to believe, to understand, to do:
designing in building
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Professor Andrea Swartz
thesis studio instructor
Professor Brian Hollars
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"... all design work
starts from the
premise of this
physical, objective
sinuousness of archi-
tecture, of its materi-
als. To experience
architecture in a
crude way means
to touch, see, hear,
and smell it."

_peter zumthor

...to the one who helped the most:
this would never have been
possible without you.

Acknowledgments, thank-you's, and my true life savers

mom, what can i say you have always been there no matter what, even through the big hair. thank you so
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more than pretty pictures...

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even when i knew you had other stuff to do. josh, my whipping boy, five years and a great friend. thank-
you for all of your help and putting up with me. bill, my foreman, the man, never change. always be who
you are today. randall, paully, and vernon, thanks for the late night drinks, the heroet, hog dog man, but
especially for being there and always being willing to help a friend. mike, today is a good day because you
are willing to listen. suzie, know it or not you have helped me more than you will ever know. thank-you for
opening my eyes; it is a beautiful world ("i like to get dirty, too"). liz, megan, and jess, ladies, you are the
greatest, my standards, and my teachers. i will never forget everything all of you have given me. my family
Material

something, such as an idea or information, that is to be refined and made or incorporated into a finished effort

Making

to bring into existence by shaping, modifying, or putting together material; construct

Craftsmanship

skill or aptitude especially in making things by hand or in the arts, the product of effort or endeavor
to understand
Lessons:

1. Nothing can ever be built as perfect as it is modeled or drawn.

2. The designer makes the first decision then the builder makes the next seven informed off of that decision.

3. Understand that instant decisions can be made, but they will have to be dealt with later.

4. There is no better way to find the flaws than with one's own hand.

This report is trying to convey the importance of being able to build what one designs or minimally having an idea how to build what one designs. It is a study of how design can be enhanced by the act of building and building knowledge. With an understanding of materials and methods, I believe more buildings and structures could be considered great architecture. If future architects do not acquire a better understanding of construction I am afraid there will be more of the same types of buildings, until designers understand that: design is advanced through the experience of building, which itself is modified as it becomes a built reality in the world of gravity and weather.

"...first make it work, then add the architecture."

_former mockbee rural studio student
“no really productive man thinks in such a paper fashion.”
albert einstein
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introduction:

The success of architecture today, relies directly on the skills, the mood, the temperament, and the imagination of the builder and contractor. No longer are architects and designers master builders. Architecture has been reduced to the reflection of aesthetic design through scaled models and drawings. The construction process is, generally, mildly understood, but rarely reflected in the design. If a builder cannot understand a set of drawings then one of two things happens, in my experience: they will call the designer, trying to figure out how to build what is drawn or they will choose to complete the detail the easiest and cheapest way. These decisions cause a great deal of conflict between architects and builders. It is not because either one does not know what they are talking about, but simply that architects and builders no longer speak the same language. I believe if contractors and architects had a more standardized set of material and construction knowledge, communication would be facilitative for all those involved in the process.

I believe more successful designs are achieved when the design and construction processes are integrated and understood. Building is an experience, which cannot be removed from the design. Architectural design should not be removed from the the experience of building. The more integrated the design, the materials,
the methods of construction, and the understanding of the limits of those methods are, the better a design will be in the final product. The more construction knowledge and experience a designer has will allow him or her to communicate with the builders, the true actualizers of design.

If one understands (with some confidence) construction processes, they will be more likely to be able to predict and achieve desirable outcomes. I believe architects should not only know the components of a wall section, but be able to construct parts of them. This physical understanding of construction will teach designers that walls cannot always be as perfect as they are drawn. Perfection can exist on paper and in the computer, but until designers are able to understand real world conditions and the limitations of methods and those constructing their work, designs will continue to fall short of what could be achieved.

Design knowledge, working with construction knowledge, moving toward a common goal will inform each other along the way. Each will benefit from the other’s experience. Collaboration between architects and builders would allow for limitless possibilities, I believe. It is impossible to solve every problem on paper; sometimes one needs to go on site and try things and ask questions until a good, acceptable solution can be derived. Paper is only a beginning place for thought. It is not the final solution.
precedents:

mason's bend community center, 2000
hale county, alabama
rural design studio-fulton, gerndt, rush, schumann

"proceed and be bold"
__sambo mockbee

this is the first rural studio project i had ever seen. it was on the cover of a magazine and i read the entire article. the building was impressive. even more impressive was that students built it. the majority of materials are found, recycled, or student fabricated. these students built a building, themselves, of this magnitude out of found materials. they were able to realize their designs, the flaws in their work, and experience on-site innovation. nothing, i have found is as great of a teacher as hands on experience.

