each surface is treated equally and has equal potential for placements, hangings, etc. Some construction mistakes or lack of careful craft may be hidden by covering material joints and seams. However, by doing so one also leaves no sign of material scale or proportion.

Synthetically:
Synthetically most domestic surfaces make surreal spaces.[2] The homeowner's

12-1: laminate

use of surface is only to place items on and against; there is no system to suggest any preferable use, proportion, orientation, or architectural articulation. New homes come with all the comfort of a laboratory clean room.

Character has come to be embodied with natural materials such as wood and stone which have natural grains that exhibit scalar and proportional qualities. These materials are desirable in U.S. culture, perhaps nostalgically. Ironically, the colonist used to paint their wood whenever they had the means - a symbol of social status.[3]

LAMINATE AS A CASE STUDY:

Most transformations in today's home have been implemented through bottom up processes as a result from the advent of new systems and economy in engineered materials. One such major material economy has been engineered laminates. They have become common place in today's builder homes. Interestingly, laminate exhibits a certain fakeness and falsehood, which is beginning to challenge assumptions about tectonics and authenticity. Laminate enhances the performance value of its various common substrates, but it possesses its own inherent material properties. Currently laminates are used for lighter ranging applications in the home which require surface durability. They are commonly applied liberally in a

13-2: laminate

decorative fashion on floors, countertops, doors, etc.; however, they've also been engineered for a range of applications from chemical and fire resistance to high-wear and impact resistance.

Laminate is an example of an engineered composite material that is now common in the majority of builder homes. It is low cost, requires no finishing in the field, malleable, and has excellent durability characteristics. Laminate is currently only used in a pliable fashion like other domestic surfaces, but if we begin to probe its latent properties we may find new uses, forms, and products. In doing so, we can charge the material with a new set of values with architectural and economic advancement possibilities.

PROCESS, METHODS AND STRATAGIES

In the teaching of architecture there is an important unlearning that takes place, to free ourselves from our learned associations and pre-conceptions; such unlearning and renewed distance is also pertinent in the research of architecture. We must break from learned aesthetic and construction mind-sets which have hindered the seen value and the advancement of architectural design in the American home.

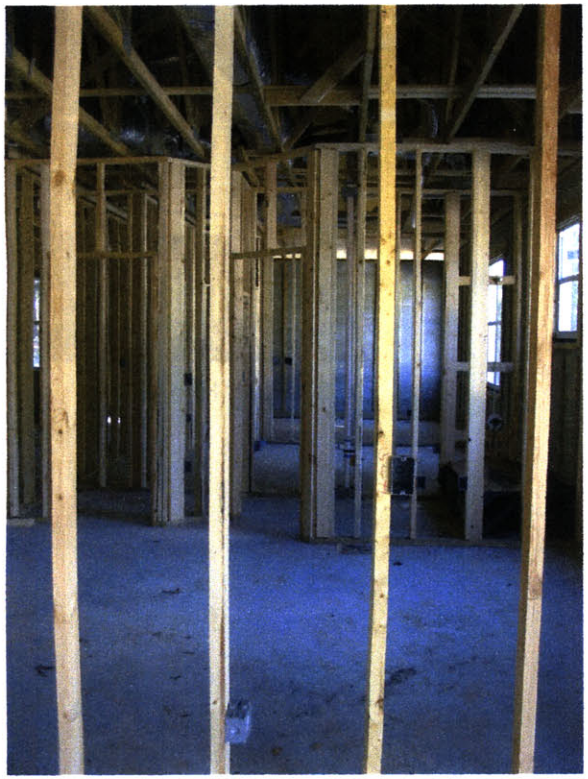
The thesis outlines a working process of general, basic, and applied research,

framing

backed by theoretical and conceptual thought. General research takes into account the science of the material; while basic research sets the stage for experimental visions. Applied research with a theoretical and conceptual backing then questions and tests the products validity.

Design methods are techniques for exploration. Architecture involves the making of spatial environments which are aesthetically pleasing and structurally viable. It is then desirable to examine domestic surfaces with respect to spatial, aesthetic, and structural possibilities; can laminate become architecture?

Building strategies take into account the larger construction industry. The advancement of domestic surfaces requires an understanding of working relationships and implementation possibilities. Some of these building strategies are: skilled trades, the consumer, and pre-fabrication. Decisions of design, transport, assemble, and use must be delegated to the designer, consumer, manufacturer, or skilled trades. These strategies have the ability to reengage industry parties with design.



framing

WHAT IS ARCHITECTURAL RESEARCH?

There is currently no advocated structure for architectural research and development. Architectural research must go beyond simplicity of just being new or different. It must offer a rigor in process backed by conceptual structure.

OBJECTIVES

This thesis proposes an open-ended framework for a process that offers a path to advance current domestic surfaces. It advocates the assertion of the value of architectural design in the home; thereby placing it among the culture. The bottom up process is analogous to a virus. The underlying objective is to explore processes of working and thinking in architectural practice which may advocate the advancement of architecture. The thesis serves to provide a personal stepping stone from academia to professional practice.

1. interview, Steve Marsh and Mike Owu, Nov. 2003, MIT.
2. Surreal as in placeless; no context. There is no special detailing or hierarchy in the room. Materials come together in unseen joints, to make a clean box.
3. American Houses: Colonial, Classic, and Contemporary, p. 54.

> 16

16-1 Palladian Villa

16-2 Gordon Matta-Clark

16-3 Builder Home

CULTURE

The story of our physical heritage is rarely taught in the classroom, though sometimes touched upon in subjects; it is usually relegated to the nonessential and formalistic externals. Winston Churchill said, "We shape our building, then our buildings shape us." The totality of our physical environment does more than merely reflect our culture; it in fact affects all aspects of our lives and the potential of future generations

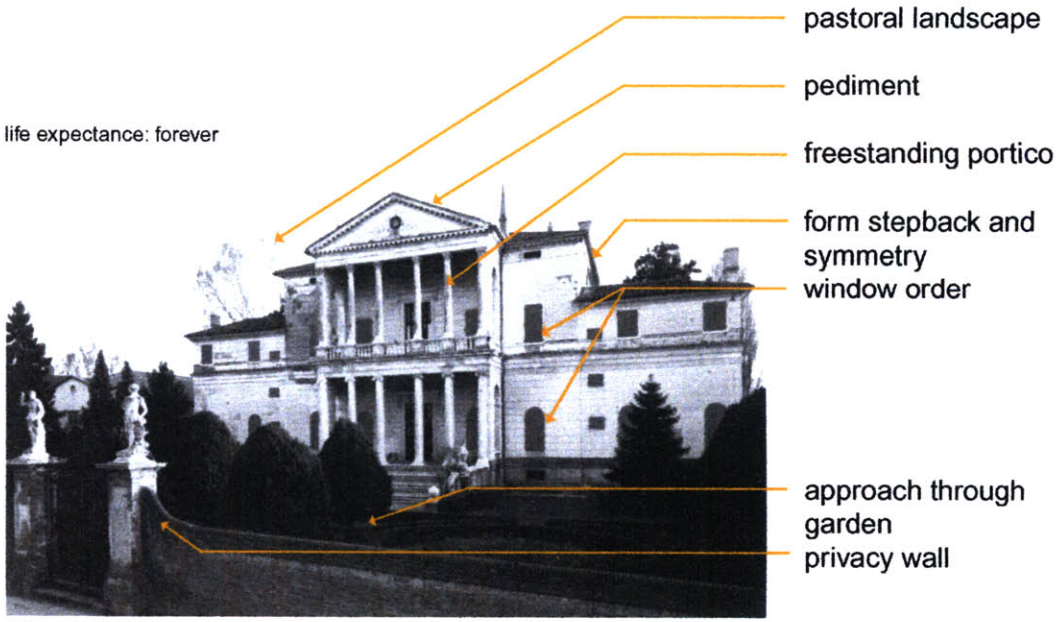
452 YEARS

life expectance: forever

No one actually 'invented' the house. It has evolved with man, from Plato's cave to the modern home, usually keeping up, but occasionally lagging behind.

Climate:
The American Plain Indians covered their tepees with the hides of the animals they hunted, Eskimos ward off the severe winter by building igloos, the Swiss in the Alps use wide overhanging roofs to keep the snow from falling too close to the house, the Irish built homes from blocks of sod from nearby fields, the Japanese use paper in light wall construction to help prevent injury in an earthquake prone country.

Early Materials:
In Japan, wood construction expertise far surpasses that of the rest of the world. This exper-



1551 Palladian Villa - Cornaro 16-1

life expectance: shorter than yours

16-3

2003 U.S. Builder Home

16-1

1551 Villa Cornaro, Padova, Italy
- Palladio raises the importance of the home by using prominent features of civic architecture as a theme in residential design.
- One of the first to use economical materials for structure and veneer finishes (faced with marble)

20-1

1700 - Colonists build as they would in their homelands, forming a collection of nomadic *styles*
- Homes arose out of cultural and religious practices, geographic location, and availability of local materials

1800 - Neo-Classical revival

1900 - Location no longer important with the ease of transportation and communication

EVOLUTION OF THE U.S. HOME

tise is a result of the heavily wooded land; its soils are volcanic as with most pacific islands. While Europe and China are abundant with both stone and good clay for masonry construction; this is not the case in Japan. Japanese carpenters where experimenting with post and lintel construction, basic to wooden architecture, long before Europe. Hence, Japan enjoys the most advanced techniques of wood construction, while Europe enjoys a highly developed art of masonry construction.

Today location is still of importance but in a different way. Contemporary architecture preaches the approach of harmonizing with the natural environment. In addition to where man lived, the house was strongly influenced by how man lived. Local cultures and religions and historical times played strongly in the early form and spatial layouts of the house.

In the early 1500's the Italian Architect, Andrea Palladio, published his "Four Books of Architecture", which would forever change western architecture - especially the home. One of his major initiatives was to borrow the Greek temple front. Palladio adapted the Greek pediment and columns to private residences in the 1500's. This gave more importance to the home, and became a symbol of cultural status. He was also one of the first to use economical materials: brick (instead of stone) faced with marble, or brick and stucco, and wood and stucco. While the house may appear to be made of stone, it is in fact structurally made of a more economi-

21-1

1920 - Sears Robuck catalouge house offers *styles* for any location

1920 - *Modern* quickly becomes just another *style*

16-3

1551 - Kit houses were unable to do more than assemble one intended result

2003 - U.S. builder home becomes a status quo collection of *styles* (from Palladian to Modern), and is strikingly similar from coast to coast

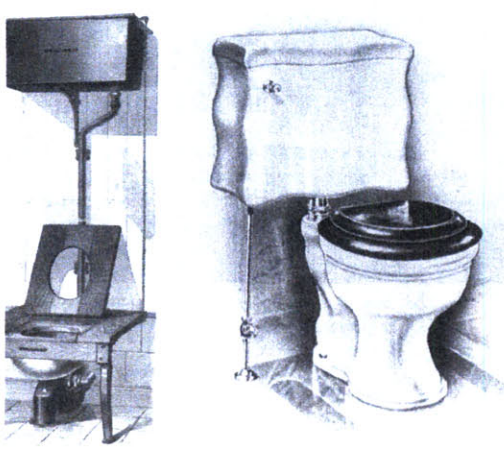
cal material and faced with non-structural finish material. Today this is of common construction practice.

Even in today's homes (500 years later) we can find the architectural elements of Palladio. But these elements do not necessarily reflect contemporary culture as effectively as they did 500 years ago. In fact the elements of pediment, front columns, palladian windows, etc., have become such common place that they now carry no special meaning of status. They have evolved simply by repetition as a typological normalcy in western culture.

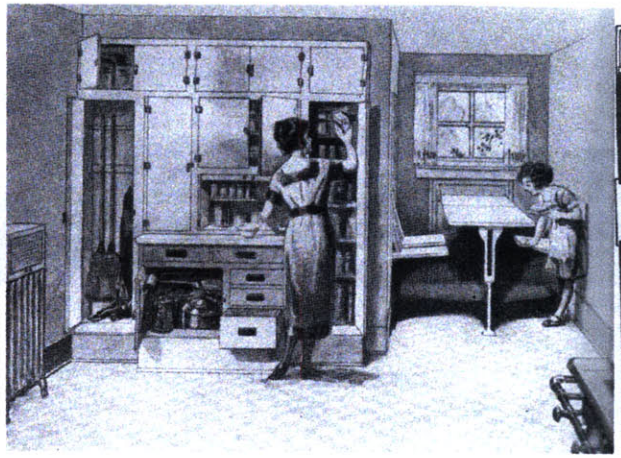
If one visits Japan, Turkey, or India, one will find very different forms of the house. The home has continually reflected where and how man has lived. The decorative Victorian home is no fancier than the clothes the people wore or the entertaining they did in their parlors.

The United States is a country of relatively young immigrant roots; such are our homes. We find home typologies in the US that were familiar constructions to early settlers. The elements and materials can often be traced back to the roots of European countries. Most of these elements were derived out of location circumstances: the Dutch used halved doors, opening the top half to let sunlight in and closing the bottom half to keep out animals.

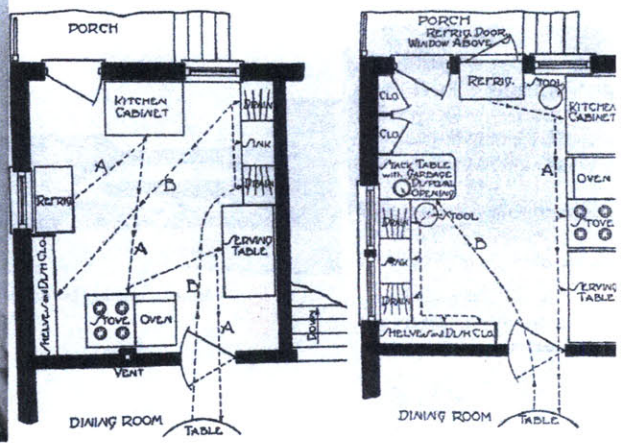
22-1



systems: electricity, plumbing, HVAC,



appliances and organization units



spatial layouts

> 22

MECHANIZATION AND GENDER IN THE U.S. HOME

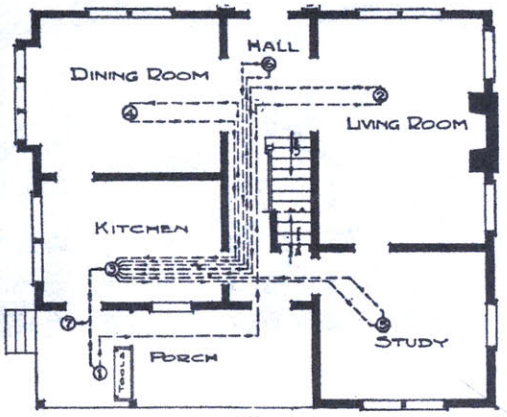
Early colonists often painted their wood furninshing whenever they had the materials to do so. The fact that we today try so hard to reproduce a worn natural finish would have seemed utterly ridiculous to them.

The manufactured home is endowed with as many problems as it is with promise. Of course factory labor is much cheaper than site labor and factory quality incomparable to site quality. The problem lies in the shear size of the home. Transportation costs from the factory to a site hundreds of miles away can quickly eat into the cost saved by using pre-fab. Building code variance is the other large problem; it can mean a considerable amount of on-site labor to adapt the pre-fab.

