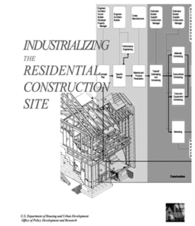
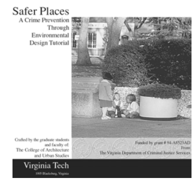
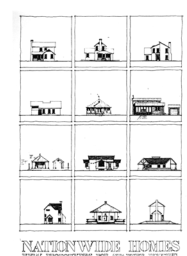
Michael J. O'Brien, Architect
Index to Research and Professional Projects
(click on text or image to link the portfolio page)

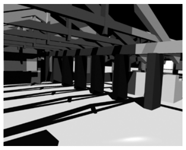


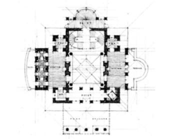


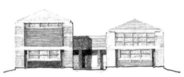


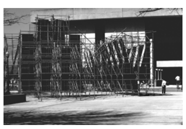
Research and Service projects

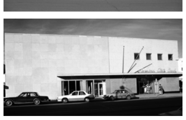
Professional Projects











Portfolio of Research

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Whole House Calculator Phase II 2006

This report documents the activities and outcomes of the primary tasks undertaken to complete contract number 2005-R-00104 titled PATH 13 "Whole House Calculator". The primary charges of this contract were to expand the functionality of the Whole House Calculator developed under contract number C-OPC-22032/CHI-T0002 "Designing Whole House Solutions". The following were the primary assigned tasks:

- Conduct a critical assessment of the calculator methodology, and output developed under C-OPC-22032/CHI-T0002, suggesting and incorpo rating improvements;
- Fully populating the elements of the Calculator including an attempt to address house location by region;
- Creating a functional Calculator that allows a user to input their house's System Choices, User Values, and house location;
- Testing the Calculator using a number of house specifications including the two original sample houses. An attempt should be made to test scor ing differences for houses located in different regions;
- Reporting the findings.

These tasks were accomplished, exceeded in most cases in response to the critical assessment. Effectively a "new" whole house calculator was developed. Even with these improvements, the calculator must be considered a work-in-progress.

While much has been improved, some key questions regarding the expectations of subsystems performance remain. Is a below average score for the super-structure important enough to provoke a failing grade and an alert on the house configuration? The calculator currently fails any house configuration with a below average score for the superstructure system. Is energy inefficiency enough to fail a house? In which climate zones? Is below average moisture man-agement enough to fail a house? Is there enough data from enough experts in the performance database to reduce the impact of bias from any one expert? These and other questions remain open and in need of timely resolution before the calculator can be considered a completed, not a beta-test product.

This web version of the calculator is currently available from the Office of Policy Development and Research at the U.S. Department of Housing and Urban Development. at http://pathnet.org/ww_calculator/

Far Right: Web interface for expert database input. Building Science experts ranked their top choices for systems in each climate zone of the U.S.


Development of a Web-Based Revised Whole-House Calculator

U.S. Department of Housing and Urban Development
Office of Policy Development and Research

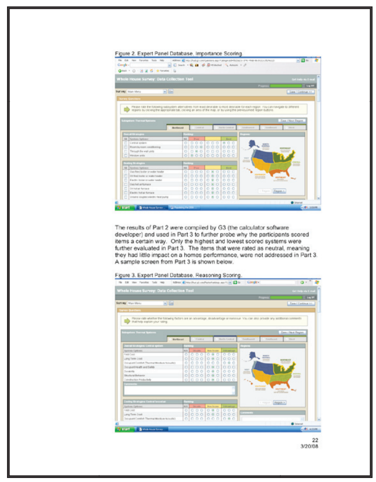
Figure 2. Expert Panel Database: Importance Scoring

The results of Part 2 were compiled by G3 (the calculator software developer) and used in Part 3 to further probe why the participants scored items a certain way. Only the highest and lowest scored systems were further evaluated in Part 3. The items that were rated as neutral, meaning they had little impact on a homes performance, were not addressed in Part 3. A sample screen from Part 3 is shown below.

Figure 3. Export Panel Database: Reasoning Scoring

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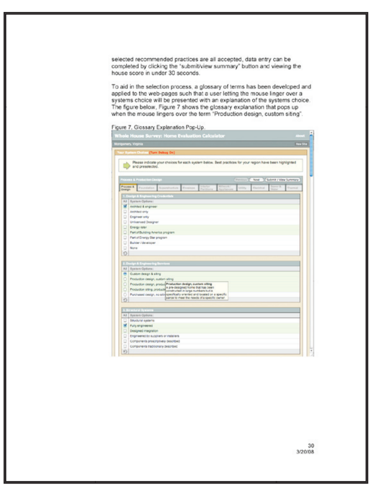
3/20/08


selected recommended practices are all accepted, data entry can be completed by clicking the "submit/view summary" button and viewing the house score in under 30 seconds.

To aid in the selection process a glossary of terms has been developed and applied to the web-pages such that a user letting the mouse linger over a systems choice will be presented with an explanation of the systems choice. The figure below, Figure 7 shows the glossary explanation that pops up when the mouse lingers over the term "Production design, custom siting".

Figure 7. Glossary Explanation Pop-Up

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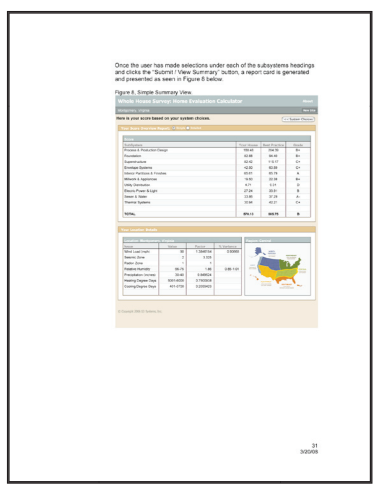
Once the user has made selections under each of the subsystems headings and clicks the "Submit / View Summary" button, a report card is generated and presented as seen in Figure 8 below.

Figure 8. Simple Summary View

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3/20/08

Left: Web interface for the whole house calculator. Far left shows the systems choice page presented after the user logs in with the zip code location of the proposed house. Recommended practices are highlighted in green. A "tooltips" feature provides an explanation of the system choice. After selecting the system choices that make up the proposed house, the user submits the choices and is presented with the "report card" shown at left. This grades the us-ers choices against recommended practices for the climatic and geologic characteristics of the zip code used at login.

Whole House Calculator Phase I 2005

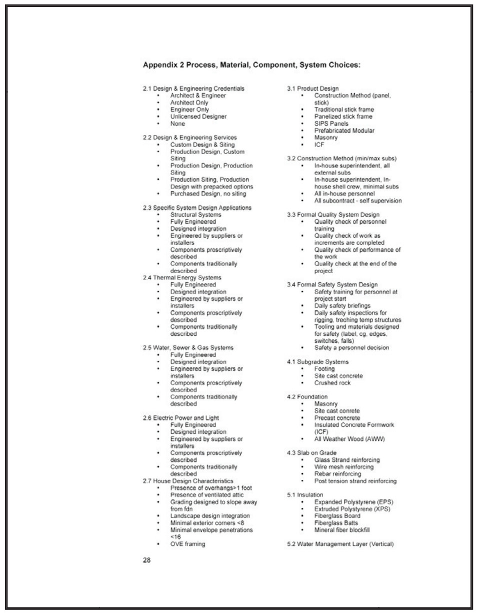
Comparing the characteristics of one house to another is one of the most difficult tasks facing a prospective homebuyer. Each house is the result of tens of thousands of decisions made by material suppliers, product manufacturers, designers, engineers, regulatory officials, marketing professionals, builders and subcontractors. Even though many appear similar, each house is effectively unique, a one of a kind assembly that will stand, breathe, manage water and shelter it's inhabitants differently. Professionals designing the house, selecting the materials and products to include and developing the processes used to design, engineer and produce the house face a daunting number of choices as well. Their choices affect how quickly the market accepts the house, how the house behaves when stressed by forces of nature and how efficiently the house uses energy, labor, and materials.

This report is currently available from the Office of Policy Development and Research at the U.S. Department of Housing and Urban Development. at www. huduser.org.

Developing a Calculator for Evaluating Physical Design Characteristics and Whole House Performance: A Preliminary Method

PD&R PATH

U.S. Department of Housing and Urban Development
Office of Policy Development and Research



Appendix 2 Process, Material, Component, System Choices:

2.1 Design & Engineering Credentials
- Architect & Engineer
- Architect Only
- Engineer Only
- Unlicensed Designer
- None

2.2 Design & Engineering Services
- Custom Design & Siting
- Production Design, Custom Siting
- Production Design, Production Siting
- Production Siting, Production Design with prepacked options
- Purchased Design, no siting

2.3 Specific System Design Applications
- Structural Systems
- Fully Engineered
- Designed integration
- Engineered by suppliers or installers
- Components proscriptively described
- Components traditionally described

2.4 Thermal Energy Systems
- Fully Engineered
- Designed integration
- Engineered by suppliers or installers
- Components proscriptively described
- Components traditionally described

2.5 Water, Sewer & Gas Systems
- Fully Engineered
- Designed integration
- Engineered by suppliers or installers
- Components proscriptively described
- Components traditionally described

2.6 Electric Power and Light
- Fully Engineered
- Designed integration
- Engineered by suppliers or installers
- Components proscriptively described
- Components traditionally described

2.7 House Design Characteristics
- Presence of overhangs>1 foot
- Presence of ventilated attic
- Grading designed to slope away from fdn
- Landscape design integration
- Minimal exterior corners <8
- Minimal envelope penetrations <16
- OVE framing

3.1 Product Design
- Construction Method (panel, stick)
- Traditional stick frame
- Panelized stick frame
- SIPS Panels
- Prefabricated Modular
- Masonry
- ICF

3.2 Construction Method (min/max subs)
- In-house superintendent, all external subs
- In-house superintendent, In-house shell crew, minimal subs
- All in-house personnel
- All subcontract - self supervision

3.3 Formal Quality System Design
- Quality check of personnel training
- Quality check of work as increments are completed
- Quality check of performance of the work
- Quality check at the end of the project

3.4 Formal Safety System Design
- Safety training for personnel at project start
- Daily safety briefings
- Daily safety inspections for rigging, treching temp structures
- Tooling and materials designed for safety (label, cg, edges, switches, falls)
- Safety a personnel decision

4.1 Subgrade Systems
- Footing
- Site cast concrete
- Crushed rock

4.2 Foundation
- Masonry
- Site cast conrete
- Precast concrete
- Insulated Concrete Formwork (ICF)
- All Weather Wood (AWW)

4.3 Slab on Grade
- Glass Strand reinforcing
- Wire mesh reinforcing
- Rebar reinforcing
- Post tension strand reinforcing

5.1 Insulation
- Expanded Polystyrene (EPS)
- Extruded Polystyrene (XPS)
- Fiberglass Board
- Fiberglass Batts
- Mineral fiber blockfill

5.2 Water Management Layer (Vertical)

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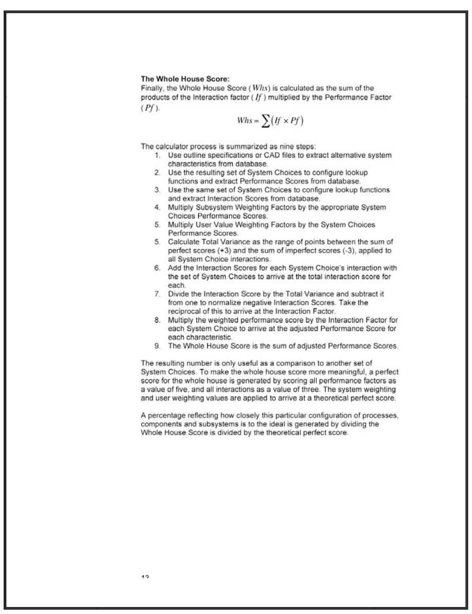


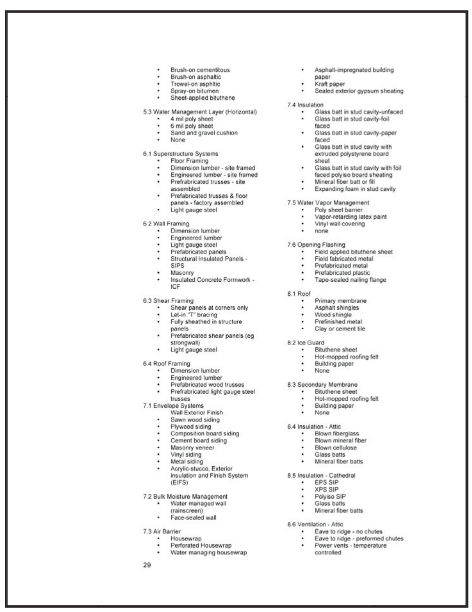
The Whole House Score:
Finally, the Whole House Score (Whs) is calculated as the sum of the products of the Interaction factor (If) multiplied by the Performance Factor (Pf).

$$Whs = \sum(If \times Pf)$$

The calculator process is summarized as nine steps:
1. Use outline specifications or CAD files to extract alternative system characteristics from database.
2. Use the resulting set of System Choices to configure lookup functions and extract Performance Scores from database.
3. Use the same set of System Choices to configure lookup functions and extract Interaction Scores from database.
4. Multiply Subsystem Weighting Factors by the appropriate System Choices Performance Scores.
5. Multiply User Value Weighting Factors by the System Choices Performance Scores.
5. Calculate Total Variance as the range of points between the sum of perfect scores (+3) and the sum of imperfect scores (-3), applied to all System Choice interactions.
6. Add the Interaction Scores for each System Choice's interaction with the set of System Choices to arrive at the total interaction score for each.
7. Divide the Interaction Score by the Total Variance and subtract it from one to normalize negative Interaction Scores. Take the reciprocal of this to arrive at the Interaction Factor.
8. Multiply the weighted performance score by the Interaction Factor for each System Choice to arrive at the adjusted Performance Score for each characteristic.
9. The Whole House Score is the sum of adjusted Performance Scores.

The resulting number is only useful as a comparison to another set of System Choices. To make the whole house score more meaningful, a perfect score for the whole house is generated by scoring all performance factors as a value of five, and all interactions as a value of three. The system weighting and user weighting values are applied to arrive at a theoretical perfect score.

A percentage reflecting how closely this particular configuration of processes, components and subsystems is to the ideal is generated by dividing the Whole House Score is divided by the theoretical perfect score.



- Brush-on cementitous
- Brush-on asphaltic
- Trowel-on asphltic
- Spray-on bitumen
- Sheet-applied bituthene

5.3 Water Management Layer (Horizontal)
- 4 mil poly sheet
- 6 mil poly sheet
- Sand and gravel cushion
- None

6.1 Superstructure Systems
- Floor Framing
- Dimension lumber - site framed
- Engineered lumber - site framed
- Prefrabricated trusses - site assembled
- Prefabricated trusses & floor panels - factory assembled
- Light gauge steel

6.2 Wall Framing
- Dimension lumber
- Engineered lumber
- Light gauge steel
- Prefabricated panels
- Structural Insulated Panels - SIPS
- Masonry
- Insulated Concrete Formwork - ICF

6.3 Shear Framing
- Shear panels at corners only
- Let-in "T" bracing
- Fully sheathed in structure panels
- Prefabricated shear panels (eg strongwall)
- Light gauge steel

6.4 Roof Framing
- Dimension lumber
- Engineered lumber
- Prefabricated wood trusses
- Prefrabricated light gauge steel trusses

7.1 Envelope Systems
Wall Exterior Finish
- Sawn wood siding
- Plywood siding
- Composition board siding
- Cement board siding
- Masonry veneer
- Vinyl siding
- Metal siding
- Acrylic-stucco, Exterior insulation and Finish System (EIFS)

7.2 Bulk Moisture Management
- Water managed wall (rainscreen)
- Face-sealed wall

7.3 Air Barrier
- Housewrap
- Perforated Housewrap
- Water managing housewrap

- Asphalt-impregnated building paper
- Kraft paper
- Sealed exterior gypsum sheating

7.4 Insulation
- Glass batt in stud cavity-unfaced
- Glass batt in stud cavity-foil faced
- Glass batt in stud cavity-paper faced
- Glass batt in stud cavity with extruded polystyrene board sheat
- Glass batt in stud cavity with foil faced polyiso board sheating
- Mineral fiber batt or fill
- Expanding foam in stud cavity

7.5 Water Vapor Management
- Poly sheet barrier
- Vapor-retarding latex paint
- Vinyl wall covering
- none

7.6 Opening Flashing
- Field applied bituthene sheet
- Field fabricated metal
- Prefabricated metal
- Prefabricated plastic
- Tape-sealed nailing flange

8.1 Roof
- Primary membrane
- Asphalt shingles
- Wood shingle
- Prefinished metal
- Clay or cement tile

8.2 Ice Guard
- Bituthene sheet
- Hot-mopped roofing felt
- Building paper
- None

8.3 Secondary Membrane
- Bituthene sheet
- Hot-mopped roofing felt
- Building paper
- None

8.4 Insulation - Attic
- Blown fiberglass
- Blown mineral fiber
- Blown cellulose
- Glass batts
- Mineral fiber batts

8.5 Insulation - Cathedral
- EPS SIP
- XPS SIP
- Polyiso SIP
- Glass batts
- Mineral fiber batts

8.6 Ventilation - Attic
- Eave to ridge - no chutes
- Eave to ridge - preformed chutes
- Power vents - temperature controlled

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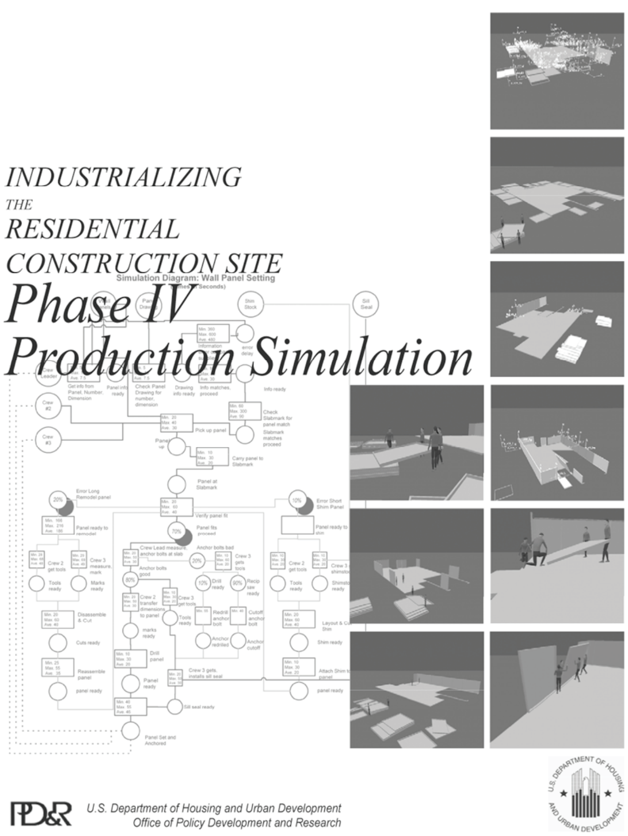
"Developing a Calculator for Evaluating Physical Design Characteristics and Whole House Performance: A Preliminary Method" has made the first steps towards developing a tool for prospective homeowners and professional housing providers to systematically consider the many "what if" scenarios common to residential construction in the United States. This tool is a calculator that takes the inventory of the processes, products and materials used to design, engineer, and construct a house.

The calculator uses performance scores for each characteristic of the house and the processes used in its design and construction. These scores are then modified by the values of the prospective homebuyer or builder and further modified by the way the construction materials and processes interact with each other to arrive at a "whole house score." In this way, the calculator allows for "what if" comparisons. The user can consider the effect of a professional architect on the whole house just as the builder can consider the effect of a formal quality assurance program.

This project is the first step towards making a tool that may become a simple website, or a "smart agent" working within a home's building information model.

Industrializing the Residential Construction Site phase IV

The fourth year of the study developed Petri-Net and Graphical Simulations for framing processes for the four production builders studied in phase III. Each builder independently suggested a portion of their overall process they believed could be improved through a simulation of framing production and assembly. The final project report includes detailed discussion of the information requirements, level of complexity, and results from the two simulation types. This report is currently under review by the project advisory team and the Office of Policy Development and Research at the U.S. Department of Housing and Urban Development. Publication is available at www.huduser.org.



The phase four report documents the development process for both the Petri-Net and the physics-based Graphical Simulation.

The report concludes that the both tools have applications in high-volume residential construction. The Petri-Net is a relatively simple, fast method that can be developed once detailed construction process maps are constructed, and video time studies are parsed to the process map. The Petri-Net allows simple variability to be programmed into each work stage of the process map to account for differences in workforce training, clarity of documentation, accuracy of components, even crew motivation.