spencer theater for the performing arts, 1997
ruidoso, new mexico
antonie predock

"where is its deepest reality?"
__predock

i have always been familiar with the architecture of predock, but i did not come to understand his design methodology until i attended a lecture by him. one of his major design objectives is to blur the line between architecture and the landscape. the spencer theatre is a surrogate mountain that rises from the plane like it belongs in the landscape. this understanding and investigation into placement and design derived from the surrounding living context is impressive. the buildings appear as if they belong where they are placed and have always been there; leaving no mark, but changing everything.

"we forget what we hear. we remember what we see. we understand what we do."
__confucious
the cook residence is located in an area where there are a great deal of mobile homes. the basic idea of the design is three connected buildings ranking from the size of a double wide mobile home to a small sized mobile home. the buildings reflect the architects knowledge of materials and construction. it would be difficult to be as expressive in the design without this knowledge. a working knowledge of materials and construction methods and limitations, allows for the architects to be expressive within the rank of buildable design. one must understand the rules to break the rules.

hill house, 1979
santa cruz mountains
jersay devil-steve badanes

"a building has a life of its own (let it evolve)."

badanes

jersay devil is the first design-build ‘firm’ i have researched. their major belief is that design evolution does not stop in models or in the drawings. while they build their building the designs are ever-changing. sometimes wall are torn down to create other things. if a joist is hanging out and looks like a tree, other joists are allowed to hang out and create the tree effect. sometimes the diversions are beneficial; other times they are not, but insight is gained. jersay devil also strongly believes in using conventional materials in non-conventional ways. everything can be a piece of the puzzle.

stoneflower, 1965
e. fay jones
eden isle, arkansas

"...you should feel the relationship to the parts and to the whole."

jones

stoneflower appears as though it is rooted to its site, that it grew there over time, like a tree. fay chooses to not disturb the site as much as possible, in some cases only allowing the materials that a crew can personally carry to be used to build. the designs are layers of simplicity, combined. none of the forms are complicated or take a great deal of skill to fabricate. the idea is to make building it simple, to create complex form rooted in nature. simple pieces creating complex built realities.
precedents:

**mill race park-structures, 1993**
columbus, indiana
stanley saitowitz

"...a type of human (made) geography"

the structures of mill race park jump out to the spectator/user like follies in a garden. they, at first glance, appear to not belong, but with secondary investigation and use the forms fit and seem to be derived from the landscape. the forms have natural rhythms. the material choice is contemporary, though. this makes the structures obviously more noticeable, but actually more functional. the park is in the flood basin; none of walls, only the structure touches the ground. this allows for the waters to flow in and out, causing little damage. the designs for the buildings are site generated, not just plopped on site.

**alice millard house- "la miniatura", 1923**
pasedena, california
frank lloyd wright

"study nature, love nature, stay close to nature. it will never fail you."

the architecture of frank lloyd wright is nature inspired. he went out of his way to study nature, deriving organic forms from it. he was always searching for the natural order of materials and the nature of materials. la miniature is an example of relating materials to the spaces they enclose. the concrete block is used to instruct the design (a unit system) and define the construction method focused on. this brings about a nature order and hierarchy of experience. a blending of the building and material scales.

"wherever you go to... know that you can effect change."

catherine lux
helmet house, 1974
southern new hampshire
jersey devil- badanes and ringel

"i just like to build."
badanes

jersey devil is continuously designing backwards- finding materials, any materials, and trying to use them to form structure and building. the main structure is made out of laminated barn rafters, spilling down from the top-like a big slinky. using common materials in uncommon ways, is one of the way jersey devil stays innovative. the buildings are efficient and graceful. typically only one design is built at a time, with the construction crew living on-site to further engage and understand the environment. nothing is taken for granite. one man’s trash does seem to be another’s treasure.

thorncrow chapel, 1980
eureka springs, arkansas

e. fay jones

"the nature of materials is a very fundamental principle of organic architecture..."
jones

jones believes materials should be used in ways that best exemplify their best qualities, letting each material express its best qualities. thorncrow is like a plant that on site. all of the majority of the materials used in the building, besides the glass, can be found native on site. the native materials are used in typical construction techniques to produce outstanding results. wood is wood, natural not stain-aging. stone is stone- a solid base. steel is steel - a fastening and structural device. nothing hides what it is doing. open and undisguised, materials are what they are. the stuff that is hidden is as expresses as that, that is not.