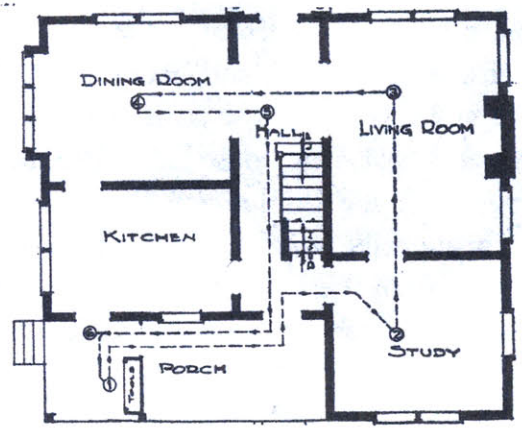
We have had possession of building materials: lighter, stronger, easier to maintain (but less familiar) than wood for a long time. Yet most of us are still buying wood-framed homes. Vinyl and aluminum siding has taken precedent over wood-siding, but still "looks" like wood siding, the familiar.

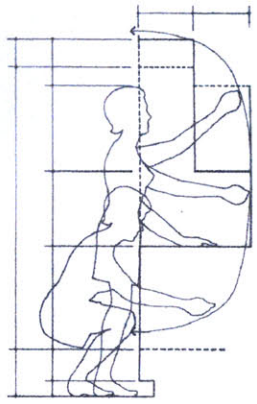
In 1926, a book titled: "The Modern home: Original Designs", contains chapters of the following kinds of homes complete with plans: Dutch Colonial, Early American, New England Colonial, English Georgian, and Italian Villa. It was back to the past again for our home-building inspiration. While these designs where born for very logical reasons in their time, that same logic is no longer relevant in the 21st century. It was a matter of style. Little consideration was given to climate or ter-

kitchen organized around women



proper cleaning patterns





Time and motion analysis of woman in a kitchen

female proportion systems

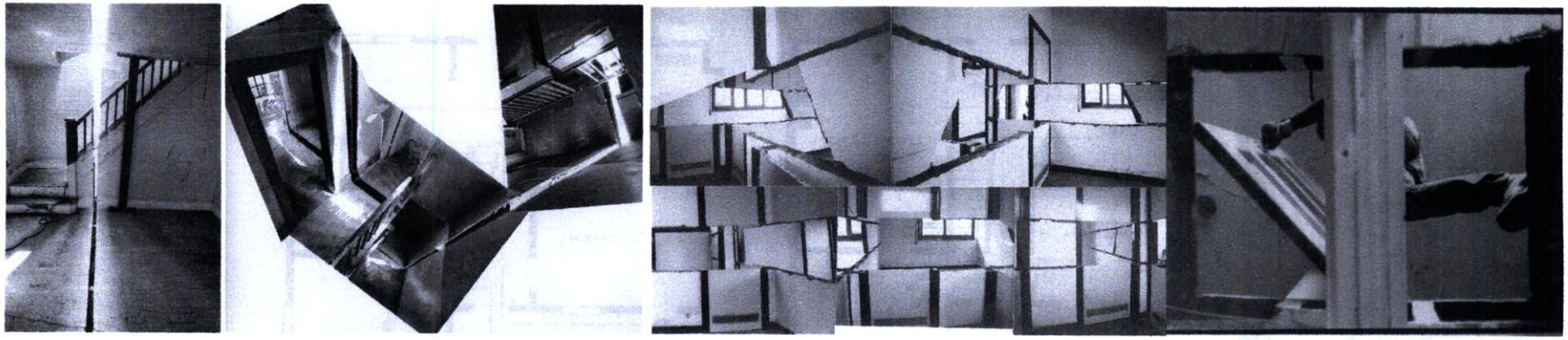
rain. Transportation systems eliminated the dependence on local building materials, and local historical heritage was usually ignored, as where the needs of the individual family. The question was, which style do you like? And the answer was, you can have it no matter where you live.

During the 20's and 30's we see European and American Architect's revolutionizing the thought of house. We can find some of these elements in builder homes today. But the "contemporary" or "modern" home quickly became another "style" added to the catalogue. (p.118)

"Nobody in his right mind would buy a car that had a brand-new engine in the chassis of a 1918 model, but that is the kind of home people are buying - houses jazzed up with the latest technology inside but looking like something the Pilgrim Fathers built" (Hoag 131).

Should we be advertising homes on TV, like we advertise cars and computers? What would happen? Should we not be selling taylored products instead of services? Products are easier to sell than services. It seems people shy away from things which are radically different from what they have known. When it comes to houses, people are particular attached to the familiar.

24-1



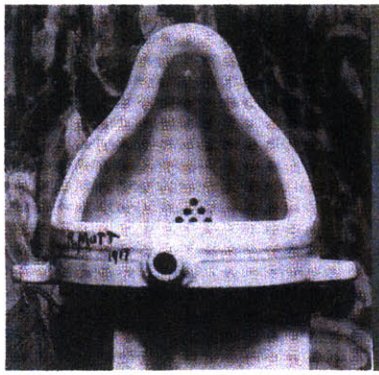
> 24 GORDON MATTA-CLARK

Gordon Matta-Clark constantly reminded us that space is apprehended by movement, of the eye, and of the body in place and time.

He says: "Why hang things on a wall when the wall itself is so much more a challenging medium? ... A simple cut or series of cuts acts as a powerful drawing device able to redefine spatial situations and structural components. ... There is a kind of complexity that comes from taking an otherwise completely normal, conventional, albeit anonymous situation and redefining it, restraining it into overlapping and multiple readings of conditions past and present."

Matte-Clarks work reveals the tectonic of production, of making; it is the effect of the diagram. He exposes the thin edges of building materials, which reveals an autographical process of its making. By undoing the building he opens a state of closure, of ahh-ha! That's what it is. His art not only provides an understanding, but puts forth richer arrangements and qualities.

25-1



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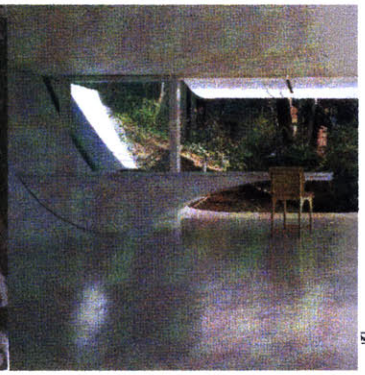

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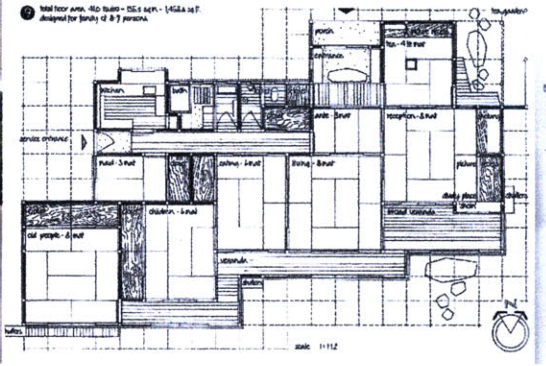
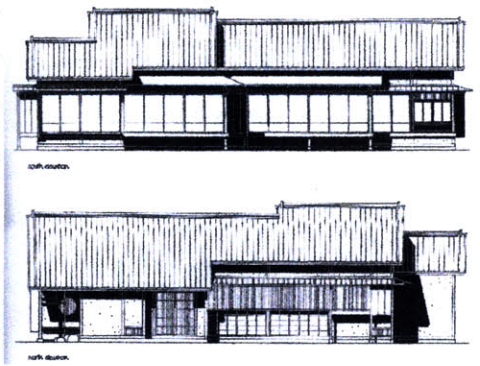
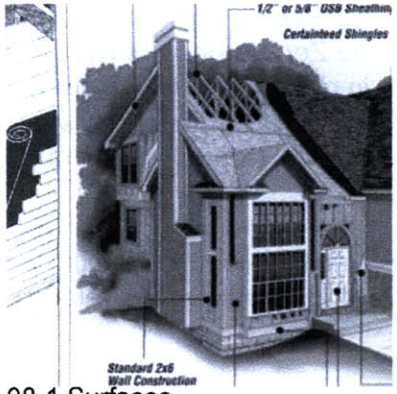




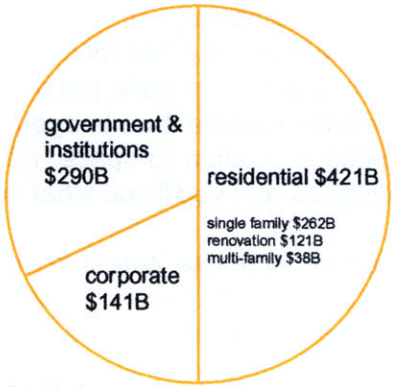
ART AND THE JAPANESE HOUSE

We can find ways of relating movement to material and space - this can be seen in the work of Artist Richard Serra and in the Japanese Zen gardens of Kyoto. In Richard Serra's work, the body passes though space in movements which are not totally dependent on image or sight or optical awareness, but on physical awareness in relation to space, place, time, and movement. Walk through his torqued ellipses and you'll see what I mean.

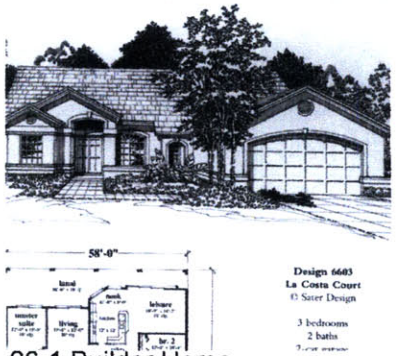
In the Japanese Zen Gardens of Kyoto, your vision is not reduced to framing an image, it includes and is dependent upon memory and anticipation, the relationships of time, space, and movement.



08-1 Surfaces



2003 Construction Industry



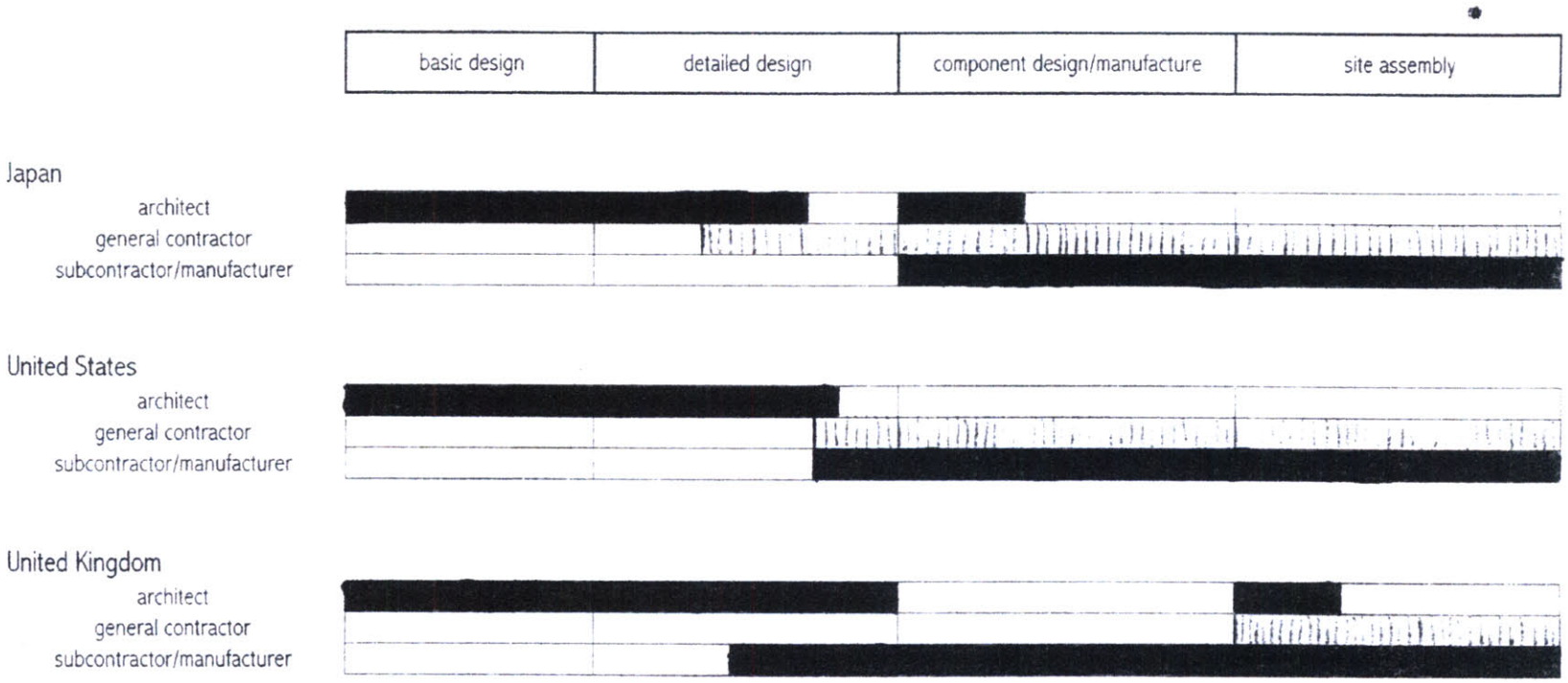
26-1 Builder Home

INDUSTRY

In 2003 the construction industry made up 8% of the U.S. Gross Domestic Product. The residential construction sector is one of antiquated production procedures and fragmented working relationships.

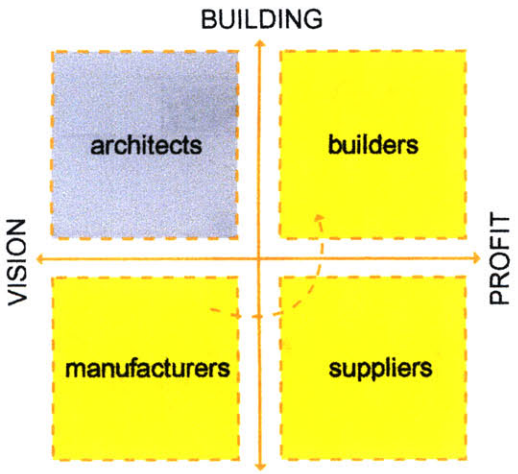
PROJECT PHASES

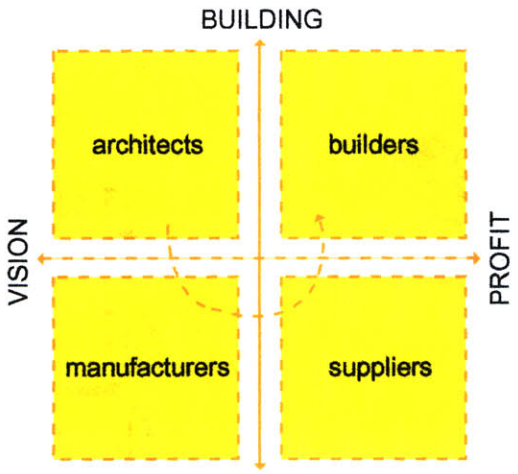
Project phases differ from country to country. In Japan and the U.K there is much more overlap in working relationships; while the United States tends to have less ambiguity, this results in less collaboration between professions. It leads to specialization through fragmentation. We might begin to think about how this process can begin to change with smaller component systems.