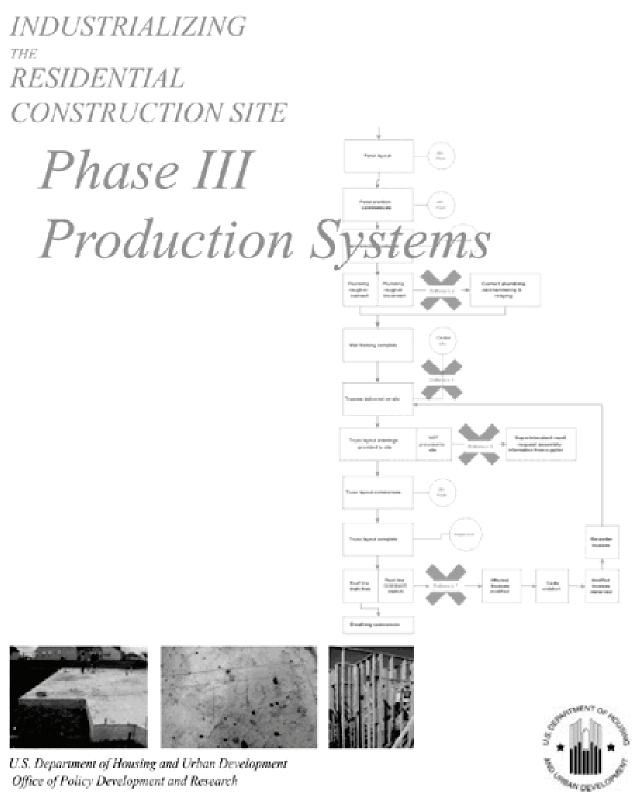
Process errors generate alternative workflows, which have distinct process maps containing work stages. Errors are simulated by branching the workflow into these alternative paths based on the probability of the error occuring.

Multiple runs of the Petri-Net provide statistical data on the consequences of the error on overall production time.

The physics-based Graphical simulator is constructed from three-dimensional CAD models. Each model component of the framing process is imported separately and mapped to a path for the component movement from staging to final installation. At this macro-scale of analysis, the impact of component stack order, staging location and panel size interference can be studied. A micro-scale study of each panel being manipulated by a virtual crew can be developed to understand the ergonomic stress experienced by a crew's arms, back, legs, or wrists while installing the component.

Industrializing the Residential Construction Site phase III

The third year of the study developed a finer grain of detailed information and process flow diagrams for four of the five production builders studied in phase II. Each builder independently suggested a portion of their overall process they believed could be improved through a study of information and workflows. It is interesting to note that during the few months between phase II and phase III, three of the four production builders switched from traditional stick framing to field installation of panelized wall framing. The final project report includes detailed diagrams of the production processes studied for the builders, identifies six general types of errors, five of which are related to the information provided to guide the activities of suppliers and subcontractors that substantially make up the workforce of the three largest builders in this study.



The phase three report documents the following types of error observed in the production builders studied.

- errors of interpretation (misread a drawing/miscounted a quantity of symbols)
- errors of omission in interpretation (didn't see a note or detail, page missing from set)
- errors of representation (drawn or specified incorrectly)
- errors of coordination (incorrect or omission of cross-check for system clearances, incomplete review of plan "handing" or mirroring on details)
- errors of precision related to installation (out of square, out of plumb, misalignments)
- temporal errors (information not up to date)

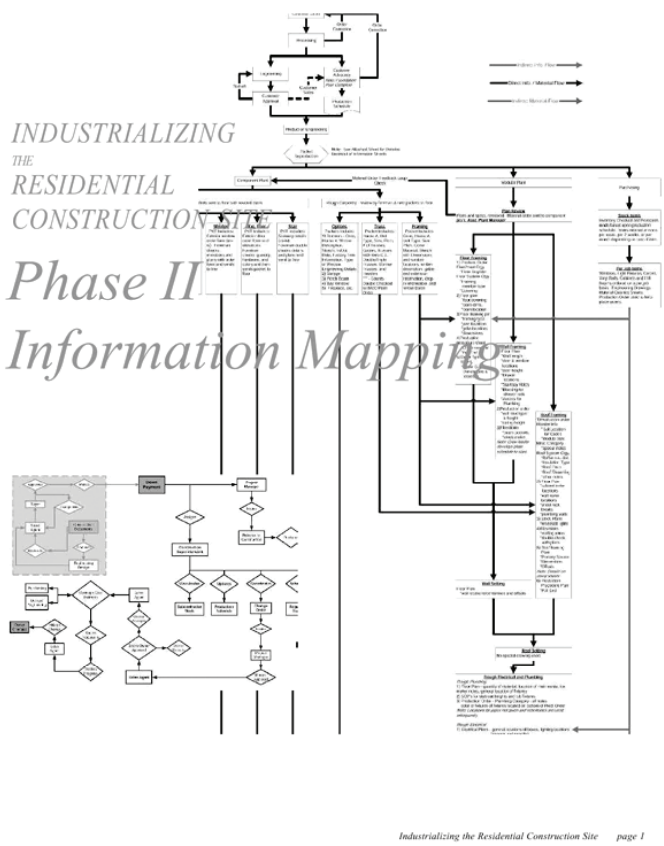
The project further concludes that to maintain quality and productivity, an integrated approach to the subcontractor dominated model is required.

This approach builds on the Design for Manufacturing, Design for Manufacturing Assembly strategies developed by Boothroyd and Dewhurst and widely implemented in the manufacturing sector of the economy.

The DF(x) approach recognizes that a critical limitation of the trend toward specialization is the compartmenting of knowledge, and the lack of knowledge feedback from problem discovery to designer. In the builder study, this lack of field to office feedback of expertise often resulted in the same error being replicated dozens of times, sometimes never being resolved in the design / engineering documents.

Industrializing the Residential Construction Site phase II

The second year of the five year contract was devoted to a close mapping of the information flows in five production builders, builders producing over 10,000 houses per year. All the builders were located on the east coast, some were national corporations, some regional. All were employing traditional “stick building” methods with the exception of one modular homebuilder. Student research assistant teams tracked information flow from the front office to the field, noting differences between the information flow assumed to be in place by the corporate headquarters and the actual information flows. The findings were reported to the builders, a project advisory board, and ultimately to the Department of Housing and Urban Development. The project developed a general information model for residential construction which will hopefully reduce the costs/risks related to the development of ERP applications for residential construction.



The phase two report includes detailed information flows for each of the five production builders in the study.

The information maps document information disconnects and related production bottlenecks.

Many of the information disconnects occurred between groups of information users. These groups were identified as information domains. Each of the six information domains,

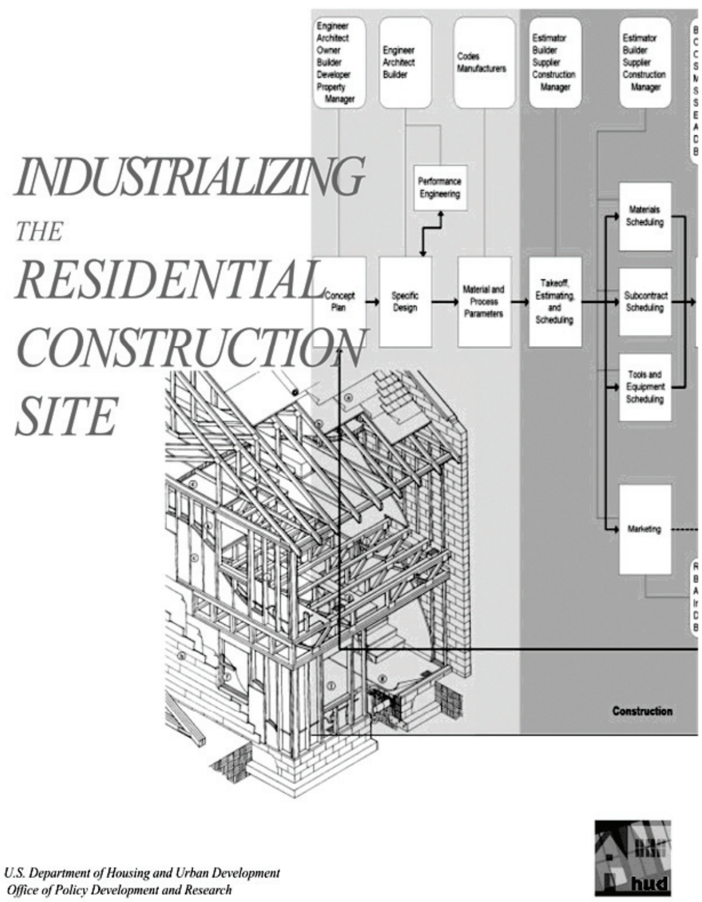
- Marketing
- Purchasing & Inventory
- Design & Engineering
- Production
- Customer Service
- Corporate Management

used different parts of a projects total information record. These parts were often renamed, or rekeyed contributing to confusion and errors that would become apparent in the production phase.

The project assembled an information model for each domain, and posited an overall general information model for production builders. This overall model depended on a central data warehouse that would hold each project’s information record. When a domain queried the data warehouse, the information would be sent back to the domain through a filter that formatted the information for type, form, and level of detail required to prevent overloading the domain with information it doesn’t need.

Industrializing the Residential Construction Site phase I

This four-year series of sponsored research projects are focused on the role of information technology in residential production building. These projects emerged from a larger discussion of integrated systems for housing proposed to the National Science Foundation by an interdisciplinary team of wood scientists, civil engineers, mechanical engineers, construction managers, architects, economists, and public policy experts. The Engineering Research Center proposal titled "CISH - The Center for Integrated Systems for Housing" was ultimately not funded by NSF, but led to a successful bid to the Department of Housing and Urban Development to be one of three preferred research providers under an indefinite quantity contract from 2000 to 2005.



The phase one final report included an overview of housing technology innovations from the late 1950's to present day. The report further elaborated on the types of systems integration that apply to housing being:

- performance
- physical
- production
- operations
- information

The report concluded that information integration was the "enabling" form of integration, underpinning the other forms.

Studies of traditional craft-based industry adaptation to Enterprise Resource Planning and the associated integration of information across design, production, inventory, shipping and customer service divisions uncovered remarkable success stories and dramatic cost savings, encouraging our next step, the close mapping of information through the corporate structure into the field.

Raymond Unwin, John Nolen and the Garden City Design Principles

2003

This paper was the first publication of the research that began in 2000 when I was awarded a Scholarship by the Nolen Archives at Cornell University. The study of John Nolen, Progressive Era Landscape Architect and Planner's work is part of an ongoing study of formal and informal structures in Architecture, Landscape Architecture, and Planning. Nolen's work between 1920 and 1934 shares many of the same structural forms found in the architectural ornament and last commissions of Louis Sullivan, and is also found throughout the architecture, ornament, and city planning projects by Frank Lloyd Wright.

This first paper, "Raymond Unwin, John Nolen and the Garden City Design Principles" focused on the Garden City Design conditions adapted from Unwin by Nolen for the emerging suburban American landscape. It was awarded honorable mention by the Architectural Research Center Consortium in the Conference Paper Competition at the ARCC 2003 Annual Meeting in Phoenix, Arizona.

Left: Excerpt from the paper presentation showing the aerial view of Windsor Farms in Richmond, Virginia and the significant structural places in the community design.

Below: Excerpt from the paper presentation showing similarities between Unwin's attention to gateway, midblock and terminus spaces in the Garden City and Nolen's translation of these same conditions in the plans for Elizabethton, Tennessee and Mariemont, Ohio

Below: Excerpt from the paper presentation comparing the 'as-designed" and "as-built" structural and spatial characteristics in Nolen's design for Windsor Farms, Richmond, Virginia.

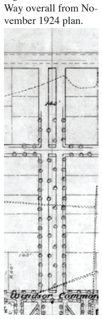
Figure 59. Bus stop at Carey St. / Windsor

Figure 61. View of Windsor Way from Windsor Green

Windsor Way, a one hundred forty foot wide boulevard, is the "front door" to Windsor farms. The "as-built" condition is slightly narrower (forty-four feet) than the June 1924 plan which showed an eighty foot wide central median. The median contains rows of deciduous street trees flanking the one way roads on each side of the median and a brick walk running down the center of the median from the bus stop structure at Carey street to the central green at Windsor

Figure 64. Location of Windsor Way on November 1921 plan

Figure 60. Windsor Way overall from November 1924 plan.



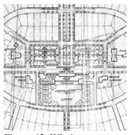


Figure 62. Windsor Common plan. June 1924 Windsor Farms;

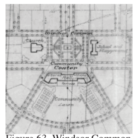
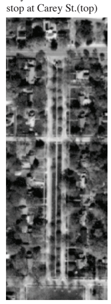


Figure 63. Windsor Common plan. November 1924 Windsor Farms;

Figure 65. Windsor Way overall from Bus stop at Carey St.(top)



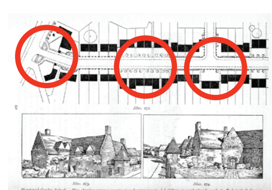


Fig. 3,4. Examples of Raymond Unwin's place-making principles at the scale of a city block: circled from left to right:
- the block entry condition
- the midblock street space
- the "tee" axial termination

Figure 5, Examples of John Nolen's place-making principles for public housing in Elizabethton, TN circled from left to right:
- the block entry condition
- the midblock street space

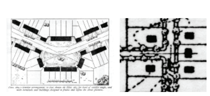


Figure 6. Comparison of Raymond Unwin's site planning suggestion for terminating visual axis created by streets (left) and Nolen/Fosters axial termination through siting/massing recommendation at the termination of Hammerstone Way at Flintpoint Avenue in Mariemont, OH.

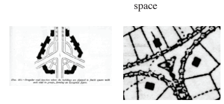


Figure 7. Comparison of Raymond Unwin's site planning suggestion for making a public "place" at an intersection (left) and Nolen/Fosters siting/massing recommendation at the intersection of Midden Way and Pleasant Street in Mariemont, OH.

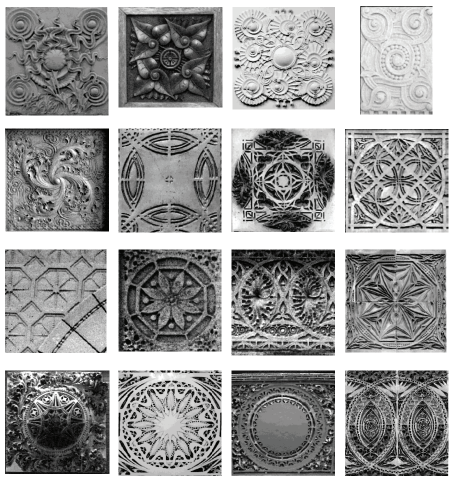
Louis Sullivan and the Medallion-Type Ornament

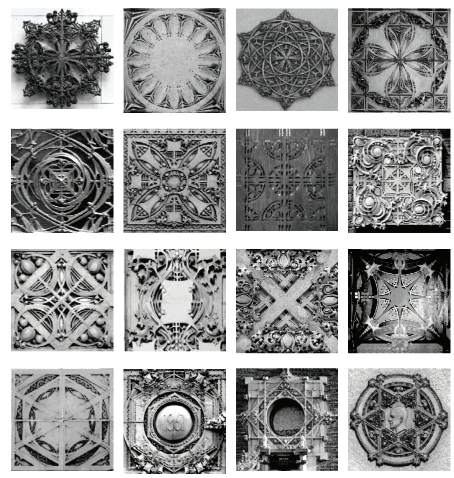
2003

This unpublished paper is the first of a planned series of publications of the research that began in 1978. It is related to the research on John Nolen, Progressive-Era Planner and Landscape Architect as an examplar of the fusion of formal and informal structures in architectural ornament. Dr. Paul Sprague has be kind enough to review and critique this work which is under revision.

The paper reviews the medallion-forms in Sullivan's ornament from 1883 to 1924, categorizes the structural and narrative elements, posits the relationship of these elements to Sullivan's writings, to Asa Gray's botanical studies, and ultimately their role as the structure and form of Sullivan's small-town bank commissions.

Subsequent papers will conduct similar analysis of structure and narrative elements in the arabesque forms of Sullivan's ornament and their role in development of structure and form in Sullivan's high-rise commissions.





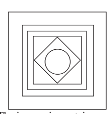
Sullivan's Medallion Ornament Type:
The medallion ornament type is distinguished from the root-stem-bloom and still-life types by a strong visual reinforcement of the center and elements rotated about that center in a radial arrangement resulting in biaxial symmetry.

The medallion form type of ornament is the example used by Sullivan uses to present the morphological development of ornament in "A System of Architectural Ornament." The circle, square, octagon, hexagon, pentagon and triangle are presented as the "containers of energy" - flower pots into which the seed germ (cotyledon) is placed at the very center. The seed develops according to it's laws of plant morphology, but along the lines of the major and minor axis of the containers geometry, acting as a geometric trellis. As the organic energy grows along the axis, it breaches the container's perimeter at the point where the axis crosses the perimeter. At the site of this breach, the organic energy bursts outward, depositing itself on the surface of the geometric container.

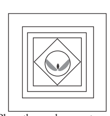
Sullivan termed this 'efflorescence' - that which is within, deposited on the surface.[11] These organic bursts of efflorescence are described by Sullivan as sub-centers of energy. These sub-centers effectively bind the concentric overlays of geometry together weaving over and under each geometric layer and ultimately reaching beyond the ornamental frame to bind the ornamental element to it's background.

In "A System" Sullivan also refers the reader to "Grays School and Field book of Botany" by Asa Gray, as his definitive source for scientific information on plant physiology and growth morphology. Gray provides a morphological explanation of the anatomy of various types of plants and flowers following the stages of growth. Sullivan's ornament seems to depend upon a few key anatomical parts, the seed germ with it's nourishing cotyledon leaves, the stem, with it's terminal and axillary buds, and the calyx or flower cup below the bloom and the corolla, or the bloom itself.

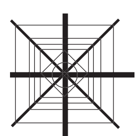
Gray illustrates these anatomical parts in plan, section, and elevation views. Upon close review the Schiller theatre proscenium medallion reveals five to six concentric forms originating in the medallion center. The first (1) is an undulating line of varying thickness that closely follows the radially arranged seed pods. This undulating line overlaps a hexagon (2) and is raised a very slight amount above it. The undulating line is unusual in that it is made up of broad areas of undeveloped surface similar to the next three concentric elements (3,4,5). The lack of surface articulation, the close mapping of the undulations with the seed pods, and the additional concentric layers possess a striking similarity to Gray's illustration of a Linden calyx from figure 223 on page 109 the radial



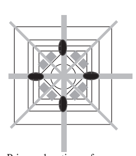
The inorganic containers of energy



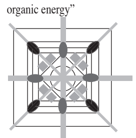
Place the seed germ at the center



The primary and secondary axis - guiding organic growth



Primary locations of efflorescent "bursts of organic energy"



Secondary locations of efflorescent "bursts of organic energy"

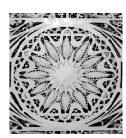


Fig. 5. 1892 Schiller Theatre Proscenium

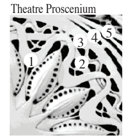


Fig. 6. 1892 Schiller Theatre Proscenium detail of undulating unrelieved line, the cut through the calyx

Fig. 7. Horizontal Section Flax Calyx, figure 256 from Gray.

Fig. 8. Horizontal Section through Linden Calyx, figure 223 from Gray.

Upper left and right: Sullivan's medallion ornament mapped from 1883 to 1924.

Lower left: Excerpt from the paper describing Sullivan's medallion form in terms of Plate 1 of "A System of Architectural Ornament".

Lower right: Excerpt from the paper describing one of Sullivan's most distinguished innovations in medallion ornament, the presentation of dissected views of anatomical structures as the primary motif, and it's relation to the writings of Asa Grey.