harris (butterfly) house, 1997
hale county, arkansas
rural studio

"...an architect must choose between fortune and virtue."
alberti

students of the rural studio start with paper and model designs, but once the materials start arriving and the construction begins, the materials and methods take on a life of their own, determining how they want to be used. each building is more than sturdy walls and a roof to protect from the elements. they are, as sambo says, more than just houses for the body; they are houses for the soul. the students are not forced into decisions, but determine their own way. "we will not be remembered for what we do for ourselves, but what we do for others." kennedy.
prior thoughts:

"construction is an integral part in the orchestra of architecture... building blocks."
_gyasi pullam

"if you can’t glue it, screw it... if you only have a minute to do it, it will only take a minute to do."
_chad hamlin

"construction teaches you the materiality and methods of design."
_jessica vargas

"efficiency, that is what contractors want..."
_paully sendejas

"there is a fine line between constructing and designing. you are typically one or the other... education should eliminate that."
_megan phillippe

"always measure twice, because you can only cut once... you can always cut more off, but you can never put it back."
_randall robison

"construction sites are not the places for bmw’s, armami suits, and $500.00 pairs of shoes."
_bill carr

"only after construction can a building be determined a success or a failure."
_josh vermillion

"why can’t you just build what i draw!"
_anonymous architecture student
before thoughts:

i began this study thinking that it would be very easy. for the past four years i had made a lot of things for family and friends. i even kept a few of the pieces i made, a true show of pride on my part to overlook the flaws, i knew were there. i was feeling rather confident that i could enclose space with my own two hands, simple, with easy and confidence.

i had in the past done the typical industrious ball state architecture student thing, turning a wooden ball. unlike most i made ten my first year. most people if they try to do it, wait until their fifth year. i used the turned ball as the form generator for a stool i made during my second semester first year. as my confidence grew i started to make picture frames. i routered the moulding, cut the glass, mounted the photos and then sealed the frames. after about a hundred frames i was pretty confident that i was getting was getting pretty good at that. i went on to start experimenting with glass and mirror etching and sand blasting. i made some other odds and ends along the way, including a clock, some cutting boards and a mission style turning nick-nack shelf.

by the time i reached fifth year, i was confident that i was pretty good at building things. i was now offering tons of help to my classmates and others in the woodshoppe. i thought:

how hard could it be to enclose space???

"doing is the beginning of understanding"

jonah garoute
future-safe prototype:

**disaster relief shelter background:** in the fall of 2001 the 13th annual takiron international design competition was held. the focus of the competition was a disaster relief shelter, with a question of can it be both temporary and permanent. the program was simply and is summarized as follows:

natural disasters, earthquakes, hurricanes, floods...they occur constantly all over the world. although we call them natural disasters, man-made disasters seem to be a better term of late. almost always, the buildings most heavily damaged in earthquakes are those which are either illegally or seriously flawed, and the main cause of flooding is overlogging which moves trees that normally soak up rain and snow melt. although architecture is built because society wants it, architects must bear their share of the blame

... it appears that we have to think about systems for temporary permanent houses, which have the potential to grow into permanent housing instead of being designed to be thrown away. **a systematic approach and concrete programs are important, covering materials, construction methods, transport, stockpiling before disasters, and adjustments to match conditions at the disaster site.** it will also be necessary to clarify the definitions of temporary and permanent and demonstrating their continuity.

you are free to use any means of expression. but the important thing is to look directly at the realities. i think models and actual size test photo of the building units would be preferable to abstract computer graphics...

how much luckier could i have gotten? i wanted to build something and now i could build with a purpose.
design criteria:

- act as a shelter
- the idea for this project should be able to be built by local people, with little assistance
- assemble time should be short
- the variety of environmental situations should mean a common form that can be (re)produced with local materials
- it should be flexible and diverse to cover a variety of situations
- it should be able to be customized by the builders and users personalities creating diversity—not a tent city
- performs functions of environmental modification and should lend its self adequately to the purpose of the activities carried out within the enclosure
- allow nature and natural laws to determine the shape and identify the architecture
- genuinely portable and primarily easily re-locatable

primary goal:

_to design the best shelter that can be assembled in a minimal amount of time with little effort using the least amount of materials possible into a usable form_
future-safe prototype:

the exploration process:

**super adobe**

This is a process which uses a lot of local materials. The system is composed of long sand bags (10'-100') that are filled with sand or dirt, by hand, and then stacked on top of each with a layer of barbed wire in between to lock the layers together.