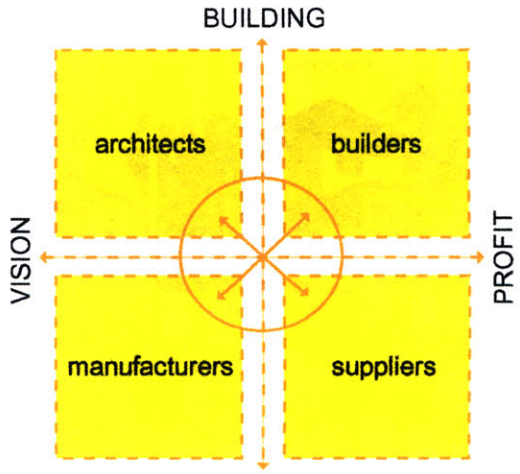


WORKING RELATIONSHIPS

The residential construction industry is currently driven by profit from building. Architects are left out of this picture. We know that manufacturers target builders. Architects need to begin to build design relationships with manufacturers and suppliers. If we can feed our vision into their marketing, then we can begin to influence the industry and build cross-disciplinary relationships.



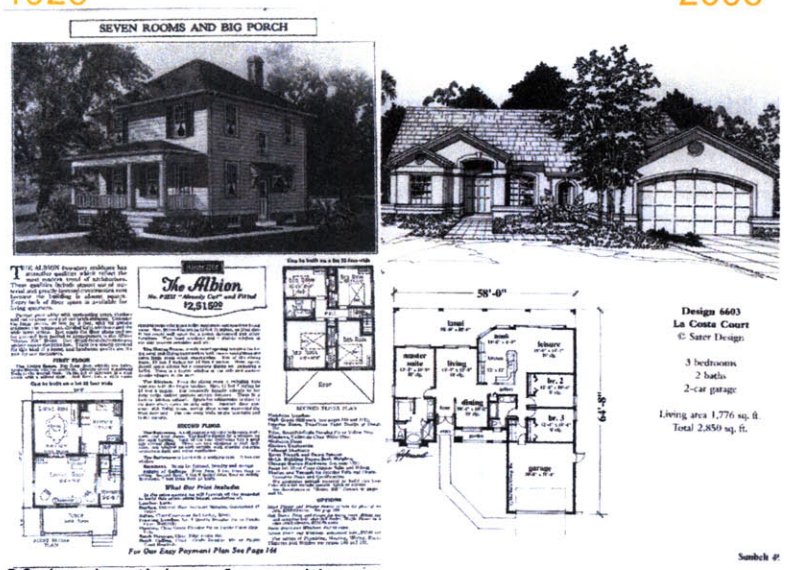




MARKETING PRACTICES

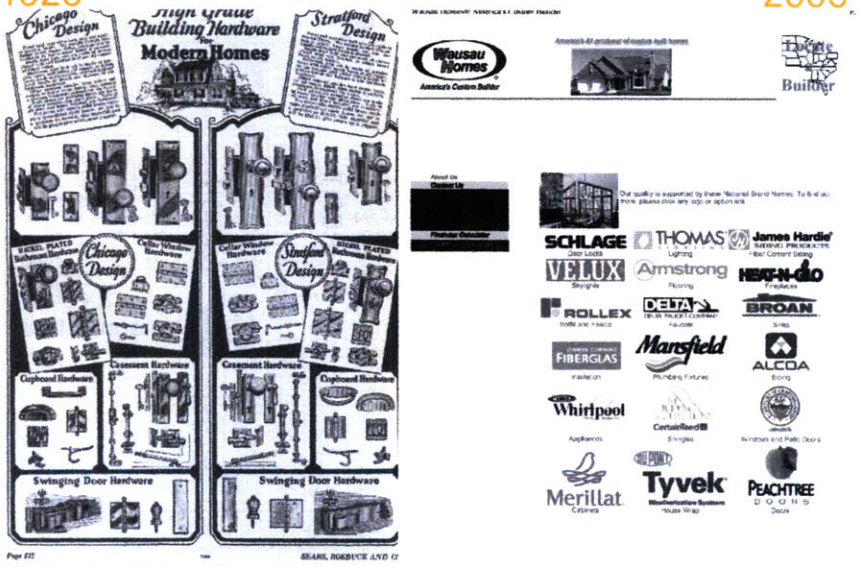
The U.S. home builders are focused on sales. Each builder offers a number of floor plans which is marketed first around the number of bedrooms, baths, and how many cars you can put in the garage, and second around amenities and finish packages. These finish packages are currently the only area that the consumer actually has the ability to change and choose finishes, primarily interior décor. Print advertisements have been unchanged for over 80 years (below).

1923 2003



26-1: advertising of amenities

1923 2003

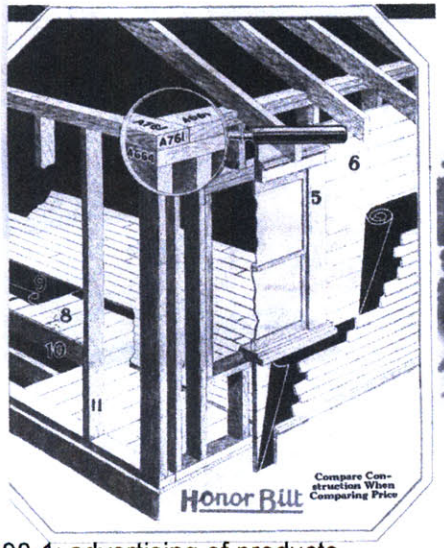


30-2: advertising of products

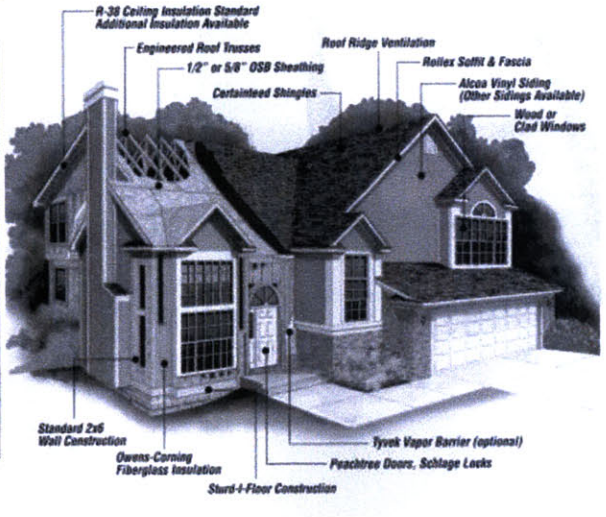
SALES

Builder model homes usually contain small sales offices. These offices are designed to initiate certain psychological responses. They are spatially centered around the sale of products and the sale of the home. Placement of product and finish sample boards draws the buyer to focus on amenities. They are set up around comfort, control, and closing. The buyer should feel comfortable, the seller should have full control, the buyer should be in view of the seller at all times, and closing rooms minimize distractions with high windows.

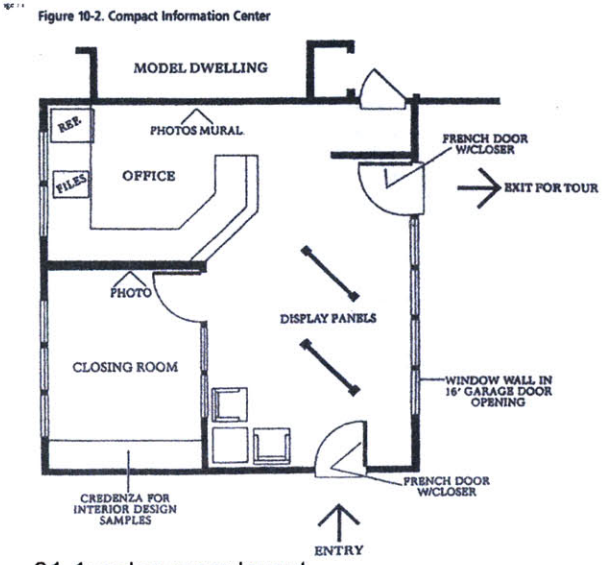
1923



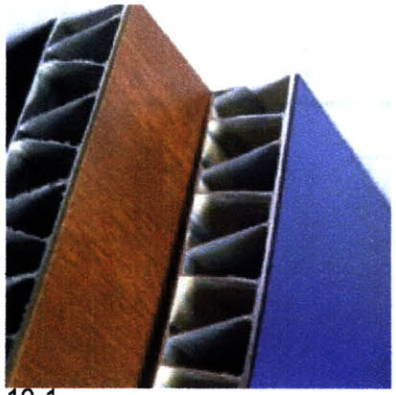
2003



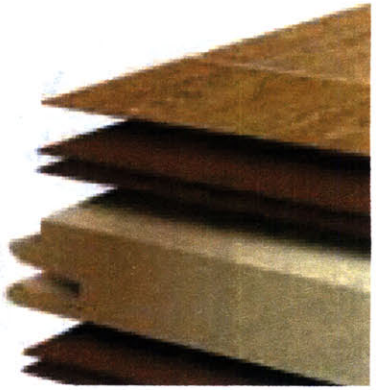
08-1: advertising of products



31-1: sales room layout



10-1



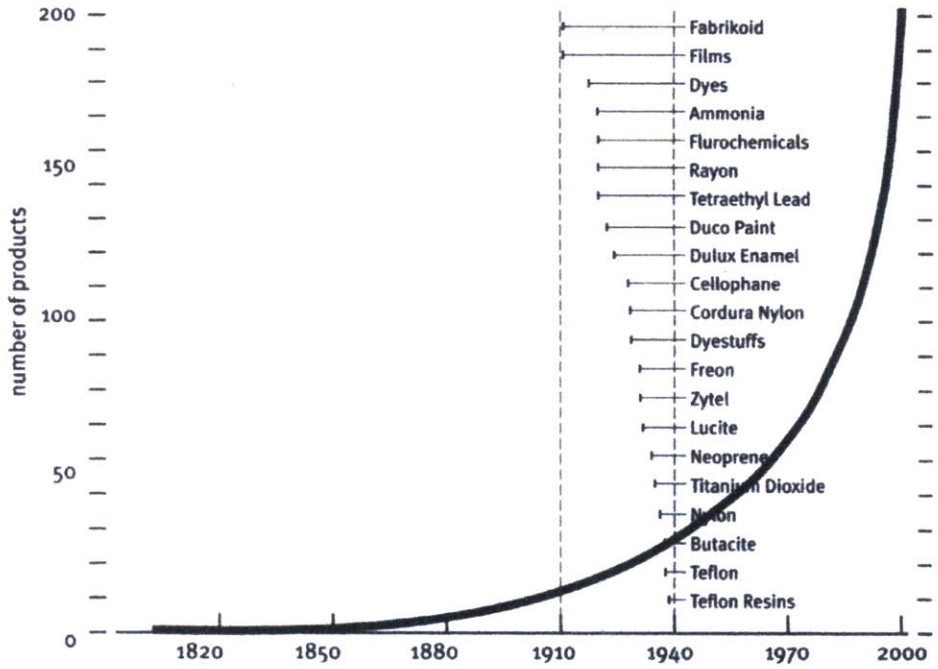
GENERAL RESEARCH

General Research is and examination of:

- material propensities: describing its chemical, mechanical, and physical properties
- forming processes, transformability, workability, combining within the family of materials to alter its performance
- Joining and bonding techniques
- Shaping and manufacturing tools and techniques
- Dry forming (make) - folding, molding, braiding, laser cutting, tucking, stitching etc.
- Chemical forming - adding different compounds to change proper ties which may change possible forming, stiffness, malleability, etc.
- Can it be a carrier for
    - Information
    - thermal protection
    - structure
- Environmental impacts
- Current products, uses, and projections

EXPLOSION OF NEW MATERIALS

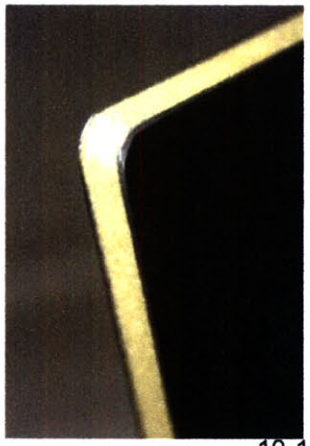
There has been an exponential growth of new materials. Scientists are actively searching for new materials; even searching for new methods to search for new materials. Why aren't Architects searching for new material applications?



34-1 DuPont Product Timeline (from refabricating Architecture, p.120).

COMPONENT INTEGRATION

Other industries such as boat building, automotive, and aerospace have begun to assemble component from sub-assemblies. This speeds product assemble time which cuts cost and controls quality.



10-1

10-1

cores

Laminate Composition:

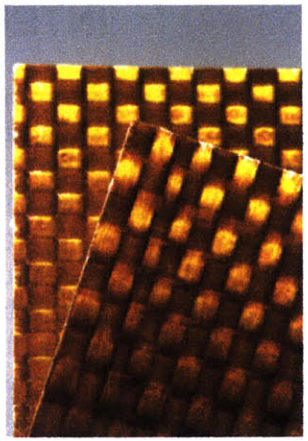
sandwiched craftpaper impregnated with phenolic resin and topped with a decorative layer of melamine protected paper.