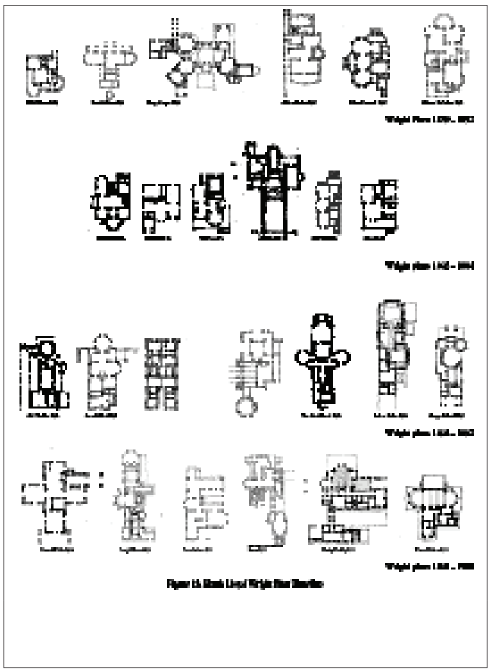
The Space of Ornament

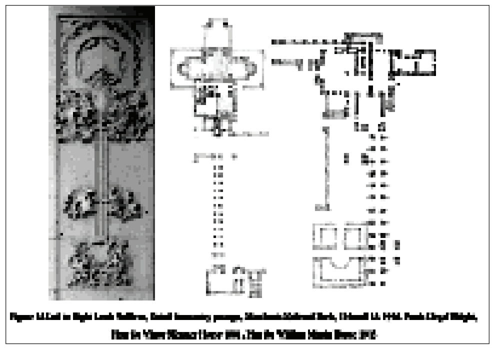
2003

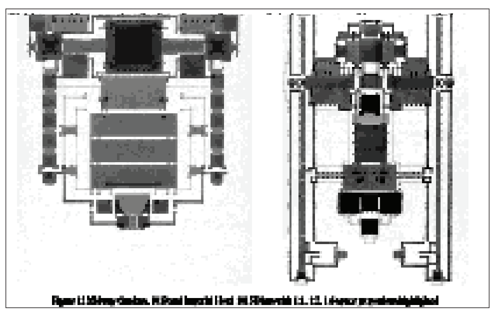
This unpublished paper is planned as the conclusion to a series of publications of the research on formal and informal structures in architectural ornament that began in 1978. It is related both to the research on John Nolen, Progressive-Era Planner and Landscape Architect and the research on Louis Sullivan's medallion and arabesque ornamental forms. This paper is an examplar of the fusion of formal and informal structures at the scale of building in the Architecture of Frank Lloyd Wright.

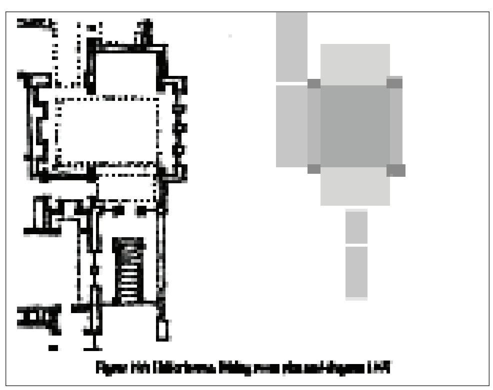
The paper reviews the similarities between Sullivan's ornament from 1883 to 1924 and Frank Lloyd Wright's architectural forms and space during the "first golden age", 1893 to 1910. The paper proposes that Wright's extraordinary ability to structure space and form was fundamentally due to the six years he spent at Sullivan's side, as the primary translator of Sullivan's ornamental sketches into built form, his work from this period is Sullivan ornament rendered by Wright "with T-square and triangle."

The seventy-six page paper traces Wright's translation of Sullivans vegetal forms into space woven around disengaged piers, beams, screens and porches through the earliest rigid experiments, through the "blossoming" in the Heller house and into the the mature Prairie House.







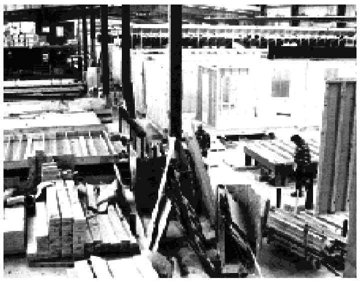


Upper Left: Timeline of Wright's plans from 1893 - 19000
Upper Right: Comparison of ornament at Sullivan's Farmers and Merchants Bank with Wright's plans for the Metzger and Martin Houses
Mid Right: Analysis of Spatial proportions and structural organization of spaces in Wright's Midway Garden and Imperial Hotel
Lower Left: Analysis of Wrights spatial "efflorescence" structure in the Heller house living room
Lower Right: Analysis of Wrights spatial "efflorescence" structure in the Heller house dining room

New Prototypes for Starter Housing:

Constructing the A1 Prototype as the O'Brien Residence

New Prototypes for Starter Housing was my first sponsored research project. The study was requested by a small modular homebuilder that sought to develop their product line from the "double-wide" image to attract first-time homebuyers. The study concluded with three designs entering production for the modular builder. After attending the first "Grand Opening" the design / research team was disappointed that the designs had been augmented with a full range of colonial accessories. In a meeting with the sponsor, the design/research team was told to "put your money where your mouth is" and in an emotional moment said OK before realizing that meant I just bought a house that would be ready to place on land I didn't yet own in less than 30 days.

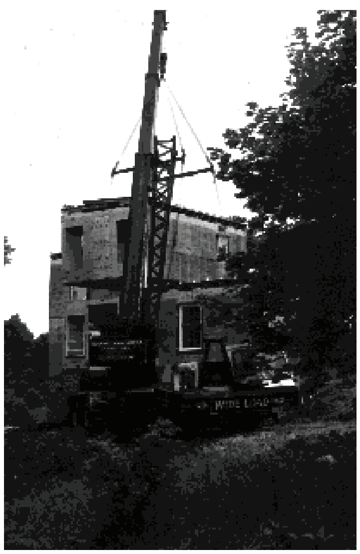


Left — View of modular production facility showing floor assembly station on left side, wall assembly on right side. Modular builders conform with BOCA building codes.

Right (2) — Views of folded and unfolded roof assembly on wood modules.

Left — Six hours after starting, the modules are set, roofs unfolded, overhangs flipped down, house is "dried-in"

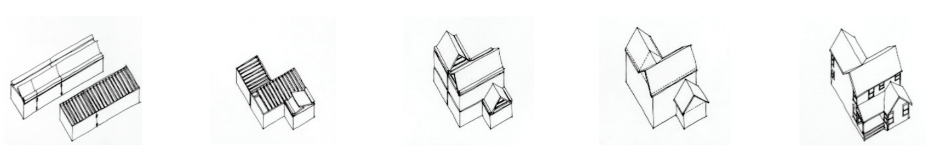
Right — Setting the front bedroom/office module. The builder had never set one module perpendicular to another...an ivory tower innovation.



Left — Crane setting the second floor master bedroom - bath module prior to unfolding the roof.

Right — House six hours after beginning. The neighbors had gone to work before the crane and modules appeared, the site was just a foundation. When they returned from work their first words to us were "had a busy day?"

The modular construction process allowed us to eliminate construction financing, working with the 30 day "float" period before the bill for the modules arrived. This saving contributed to the "affordable" aspects of the project.



Left to Right, Modular site installation using crane-set divisible module strategy.

1. Two modules arrive on custom low-boy flat transporters, one module is roofed and roofs, overhangs are folded to meet max shipping height of 14'-0" above grade. Unroofed module has "redundant" ceiling joists to stiffen module for shipping and placement. Precut slots just below top plates and above rim joists show field personnel where to insert chain saw to cut module segments (rooms) free for placing.
2. After divisible module sections are cut free, they are rigged for crane placing (precut slots show rig points)
3. After all modules are placed, modules are joined with one inch dia allthread rod at four feet o.c. at mating rim joist surfaces. Modules are nailed down/together six inches o.c. at perimeter. Roofs are unfolded with crane assist, knee wall studs are hinged and fall on ceiling joists as roof is lifted to provide temporary support until ridge is nailed off.
4. Overhangs, gable ends are unfolded into place, plumbing splices are made, electrical home runs are connected to panel, drywall, subfloor splices are made, carpet extensions unfolded.
5. Exterior siding, trim, gutters, downspouts, porches and decks are installed. Inspection for Certificate of Occupancy is passed on the 28th day for this house, The C-3 prototype, similar in size and height, is regularly completed in under fifteen days.

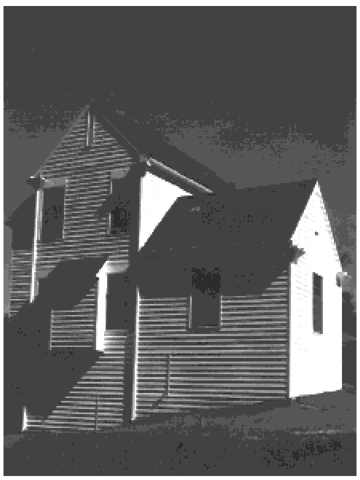
New Prototypes for Starter Housing:

Constructing the A1 Prototype as the O'Brien Residence

The A1 Prototype, market named "Maryland" by the builder would be built over 300 times in the three years it was part of the builders product line. Knowing this, it seemed important for our family to "touch" this house. Partly this "touch" came out of having a minimal budget for siding, porches and trim, partly it came out of the innocence of my little girls desiring "their" windows be marked distinctively.

Maggie requested a fish over her window, Erin a hummingbird, my wife asked for the sectioned nautilus shell and after completing those carvings, I made a horseshoe crab for myself.

The scuppers came out of my dislike of the "elbow" pipe usually found connecting the gutter to downspout. They are galvanized, made by a ductwork fabricator. The "beak" on the scupper is the overflow, anticipating my lack of enthusiasm for ladders and gutter cleaning.

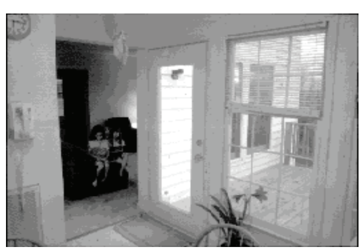


Left View of the south face of the house 30 days after crane day. The siding is agricultural quality pine, primed each side with three topcoats. The siding has a vent space behind it on three sides of the house, has tarpaper over the sheathing on two sides and tyvek on two sides. After fifteen years, I can find no appreciable differences in the life of the paint or siding due to those different substrates.

Right Front and side views of scuppers. The width of the scupper reaches a short downspout from the gutter on the overhang, The downspout and clamps from the scupper sized the cornerboard.

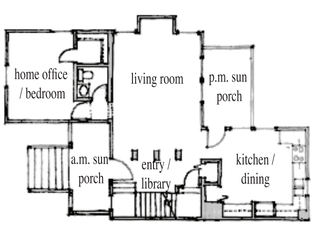
Left View of the scupper and window ornament. This is "my" window marked with the horseshoe crab abstracted and carved in low relief into the 5/4 fir head trim.

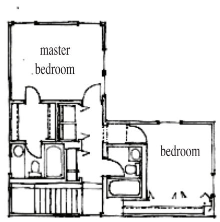
Right Erin's window, marked by the hummingbird ornament



Left Living room looking to entry and stair. The piers house plumbing risers for laundry, bath, and master bath.

Right View from kitchen to living room. The house uses 3 foot by five foot double hung windows throughout as a strategy to balance light in each space, and minimize wall presence, visually enlarging the small spaces.





Floor plans showing the small-house making principles:

- enter rooms along one edge to preserve privacy without closing a door
- place windows on two adjacent walls to balance light, thereby reducing glare, enhancing transparency and drawing one's eyes outside, diminishing the presence of the walls in small spaces

Wood: An American Tradition 2000 - 2001

An Exhibition curated for the National Building Museum

Presentation of a paper titled “A brief history of Systems and Materials additions to the American Light Wood Frame” in Montreal led to an invitation to co-curate this exhibition for the National Building Museum in Washington D.C. Sponsorship by the Society of American Foresters allowed for collecting notable wood artifacts, tools, and historic photographs. The Building Museum’s commitment to connect building and architecture led to the loan of models from the office of E. Fay Jones (Thorncrown Chapel) and Centerbrook Architects, as well as the chance to build some small timber frame, log structures and reproductions of a ca. 1835 Chicago Balloon Frame structure. The museum also constructed a portion of the 1930’s era structural panel - international style house designed by the Forest Products Laboratory, and assisted by students from Virginia Tech, reproduced the plywood vaulting method published by Paul Rudolph in the early 1960’s and used in his design for the Hook Guest House in Florida. The exhibition was in place for six months, and attendance was the fifth largest in Museum History.

The exhibition was organized in six adjacent gallery spaces approximating a timeline of technological and architectural development of wood in American culture. The first room “A Wooden World” collected furniture and artifacts handcrafted from wood pre-1800 to demonstrate the insights of early settlers in matching the qualities of wood from different species of trees to the function of the artifact. Following “A Wooden World” was a room structured by a small timber frame and filled with the tools used to refine trees into building timbers.

Left “A Wooden World.” The Introductory space for the exhibit presenting artifacts made from over 120 different species of trees and a tree-ring sample dating back before the discovery of America by Columbus

Right View into the timber frame structure exhibit of tools and historic buildings from the colonial era. Translucent scrims mounted on each side of the frame present photographs of current and historic architectural uses of timber framing.

Above: View of a partial balloon frame supporting tools and products related to the steam engine’s contribution to the development of wood construction. The foreground panel also presents the rapid harvest and environmental damage related to the application of steam to forest products development.

Wood: An American Tradition 2000 - 2001

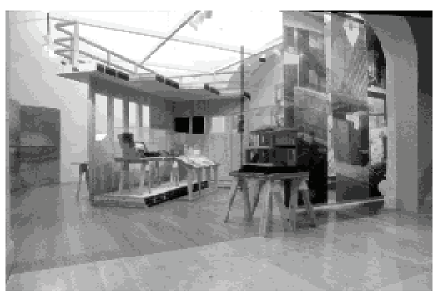
An Exhibition curated for the National Building Museum

Right Balloon Frame house reproduction with model of Thorncrown Chapel

Below Reconstructed Log structure in room presenting the role of log cabin imagery in American Politics.

Below Center Portion of the Forest Products Laboratory's design for what is the first Structural Insulated Panel house built in Madison, Wisconsin in 1930.

Below Plywood vaults reconstructed using the methods Paul Rudolph described for making the roof of the Hook guest house in Florida.



Next was a room filled with the tools and products related to the introduction of steam power. Sawn dimensional lumber, machine made ornament filled this room, which also presented the rapid harvesting of the forest during this period the resulting environmental damage, and the birth of professional forestry. The following room was structured by a reproduction of an 1835 Chicago Balloon Frame structure filled with the tools, pattern-books associated with the introduction of the balloon frame. The following room breaks the time line presenting a reconstructed saddle-notched log structure as a backdrop for a presentation of the role of the log cabin image in American politics, and the enduring romantic image of the log cabin as a symbol of authenticity in substance and deed. The following two rooms present the ongoing development of engineered wood. A portion of the 1930's international styled structural insulated panel house is the anchoring artifact for the room presenting plywood, oriented strand board, the use of veneers as a surface, and the development of wood-plastic composite materials.

Possible roles for Surplus Shipping Containers in SRO housing

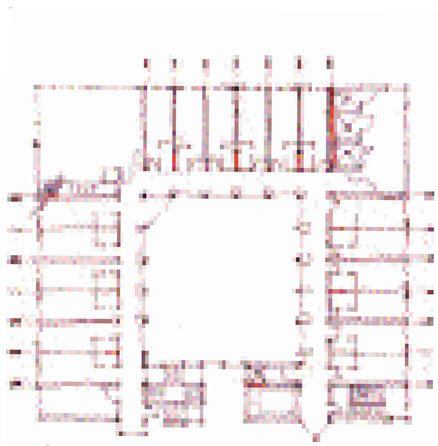
1991

The standard inter-modal shipping container is about the same height, width and length of the monk's cell in La Tourette. I had spent three days in one of these cells and remember thinking this was just the right space for one person. I inquired about container costs and availability, purchased two, and conducted a detailed design and cost study to determine how competitive the container could be as a housing unit for homeless people. We found that the container-based design was competitive with recently constructed Single Room Occupancy Transitional Living Centers in Richmond.

This gave us confidence to proceed to build a prototype living unit. After purchase and delivery of a container, we developed methods to assess, remove, and repair bent structural members, flooring, and were proceeding to frame firring walls when the tests on the paint composition were returned from the campus safety office.

The paint had high levels of lead and cadmium in it. This meant we were forbidden from working on any operation that would drill, scrape, or cut the paint. The project is currently on hold pending a decision from the campus safety and EPA as to whether sprayed-on bedliner material would be an acceptable method for encapsulation of the cadmium and lead.

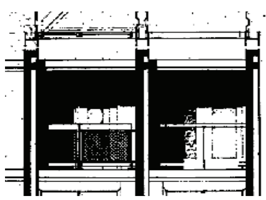
If a favorable ruling is made, we will resume prototype construction. Ideally, the completed prototype would be trucked to the major cities of Virginia to have SRO occupants and homeless advocacy groups evaluate the design and prototype.



Left, the plan of a typical floor of the six story SRO design. the rooms themselves provide for sleeping, study space, a toilet, some storage, and lavatory. The corners of each floor have a kitchen / classroom for common cooking and dining. These spaces are programmed to conform to existing SRO projects administred by Virginia Mountain Housing. These SRO's are considered transitional living centers. Applicants must pass a screening process to be admitted to the program which includes classes in money management, parenting and other life skills .

The plan at left shows 18 units per floor, clustered around a courtyard space. Families living at the SRO have a double-unit on the ground floor and access to the courtyard as a secure childrens play area.

First floor functions also include a full time resident supervisory, counseling offices, mailboxes, and computer lab.



Far left, Elevation of container faces at the street elevation. With the doors removed, the end of each unit is a small balcony space. Joints between the containers are closed with welded steel channels. With the corner structures made of precast and masonry, the corrugated steel container is not exposed, a strategy to minimize the NIMBY factor.

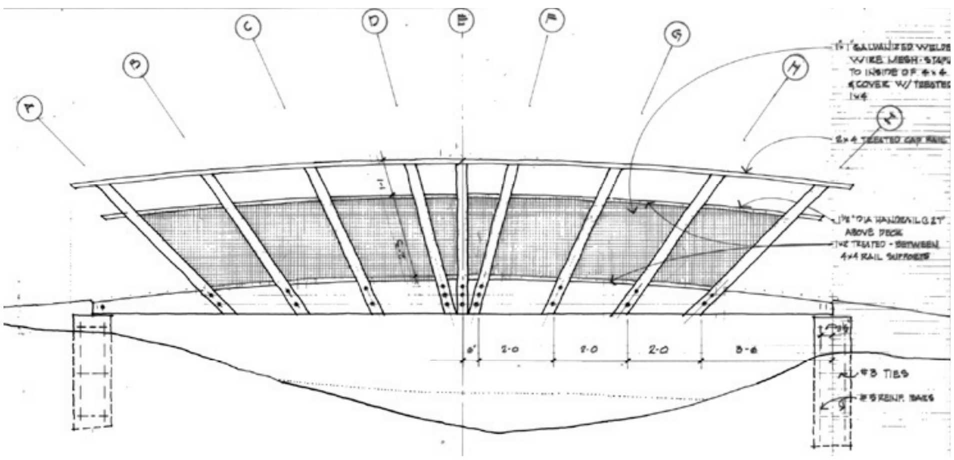
Center, exterior view of stacked containers. Containers can be stacked up to six units high without secondary structure.

Right, view inside the 8x8x40 foor container. End wall would be opened up to make a corridor with windows to the courtyard.

Bottom Center, View of stacked containers.

Design / Build for Liberal Arts Majors: A footbridge at Hollins College

1995



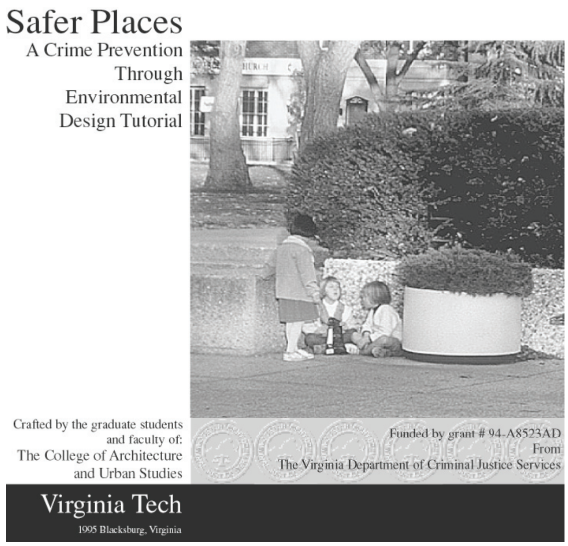
As part of the public service mission of our land-grant university, I was asked to work with a group of liberal arts majors and their faculty advisor to develop a design and drawings that would allow a group of theatre, language, womens studies, and biology students to build a small structure as a gift to their campus.

Design and site selection was completed in a series of informal meetings with the students. The design and documents were prepared to allow the maximum amount of prefabrication by the students using the limited shop facilities available in the physics department. Prefabrication allowed the shop technician to effectively teach safety, proper tool use, material processes, and forward thinking in a more controlled environment than many construction sites allow.

The students completed on-site assembly in the Spring of 1995. A number of the students went on to become regular volunteers with Habitat for Humanity.

Safer Places:
A Crime Prevention Through Environmental Design Tutorial

1995



"Safer Places" developed from *"Building Technology"* a prototype interactive learning package designed to support learning of building material and methods topics. After viewing *"Building Technology,"* the Virginia Department of Criminal Justice Services awarded the College of Architecture and Urban Studies at Virginia Tech a five-year grant.

"Safer Places" was the product of the first year of that grant. I led the design and development of this interactive courseware. Significant contributions to the courseware were made by the Departments of Landscape Architecture and Architecture.

The tutorial is structured as modules for architecture and landscape architecture topics. Through the use of overlay, dissolve, and interactive choice, users learn the principles of Crime Prevention Through Environmental Design, and the role of design professionals, citizens, property managers, and law enforcement in design, construction, management and use of the built environment for crime deterrence.