**evaluation:**
The system uses a lot of native materials. It can become permanent with a layer of stucco on the outside and inside forms have to be used until completion. It is a long labor intensive process and the bags cannot be reused.

**cement-burlap shell**

This is a good process. If someone can figure out paper mache then they can do this. The formula for the mix is Portland cement with burlap acting as the aggregate. The user is able to determine the form because until the cement hydrates rebar and chicken-wire are the form.

**evaluation:**
In the United States, burlap, cement, rebar, and chicken-wire are abundant, but not in other places. To create a dome that was 1/4" thick and 12' in diameter it would weigh one ton literally, 25-80lb. bags of Portland cement.

**geodesic dome**

This is a great building type that Buckminster invented in the 1940's. The system encloses a great deal of space and relies on a structural system that can be lightweight. The skin can be of varying types, but it just attaches to the structure as a skin, not structure.

**evaluation:**
This is a good system. I actually chose to further research this system because I believed it would make for the most lightweight system I could afford. It would also break down to smaller pieces.
emt/conduit

emt/conduit is the typical building material most novice dome builders choose to use. It is for its strength and durability. It is also, in most small cases, the way over structured. There are several steps involved in making the pieces for the emt construction. The emt must be cut to length, in my case by hand. Then in must be flattened on both ends, by hand, and bent to a precise 17 degree angle. Then holes must be drilled in precise location for the pin connection. No matter how precise it still must be nudged into place.

plate construction

I visited a dome green house and saw this construction with 7 ga steel plates and 2 x 4's. Needless to say I cannot bend steel. In this case I chose to vacuumum form plexiglass plates and then fashion them myself. There were two different types of plates, a hexagon and a pentagon. Once these plates were form I cut the struts to length and started to sandwich the struts in between plates. This construction was awkward and a hassle. It was also confusing and could take a long time to assemble.

pvc pipe

The pvc pipe was the construction type I chose to investigate on a whim. I used pin connections, which made it an awkward assembly, but the utter lightness of the system more than made up of my initial connection idea. It, the connection would need some further investigation, but I believed the pvc pipe would work best for my situation with some further study and investigation. It’s light-weightness was more than made up for by initial difficulties.

"(this) is not just playtime in the sandbox"

Jeff Culp
future-safe prototype:

joint resolution \textit{(full-scale)}:

once i determined
to use a cut tooth
and dual groove
system, i had to
determine the
minimum number of
teeth and the
groove depth.

piece fabrication \textit{(full-scale)}:

there is nothing like
fabricating the
pieces for something
you have design.
even the monotony
is forgotten...i am
building something i
designed.
construction (full-scale):

there are 46 connectors and 120 struts that make up the future-safe (3/8 sphere) dome. After the first time of putting it together we were able to assemble it future times in less than 30 minutes.

while we were putting it together i was wishing it would fail so i could stop working on it. the pride of seeing it rise and stand was worth all of the pain.

"there is no better way to learn how to build a structure than to go and do it"
_rural design studio student_
future-safe prototype:

analysis (full-scale model):

lessons:
- domes decrease the surface area of material needed to cover a much larger space
- its exposure to the cold in the winter and heat in the summer is decreased due to the shape and reversible skin
- the concave interior encourages natural airflow
- drag is decreased due to the shape
- pvc is very fragile with strong impacts
- heat seaming is better than duct tape and cheaper
- economy of pipe sometimes means you will still have a few 8" pieces left over
- trust the math; it is a 20'-0" diameter dome, 7'-1" in the center
- everyone wants to help build, but no one likes to help fabricate the pieces
- unlike a computer, you are the one in control in fabricating pieces
- always make extra pieces, something will go wrong
the program of this project was to create a shelter that has a top, a bottom, protected sides, and that could be user changed, to define space. i believe i not only designed this, but i built it as well. the geodesic dome has existed for almost a century now. all of the materials i used did or do. i did not invent anything new. i just practiced innovation and combined a few different systems to create something new and even more useful.

the only way to understand a building, you design or structure, is to build it. i fabricated every piece and thought about every piece, modifying everything as i built more pieces. the reality is; it is a system that works. not every material is available everywhere. the structure is the universal, which will be provided. the skin is the variable that can be changed and modified to fit the environment it is in.

this problem could have been solved a variety of ways. the truth is a stuck with an idea and early decisions and dealt with the implications along the way. i designed in building for a variety of situations. my solution is just one conversation with the situation.

an honorable mention was received in the competition
the bench:

diversion number one (background):

this project began when i was talking with my thesis advisor about different types of construction and interest. some of my work for my final project was leaning toward a curved uniform surface. i was not completely sure how i was going to do it. he suggested: laminated wooden curves, like wooden boats.

the craft tradition as the inspiration

curve exploration:

direct material exploration

_michianna shores wooden boat builders

_cutting 1"8" slats

_a lot of glue and...