- Craftpaper: 10% pearl, 90% cellulose (a natural polymer)
- Phenolic resin: is flexible bonding agent, with a strong heat resistance, low water absorption, and good thermal shock resistance, chemical resistance; it is inherently low smoke and low toxicity attributes – used in airline cargo holds as a liner (conolite, light weight high impact) – sometimes combined with woven fiberglass reinforcement
- Melamine resin: adds mechanical strength, has a low reactivity to solvents, no swelling or shrinking, high temperature stability
- Resins appear to be non-directional operative
- Craftpaper may prove directional fibers

Bonding:
Adhesives (composition: synthetic rubber, talc, and starch)

Forming Processes:
Under high pressures (around 1000 psi) and temperatures (near 300F)

substrate properties



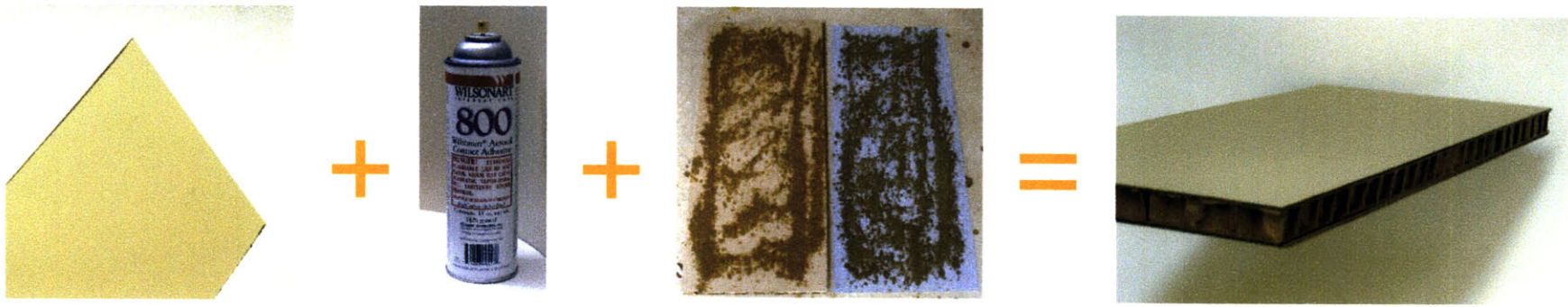
ballistic & clear

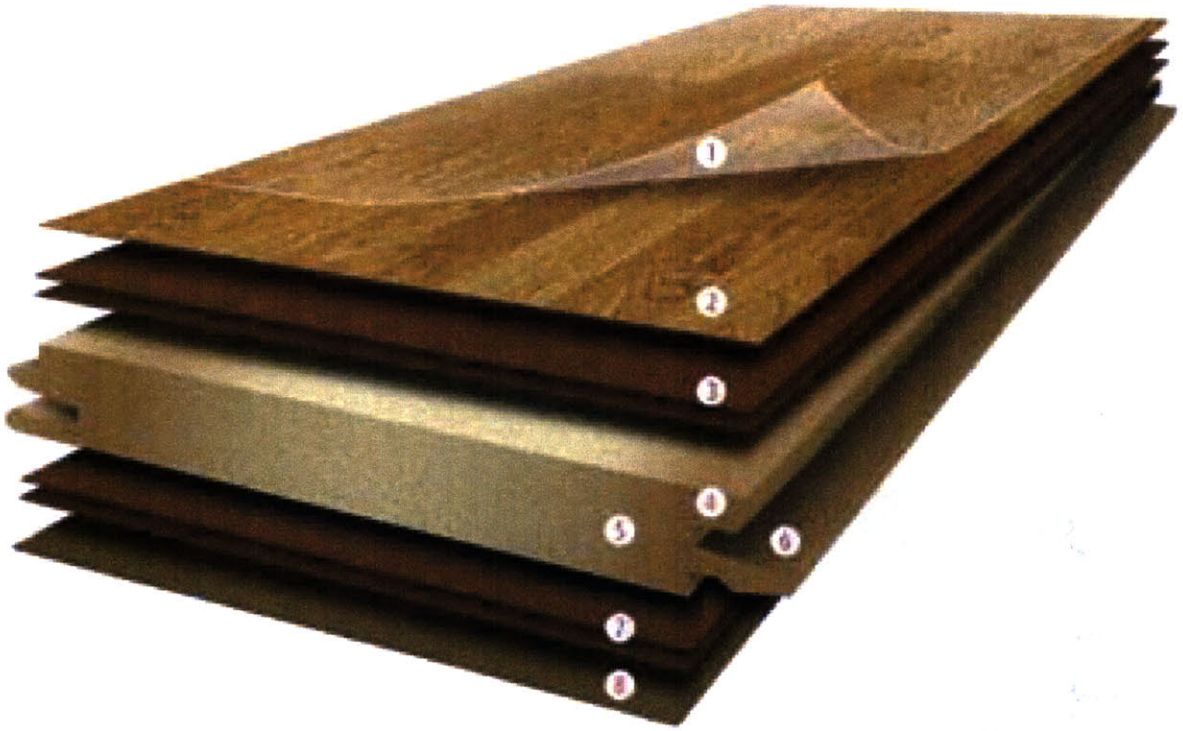
Types:
- Basic: durable surfaces
- Fire-resistant: composites thickened for desired fire-rating
- Chemical resistance: a third resin is applied on top to obtain the desired resistance
- High-wear: high wear surface papers are used instead of craft-paper – to obtain 5 times the abrasion and scuff resistance
- Solid Phenolic core: produced in various thickness adequate to preclude the use of a substrate (added paper layers)
- Marker board: multiple decorative surface papers impregnated with melamine resin over kraft paper core sheets with phenolic resin
- Metal core: bonded thermally to an aluminum core (use in light industrial and commercial)

Environmental:
- No ozone depleting substances
- Recycled scraps into other industries
- Uses 40% recycled material, by weight

INTERIOR APPLICATIONS

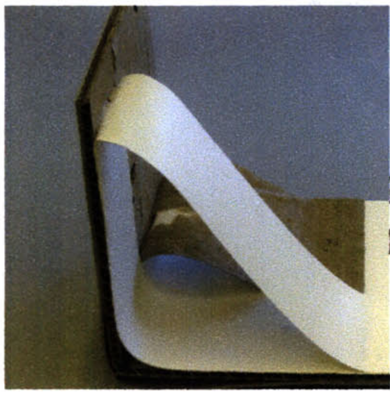
- Commercial Applications
- Store fixtures and displays
- Office furniture and partitions
- Institutional Applications
- Hotel and motel furniture
- Restaurant furniture
- Hospital and medical casegoods
- Institutional interiors
- Residential Applications
- Kitchen and bath cabinets
- Entertainment centers
- Closet shelving systems

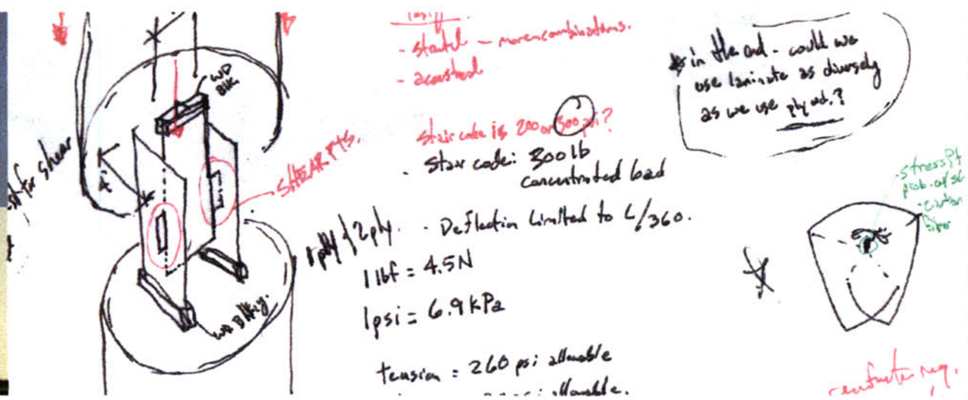




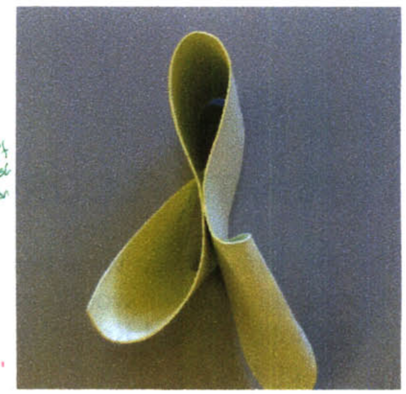
LAMINATE FLOORING

1. High Performance wear layer: resists stains, scuffs, and fading
2. Decorative sheet: woodgrain or tile
3. Phenolic Treated Kraft Sheets: provides additional impact resistance and sound deadening properties
4. Penetrating Seam Sealant: Hot wax-oil emulsion treatment penetrates HDF fibers for long-term moisture protection Water Resistant
5. High Density Fiberboard: Provides improved structural integrity and additional moisture protection
6. Tap-N-Lock™ Glueless Technology: Dual-locking tongue-and-groove design offers faster, non-angled installation eliminates "peaking" for a smooth, level finish
7. Phenolic Treated Kraft Sheets: Helps provide additional impact resistance and sound deadening properties
8. Balancing Layer: Made from the same HPL material as the flooring's surface, the balancing layer helps keep flooring panels level and ensures a better installation





SHEAR PTS.
Stair code: 300 lb concentrated load
Deflection Limited to L/360.
1 lbf = 4.5N
1psi = 6.9 kPa
tension = 260 psi allowable
in the end - could we use laminate as diversely as we use plywd.?

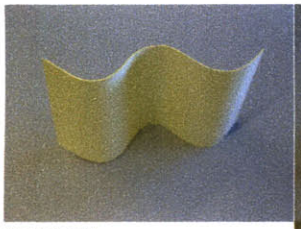


BASIC RESEARCH

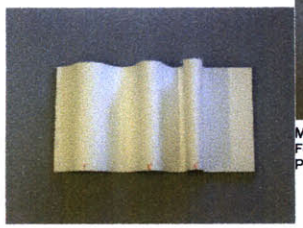
Basic research is an investigation into the latent properties of the material.

- shaping axioms
- assembly expression
- juxtaposition of material to other materials
- joining
- force reactions

2D curve

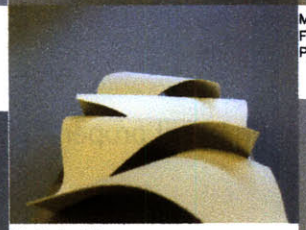


Min. Radius: 3"
Forming: cold
Properties: structural & surface



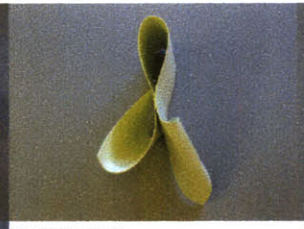
Min. Radius: 1/4" - 1"
Forming: hot
Properties: structural & surface

2D torque

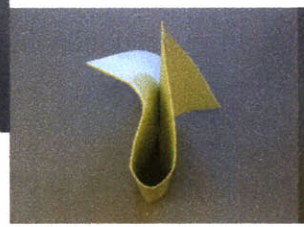


Min. Radius: 3"
Forming: cold
Properties: surface

3D curve

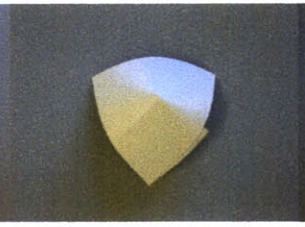


Min. Radius: 1" - 3"
Forming: cold or hot
Properties: surface

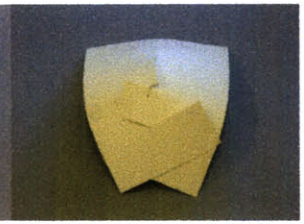


Min. Radius: 3"
Forming: cold
Properties: surface, curvature puts added tension on glued joint

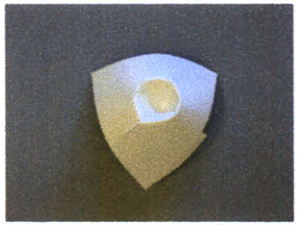
cross & lock



Min. Radius: 3"
Forming: cold
Properties: structural

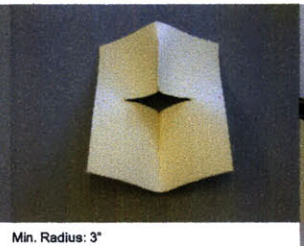


Min. Radius: 3"
Forming: cold
Properties: structural



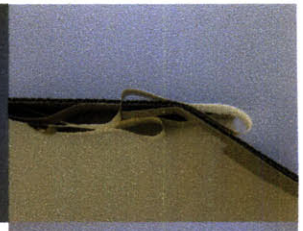
Min. Radius: 1/2"
Forming: hot
Properties: structural dip

cut & pull

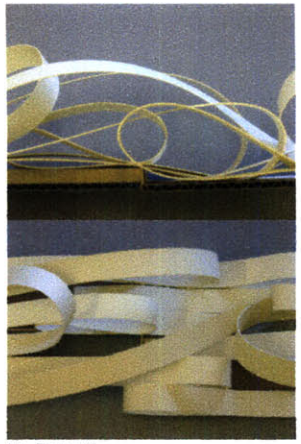


Min. Radius: 3"
Forming: hot
Properties: structural in tension, pulling puts added tension on glued joint

delaminate



Min. Radius: 3"
Forming: cold
Properties: surface

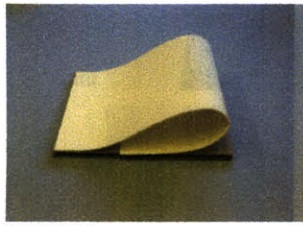


Min. Radius: 3"
Forming: cold
Properties: surface

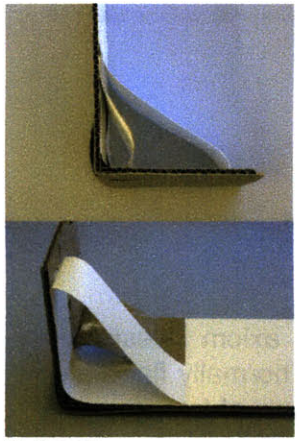
FORMING AXIOMS

The axioms here are singular investigations with the material of laminate. They express the spatial possibilities of a normally flat material.

turned onto itself

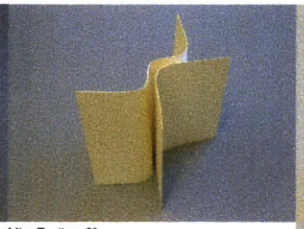


Min. Radius: 3"
Forming: cold
Properties: surface



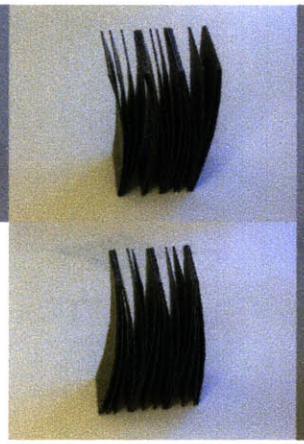
Min. Radius: 3"
Forming: cold
Properties: structural tensions

rotate



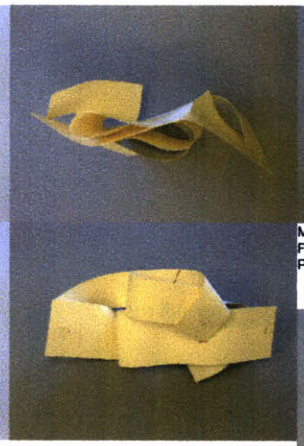
Min. Radius: 3"
Forming: cold
Properties: surface, rotations

pin & fan

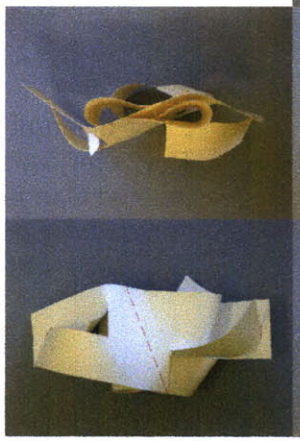


Min. Radius: n/a
Forming: cold
Properties: surface, pinned in tension

planer torque

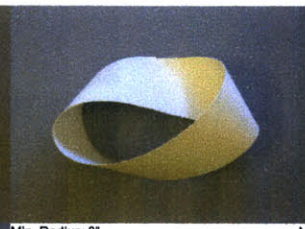


Min. Radius: 3"
Forming: cold
Properties: surface & structural along laminated axis