"Safer Places" is in it's third printing at this time from the Virginia Department of Criminal Justice Services.

Building Technology, A Prototype Interactive Tutorial

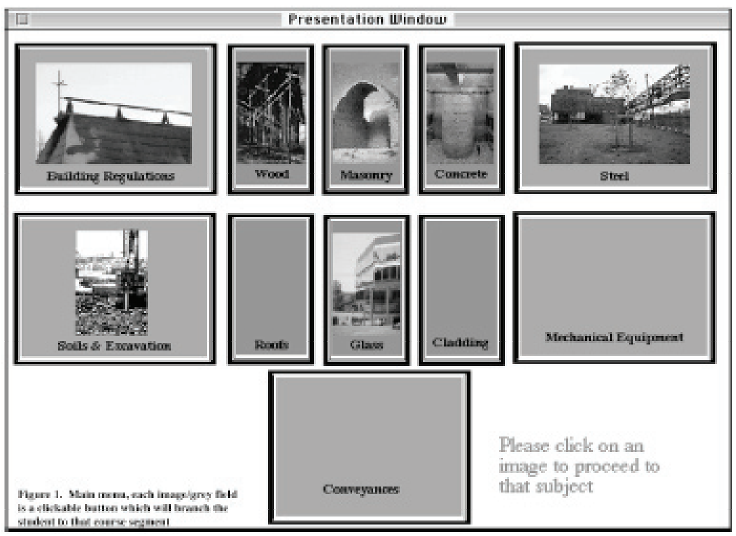
1994

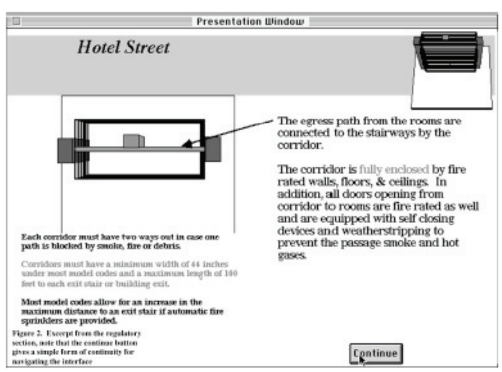
"Building Technology" is a prototype tutorial developed using Authorware interactive courseware. This prototype was developed with Professor A.J. Davis it was funded by a small seed grant from the Virginia Tech Center for Excellence in Undergraduate Education.

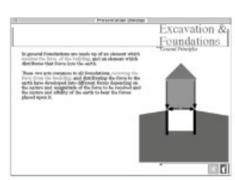
"Building Technology" was intended as a stand-alone tutorial for architecture students. Eleven modules were started, each has varying degrees of completion as the modules were intended as demonstrations for the effectiveness of dissolves, fades, animations, and interactive testing in technical subjects.

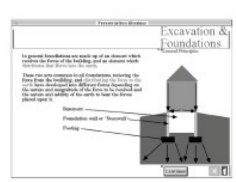
The project was presented as papers at the ACSA Seattle conference, and the ACSA technology conference in 1994.

Presentation of *"Building Technology"* to the Virginia Department of Criminal Justice Services was a key factor in securing funding to develop *"Safer Places"* an interactive tutorial on Crime Prevention Through Environmental Design.









Top, menu screen for the interactive modules

Above, excerpt from building regulations module introducing egress components

Right, three-screen sequence from an animation in the soils and excavation module showing load path and distribution from roof to foundations

Portfolio of Professional & Unbuilt Commissions

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A Small House with Lots of Room in it:

Mobile: Constructed from enhanced HUD code construction balancing sustainability and affordability

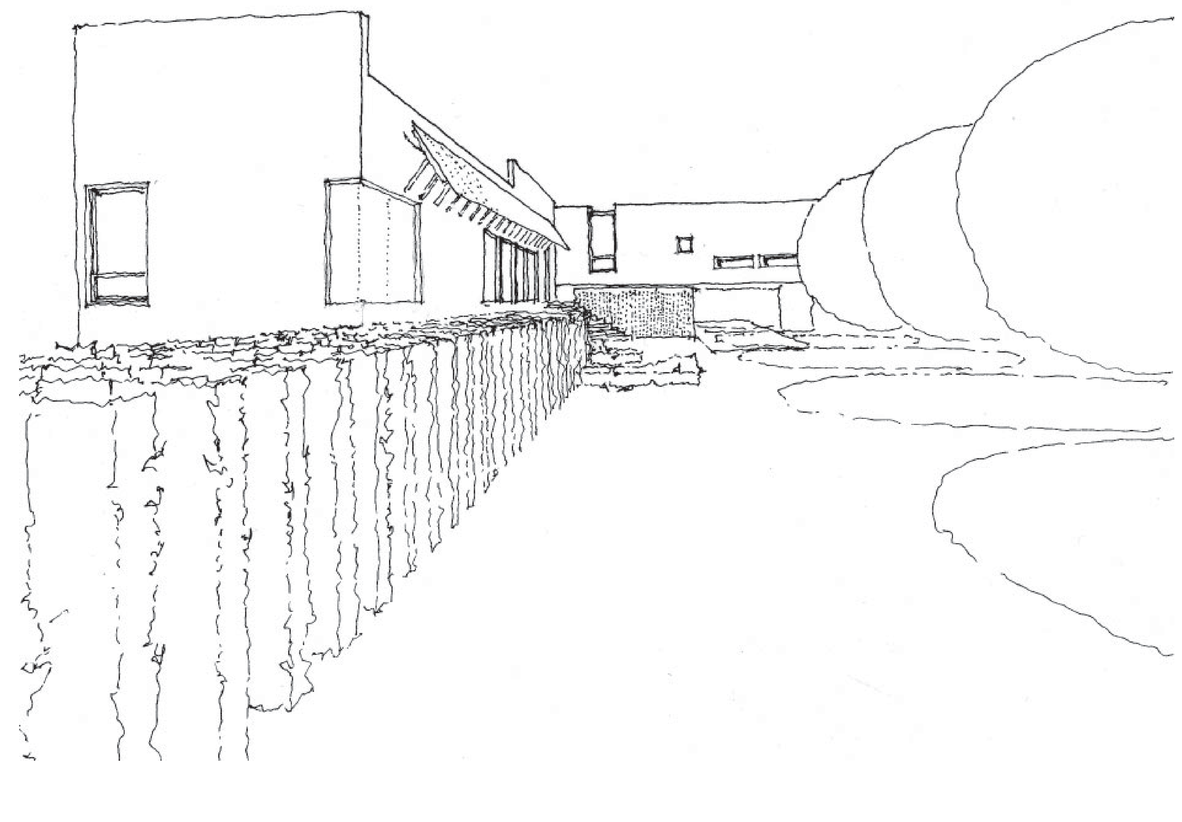
- Removable wheel/axle assembly and tow frame
- Steel main beams and steel overlay floor joists
- Flood-resistant foundation design for simple crane-set
- Less than 30 days from sitework to occupancy certificate, no construction financing!
- Shipped height 11'6", width 16'-0", length module 1, 64-0"', module 2, 56-0"'. (parapets, pv sunshades installed onsite)

Environmental & Infrastructure load-reducing design elements:

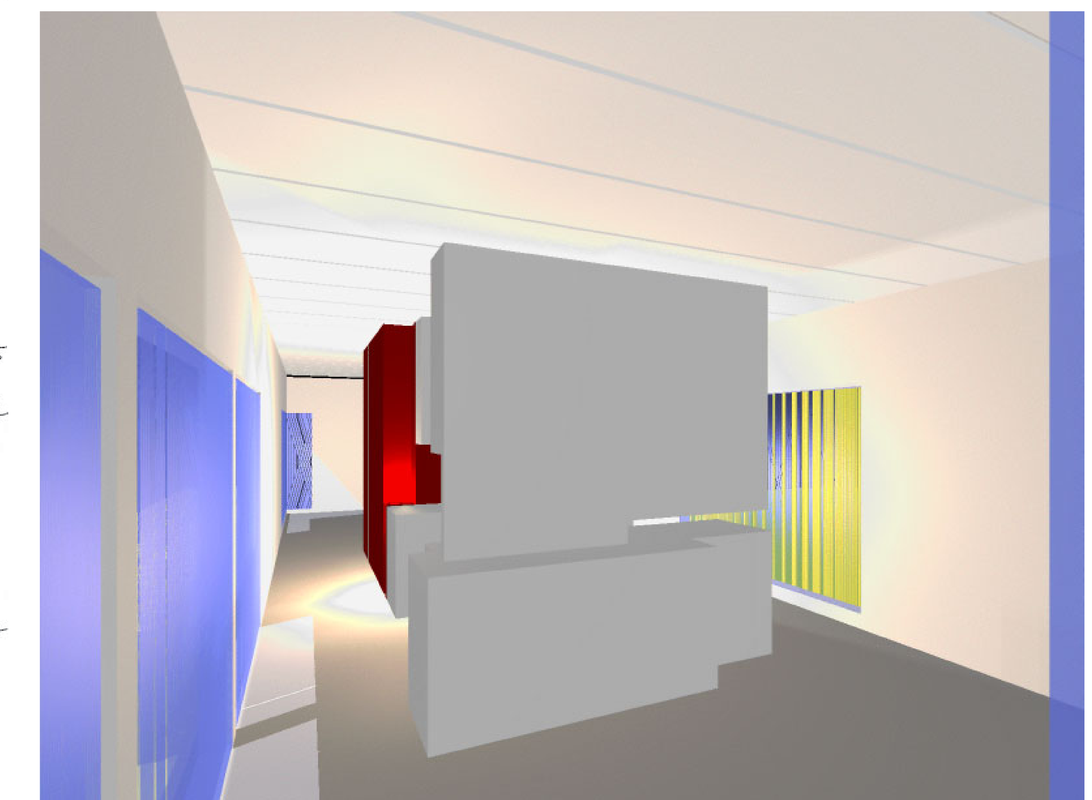
- 2x6 R-19 Wall Construction
- High performance R-12 low-e, argon filled insulating glass with suspended mylar film in cavity
- 3 1/2" - R-23.75 SIPS chassis enclosure
- Fully-adhered-single-ply hypalon rain-harvesting cool-roof
- 5 1/2" - R-41.25 SIPS Roof deck
- 12 roto-molded rain storage cisterns 300 gallon tanks in structural culvert-columns for a total storage capacity of 3,600 gallons of rainwater
- 1 - 1,350 gallon roto-moldedgrey-water cistern in structural culvert-column
- 20 - photovoltaic shading panels producing 2000 watts peak power to a/c inverter
- 1'x2' recycled flyash concrete floor tiles along interior of south wall for thermal mass
- 1'x2' cork flooring for living, dining, bedroom areas
- bamboo strip flooring at main entry
- fiber/cement board exterior cladding panels

Small footprint - lives large

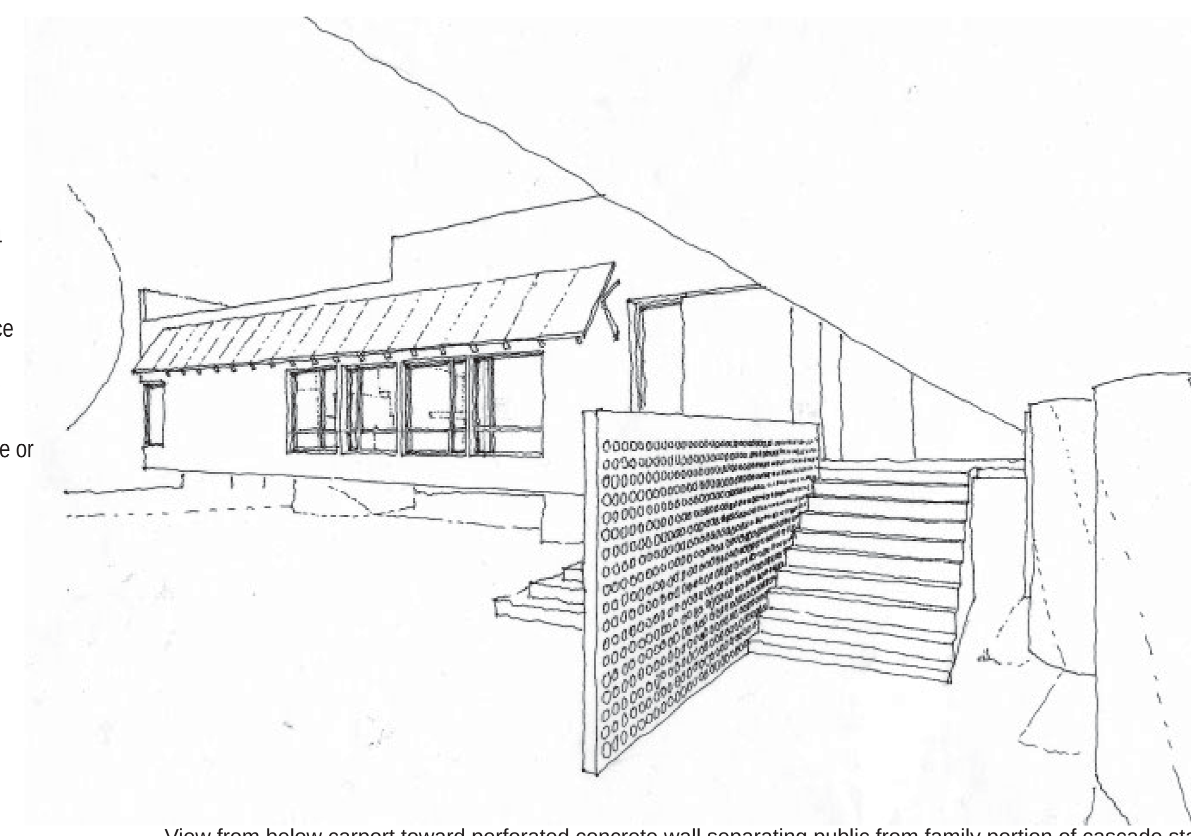
- windows in bedrooms located across from room entry points enhancing perceived space dimensions
- standard precut stud mounted on 6" perimeter stiffener combined with SIPS roof structure raises ceiling heights to 8'-6"
- module 1, 16'-0" x 64'-0" = 1,024 square feet (living room, dining room, kitchen, full bath, master bedroom, mechanical room, guest 1/2 bath)
- module 2, 16'-0" x 56'-0" = 896 square feet
- total floor area, including entry connector prefabricated for rapid on-site completion = 1,984 square feet
- 10' diameter, 9 foot ceiling below module 2 for storage of recycling, garden tools.
- doors located for corner entry to spaces, preserves privacy, presents diagonal view of space for perceptual lengthening of room
- thin and translucent partitions between living/dining/entry for maximum length of view upon entry.
- raised bedroom module #2 allows 9'-0" clear height above driveway, can be fitted as garage or left as carport to maximize visual prospect of courtyard.



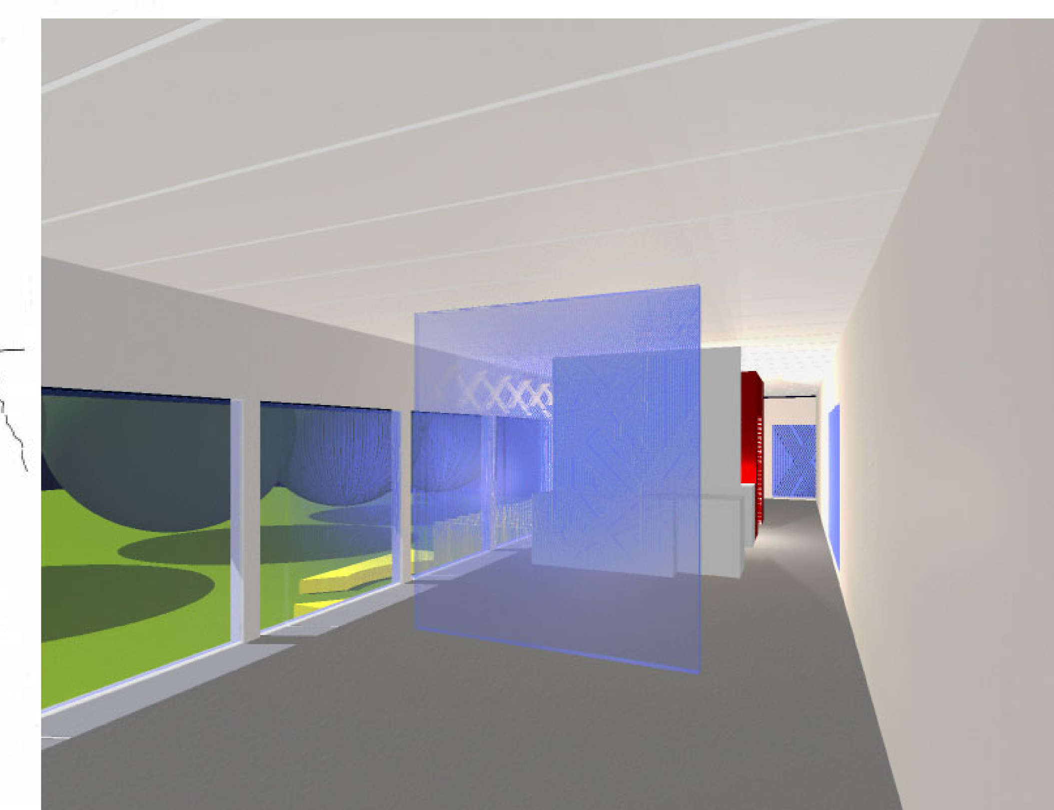
View to the East from courtyard through carport to street along row-crop garden



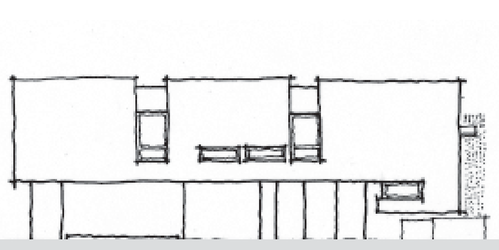
View from dining room towards kitchen pass -thru and living-screen bamboo planting beyond



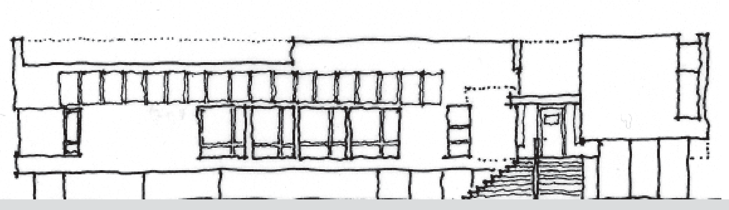
View from below carport toward perforated concrete wall separating public from family portion of cascade stair
Photovoltaic panels shade living dining kitchen windows on living module in background



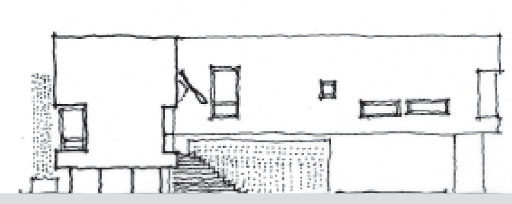
View from living room through dining screen towards dining, kitchen, master bedroom



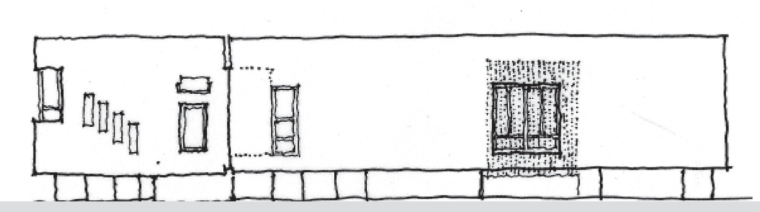
East Elevation (Street face)



South Elevation (Courtyard face)