42 clamps makes an arch
process and construction:

- squaring the sides
- arch leg and shape
- repairing fractures
- lots of sanding
- the second lamination
- a couple of screws
- well hidden screws
- angling the back legs

"(try to not) make it fall down"
_gwen earle
the bench:

diversion number one (resolution):
reflections and analysis:

some people thought of this project as a diversion for me, thus the partial title, but it was more of an exploration. once i realized how easy it truly was to laminate together one’s own chosen shapes i went a little wild. i made eight of the arches and then decided what i could make out of those.

creative reuse of scrapped, warped 2x4’s put into a practical use. the shape is derived from the arch. all of the pieces of the arch are used in the construction of the supports. little was wasted.

the bench leans more on the artistic side than it does on the utilitarian side. it must be placed against a wall, because the back legs stick out so far. the seat, also, comes short of covering the front legs and some people run into them. lateral stability is sort of questionable. it does sit well and is comfortable against a wall for short conversations.

"be realistic, think the impossible"

che guevara
visual thought:

background:

going off of the basis of the future hope disaster relief housing dome and the bench success, i thought i should try to build an even larger piece. i was confident in my design and construction ability, but did want it to be something i would be able to personally build in less than a semester.

i began to evaluate ideas and decided i should make a small picnic or bus shelter. this seemed small enough to me that i could be one in the amount of time i had available to complete it.

how hard could it be?

i was all over the place over the end of fall semester and the beginning of spring semester trying to determine a project to build. not having a client or a budget i was able to go off on a lot of seemingly unrelated tangents. some of them were related, others did not really know each other.

they are all really small shelters.

the idea was since it was so small and others were dealing with a lot larger of projects was to try to make it more complex than simple. i was sure i could build a simple picnic shelter, so mine must be more complex to challenge me.

i finally settled on the idea of making a mobile (a thought i would regret many times later) pedestrian rest stop. the idea would be that in its most basic qualities it must be able to comfortably be sat on and it should protect users from the elements- basically it was suppose to provide seating and shed water.

simple and easy to accomplish, right?
initial

(my personal design) rules:

- nothing can be purely aesthetic
- every element must serve at least two purposes
- every must be thought about and designed to the same level
- this is for people to use, not just artwork
- if it effects the design-fine; effects the idea-fight to the death
- think about user comfort, physically and mentally
- make decisions and deal with the implications
- don’t reinvent the wheel
- to express design simply and cleanly
- have fun above all else

goals (for my design/build):

- to have a project i like enough to keep
- to be able to say i built this and i did this because...
- to gather hindsight and foresight in design and construction
- to understand construction, materials, and methods
- to accept design and construction implications
- roof-rafter-stud-seat-base
- to provide shelter and comfortable place to sit
- don’t reinvent the wheel, just improve on it
- understand upkeep, prolonged use, and exposure
- to have the respect of my peers for my choices

“if you can’t draw it, make it”
- antoine predock
visual thought:

study models:

fixed
one sided
expressive
formal

12.15.01
an over expression of structure and locatable pieces.
nice to look at, but frightening, too.

adjustable
multi-sided
& spaced
many
options

7.01
difficult to build (full scale).
waste of materials and hard to move into other shapes
installer defined shape, users could adjust slats to preference

user is allowed to adjust to comfort, materials to build with hard to locate

arrangable sectionally mobile multiple spaces

arrangable mobile two spaces
by the time of the midpoint thesis reviews I was still playing with the idea of laminated pieces. I finally decided it was going to be a central column support with seating surrounding it
study models "covered seating area":

02.19.02

A week later I had decided what I wanted the piece to look like since the laminated arches would not work in this situation. Rules and parameters help designs to come a long way. Not blind stabs in the dark.
visual thought:

resolution and construction (full-scale):
having not poured concrete before, the first step was to take advantage of the liquid possibilities of it, by making a form it would take - concrete takes any form. it is difficult to keep mixes consistent - just accept it. corners are difficult and they show - always vibrate the air bubbles up and over.