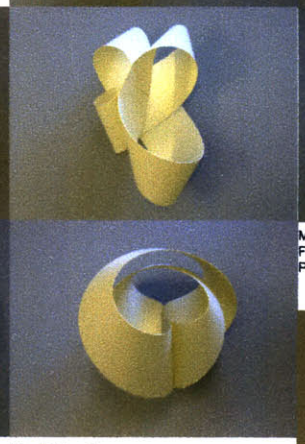


Min. Radius: 3"
Forming: cold
Properties: surface & structural along laminated axis

stripes

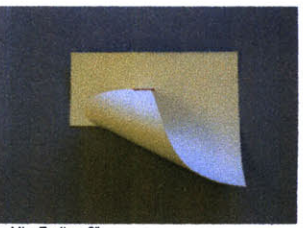


Min. Radius: 3"
Forming: cold
Properties: surface - 1 stripe

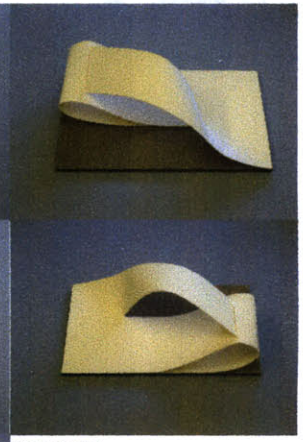


Min. Radius: 3"
Forming: cold
Properties: surface - 2 stripes

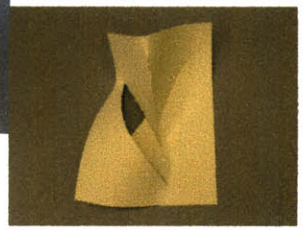
tucking



Min. Radius: 3"
Forming: cold
Properties: surface

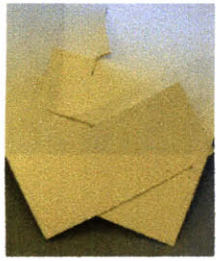


Min. Radius: 3"
Forming: cold
Properties: surface



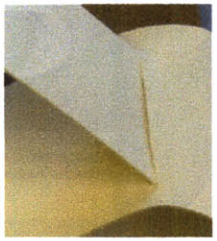
Min. Radius: 3"
Forming: cold
Properties: surface

corner tuck



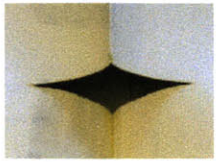
cross-n-lock

delaminate



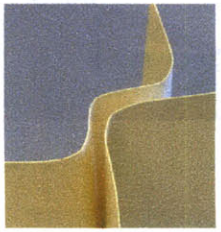
full-ruck

self-laminate



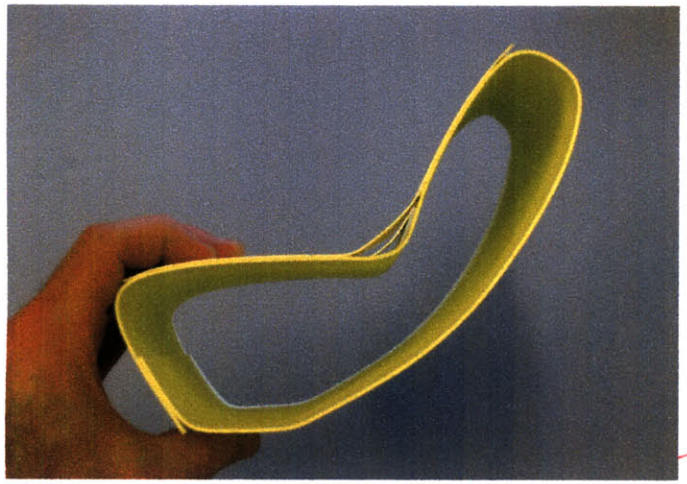
pinch

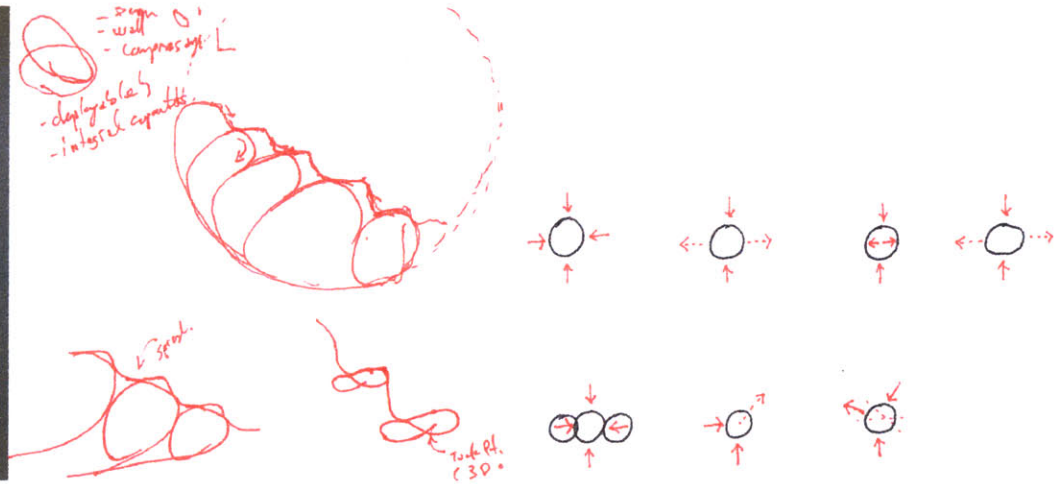
fan

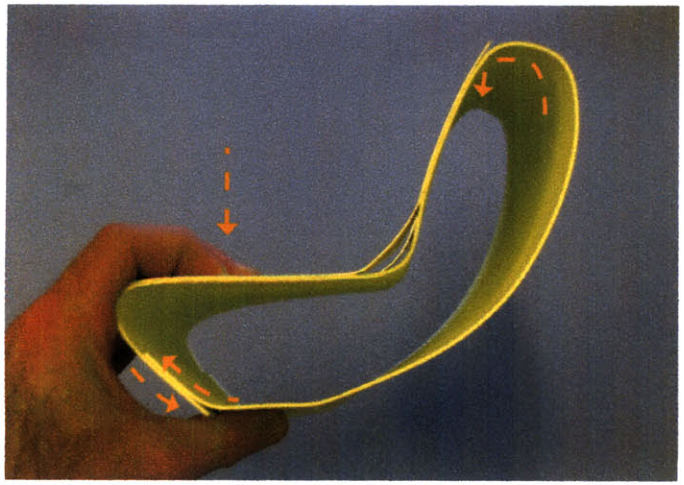


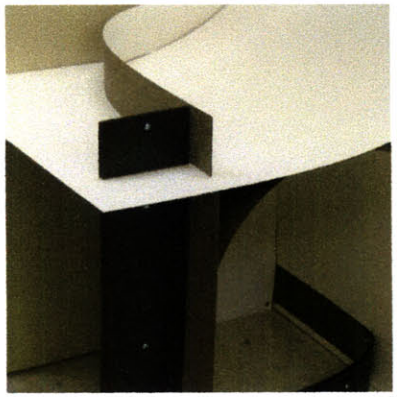
hinge

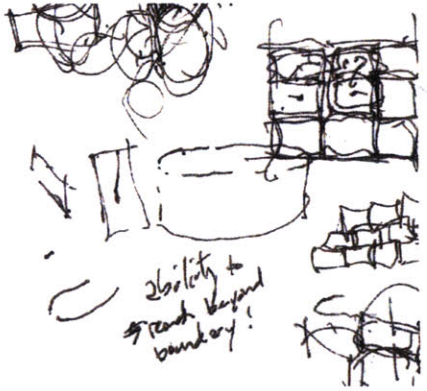
Eight different joining possibilities were discovered in the axiom investigations. They are joints which actually give spatial dimension to a normally flat material. (above) Can laminate be structural on its own? (right) A study of forces was conducted for a possible stair system. Concentrated forces may be distributed over a large area when small cylindrical increments are used.

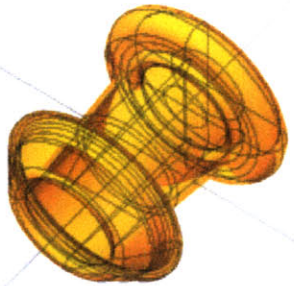








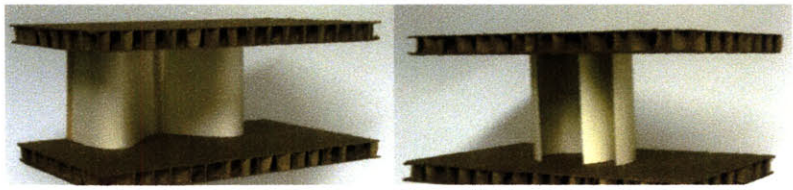

2boleh +
reach beyond
boundary!



APPLIED RESEARCH

Applied research looks at the possible qualities, functions, and imapct of the material latent properties.

- material and social qualities
- possible uses in spaces and surfaces
- desired effects for richer and more viable spaces
- mock-ups



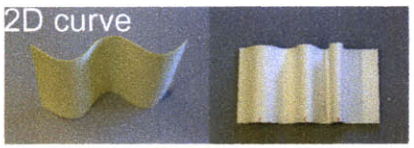
COVE

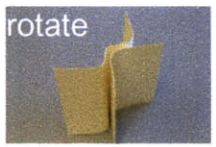
Methods:

- organizational element / datum
- material thinness saves space
- linked coves compact organization
- holder of auxiliary functions normally dispersed throughout the home
- inserts a consistent reference visually and functionally
- scalable in plan, 3', 4', 6', etc.
- still generically programmable, a referential space and surface that carries with it a programmable function by the occupant, it becomes a distributable system.
- Containers to house home goods and auxiliary functions
- Breaks the monotony of the flat plane. Creates transitional spaces to pass through, vs. a hole in a flat wall. But offers enough surface space visually to still hold and define spatial continuity that it found in the home (does not have to be an object)

Strategies:

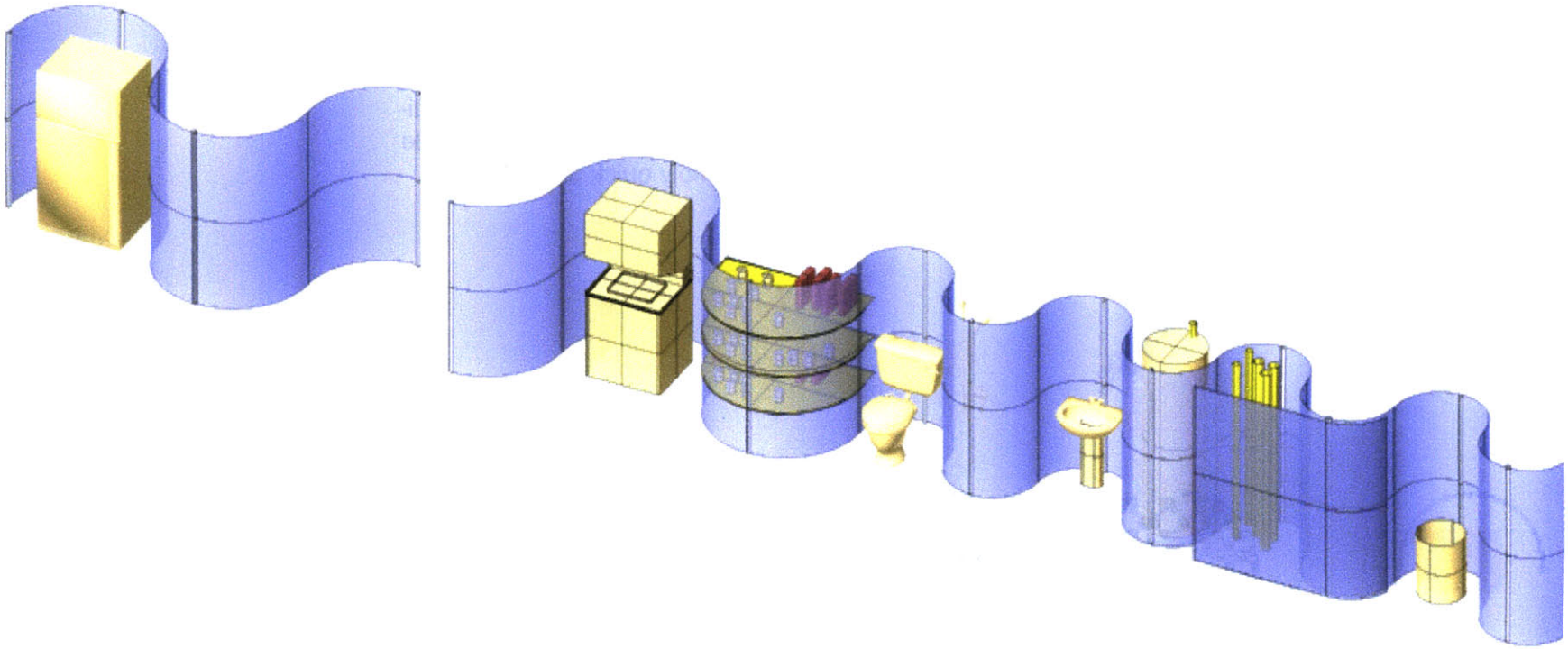
- Defines space by the thinness of surface alone, and not a constructed wall
- Involves on-site to assemble, and manufacture's preparations
- Alters manufactures thinking of the product possibilities
- Becomes an organizational element for builder designs
- Still programmatically generic, but not as generic as a standard stud wall

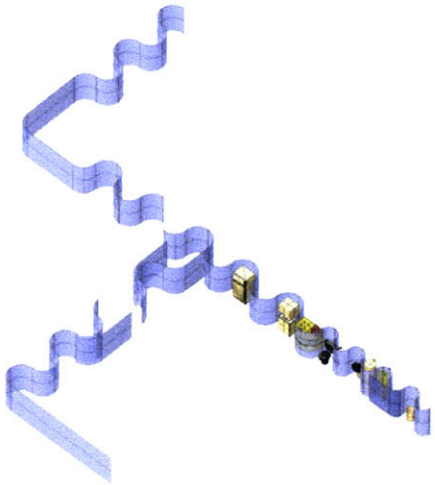


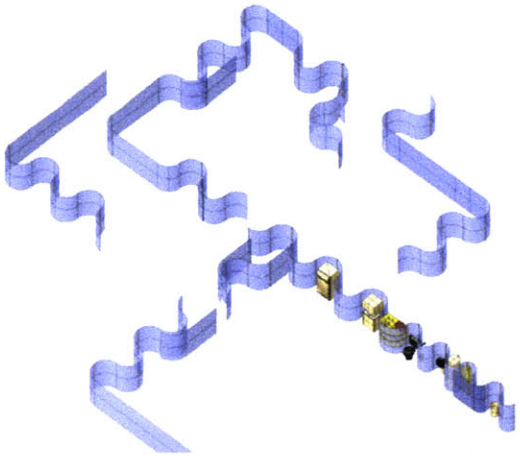


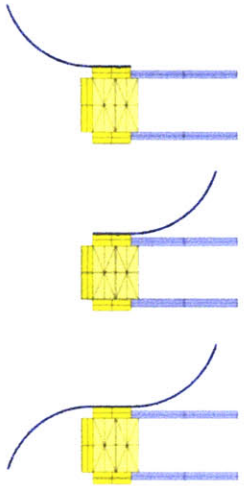
- Combinatorial with std. Drywall system, by overlapping and creating an articulated material seam.