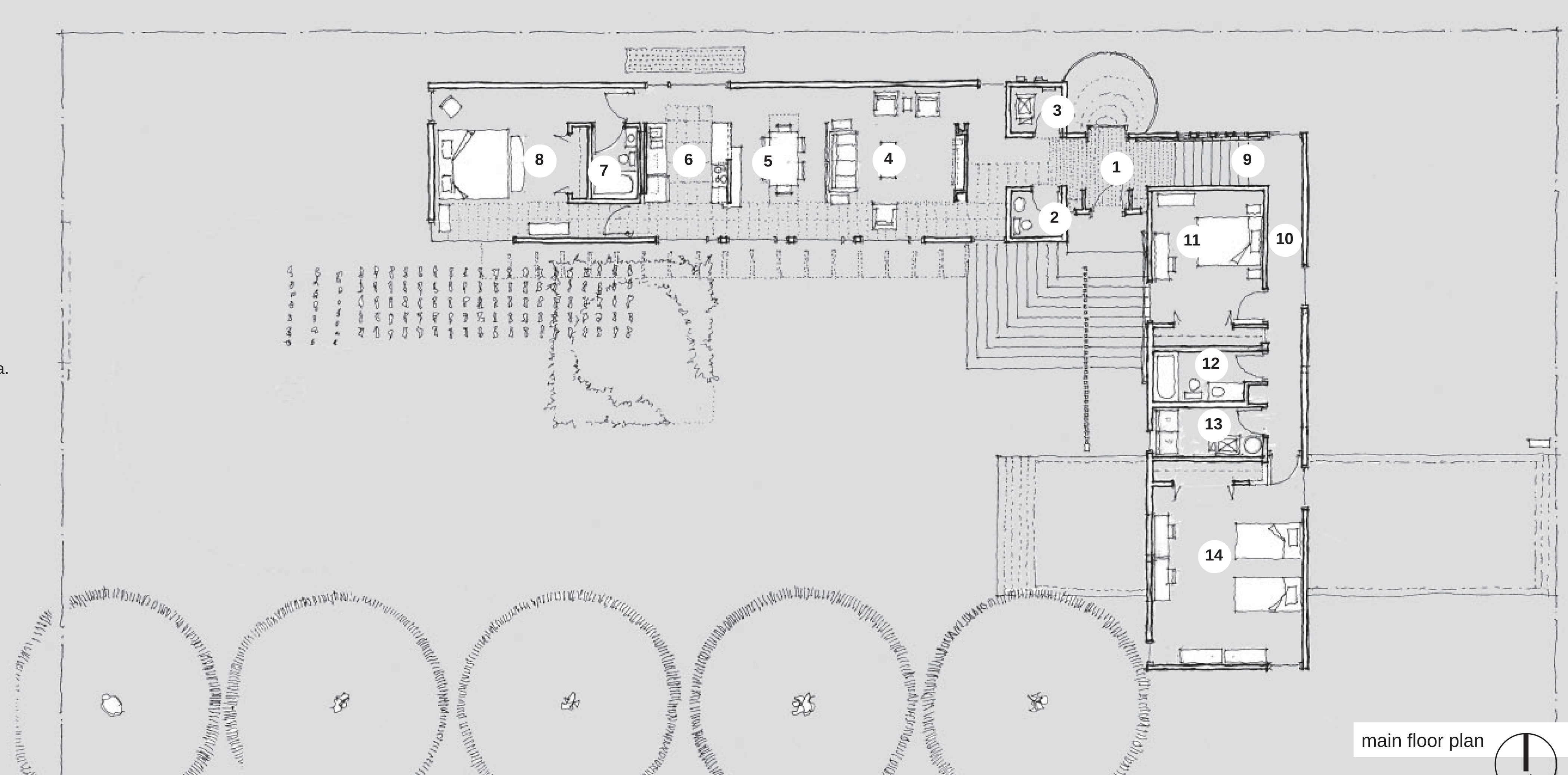
West Elevation (Courtyard Face)



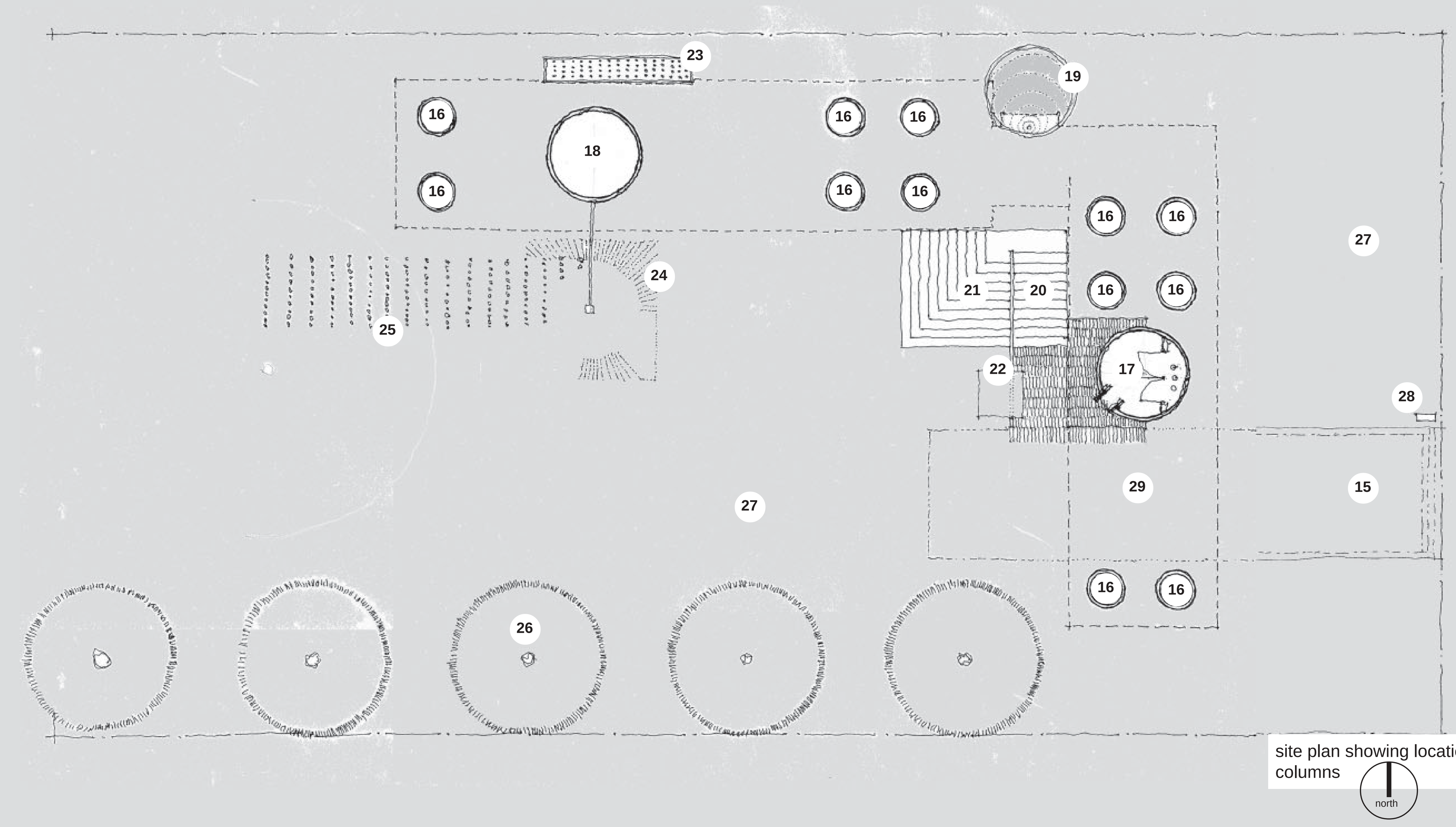
North Elevation (Face for Neighbor)

1. Entrance 8' x 8'
2. Guest bath 5' x 5'
3. Mechanical 5' x 5'
4. Living
5. Dining
6. Kitchen 8' x 8'
7. Master Bath 5' x 8'
8. Master Bedroom 16' x 15
9. Stair to module #2, bedrooms
10. Bedroom hallway
11. Bedroom #2 16' x 12'
12. Full bath 5' x 8'
13. Laundry & Mech. 5' x 8'
14. Bedroom #3 21' x 16'

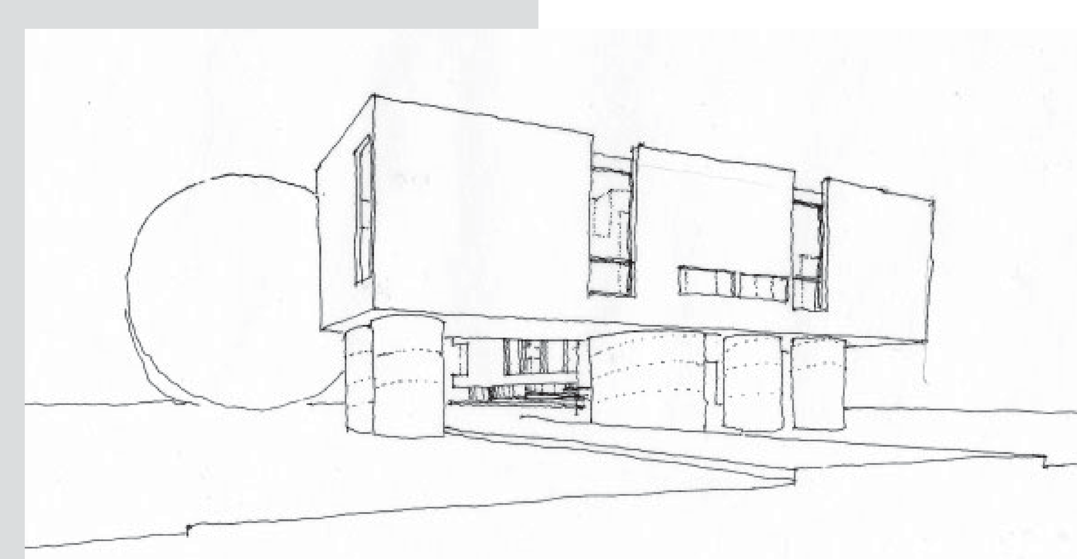
15. Brick driveway to street
16. 300 gallon cistern in 48" dia. concrete pipe column
17. Recycling/gardentool storage in 120" dia. concrete pipe column
18. 1,350 gallon greywater cistern in 120" dia concrete pipe column
19. Circulating rainwater fount in 120" dia concrete pipe column outside entry window
20. Public side of cascading entry stair
21. Private courtyard side of cascading entry stair
22. Perforated concrete wall separating public, private
23. Bamboo planted screen outside kitchen window
24. Herb & Vegetable Garden
25. Rowcrop Garden
26. Russian Olive screen along South property line
27. Xerascape ground covers and gravels for lot surface.
28. Mailbox
29. Carport parking for 2 cars below bedroom module



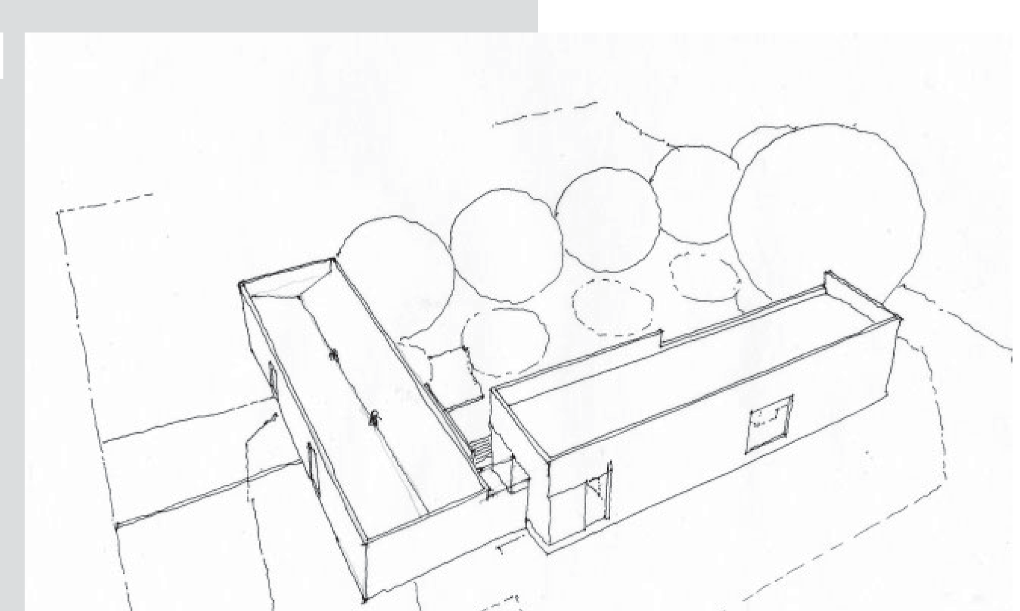
main floor plan



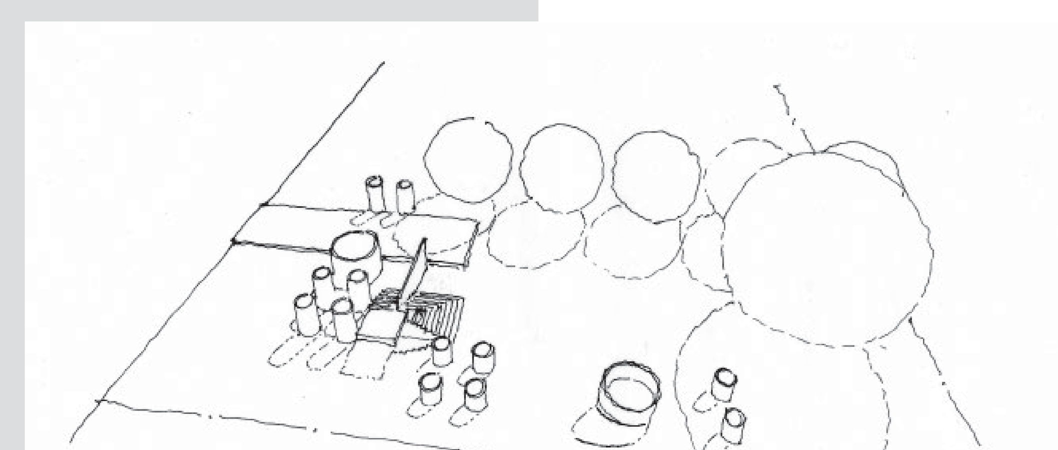
site plan showing location of cistern columns



East - street face showing bedroom module raised on cistern columns to make carport

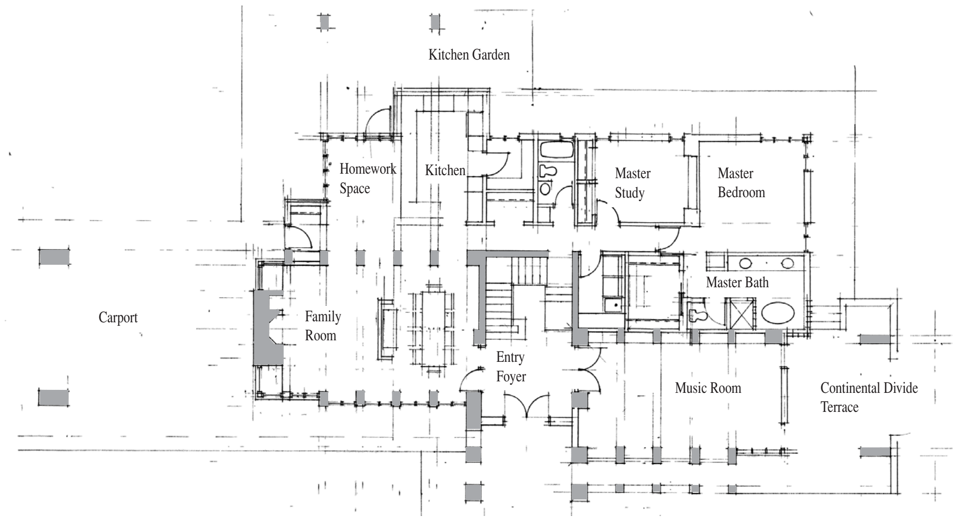


Aerial view from Northeast showing bedroom and living modules forming family courtyard

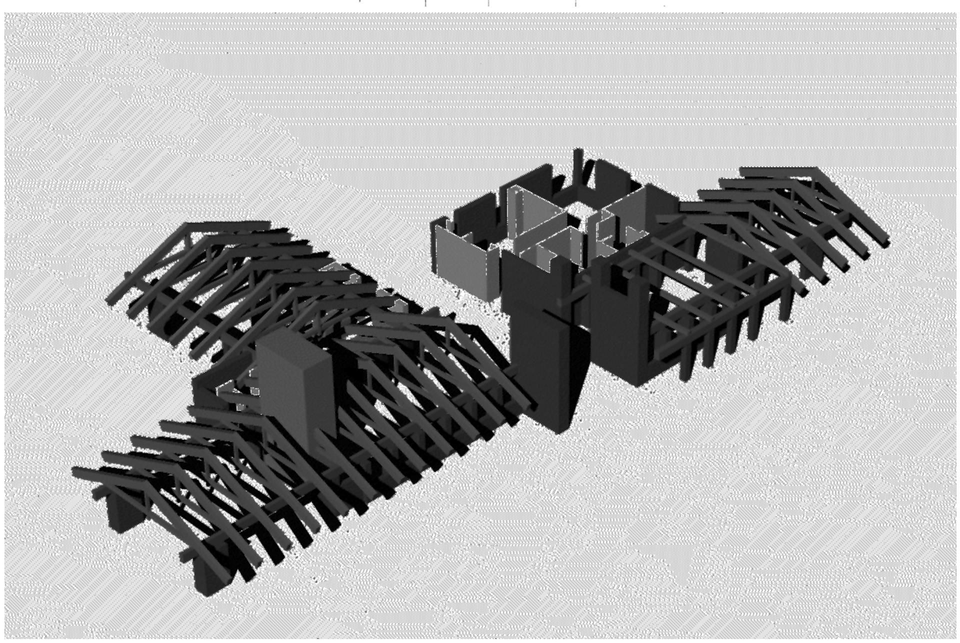


Aerial view from Northwith modules removed to show cistern column locations, cascading stair and drive

Watershed House 2000



The plan is structured by masonry piers separated by a pair of casement windows. Each pier receives a timber structural element supporting either the roof or second floor.



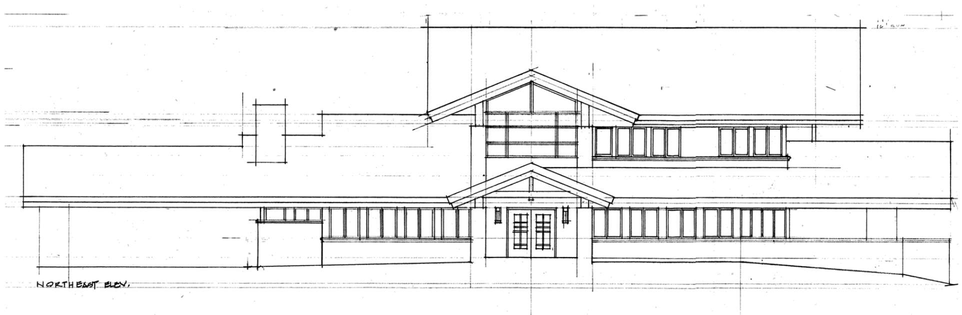
Still frame from walk-thru model with second floor, roof decking removed.

The watershed house is a design for a family of five on a parcel of land straddling the continental divide between the New River / Gulf watershed and the Roanoke River, Chesapeake watershed in Montgomery County, Virginia. The working parents sought a “dual house” design, one that would allow for each member of the family to have an individual space for quiet study and music, as well as a group house to bring the family together around cooking, dining and conversation. To meet these desires, the 4,200 square foot house splits on either side of the front entry. To the left is the family dining, living, kitchen and homework space. To the right of the entry is the music room, master suite, and upstairs on the right side is the children’s suites.

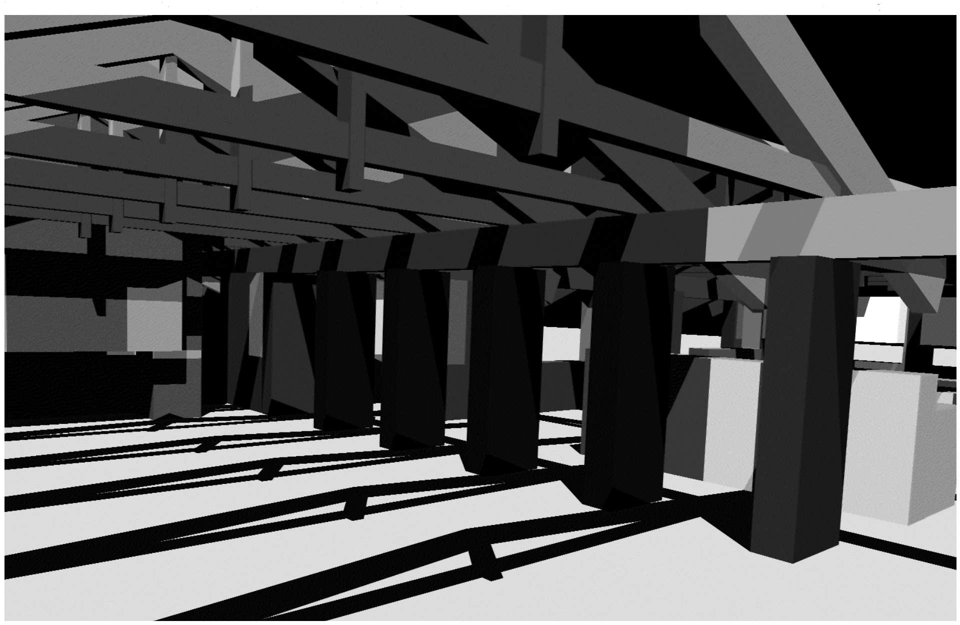
Dramatic views to the east - northeast supported the elaboration of the piers and casement windows. A roofed terrace was developed as an extension to the music room allowing the family to listen and perform while overlooking the vista along the continental divide.