2x14 cedar would have been too expensive for my student budget. to get around this i made my own 2x14’s by splinning a 2x6 and a 2x8. to make the rest of the cruciform, i laminated a 2x6 on either side of the spline and then used all-thread reinforcing 8” o.c. all the 10’-0”. 32’-0” of 3/8” diameter reinforcing- bolted on both ends.

i thought the rafters would be easy to put up until i realized it was a 10’ board that i was on one side of - i needed help, thank god for friends. i cut the angle for the rafter twice, for the slope i wanted - design-build-modify. the rafters went up first to hold the roof angle, to bring everything else off of one standard for deriving all other pieces.
resolution and construction (full-scale):

03.12.02 - the arches
03.21.02

the arches were a project of affection, integration of the curve into the project, again. the arches are made of three 1/2" layers of plywood laminated together, rough cut. i had to use the router to clean up the edges of the wood. wood glue is stronger than the actual wood, strength is needed.

03.21.02 - the fascia
03.22.02

having 10' plus span at the end of the rafters, the fascia needed to have a larger section to subdue deflection. most of the pieces needed a second person, a third for the fascia. i was trying to hide the connections as much as possible, so i toe screwed the fascia, making a better connection.

03.18.02 - the roof
04.01.02

the indy star donated used printing plates to be used for the roofing scales. there was a lot of work cleaning and preparing the edges. the matching cuts for the purlins, which no one is going to see, took ten tries to get the compound cut correct, 21 deg. vertical and 41 deg. horizontal.
04.03.02

The cap

I could not finish attaching the printing plates to the purlins until I fabricated a cap. I was going to make a typical cap, but once I spoke with Antonie Predock I decided it needed to be a frosted cap with lighting possibilities. It is made of frost plexi and sheet metal riveted and caulked to seal.

04.04.02

Self-supporting

One of the most exciting days was the day I completed the roof and cut the temporary legs off. To see visual thought holding its own was great. I built it and it was standing with no help. The rafters are cut long based on a Japanese influence. It shed water, but still needed to provide seating.

04.05.02

The bench

The bench surface was the last piece I needed to fabricate. I made templates of the sections and then fabricated the four sections inside without the base pieces to reference, that was a mistake. The benches are nice, but they could have matched better. They do seat comfortable, though.
visual thought:

drawings (as-built drawings):

these drawings were done four days after I completed "visual
thought" for the construction specifications institute honor medal
competition for senior theses. I received the medal for the project
SELF TAPPING NEOPRENE
SCREWS - SQUARE DRIVE
RIDGE CAP - 6" GALV.
CENTER BENT
INTERLOCKING RECYCLED
PRINTING PLATE SHINGLES
2x2 CEDAR PERLITE
COUNTERSUNK SCREWS

2x6 CEDAR RAFTER
1/2" LAMINATED PLYWOOD
ARCH SUPPORT
2x6 CEDAR FASCIA

2x2 CEDAR VENTED BENCH
1/8" PVC SPACERS - COVERING
- 1/2" 3/8" ALL THREAD REINFORCING
2x2 CEDAR NAILER - BOLT
CONNECTION TO CONCRETE
CEDAR CEIL FORM COLUMN
PRECAST CONCRETE BASE
visual thought:

reflections and analysis (full-scale model):

lessons (in building):

- It is really difficult to build things bigger than a picture frame or furniture.
- There are tons of decisions you must make on-site that the drawings and models know nothing about.
- Every piece effects another effect another effects another - its all related - choose wisely.
- It can be drawn perfect, but it cannot be built perfect - you must adapt.
- Quality standards change when you build and where you build.
- It is easy to express structure, but the details are what it's worth.
- Models and overall drawings are nice, but the owners only care about the price they pay, not how the whole works.
- You can't make the model realizable and make it work in the real world - expect the expensive early to be wrong and be thought out in the least amount of expensive early.
- When learning something use a cheaper material to figure it out, then use the expensive stuff.
- It is hard for one person to build most things.
- It is hard to build most things, respect the skills and trades.
- It will always work in biosa and on paper, but it is another story when you build it.
- The designer makes one decision, the builder makes the next seven.
- Always tell people it will take twice as long as you estimate it will take.
“buildings still know the feel of the hand, doing it by hand you see what you are doing. there is evidence of the work that is done and what still must be done. a history of the development of an idea”
_tod williams

thoughts (on building):
...if i had only known the commitment this project was going to take before i began, i might have reconsidered before starting. having completed it, i now would not give up any of the doubts, depressions, and long nights because of what i have learned. i built something i designed. i found out everything that i had not thought about while designing it and more importantly what i should have thought about while i was designing it.

i believe the project was successful as a build. it was even more successful in teaching me how i should be thinking when i design, what i should also be thinking about before i design, and what i should know while i design. it is impossible to build everything you are able to design, but i believe a designer should at least have some actual familiarity with what they are designing.
critical analysis and reflection:

thesis year *(fall 2001-spring 2002):*

Design is fun. Designing makes me happy. Designing is fun because it is hard to do, but the returns are great. Building is difficult. One realizes their errors as they build and the ability to make decisions quickly. Without the construction trades, there would not be any buildings or architecture.