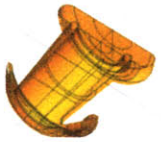
Testing:
- structural properties:
- tested in compression and tension .. results ....
- Needs further test, combinations, lateral, etc.
- needs acoustical test for percentage of sound transference.
- Fire resistant finishes may be applied as needed - already tested by manufacturers

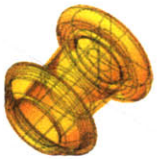


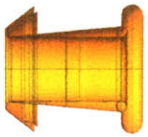










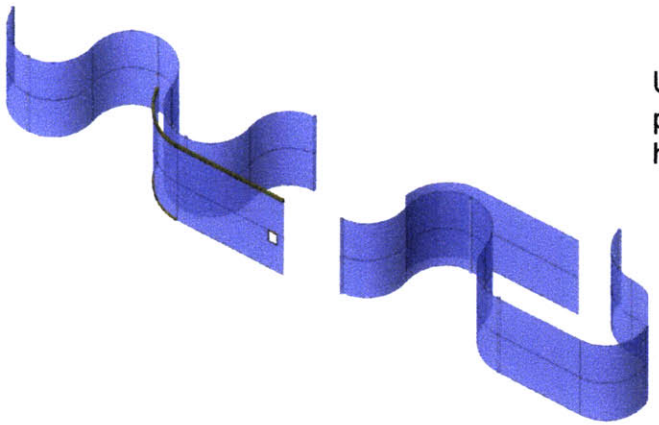


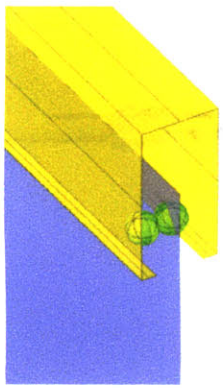
CONNECTIONS

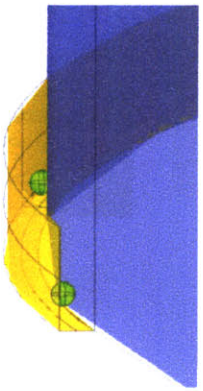
Various connections are derived for edge conditions and pinning panels together from one side to make on-site assembly quick and easy.

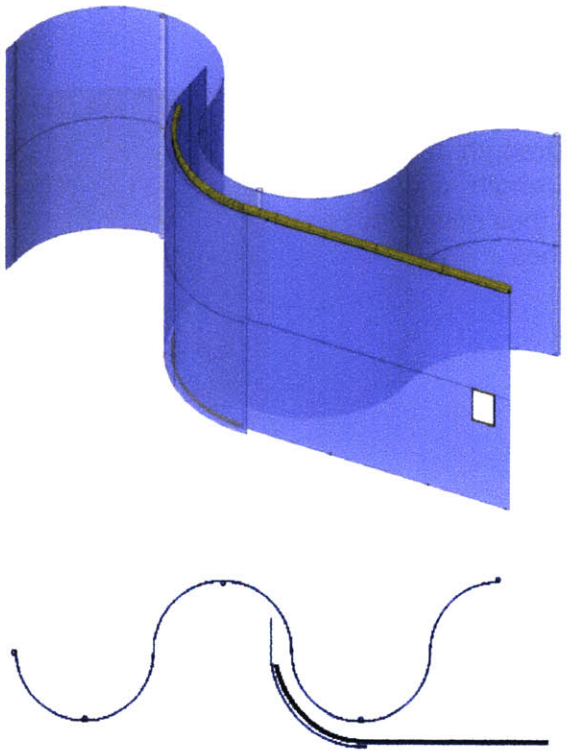
DOOR

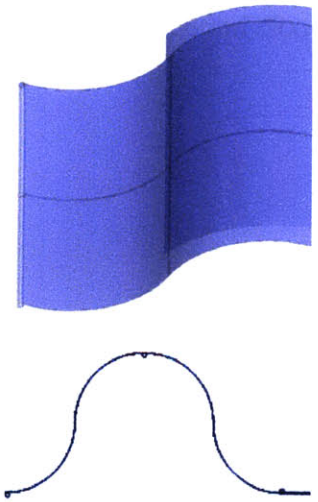
Using Laminates memory shape qualities, door panel may be folded in with out added complex hardware.





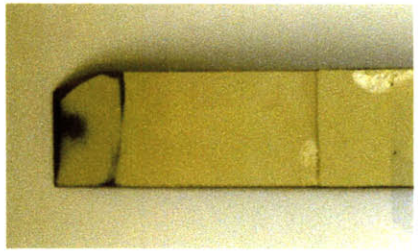


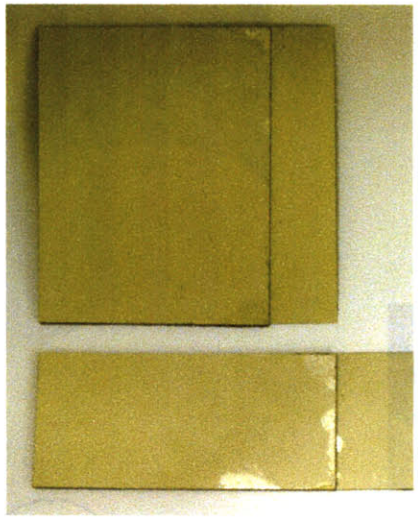


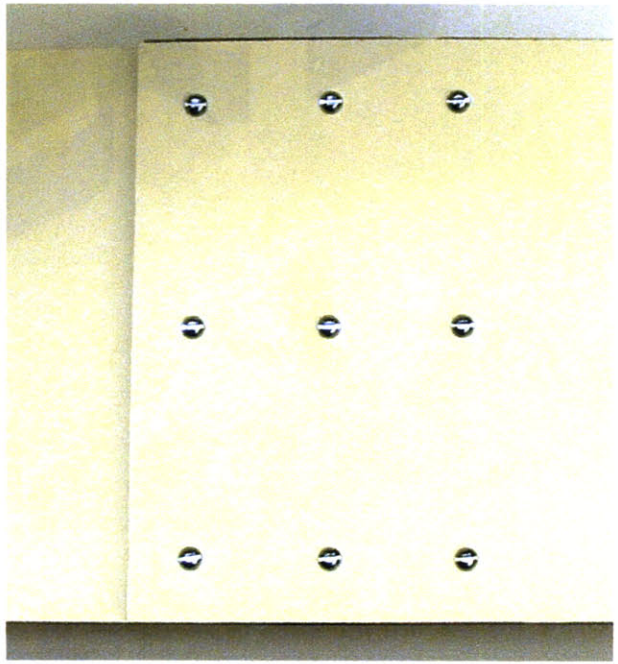


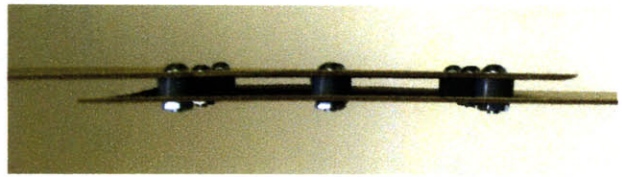
BRACING PANELS

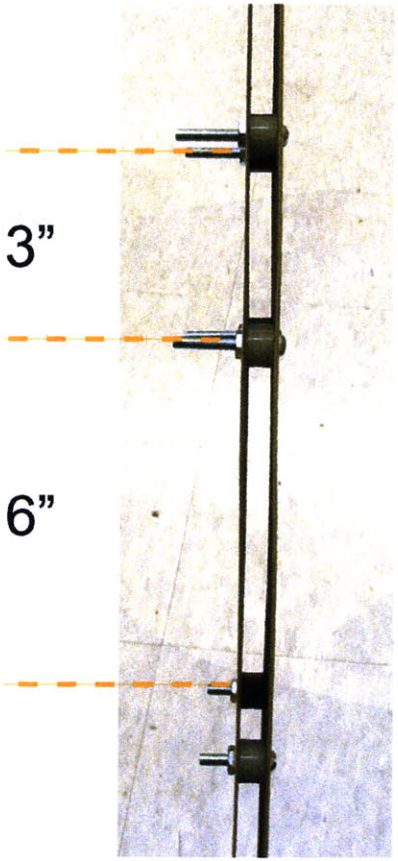
> 52 Panels sandwiched together have additional strength. Shown here are glue bonds and mechanical fastening with spacers. The distance and patterning of the mechanical fasteners affects its directional strength. It was found that the maximum strength occurs when the panels are braced at their minimum cold bending radii of three inches.

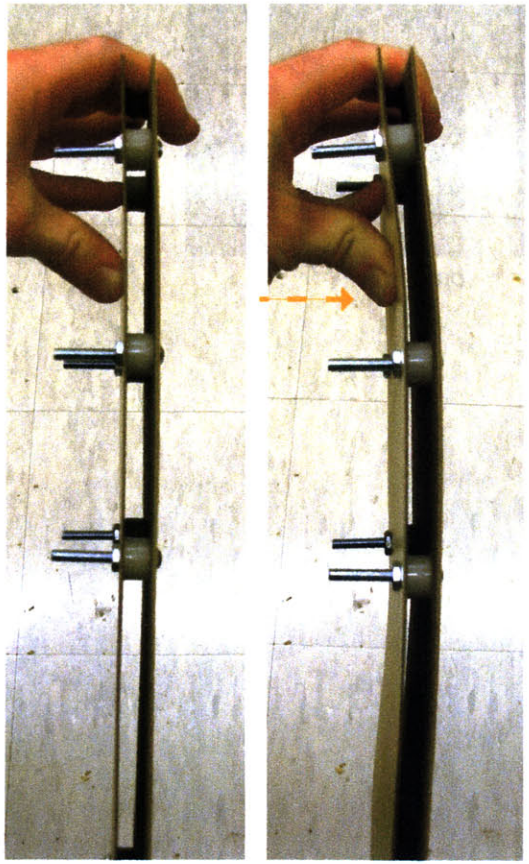




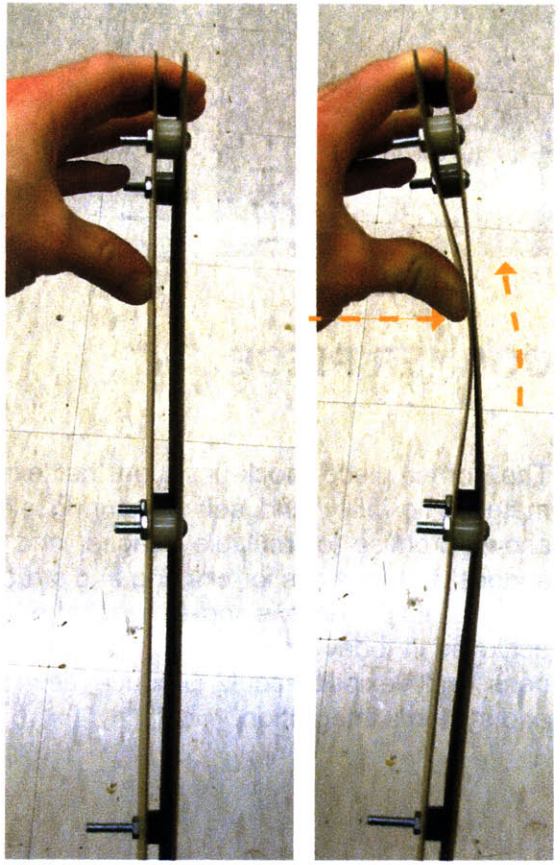




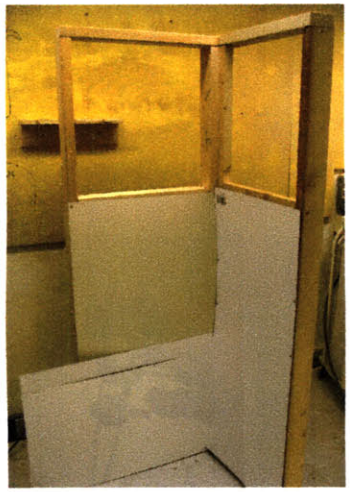




3” - stiff

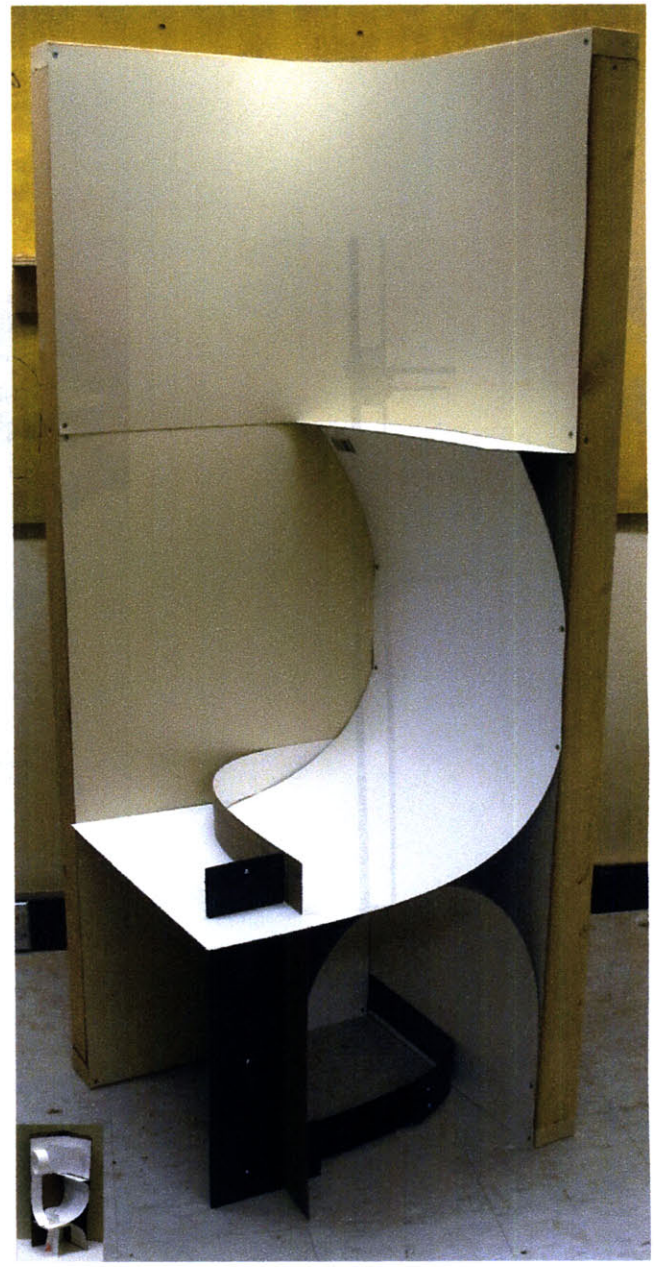


6” - collapse


flat

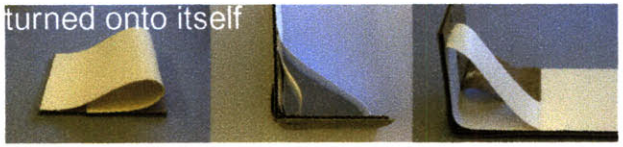

bend

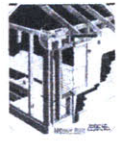

brace

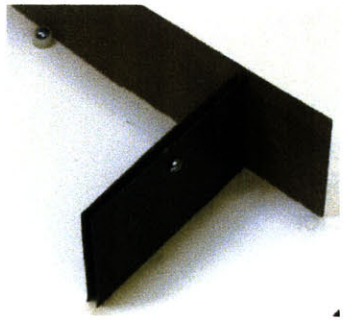


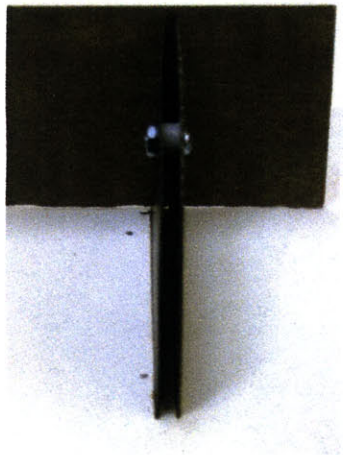
CORNER PIECE

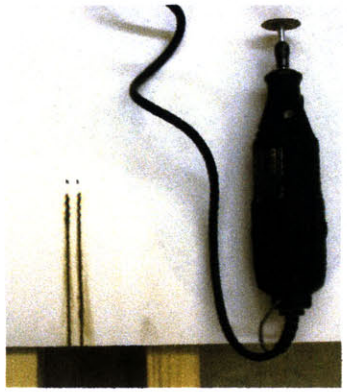
The corner piece mock-up is on that explores the material flexibility and self-structuring elements. It shows promise for multiple usages, and begins to suggest further ways for working and structuring the material. Its thinness is something that has not been achieved in today's housing components. This thinness and flexibility could produce new typologies and systems integration.