The project proceeded into the early stages of construction documents when poor returns from the stock market following 9.11 caused the owners to terminate the project and sell the site to meet financial obligations.

Watershed House 2000



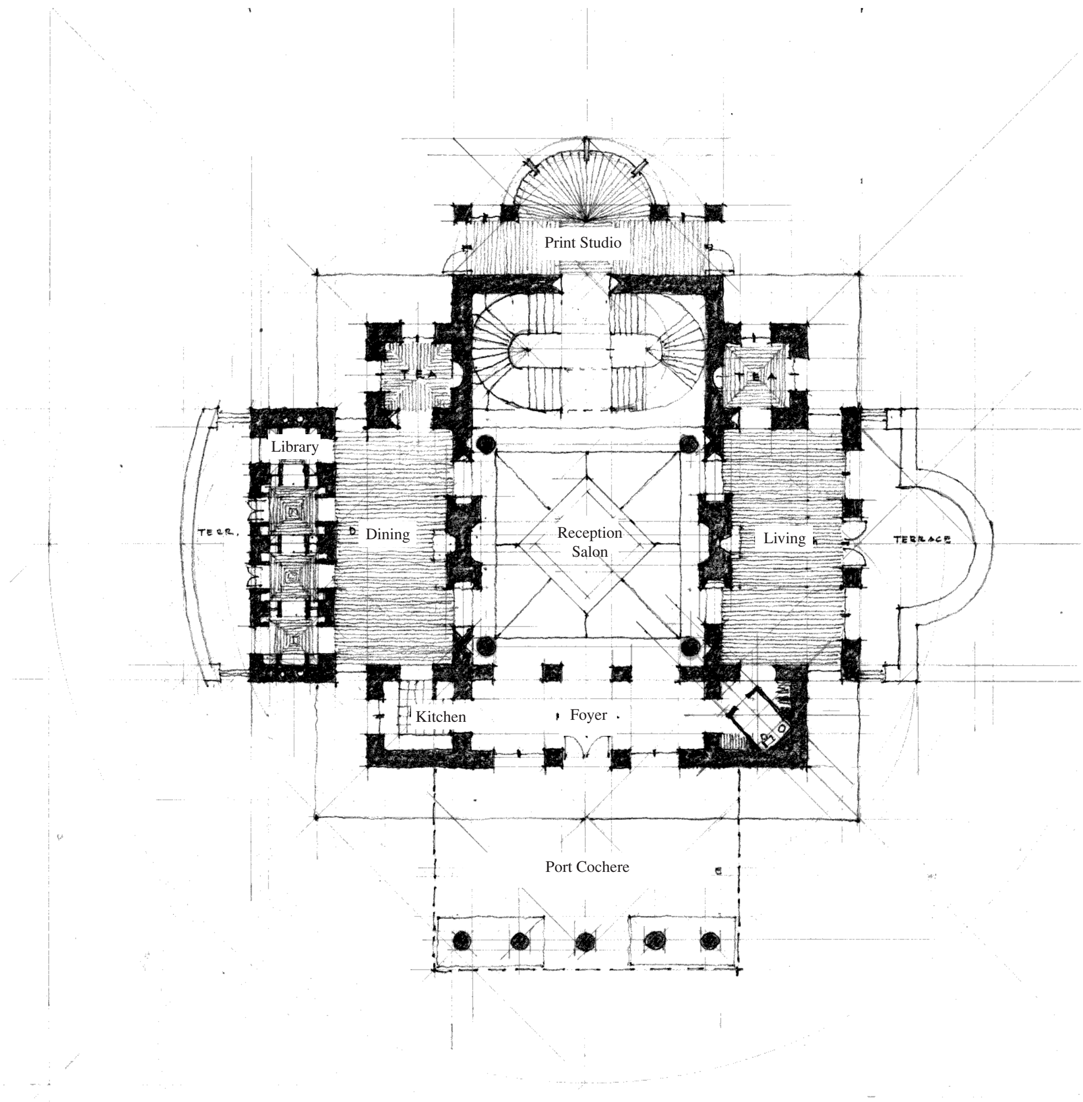
Elevation showing six foot overhangs, masonry piers, casement windows

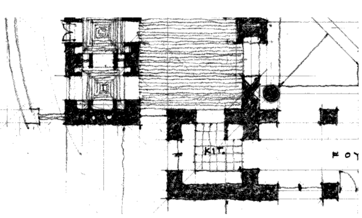


Still frame from walk-thru model showing view through living room towards fireplace with homework room and kitchen to the right

Villa on the Blue Ridge Plateau v.2

This unbuilt project was the second parti in an extended dialogue with a colleague on the form and character of a house built upon generosity and grace. The underlying geometries served as anchor and snap while the generosity of masonry construction provided places for books, silver, fire, coats, objects as well as ductwork and structure.

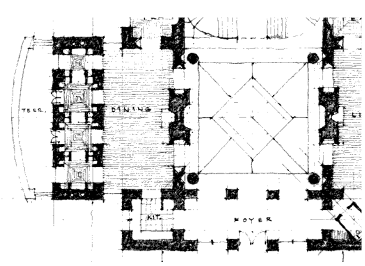




Above Overall plan organized on either side of the formal entry axis. Dining, library and terrace fall on the right side of the entry hall, Living and terrace fall on the left. The corners are held with masses containing kitchen, toilets, coat rooms and tea rooms for morning and afternoon sun. The print studio falls on axis behind the reception salon and stair to the private quarters.

Left Detail of lower left corner of the plan showing kitchen relation to foyer, dining (above) and the articulation of masonry for the library, and object-holding threshold to the salon.

Right Partial plan showing entry foyer in relation to reception salon (center), dining, (left) and library - loggia between the dining and terrace

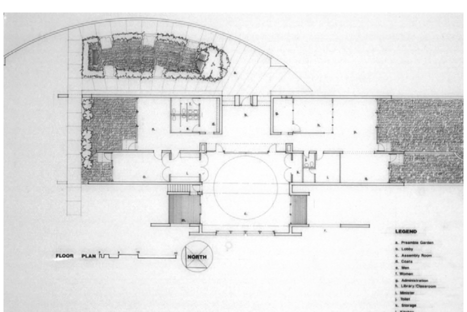


Unitarian Universalist Fellowship of the New River Valley 1991

The conception of the design for the UUFNRV is addresses two concerns. The first is the making of a meeting room as the primary room of the structure. The second was structuring the hillside overlooking Brush Mountain upon which the fellowship was to be built. I worked as an associate architect with James Ritter Architect we conceived a series of walls stepping down the hillside. These walls extend beyond the immediate limits of the building in order to structure the parking area and remaining land into a series of terraces. This gave the building and the land a primary architectural relationship. As the walls extend across the hill, they meet the meeting room. The room has a primacy equal to the hillside, and the walls stopped, did not penetrate the room turned, offering spatial definition to the meeting room. Those program activities that have come to be important in supporting the meeting service take place between the walls. Each classroom between the walls has a small adjacent garden space and a secondary exit to the garden. The fellowship hall can be extended into the lobby by opening two large sliding doors. The project had a modest budget and is built with a combination of load bearing masonry walls, studwalls, light wood trusses, painted drywall interior surfaces, concrete floors in all spaces except the fellowship hall which has a hardwood floor.

This project was recognized with a design award by the Northern Virginia Chapter of the American Institute of Architects in 1992.

Northwest Elevation showing meeting room supported on masonry walls, horizontal battens over cedar plywood



Floor plan of final scheme showing entry garden, classrooms and offices between walls, kitchen adjacent to meeting hall, and meeting hall balconies.

Curved entry garden under construction, Truss cantilever provides sheltered path along entry.

Unitarian Universalist Fellowship of the New River Valley 1991

Below Right, view of light wood trusses over the classroom space, masonry piers defining the classroom doorway, and classroom gardenspace.

Below Center, view of meeting room showing sliding doors to the lobby in the open position for overflow seating.

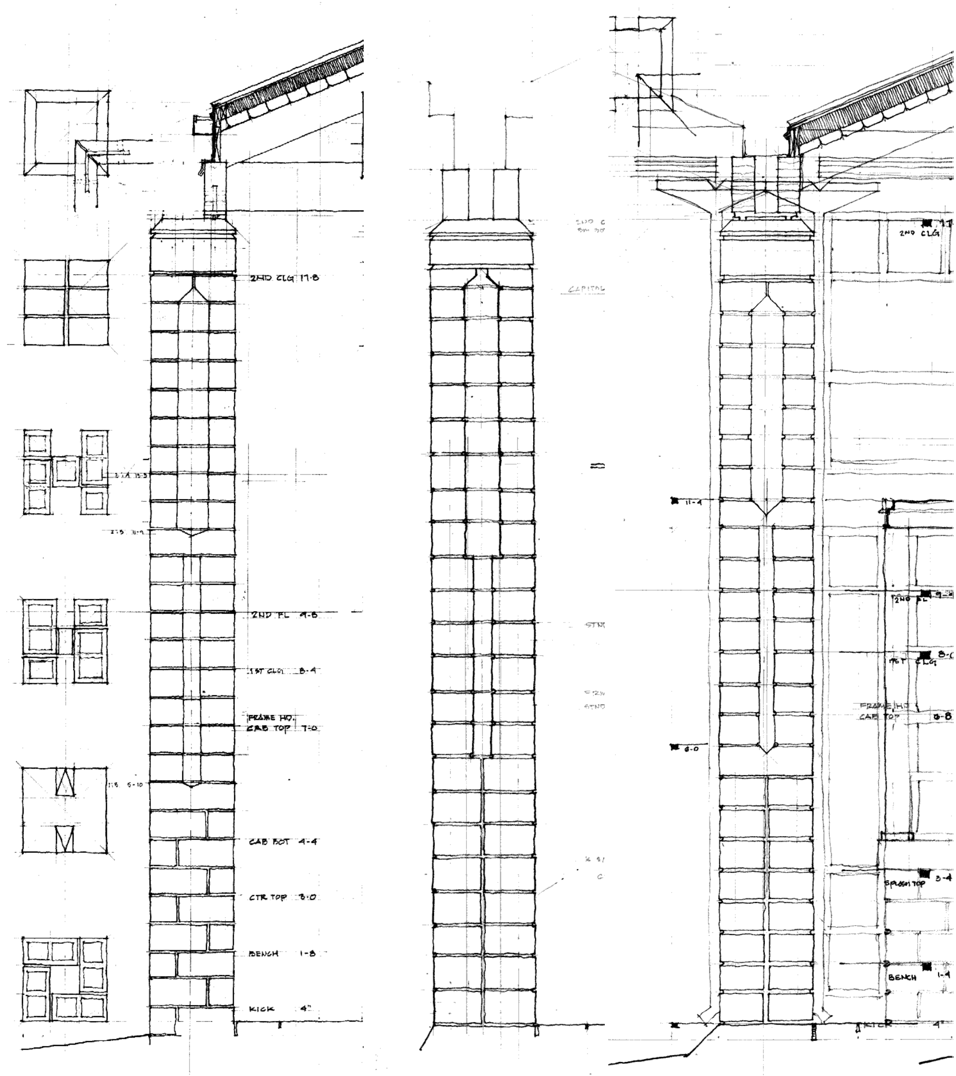
Below Left, View of completed meeting room with chairs in storage room to allow use for dance studio. (bar is at lower mullion)

The meeting room was considered two rooms. A lower room for the body made by the grey painted drywall, windows and wood floor, and an upper room for the spirit made by the white painted drywall, OSB SIPS panels, trusses and gable lite.

During the week the room serves as a dance studio, and activity space for the resident preschool.

Family Room Addition in Ellett Valley **1991**

This unbuilt project was commissioned by a locally prominent surgeon with a simple program for the design; construct an addition to the existing mountain house with a room large enough for him to entertain his children and grandchildren (totalling 18) at the holidays. The kitchen must be big enough to have four people cooking, and at least two turkeys in ovens at the same time. In addition to this family room, the client required an on-grade master bedroom suite to replace the second floor suite in the existing house, and a small caretakers apartment.



Left — Section through roof pavilion showing column in elevation

Center — Elevation of column receiving twin glue-laminated beams for roof framing.

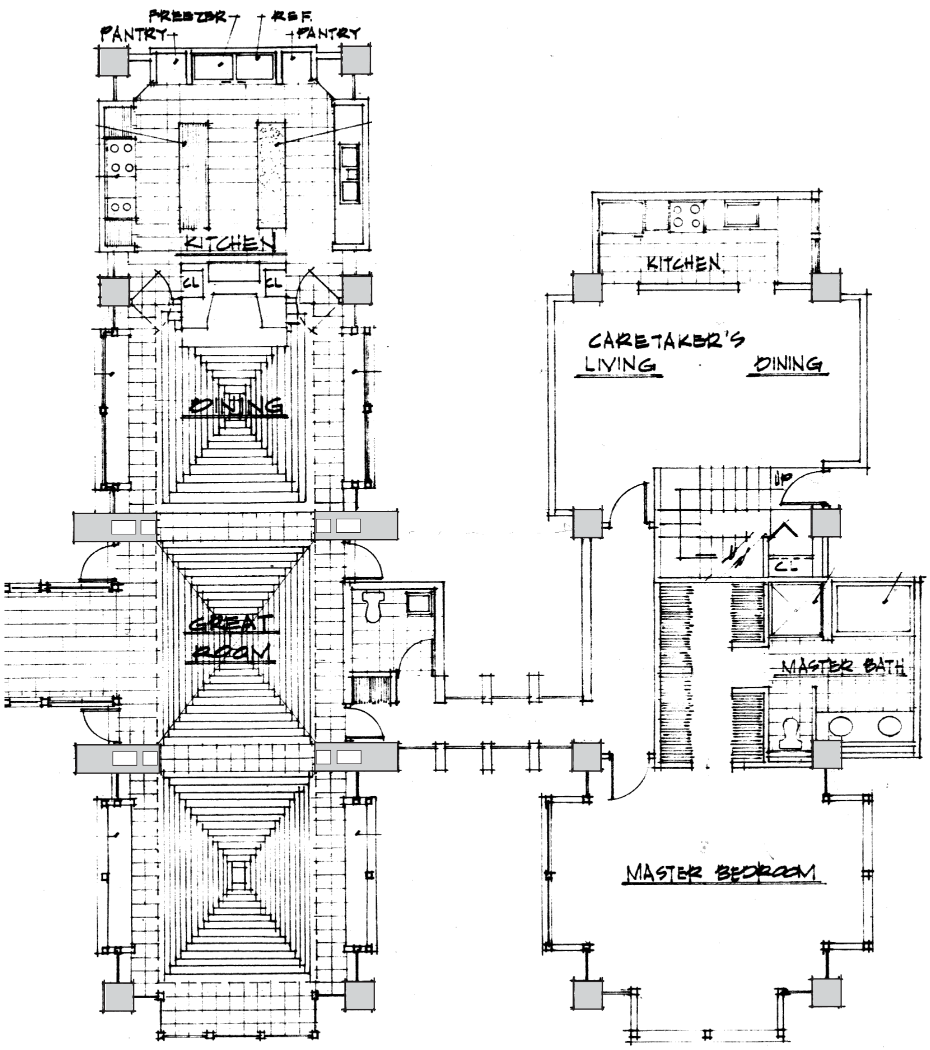
Right — Elevation of column, infill glazing, and lower projecting bay window.

The primary organizing element in the existing house was square masonry columns twenty-four inches on a side. In the existing house these columns had been reduced to hollow brick shells having no role in the support of the floors or roof. Their visual prominence made the column the beginning for the family room addition. These new columns were twenty-four inches on a side, built up from courses of twelve, ten, and eight-inch concrete masonry units with a precast cap tieing the wythes together at six feet, eleven feet-four inches and seventeen feet-eight inches. The columns held the twenty-four inch perimeter from earth to sky. A four inch shadow separates the two ten inch block from elevation six feet to elevation eleven feet-four inches and an eight inch shadow separates the eight inch block from elevation eleven feet-four inches to elevation seventeen feet-eight inches. Each eight inch block carries a glue-laminated perimeter beam supporting the glue-laminated roof framing, wood decking and terne roof.

After successfully bidding the project, the owner was compelled to terminate the project after a court ruled his interpretation of the tax code fell outside of the norm. His subsequent domicile was a minimum security federal penal institution. The project remains unbuilt.

Family Room Addition in Ellett Valley 1991

The plan was organized as parallel buildings linked by a central entry, and a connecting link to the existing house. The columns formed eighteen foot square structural bays. The mass on the left is the living / dining mass, with an undesignated bay between them. This undesignated bay was to be used for overflow situations during large dinners or professional receptions. The fireplace mass separates the kitchen from the living / dining spaces. Small projecting bays between the columns hold counter-high millwork pieces for china storage, library, and also act as supply-air chases to wash the windows above the countertops with a stream of warm air. The mass on the right is the master bedroom suite with a small caretakers apartment behind. 2,800 total square feet in the addition.



Kitchen

Dining

Holiday expansion space, connector to existing house

Living room with library bays

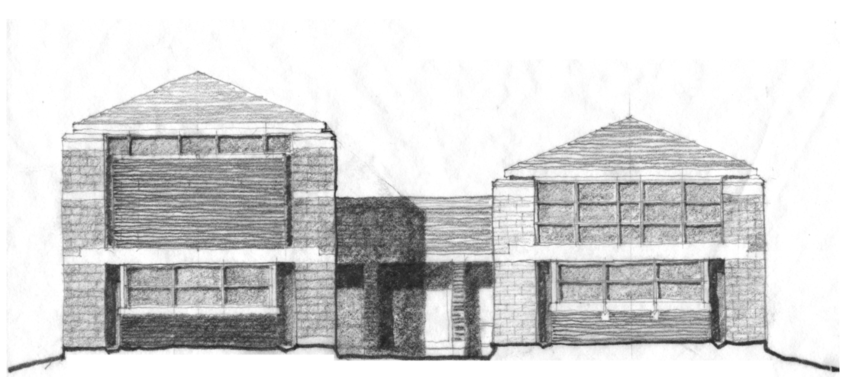
Caretakers Kitchen

Caretakers Living and Dining

Caretakers Private entry

Master Closet and Bath

Master Bedroom with sitting bays



Left Elevation of the front (southeast side) of the addition showing concrete masonry unit columns, precast caps and tie beams and connecting entry mass.

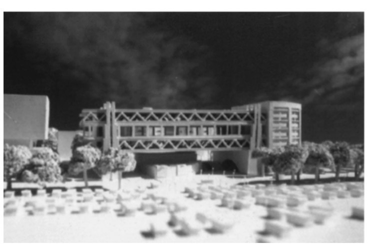
Cowgill Hall Design Charrette

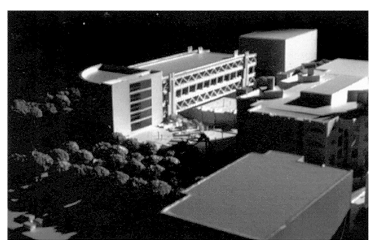
This unbuilt project was recognized with the first award among 25 entries in an ideas competition sponsored by Virginia Tech to design a 60,000 s.f. Engineering lab and classroom facility and a 60,000 s.f. addition to the Cowgill Hall architecture building on the Virginia Tech campus. This design was developed in collaboration with Mr. Barry Light, a graduate student at the time. The scheme proposes the engineering building align with existing street fronting buildings completing the Perry Street building wall while raising

View from west looking at curved corner of engineering addition in foreground, arched openings in perimeter additions to Cowgill hall in background

View of engineering courtyard from commuter parking lot showing laboratory space trusses and monumental stair below.

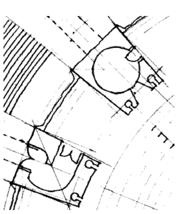
Below left and right, plan of auditorium showing column masses enlarged to become projection booth, light trap entrances, supply air ductwork

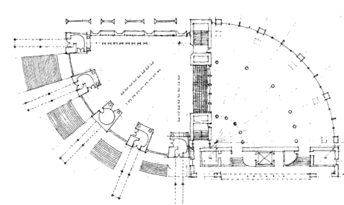


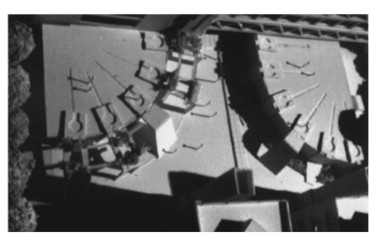


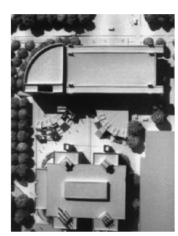
View of courtyard elevation of engineering addition showing laboratory spaces in full-floor height trusses, auditorium spaces below

Below left and right, aerial view of auditorium and classroom spaces with roof gardens.