I chose to explore materials and construction methods in an effort to direct my education toward an understanding of the construction fields. I believe with more of an understanding, I would be able to design better. Most architecture students, who are formally trained, do not have a great deal of exposure to the construction field. Education for future architects and designers is coming up short. If the trend in architecture continues, as it is today, there are going to be more buildings and no longer will there be architecture. Great architecture is a process of designing, building and modifying what was designed to fit the situations. The act of designing is to challenge reality. This does not mean we do not have to follow the rules of reality or understand reality. It means- to break the rules, we must first understand what the rules are.

Wolf Prix says, "...that architecture does not complete function but is rather the improvement of the illusion of reality. The eye is the most powerful organ to perceive architecture, but it is not the organ. To experience space you have to use your body as well. It means that you can read the cross section or the plan, but in order to experience it you have to walk through it."

Todd Williams says, "You have to visit or build it to (truly) appreciate it (a building)."

Both of these men are correct, I believe. In order to understand a space one has to be in that space and figure out why there are flying buttresses or where the curtain wall is reflected in the surrounding balconies. Not everyone notices these little pieces of design. There are some architects, who do not recognize them, but those spaces, which are designed well, are always noticed, accepted, and understood. Most architects, who consistently design well, have a background or familiarity with the construction process and building methods. They have come to accept that they are not perfect and that their designs could always need some help. As I have said in numerous portions of this book, design can exist perfectly on a piece of paper, in model, or in the computer, but in the built world, there is a different story. People, who are emotional,
critical analysis and reflection:

thesis year (*fall 2001-spring 2002)*:

, of varying skill levels, and who some days just want to get done as quickly as possible, build what is designed. When the design does something they are not familiar with or takes a bit more effort, at times, they choose to do things how their fathers and grandfathers did, relying on their experience and not trusting the inexperienced designer.

Crazy and challenging buildings are built everyday. The people, who build those buildings, enjoy going to work most of the time because the designer is informed of the processes of building and understands how it, his or her building, is going to be built. The understanding of how it is going to be built is reflected in the design. Builders appreciate and respect someone who knows how something is going to be built and where some parts do not matter. As much as we, as designers, would like every part of our buildings to be perfect; we have to accept that they will not be. Buildings move. Concrete cracks. Steel rusts. We must learn to accept this. Nothing, even if it starts out perfect, will remain perfect- that is reality.

I chose to explore the design/build process of architecture because I have an interest in building. I have a mind, which allows me to design, but I also have hands that allow me to try to build what I design. I built two major projects this semester and several diversion/side projects. I learned a great deal along the way, as I have in my five years of education. As I built the furniture pieces I was quite confident. They turned out fairly well over the years. As I built larger pieces I soon learned why those small piece turned out well and why designers and architects love to design furniture. There are a limited number of decisions and at that scale and smaller it is very easy to attain a level of visual perfection, if not a supposed perfection. When there are only three or four decisions to make and two or three questions to answer, designing and building is easy.

The experience of building two larger projects, one basically a large tent and the other a picnic shelter, taught me there are so many decisions and implications of those decisions in small projects. I can only imagine the millions of decisions and question in a school, much less a single family home. I learned that the decisions made in the beginning, in a lot of cases dictate what is going to happen in the end. The final product will be of the design and idea, but it is rarely the design. Everything is constantly modified by earlier or current choices. It is very difficult to remove days worth of work when an implication
or mistake is realized. They are dealt with and are allowed to influence other pieces. I have learned, building my own small projects, that a building is a compromise between design and what is possible and the attainable levels of construction. Building my own project, my baby, in some people’s eyes, with my two hands and my unwillingness to accept change or compromise soon learned that perfection is impossible. It is very easy to accept an implied visual perfection when it is going to be almost impossible with cash, material, time, and ability to achieve perfection. I am still making these realizations as I write this and will continue to for the rest of my life. Experience is the best teacher.