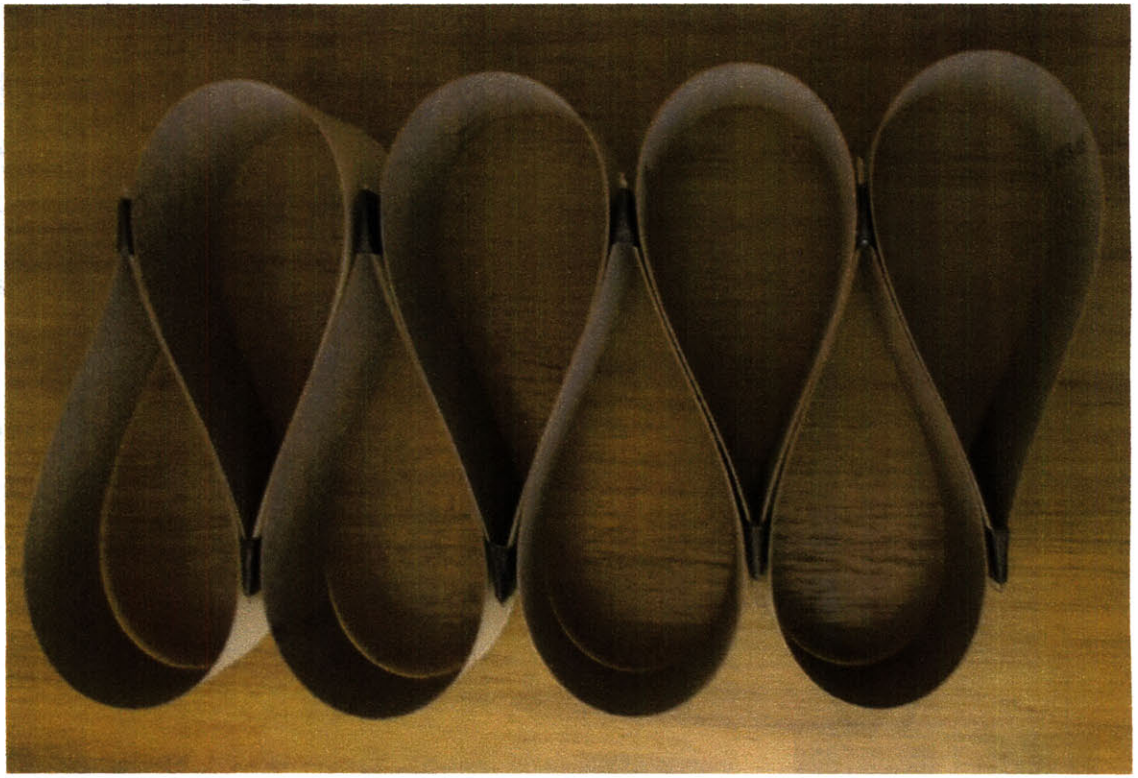


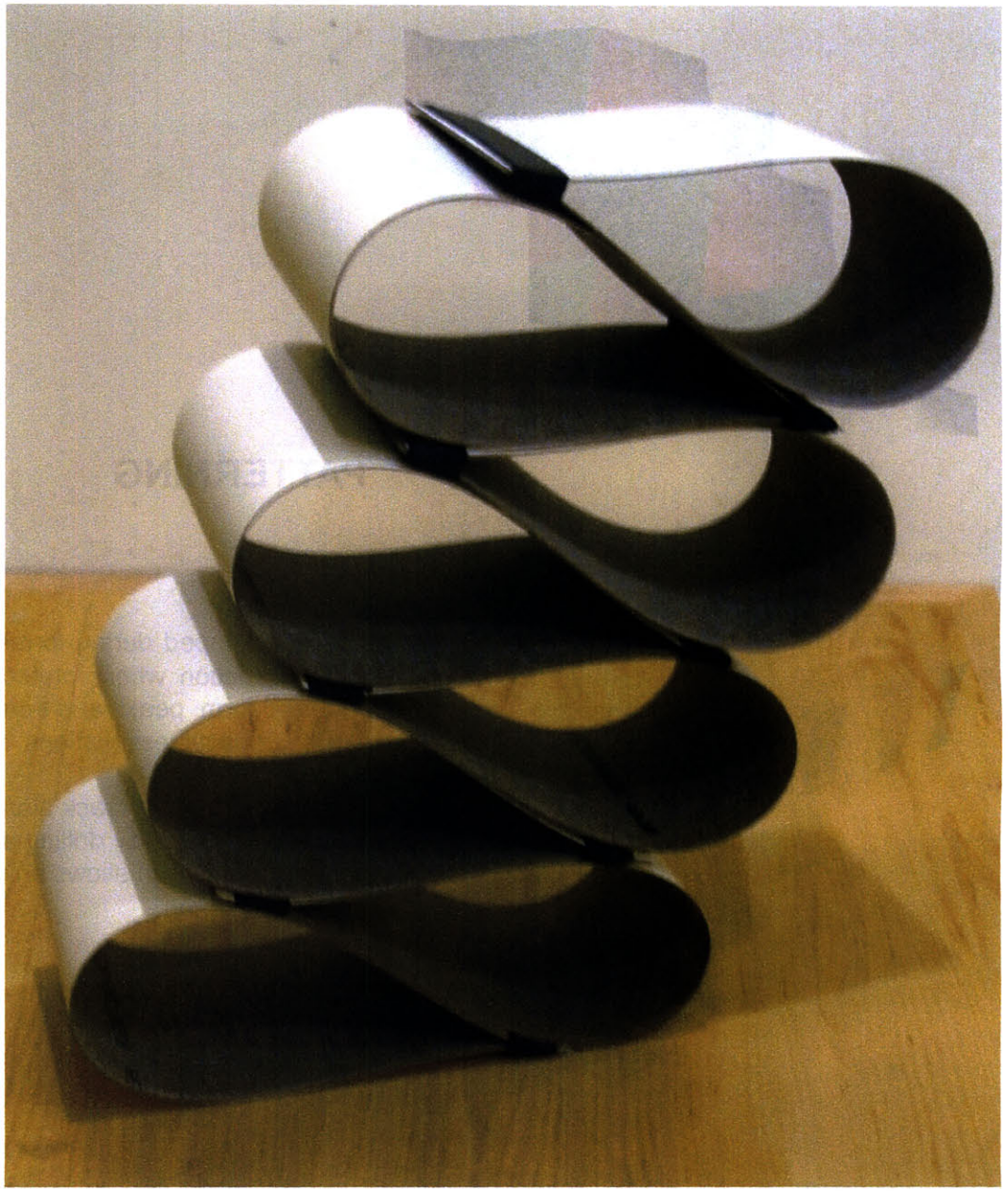


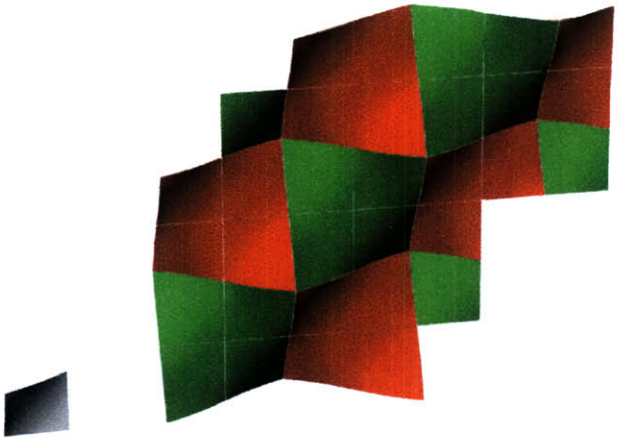
MINIMUM CURVATURES

This component exploits the material minimum curving radius of three inches in a cold state; another half inch is added for a safety factor. It may be applied to shelving, and ceiling light deflector among other possible usages.

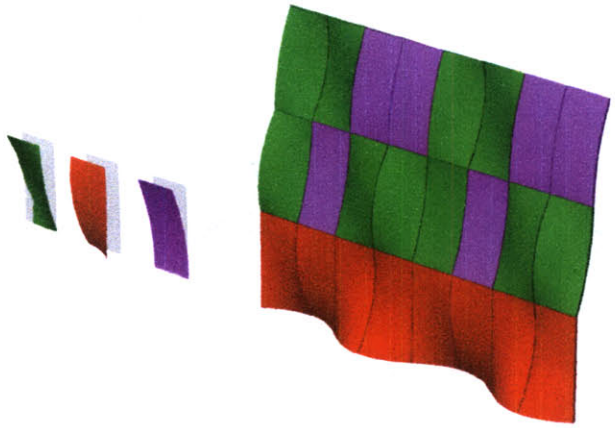
minimum cold forming radius of 3.5”



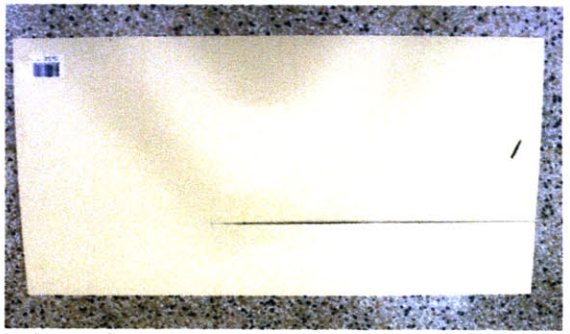




PATTERNING

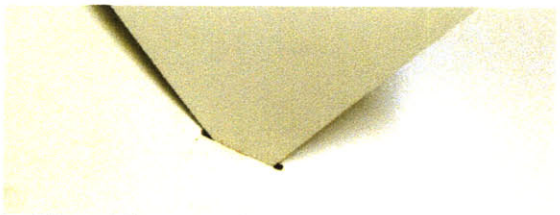


- panels shaped during forming in the Z direction when rotated and mirrored form peaks and troughs
- mathematical tessellations
torque panels
- material wants to crack along cut line; this is solved by drilling a hole at the vertex which allows an equal force distribution.