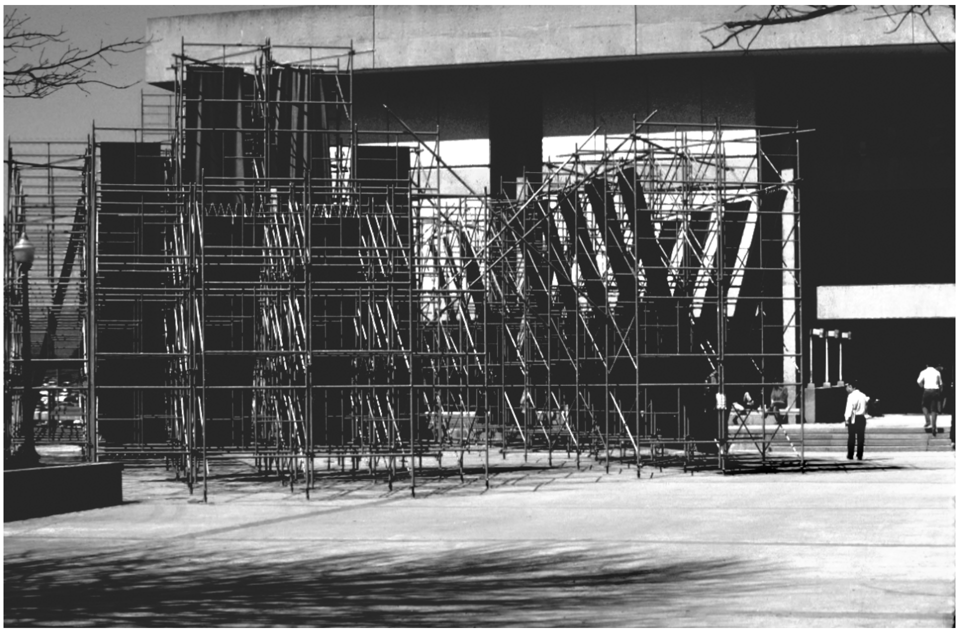


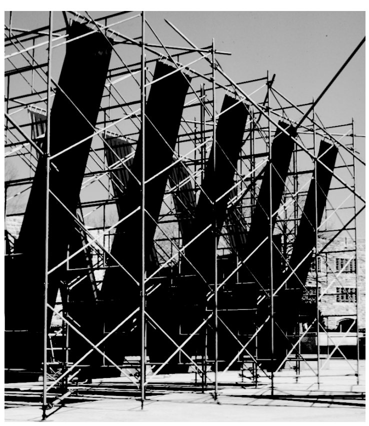


the lab spaces above a grand staircase to make an “entrance” to this largely undefined campus edge. The grand stair lands at the upper level courtyard where quarter-circle auditorium and classroom spaces suggest movement to the pair of existing paths on either side of Cowgill Hall. The curved end of the engineering building houses faculty office spaces and building infrastructure elements.

Twenty-Fifth Anniversary Pavillion,

College of Architecture and Urban Studies, Virginia Tech 1991





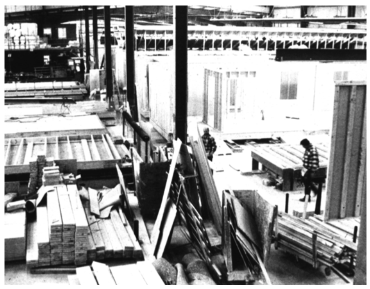
This project required the design and construction of a temporary pavillion meant to be an event marker for the campus and backdrop for dignitary speeches related to the Twenty-fifth anniversary of the College of Architecture and Urban Studies. Scaffolding and panels of ballistic nylon fabric were used to meet time and budget parameters for the project. The repetition of line and plane present in the pavillion and the interplay between the mass produced scaffolding and custom fabricated nylon panels were considered sympathetic to the principles of the Ulm school that underpin the College's values in education and design.

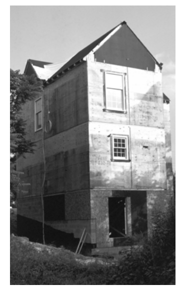
New Prototypes for Starter Housing:

Constructing the A1 Prototype as the O'Brien Residence

New Prototypes for Starter Housing was my first sponsored research project. The study was requested by a small modular homebuilder that sought to develop their product line from the "double-wide" image to attract first-time homebuyers. The project was in collaboration with three graduate students.

The study concluded with three designs entering production for the modular builder. After attending the first "Grand Opening" the design / research team was disappointed that the designs had been augmented with a full range of colonial accessories. In a meeting with the sponsor, the design/ research team was told to "put your money where your mouth is" and in an emotional moment said OK before realizing that meant I just bought a house that would be ready to place on land I didn't yet own in less than 30 days, a surprise my wife wasn't too excited about.





Left View of modular production facility showing floor assembly station on left side, wall assembly on right side. Modular builders conform with BOCA building codes.

Right (2) Views of folded and unfolded roof assembly on wood modules.

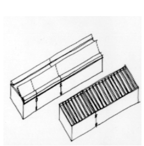
Left Six hours after starting, the modules are set, roofs unfolded, overhangs flipped down, house is "dried-in"

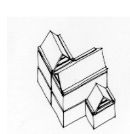
Right Setting the front bedroom/office module. The builder had never set one module perpendicular to another...an ivory tower innovation.

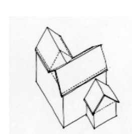
Left Crane setting the second floor master bedroom - bath module prior to unfolding the roof.

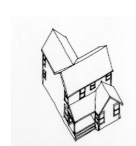
Right House six hours after beginning. The neighbors had gone to work before the crane and modules appeared, the site was just a foundation. When they returned from work their first words to us were "had a busy day?"

The modular construction process allowed us to eliminate construction financing, working with the 30 day "float" period before the bill for the modules arrived. This saving contributed to the "affordable" aspects of the project.









Left to Right, Modular site installation using crane-set divisible module strategy.

1. Two modules arrive on custom low-boy flat transporters, one module is roofed and roofs, overhangs are folded to meet max shipping height of 14'-0" above grade. Unroofed module has "redundant" ceiling joists to stiffen module for shipping and placement. Precut slots just below top plates and above rim joists show field personnel where to insert chain saw to cut module segments (rooms) free for placing.
2. After divisible module sections are cut free, they are rigged for crane placing (precut slots show rig points)
3. After all modules are placed, modules are joined with one inch dia allthread rod at four feet o.c. at mating rim joist surfaces. Modules are nailed down/together six inches o.c. at perimeter. Roofs are unfolded with crane assist, knee wall studs are hinged and fall on ceiling joists as roof is lifted to provide temporary support until ridge is nailed off.
4. Overhangs, gable ends are unfolded into place, plumbing splices are made, electrical home runs are connected to panel, drywall, subfloor splices are made, carpet extensions unfolded.
5. Exterior siding, trim, gutters, downspouts, porches and decks are installed. Inspection for Certificate of Occupancy is passed on the 28th day for this house, The C-3 prototype, similar in size and height, is regularly completed in under fifteen days.

New Prototypes for Starter Housing:

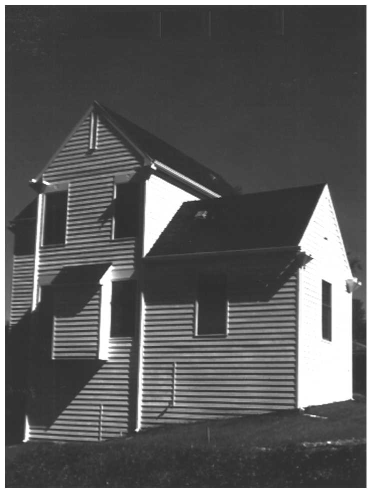
Constructing the A1 Prototype as the O'Brien Residence

The A1 Prototype, market named "Maryland" by the builder would be built over 300 times in the three years it was part of the builders product line. Knowing this, it seemed important for our family to "touch" this house. Partly this "touch" came out of having a minimal budget for siding, porches and trim, partly it came out of the innocence of my little girls desiring "their" windows be marked distinctively.

Maggie requested a fish over her window, Erin a hummingbird, my wife asked for the sectioned nautilus shell and after completing those carvings, I made a horseshoe crab for myself.

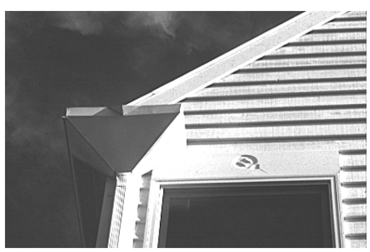
The scuppers came out of my dislike of the "elbow" pipe usually found connecting the gutter to downspout. They are galvanized, made by a ductwork fabricator. The "beak" on the scupper is the overflow, anticipating my lack of enthusiasm for ladders and gutter cleaning.

The plan is fundamentally "stock" as the research team designed it with the exception of a second-floor laundry and first floor half-bath.



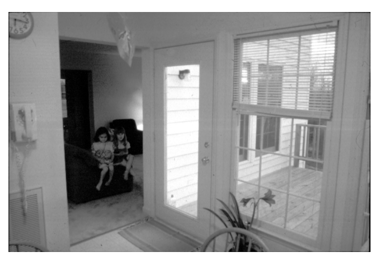

Left View of the south face of the house 30 days after crane day. The siding is agricultural quality pine, primed each side with three topcoats. The siding has a vent space behind it on three sides of the house, has tarpaper over the sheathing on two sides and tyvek on two sides. After fifteen years, I can find no appreciable differences in the life of the paint or siding due to those different substrates.

Right Front and side views of scuppers. The width of the scupper reaches a short downspout from the gutter on the overhang, The downspout and clamps from the scupper sized the cornerboard.



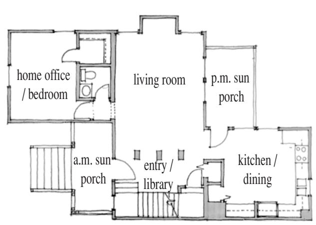

Left View of the scupper and window ornament. This is "my" window marked with the horseshoe crab abstracted and carved in low relief into the 5/4 fir head trim.

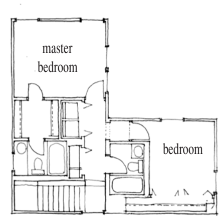
Right Erin's window, marked by the hummingbird ornament

Left Living room looking to entry and stair. The piers house plumbing risers for laundry, bath, and master bath.

Right View from kitchen to living room. The house uses 3 foot by five foot double hung windows throughout as a strategy to balance light in each space, and minimize wall presence, visually enlarging the small spaces.





Floor plans showing the small-house making principles:

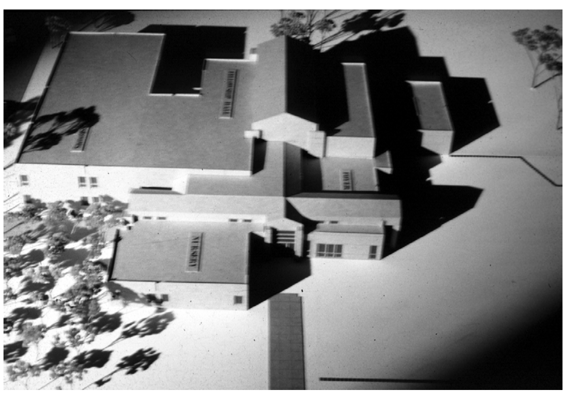
- enter rooms along one edge to preserve privacy without closing a door
- place windows on two adjacent walls to balance light, thereby reducing glare, enhancing transparency and drawing one's eyes outside, diminishing the presence of the walls in small spaces
- enter private rooms off of alcoves for privacy, grace, and a place to put a door when you add on.
- put a window at the visual termination of every walkway, to light the path without lights

Bethel Evangelical Free Church

1987

Above, view of the phase one main entry adjacent to the office suite.

View from the parking area looking towards the main entry. Sanctuary window is in the background. The classroom building is in the foreground on the left side of the frame.



Right, aerial view of phase one construction showing classroom building on the left, office suite near the bottom of the frame, and fellowship hall, the phase one sanctuary in the middle of the frame.

View of the cross axis entry to the fellowship hall., which serves as the sanctuary during the first phase of construction.

As the firm slowly imploded under excessive accounts recievable, this is the last project I led as a principal in Twichell, Thompsen, Martens & O'Brien. This master plan for a rapidly growing evangelical christian congregation was designed to be constructed in three phases on a sunflower field in Cass County North Dakota. Phase one included the fellowship hall that would also serve as the sanctuary for the first four years, school for four-hundred children, and a small office and kitchen suite. Phase two included the sanctuary with theatre-type seating for eight hundred worshipers, television production and broadcast facilities, and generous spaces for choir, and music ministers. The final phase was made up of the gymnasium and catering kitchen. Together, all three phases total just over forty-nine thousand square feet. The project was designed to be built using steel joists, concrete masonry/brick walls, epdm and standing seam metal roofs.

The Upper Nine Mixed Use Development

1987

Above, satellite image of built-out project showing office buildings fronting on the highway, blocking noise and visually enclosing the courtyard space.

Left, view of twin and single cluster houses and front garden space. Each house has a private courtyard behind the garage.

Below Center, view of the twin and single cluster house from loop drive.

Below, view of access drive to loop from highway frontage road. Office building is to the left, twin cluster house visually terminates the axis.

Below, highway elevation of office building, access road to residences is to the right of the office building.

View of the back / front of the office building from cluster houses

The Upper Nine mixed-use development, constructed from 1985 - 1987 in Fargo, N.D. is located on a commercial strip adjacent to a residential district. With access restricted to the frontage access road, the design places a loop drive in the center of the site, with 12 cluster houses around it. Between the cluster houses and the strip are two office buildings designed to mediate between the scale of the commercial strip and the residential buildings behind. This project was honored with a design award from the North Dakota Chapter of the American Institute of Architects in 1989 (Jurors from the Kansas City Chapter)

Rental Prototypes for Established Neighborhoods

1986

Above, view of the streetfront elevation showing parking below, common entry and two apartments. The remaining two apartments face the backyard of the building lot.

Left, view of context for the prototype. on the left edge of the frame is the low long four plex the city seeks to avoid, on the right edge of the frame is an existing victorian working-class home from the late 1800's. Broken massing and 12:12 pitches on the prototype enhance the neighborhood fit.

Like many railroad cities, Fargo faced the problem of the decline of established neighborhoods surrounding the original downtown district. These close in neighborhoods had been originally developed with Victorian and Four-square houses too large for the contemporary family, and too modest for historic district status. As these tall square houses fell into decline and were demolished, new long, shallow pitched duplex and four-plex apartment buildings replaced them. City planners and the remaining homeowners were concerned that these cost-optimized rental units were eroding the character of the neighborhood. This four-plex prototype was developed to respond more sympathetically to the historic district. Where many of the adjacent rental properties have no off-street parking, the prototype offers parking below each apartment, where the typical four-plex has small, dark common spaces, the protoype has a tall stair / lobby daylit by a large window over the entry. The tall roof structure becomes a cathedral ceiling in the apartments and overall massing makes a better fit in the established neighborhood.

Addition to the American State Bank, Williston, N.D.

1986

View of completed main street elevation of existing bank and remodeled space.

Far left, view from the existing bank to new offices in the hardware store shell. The existing party walls were opened around existing plumbing and mechanical chases and plaster ceiling extended from bank to office to help make the visual connection to the new space.

Center, view of existing brick hardware store facade meeting the existing limestone bank facade.

Left, view from main street entrance through the remodeled space. Lower plaster ceiling element is an extension of the bank ceiling.

This project, for a small bank in western North Dakota was to simply extend the existing limestone-clad bank into the adjacent hardware store. The hardware store became the new offices for the bank's loan and trust officers. The floor, roof, and front wall of the two buildings did not align, requiring a ramp between the two spaces. The hardware store shell allowed for a generous ceiling height, which made it possible to extend the lower plaster ceiling from the bank into the circulation path for the new office space in the hardware store. The hardware store was reclad with Bedford limestone to make as close a match as possible on the main street elevation.

First Bank Fargo Remodeling

1982

Top, view of remodeled exterior. Cast stone panels were used on the street level to replace the marble cladding that had begun to buckle and deform.

Middle, view of the "before" condition. Dark brick and white marble cladding development of Durrell Stone & Yamasaki's "New Formalism" as interpreted by a local architect. The cladding had been ordered (by the owner) in a thinner panel than specified on the drawings, this reduction in thickness combined with the geologic immaturity of the marble and substitution of copper wire for stainless steel pin anchors contributed to extreme buckling of the panels by 1980. Four foot long panels had buckled over two inches in many places. During demolition, small caches of pint whiskey bottles were found behind the buckled panels, they were being used as storage sites for drugs and alcohol by street people.

When the "arch" cladding at the tower roof was being removed, the contractor invited me up the scaffolding to take down a piece. He took out his pocket knife and cut through the sealant between the marble panels and said "ready?" A slight tug released the panel into my arms. No pins had been installed to secure the cladding in 1963.

The tower was re-clad with EIFS using stainless steel sill flashing at the windows.

Lower photo, view of plaza and "new" entry to bank lobby. The plaza landscaping was cut back by the owner who desired a more prominent presentation of the new entrance. Subsequent owners have begun replanting the site.

The First Bank Fargo Remodeling involved removing failing marble cladding (supported mainly by sealant) and re-configuring the lobby and lower level to meet changes that occurred in the banking business since the original 1963 construction. After beginning construction, the city re-routed a skyway system and demolished two properties to extend the skyway over and through the bank lobby roof and develop a public plaza on the main commercial street. This required a redesign of what had been the "back" of the bank into the upper and lower "front" for the skyway and required design of a public plaza space.

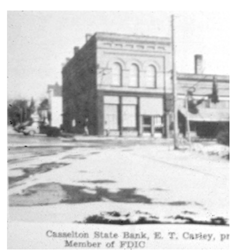
The Casselton State Bank

1978

Left, View of completed exterior remodeling. New masonry arches and canvas canopies below the second floor band

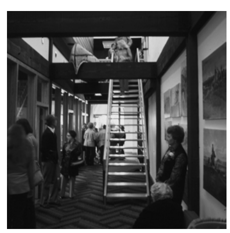
Right, Casselton State Bank after completion of aqua screening and tiling first floor.

Center, view of Casselton State Bank in 1901.



Right Center, View of stair to staff mezzanine in Cassabanka Insurance building.

Right, View of lobby looking toward teller line. Party walls opened with new arches to connect lobby to bank officers conference spaces



Left, Entry canopy detail at new masonry arch.

After being commissioned to remodel a small town bank on a prominent corner in Casselton N.D., our first act was to explore what had been covered by previous remodelings.This led to the discovery of a series of second floor arches and elaborate brickwork. Closed-up openings were discovered behind the aqua tiles on the street level. New arches were constructed in these openings, the second floor masonry cleaned and pointed, and adjacent 1890's era commercial buildings were remodeled to match. These became additional offices and meeting spaces for the bank.This project, for which I was project architect was honored with publication in the 1980 annual collection of american architecture by the AIA journal.

In addition tto discovering and uncovering the strength of the original bank building, the project required remodeling of the adjacent commercial structures to present a unified appearance and interior space which would function as as a bank-owned insurance agency (Cassabanka Insurance.) In order to shore up inadequate framing, a new skeletal frame was installed between the masonry party walls. This frame, constructed of 8x8 and 8x16 timbers also structured office space and provided a mezzanine level for staff training space.

This project was honored with a design award from the North Dakota Chapter of the American Institute of Architects in 1978.

Curriculum Vitae: Michael O'Brien

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Myers-Lawson School of Construction
Department of Building Construction
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Virginia Tech
Blacksburg, Virginia 24061

office: 540 320 2149
home: 540 552 6159
e-mail: mjobrien@vt.edu

Education:

- Master of Architecture — Virginia Polytechnic Institute and State University, 1982
- Bachelor of Architecture — North Dakota State University, 1976
- Bachelor of Arts — North Dakota State University, 1975

Professional Certification:

- Registered Architect: North Dakota 1981 to present, Virginia 2005 to present.
- National Council of Architectural Registration Boards Certificate: 1981.

Academic Appointments:

Virginia Polytechnic Institute and State University, Department of Building Construction

- Adjunct Faculty, Charles Edward Via Department of Civil and Environmental Engineering: Aug. 2006 to present
- William E. Jamerson Professor of Construction — Aug. 2005 to present
- Housing Research Center at Virginia Tech
  Associate Director for Technology Research — June 2005 to present

Virginia Polytechnic Institute and State University, Department of Architecture

- Professor — June 2002 to Aug. 2005
- Associate Professor, — May 1993 to May 2002
- Assistant Professor, — Aug. 1987 - May 1993.

North Dakota State University, Department of Architecture

- Studio Critic — 1985.
- Assistant Professor — 1979 - 1980.
- Instructor — 1976 - 1977.

Administrative Appointments:

- Virginia Center for Housing Research, Associate Director for Technology Research, 2005 to present
- Virginia Polytechnic Institute and State University, Department of Architecture: Chair, Graduate Programs in Architecture, Aug. 1994 - Aug. 1998.