My project, to believe, to understand, to do, was quite a shock to the faculty of the College of Architecture and Planning at Ball State University. Questions arose all of the time: Why do you want to do that? We are a design school? Just make it look pretty, some else will figure out how to make it stand? I asked, why shouldn’t I build it and see if it works. Design and construction make architecture. Neither can be removed from the other, but when there is a common understanding architecture is easily produced. Not only at my current learning institution, but at most others, architectural education is coming up short. Students rarely go on site visits and almost never are forced to observe the building process. Books, slides, movies, and war stories are not the answer. Hands on understanding and experience is the only way people are going to understand what makes a building stand up much less what makes it architecture. If the future designers and architects of the world are not being taught this then where are they ever going to be given the opportunity to learn it?

My answer is design/build components to the architectural education. Not small pieces of furniture, but shelters of varying sorts. There is enough involved in the building of a shelter that student-builders would be made to realize their design implications and their design impossibilities. As much as I like the way glass wall look, glass is not a structural. Brick was not conceived as a veneer material. Thirty plus foot cantilevers with no support are cool and can exist in the computer and a balsa model, but there is not enough kryptonite in the world to keep them up. Students do not understand this. I did not understand a lot of this. Building a pieces and thinking about how future pieces and project would have been built has taught me; I have a lot to learn still. If I believe I have a lot I can still learn then there are probably hundreds of thousands of architectural students, like myself, who want to learn even the simple lessons I learned as I built my small shelter. Scales might change and details become more complex, but there will always be implications that should be thought about and understood while designing at any level. Gravity exists, even if the computer can shut it off and the designer chooses not to think about it. As much as we, as designers, want to think our buildings will be picture perfect everyday, the truth is they are going to get rained on a sunned on minimally and mother nature can do a lot worse.
critical analysis and reflection:

thesis year (fall 2001-spring 2002):

I can understand students, fresh out of school not understanding construction, as much as I think that is almost the most incorrect statement I could make. Then when I think about how much architects do not know about construction, methods or materials I am shocked and even more when I realize they do not care to know, in some cases. If you know the master mason is going to lay the corners of the builder and the trainee is going to do the in-fill, only snapping a horizontal line every six or nine courses why doesn’t design reflect this, emphasizing the corners and understanding the who and how the infill is going to be placed. Five o’clock comes everyday and as much as we think it does not, work is going to stop until seven or eight the next morning. The stopping areas are noticeable. Why not design stopping points into the construction and celebrate where changes occur? Brick is laying is only one of hundreds of thousands of areas and methods we, as future designers, should be familiar with and there is not excuse why architect are not at least familiar with them. Architecture should not be the process of making drawings and models to be able to build buildings. It should be the art of building and designing and design and building.

The hand is controlled by the mind. Architecture is not all just in our minds. We should have the ability to build or the familiarity with construction methods to understand or the courage to ask when designing buildings. We, as designers, should accept the fact that people are human and they do not mistakes. To be human is to make mistakes and cause imperfection. Perfection exists in the computer, but not in reality. Why not celebrate the imperfection of construction instead of hiding everything, especially since most people, design or building educate or not, know that we are hiding stuff. I am not saying we should accept poor construction or craftsmanship, but we should understand that these are skill and respect the crafts people who have dedicate their lives to the art of building. One of the most important lessons I learned, building my own design, was how many decisions I left up to the builder, myself, in this case.

Architects and designers make one of every seven or eight decisions that are made during the building/construction process. If they were more informed, in construction, their designs would reflect some of the other decisions and choices that would have been left up to the builder. The more in-
formed about the processes the better the designs will be. I do not understand why more designers, myself included, do not start designing with a material in my mind aware of its limitations and design to that material or why is a materials needs to perform specifically to certain tasks why materials are chosen that can do fulfill those needs. Design is about collaboration between ideas and ways to accomplish those ideas. The more informed and better one designs to materials and methods the less compromise there will be of the big ideas. Knowing is half the battle, but nobody knows how to do everything. Ask questions and prepared to compromise. Every little more one learns is less of a compromise later. Architecture, its my enemy, sometimes it keeps me up at night. I am not its friend, but I do respect it. Frank Lloyd Wright said, “Architecture is life.” Architecture is an extension of our lives dedicated to making us and others comfortable. Building a building does not have to be a battle if both the designer/architect and the contractor/builder want the same thing and the same results.

—the christening of visual thought

debry...what a party

“there is a secret bond between slowness and memory, between speed and forgetting.”

tod williams

_krenzke_
bibliography:

thesis year *(fall 2001-spring 2002):*


from the desk of:

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04.21.02
architecture