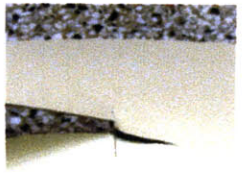


cut panel

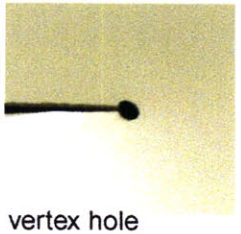
tucking / bending surface



tucking slot connection

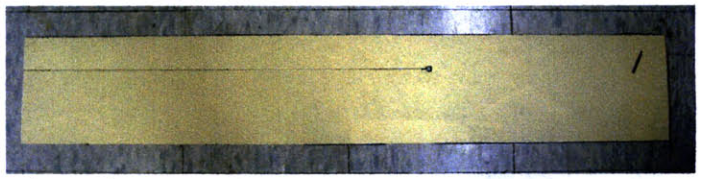


fracture when bent

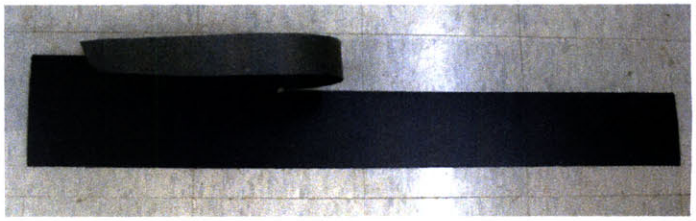


vertex hole

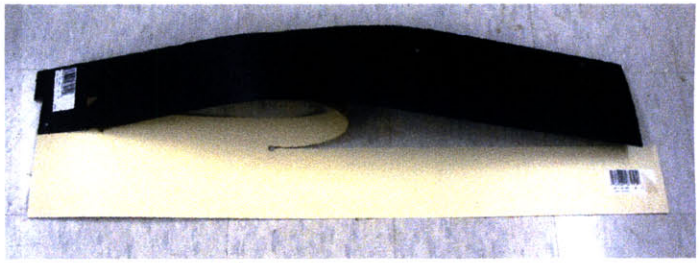
panel system



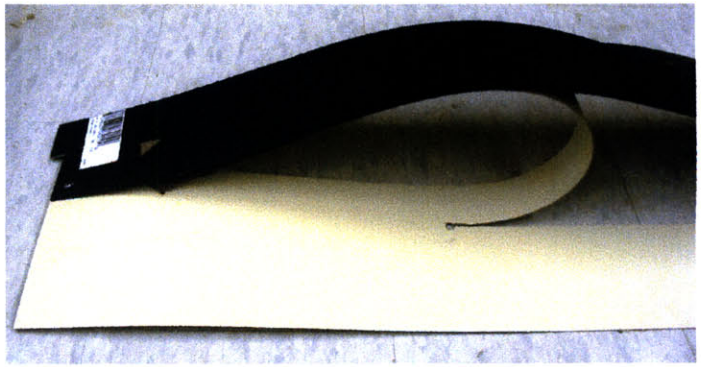
cut panel



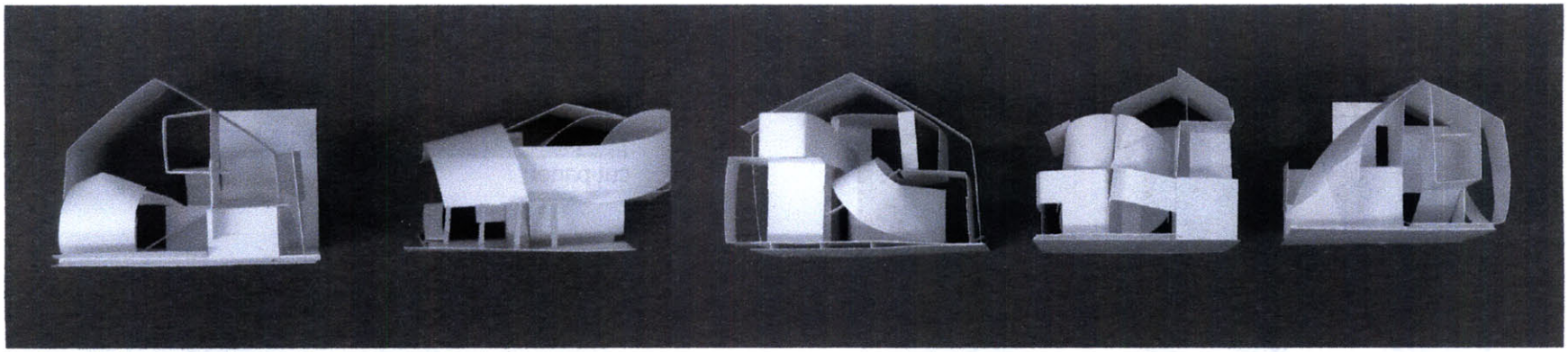
folded back



laminated to second panel



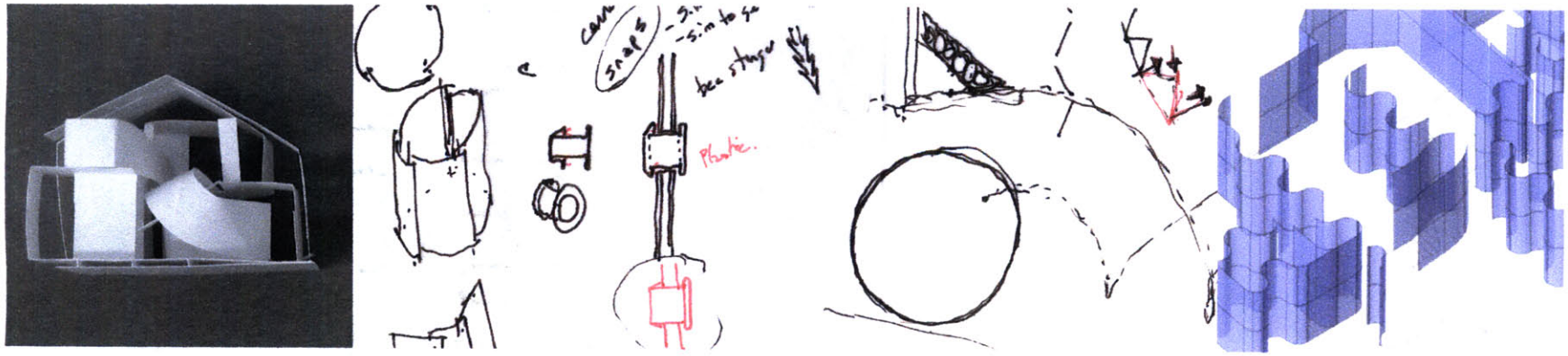
laminated and tuck connection



house diagram studies

laminated panels

laminated panels

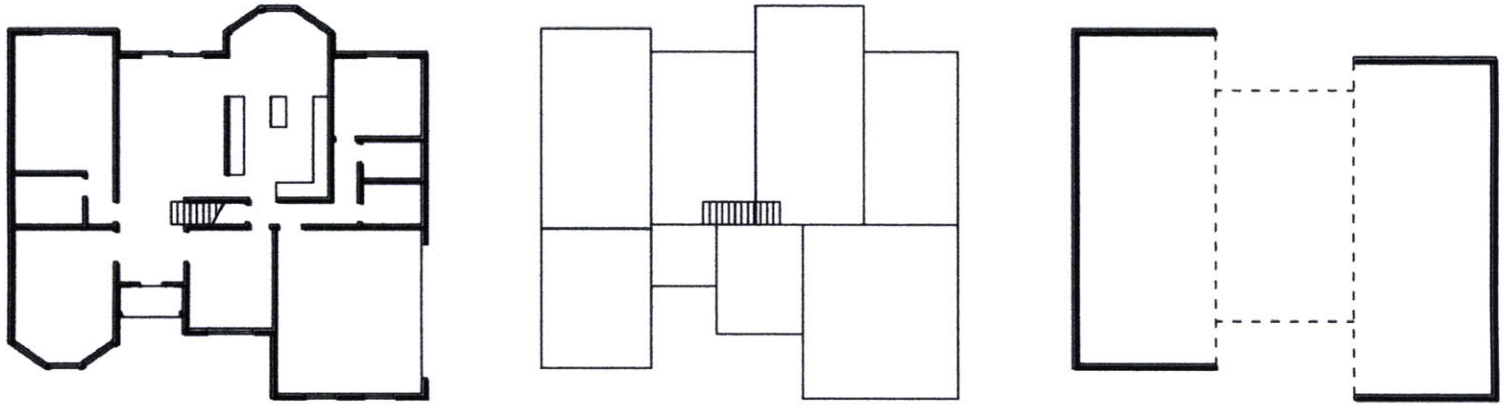

Plastic.

CONCLUSIONS

The American public is largely uninformed of the value or the relevancy of architectural design. Everything we see has been designed; to what extent and with what thought is the question of design value. Design affects the way we perceive, the way we move, use objects, live and reside, places we stay and enjoy, the ability to learn, to work, to be productive, to feel comfortable, the senses, and state of mind. It affects our understanding of materials by the way they are assembled and used, which gives us meaning of materials and forms our presumptions of materials, spaces, and programs. Design has the power to make us aware of place. So the value of design is actually the value of the physical and mental wellbeing of human life itself.

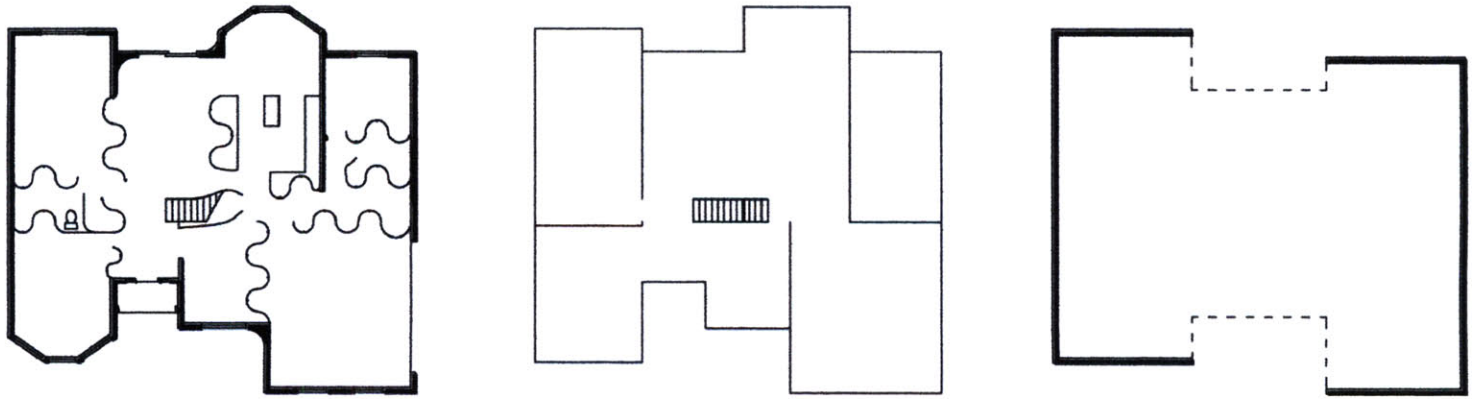
Architects are trained to form and alter these ambiguous conditions which provoke the human psyche. We bring the vision of application for material and products to the table. We have an understanding and controllability of spatial ramifications. We are public intellectuals, thinkers, and assemblers of: culture, space, time, process, material, theory, people, the intangible, and the tangible. We are communicators. Architecture is in the infancy of a revolution; of marrying science, architecture, and business. The rate of progression is dependent upon the Architects. The outcome will be of radical spatial, material, technological, and ultimately cultural transformations. We've fully lost the "master builder" status - our focus has shifted introvertly to our own theoretical concerns. We must now shift to architecture of substance; while extrovertly exercising our impact if we are to ever de-marginalize our profession again.

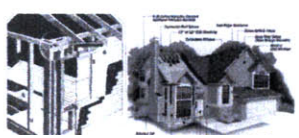
TYPICAL BUILDER HOME

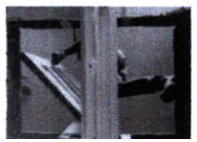


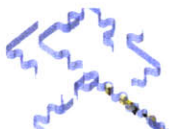
COVE INTERVENTION

The builder home is looked at diagrammatically and components are substituted.
Further investigation is needed here on the effects of component implementation.



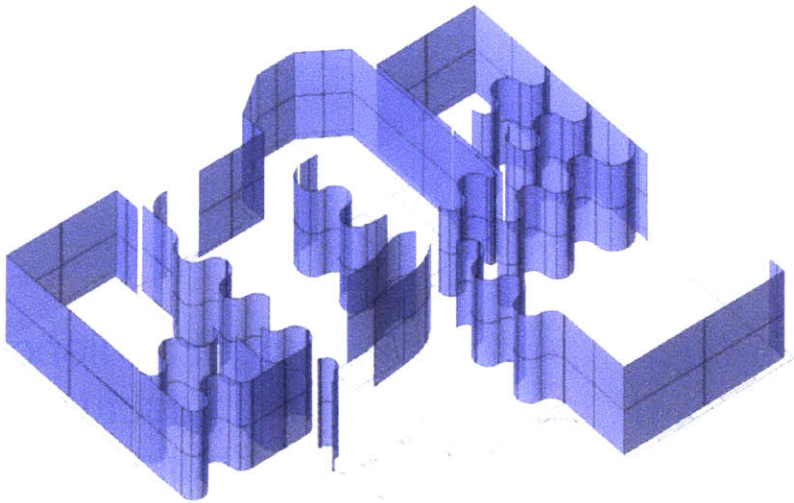






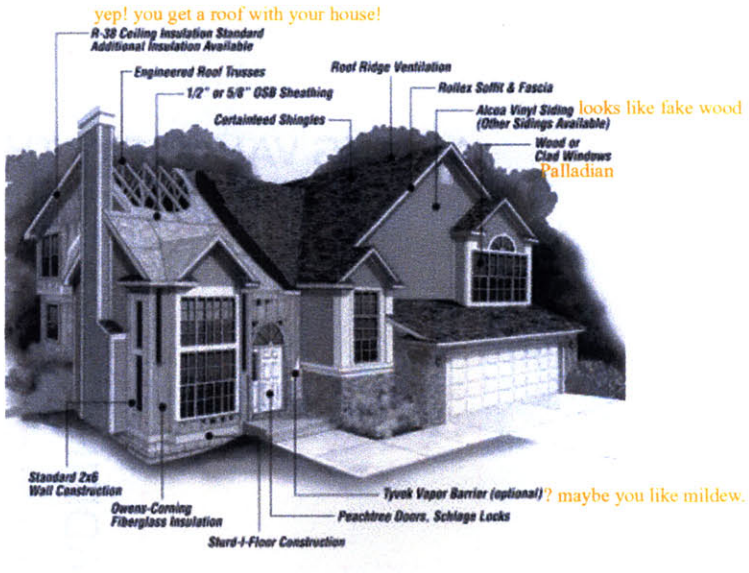
This thesis has set a framework for defining a process of architecture research by looking at surface, and setting forth ways of working and thinking in the context of the domestic.

Architectural Research:
- finding where to innovate
- how to sustain in the marketplace
- must understand the context of the application and it's marketplace

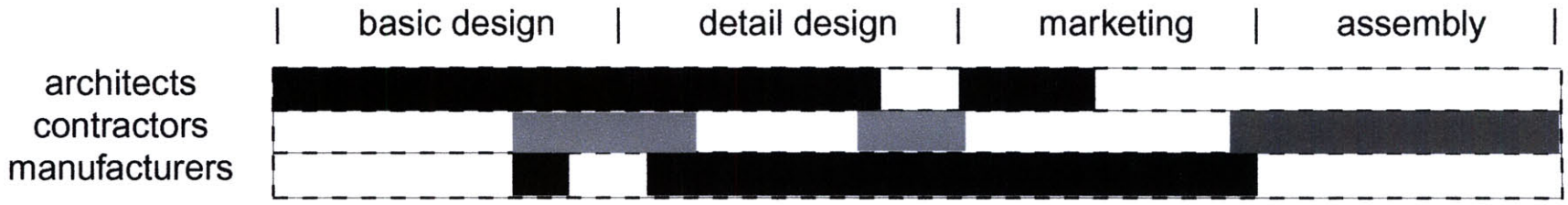


continuity between spaces

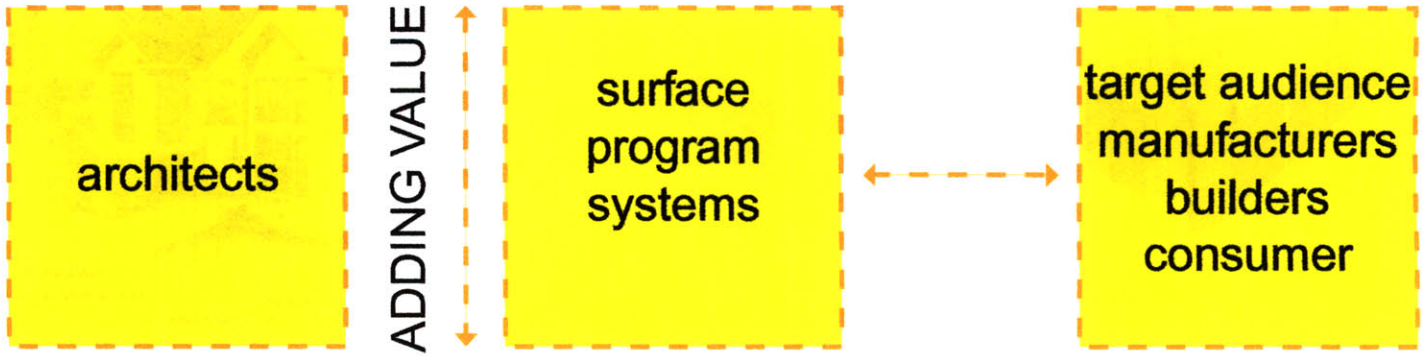
the cove component is implemented here



DEVELOPMENT PHASING



ADDING VALUE SYNTHETICALLY



Academia needs to focus definitive paths with design abilities:

- how to research - courses in architecture
- asserting the tangible and quantifiable values of architectural design
- how to locate opportunity, how and where to innovate
- how to build teams to advance architecture
- how to bring design ideas through to business fruition ideas
- how to build research knowledge databases

I believe laminate quite possibly has the potential versatility similar to the array of uses of plywood. As plywood has its own working characteristics, from how you cut it to how you fasten it; so does laminate as it is being defined here.

If we can begin to establish new visions and methods for surfaces, then we can begin to form valuable counter arguments to current construction and aesthetic mindsets, because we produce a value which necessitates change. Current mind sets have hindered the seen value and advancement of architectural design in the builder home.

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APPENDIX A

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10-1 www.materialconextion.com
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12-1 Texas Laminate Home
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