Professional Positions:

- Principal, Twichell, Thompsen, Martens, O'Brien Architects P.C. Fargo, N.D. 1982 -1987.
- Project Architect, Seth W. Twichell & Associates Architects and Planners P.C. Fargo, N.D. 1981.
- Associate, Mutchler and Lynch Associates Architects and Planners P.C. Fargo, N.D. 1979.
- Job Captain, Mutchler and Lynch Associates Architects and Planners P.C. Fargo, N.D. 1977-1978.

Research and Teaching Interests:

- Historical Development of Light Wood Framing and Associated Systems
- Information Integration as Enabling Technology for Systems Integration
- Affordable Housing Design and Construction
- Progressive-Era Town Design and Planning
- Organic and Inorganic Structures in Physical Planning and Urban Design
- Organic and Inorganic Structures in Ornament and Architectural Space

Honors and Awards:

National Awards:

- 2003 NCARB Prize for Creative Integration of Practice in the Academy. Award from the National Council of Architecture Registration Boards for "The Art of Integration/The Science of Building." Project leaders, Robert Schubert, Robert Dunay, Michael Ellis.
- Honorable mention for "Raymond Unwin, John Nolen and the Garden City Design Principles" awarded by the Architectural Research Center Consortium in the Conference Paper Competition at the ARCC 2003 Annual Meeting in Phoenix, Arizona.
- Nolen Scholarship award, Rare Book and Manuscript Division, Kroch Memorial Library, Cornell University, 2000.
- National Notable Documents Award, American Library Association: O'Brien, M., with Johnson, B., "Safer Places: A Crime Prevention Through Environmental Design Tutorial" Interactive CD ROM tutorial first printing published by The Virginia Department of Criminal Justice Services. One of two Virginia publications recognized in 1997

University and College Awards

- 2007 Creative Achievement Award, College of Architecture and Urban Studies.
- 2007 Excellence in Teaching Award, College of Architecture and Urban Studies, University Certificate.
- 2006 Wine Award Nominee, College of Architecture and Urban Studies. One of 9 finalists drawn from the 2,706 faculty.
- 2006 Excellence in Outreach Award, College of Architecture and Urban Studies, Virginia Tech Solar House 2006. Project team led by Robert Dunay, Joe Wheeler, Robert Schubert, Michael Ellis.
- 2006 Excellence in Teaching Award, Myers-Lawson School of Construction, Department of Building Construction.
- 2003 XCaliber Team Award. Member of "The Art of Integration/The Science of Building." Project team led by, Robert Schubert, Robert Dunay, Michael Ellis awarded by Virginia Polytechnic Institute and State University
- Distinguished Scholarship Award, College of Architecture and Urban Studies, Virginia Tech. 2000.
- Certificate of teaching excellence, College of Architecture and Urban Studies, Virginia Tech. 1992

American Institute of Architects Component Awards

- Merit award, Unitarian Universalist Fellowship of the New River Valley as an Associated Architect with James Ritter FAIA. Constructed in1991, honored by the Northern Virginia Chapter of the American Institute of Architects in 1992.
- Merit award, The Upper Nine, Fargo, N.D. Project architect, Twichell, Thompsen, Martens, O'Brien. Constructed in 1985 - 87, honored by the North Dakota Chapter of the American Institute of Architects in 1988.
- Merit award, The Casselton State Bank, Casselton, N.D. Project designer, Mutchler, Twichell, and Lynch. Constructed in 1978, honored by the North Dakota Chapter of the American Institute of Architects and with publication in the American Institute of Architects Journal in 1980.

Funded Research Projects:

Principle Investigator or Co-Principle Investigator

- Co-Principle Investigator with Tom Martin, Electrical and Computer Engineering; Ed Dorsa, Industrial Design; Ron Kemnitzer, Industrial Design, Eloise Coupey, Marketing, "Interdisciplinary Research in Pervasive Computing" Awarded by The Institute for Critical Technology and Applied Science, Virginia Tech, 2007-2008, $80,000.00.
- Co-Principle Investigator with Tom Martin, Electrical and Computer Engineering; Ed Dorsa, Industrial Design; Ron Kemnitzer, Industrial Design, "Intersections between Pervasive Computing and Construction Safety" Awarded by The Center for Innovation in Construction Safety and Health, Virginia Tech, 2007-2008, $5,000.00.
- Co-Principle Investigator with Tom Martin, Electrical and Computer Engineering; Ed Dorsa, Industrial Design; Ron Kemnitzer, Industrial Design, Francis Quek, Computer Science; Ivica Ico Bukvic, Music., "Interdisciplinary Study Group" Awarded by The Center for Excellence in Undergraduate Education, Virginia Tech, 2006-2007, $1,800.00
- O'Brien, M., Bowles, L., "PATH 13 Whole House Calculator" Awarded by the Department of Housing and Urban Development, 2005, Washington, D.C. $229,350.00.
- Wakefield, R., O'Brien, M.,"Designing Whole House Solutions" Awarded by the Department of Housing and Urban Development, 2003, Washington, D.C. $249,941.00.
- Mills, T., Wakefield, R., O'Brien, M. "Industrializing the Residential Construction Site Phase V, Virtual Manufacturing." Awarded by the Department of Housing and Urban Development, 2003, Washington, D.C. $207,277.00. Addendum - additional tasks added Sept. 2004 increasing total project to $449,277.00

- Wakefield, R., O'Brien, M. with Newport Partners LLC, "Creating Whole House Solutions" Awarded by the National Science Foundation, PATH-9, 2003, Washington, D.C. Subcontract value $99,741.00.
- Co-Principal Investigator with Prof. Yvan Beliveau, Prof. Ron Wakefield, Department of Building Construction, Prof. Ted Koebel, Virginia Housing Research Center, Proposal establishing "The Building Technology Research Consortium" (VT, Michigan State, Arizona State) to conduct housing research for the Office of Policy and Research, United States Department of Housing and Urban Development. Awarded as an Indefininte Quantity Contract budgeted at fifty million dollars over three years.
- Wakefield, R., O'Brien, M., Beliveau, Y., "Industrializing the Residential Construction Site Phase IV Simulation Systems." August 2002 – August 2003. Department of Housing and Urban Development, Washington, D.C. $175,000.00.
- Mills, T., Wakefield, R., O'Brien, M., "Residential Construction Information Mechanisms and Procedures" Department of Housing and Urban Development, Washington, D.C. $172,500.00.
- Wakefield, R., O'Brien, M., Beliveau, Y., "Industrializing the Residential Construction Site Phase III, Production Systems." August 2001 – August 2002. Department of Housing and Urban Development, Washington, D.C. $249,909.00.
- Wakefield, R., O'Brien, M., Beliveau, Y., "Industrializing the Residential Construction Site Phase II, Information Modeling." June 2000 – June 2001. Department of Housing and Urban Development, Washington, D.C. $249,680.00.
- O'Brien, M., Wakefield, R., Beliveau, Y., "Industrializing the Residential Construction Site." June 1999 – June 2000. Department of Housing and Urban Development, Washington, D.C. $199,447.00.
- Koebel, C. T., O'Brien, M., Beliveau, Y., Easterling, W. S. Dolan, D., "Research Services for Building Regulations and Technology" Indefinite Quantity Contract signed December 1998 extending to December 2003. Funding level minimum $200,000.00 maximum $8,000,000.00.
- O'Brien, M., with Johnson, B., "Safer Places: A Crime Prevention Through Environmental Design Tutorial" August 1995 – August 1996. The Virginia Department of Criminal Justice Services. $98,204.
- . O'Brien, M., with Gilboy, E., Landes, B., "Family Resource Center Preliminary Planning" October 1994 – February 1995. $427.00.
- O'Brien, M., with Gaddis, V., "Diversified Applications of Modular Construction Processes" September 1989 – March 1990. Nationwide Homes, Inc. $3,583.00.
- O'Brien, M., with Tenace, S., Wall, M., Kostelecky, S., "New Prototypes for Starter Housing" November 1987 – June 1988. Nationwide Homes, Inc. $7,500.00.

Contributions to sponsored programs as consulting investigator:

- "Review of International Housing Technology Research" Koebel, C. T., Wakefield, R., Beliveau, Y August 2001 - January 2002, Department of Housing and Urban Development, Washington, D.C. $79,931.00.
- "Feasibility study for the Center for Advanced Housing Structural Systems" August 1997 - August 1998, Center For Innovative Technology, Arlington, VA $25,000.00. Principal Investigators Dr. Dan Dolan, Wood Science, Dr. Yvan Beliveau, Building Construction. Authored chapters on housing systems history, information technology for housing, systems integration for housing. Authored education chapter forming housing concentrations in Civil Engineering, Mechanical Engineering, Architecture and cross-disciplinary housing degree program.
- "Integrated Building Design Experience" Funded by the National Science Foundation through project SUCCEED, VT # 98-0879-01 $65,446.00 Principal Investigator, Dr. Sam Easterling, Civil Engineering, Co-Principal Investigator, Dr. Maurice White, Wood Science & Forest Products. July 1, 1997 to June 30 1998.

- "Web based C.P.T.E.D. tools and training" Virginia Department of Criminal Justice Services, Richmond, Va. July 1997 - July 1998. $78,000.00. Principal Investigator Diane Zahm, Urban Affairs and Planning.
- "Health Care applications for Crime Prevention through Environmental Design Charrettes" Virginia Department of Criminal Justice Services, Richmond, Va. October 1996 - July 1997. $88,000.00. Principal Investigator Diane Zahm, Urban Affairs and Planning.
- "Survey of Continuing Education Needs in Housing" Funded by REACH OUT, Virginia Tech Division for Outreach, $7,500.00. Principal investigator Dr. J.D. Dolan, Wood Science & Forest Products, January 1998 - June 1998. Developed contact list and questions for architects to be surveyed, developed cross - platform database, input forms, report forms for tabulating returns.

Total P.I. co P.I. and contributing $2,615,236.00

Curatorships, Editorships:

- Co-Curator with Michael Harrison "Wood – An American Tradition" National Building Museum, Washington D.C. September, 2000 through April 2001. This exhibition was budgeted at $315,000.00, sponsored by the Society of American Forestors and occupied over 7,000 square feet of space in the National Building Museum. The exhibition was open to the public from September, 2000 to April, 2001. Over 40,000 people attended this exhibition placing it as the 4th highest attendance in the history of the National Building Museum. This exhibition was co-curated by Michael Harrison staff curator for the National Building Museum.
- Editor, Proceedings of the Twenty-fifth annual research meeting of the Architectural Research Centers Consortium Inc.

Publications:

- Mills, Thomas, Wakefield, R. O'Brien, M. "Industrializing Residential Construction for Small to Medium Size U.S. Homebuilders." Chapter 4 in "CRC Construction Innovation: Building Our Future. Brown, Hampson, Brandon, ed. CRC, Brisbane, AUS, 2006. Pp 25-29.
- O'Brien, M., Wakefield, R., Nowak, M., 2005, "A Preliminary Method to Develop a Calculator for Evaluating Physical Design Characteristics and Whole House Performance Scoring " U.S. Department of Housing and Urban Development, Office of Policy Development and Research, Washington D.C. 42 pages.
- O'Brien, M., Wakefield, R., 2004, "Industrializing the Residential Construction Site Phase Four, Simulation Systems" U.S. Department of Housing and Urban Development, Office of Policy Development and Research, Washington D.C. 64 pages.
- O'Brien, M., Wakefield, R., Beliveau, Y. 2002, "Industrializing the Residential Construction Site Phase Three, Production Systems" U.S. Department of Housing and Urban Development, Office of Policy Development and Research, Washington D.C. 69 pages.
- Wakefield, R., M. O'Brien, Y. Beliveau, 2001, "Industrializing the Residential Construction Site Phase Two: Information Modeling" U.S. Department of Housing and Urban Development, Office of Policy Development and Research, Washington D.C. 77 pages.
- O'Brien, M., Wakefield, R., Beliveau, Y., 2000, "Industrializing the Residential Construction Site" U.S. Department of Housing and Urban Development, Office of Policy Development and Research, Washington D.C. 87 pages.

Papers in Refereed Proceedings:

- Michael O'Brien, Ron Wakefield, "Considering the Whole, Developing a Whole-House Calculator" Published in CD-ROM proceedings of the Architectural Research Centers Consortium Spring Research Meeting "Green Challenges in Research, Practice and Design Education" University of Oregon, Eugene, 2007, pages 1-8 under "OBrien, M." link.

- O'Brien, M., Wakefield, R., 2003, "A Preliminary Method for Evaluating Physical Design Characteristics and Whole House Performance Scoring", presented to the National Science Foundation at the Housing Research Agenda Workshop, February, 2004. Volume II pp. 290 - 298. Published at http://www.pathnet.org/sp.asp?id=12201.
- O'Brien, M., Martin, C., "Building the 'whole house'greater than the sum of its parts: The whole house and systems integration focus area summary" Proceedings of the National Science Foundation Housing Research Agenda Workshop, February, 2004. Volume I pp. 77 - 88. Published at http://www.pathnet.org/sp.asp?id=12201.
- O'Brien, M.. Raymond Unwin, John Nolen and the American Garden City Principles. Presented to the inaugural research symposium of the College of Architecture and Urban Studies. To be published in the proceedings, publication date not announced.
- O'Brien, M., "Raymond Unwin, John Nolen and the Garden City Principles" Published in the proceedings of the annual Spring Research Conference of the Architectural Research Centers Consortium "Stimulating Research" April 2003, Arizona State University. PDF index "O"Brien" pp. 1-13.
- Gebken, R, Wakefield, R and M. O'Brien, "Process and Information Mapping in the Construction Industry: A Residential Case Study" Presented to the XXX IAHS World Congress on Housing, University of Coimbra, Portugal, September 9-13, 2002. Published in Proceedings V.3, pp 1193 – 1201.
- Wakefield, R. and M. O'Brien, "Information and Systems Integration for Residential Construction" presented at the 1st. International Conference on Innovation in Architecture, Engineering and Construction (AEC) Loughborough University, UK, July 18-20 2001(proceedings in press).
- O'Brien, M "The Five Ages of Wood" presented to the Society for Wood Science and Technology at the SWST Annual Meeting, Lake Tahoe, NV, June, 2000. Published in the Proceedings pp. 1 – 6.
- O'Brien, M "A Brief History of Systems Additions and Material Innovations in the Light Frame House" Presented to the International Science and Technology Meeting of the ACSA, CIB, ARCC, SBSE, Montreal, Canada, 1999, Proceedings p. 235 - 240.
- Weiner F. and M. O'Brien, "Sweet Tectonic" presented at the Northeast Regional ACSA Conference, University of Michigan, Ann Arbor, MI Nov. 4 2000. Published in proceedings pp 131 - 137.
- O'Brien, M. "Homeless Transitional Living Center" Presented to the Spring Research Conference, Architectural Research Centers Consortium, April 1997, Atlanta, GA. Abstract published in Proceedings p.188.
- Davis, A. and M. O'Brien, "The Re-presentation of Designed Technical Courses" Presented to the annual ACSA technology conference, Seattle Wa. 1995. Published in proceedings.
- O'Brien, M., "New Prototypes for Starter Housing - A Model for Public / Private Partnership" Accepted at the XX I.A.H.S. World Congress on Housing, Birmingham England for presentation and publication in Proceedings page 406 - 415, Sept. 21 - 25, 1992.
- O'Brien, M., "Design Innovations in Affordable Housing" International Association on Housing Science XIX I.A.H.S. World Congress on Housing. Presented at the Congress in Ales, France in Sept. 1991, Proceedings Volume 3 "Annexes" p. 13 - 23.

Publications in Popular Press and Professional Journals:

- "Failing Grade" Interviewed by Bruce Nolan as a Building Culture expert on the subject of the origins and diffusion of slab-on-grade construction in the U.S. Published 10-25-06 in the New Orleans Newspaper, The Times Picayune.
- HUD PD&R "Homebuilding Industry Slowed by Old Fashioned Processes." An overview of Phase I through Phase IV of Industrializing the Residential Construction Site" Published in "Research Works" a monthly publication from HUD's Office of Policy Development and Research. October 2005 pp. 6-7.

- O'Brien, M., with Johnson, B.,"Safer Places: A Crime Prevention Through Environmental Design Tutorial" Interactive CD ROM tutorial first printing published by The Virginia Department of Criminal Justice Services in 1995. Second printing in 1997, Third printing 2000.
- O'Brien, M, with Tenace, S, Wall, M, Kostelecky, T., "New Prototypes for Starter Housing" INFORM magazine, 1996 vol. 1 p.19.
- Post, Nadine M. "Oklahoma Blast forces unsettling design questions" Featuring our work on the Safer Places interactive CD ROM, Engineering News Record, May 1. 1995 p. 10 - 26.
- Arcidi, Phillip, "Nationwide Homes: A Factory Built Prototype" Featuring in the B1 Prototype affordable house developed by Steve Tenace and myself. Progressive Architecture, August 1992, pp. 76.
- Canty, Donald, "State of the Art" featuring my renovation of the Casselton State Bank AIA Jounal Mid-May 1981. p 138 - 139.

Additional Presentations at Professional Meetings:

- O'Brien, M., "Maintaining 'House' in Affordable Housing" Presented to Governors Conference on Housing, Phoenix, Arizona, April 1996.

Invited Presentations:

- Invited Keynote Speaker, "Weighting the Whole: Development of System Weighting Factors for the Whole House Calculator", IAHS 35th World Congress on Housing held September 4-6 2007 at the Royal Melbourne Institute of Technology, Melbourne, Austriailia.
- Invited to present "What Lies Beneath; Form and Structure" to the students and faculty at the College of Architecture, Planning and Design, Kansas State University, February 2007.
- Invited to consult on constructability, production planning, design and safety issues for Extreme Makeover - Home Edition, Crawford House episode, broadcast 2.12.06.
- Invited to present my professional work and research to the students and faculty at the department of architecture, The Penn State University, January 2004.
- Invited to present "Structure, Form, Ornament" to the students and faculty at the School of architecture, University of Illinois, Urbana, February, 2004.
- Invited to be an "on camera" expert for "Modern Marvels - The House" hosted by Ron Hazelton, broadcast on the Discovery Channel, October 15, 2001. Provided research materials, script points on historical origins and contemporary uses of materials, tools and processes used in the typical light wood frame house.
- O'Brien, M., "The Case for Research Literacy in Architecture" Presented to the 89th Annual ACSA meeting, Baltimore, MD. March, 2001.
- O'Brien, M "The Five Ages of Wood" Plenary Session One. Society for Wood Science and Technology Annual Meeting, Lake Tahoe, NV, June, 2000.
- O'Brien, M., "Research and the Future of Architectural Education" Presented to the 87th Annual ACSA meeting, Minneapolis, MN. March, 1999.
- O'Brien, M., "The Role of Limited Design-Build Activities in Technical Curricula" at the 1997 ACSA Technology Institute in San Fransisco CA, July, 1997.

Teaching Summary:

Department of Building Construction, (typical semester teaching load) August 2005-present

- BC 4444-ARCH 3016 Integrative Practice-Design Build Capstone Studio
- BC 1214-1224 Introduction to Building Construction
- BC 5984 History of Construction
- BC 3116 Building Cultures

Professional Programs in Architecture (typical semester teaching load): 2003 to 2005:

- Architecture 3045-3046 Building Assemblies
- Architecture 3015-3016 Architecture III Design Studio
- Architecture 4214-5134 Topics in History & Theory: Ornament and Architecture

Graduate Architecture Program (typical semester teaching load): 1987 - 2003:
- Architecture 4765-4766: Building Technology
- Architecture 5515-5516: Architecture and Systems Laboratory
- Architecture 5134-4134: Housing and Affordability
- Architecture 5994 Research and Thesis

Adult and Continuing Education Courses:
Indoor Air Quality and Durability
- "20th Century Homes on the Brink of Disaster? The Science of Moisture: Damage and Control" A seven-hour continuing education program developed with Professor Joe Laforski, Department of Wood Sciences and Forest Products, Virginia Tech prepared for the Virginia Home Inspectors Association, Roanoke, Virginia, February 10, 2007.
- "Center for Integrated Systems in Housing (CISH) Seminar" Simpson Strong Tie, San Leandro, CA. Seminar co-presented with Prof. Dan Dolan, Prof. Yvan Beliveau. September 1998.

Crime Prevention Through Environmental Design
- Continuing education session with Dr. Diane Zahm for Certification as Crime Prevention Specialists, "Crime Prevention and the architectural design process" Norfolk, VA. May, 1996
- Presentation with Dr. Diane Zahm to Virginia Crime Prevention Association "Safer Places - an interactive approach to Crime Prevention through Environmental Design Teaching" Richmond, VA. March, 1996
- Presentation with Dr. Diane Zahm to Renaissance 2000, a Commonwealth gathering of law enforcement leaders. Presented "Safer Places - an interactive approach to Crime Prevention through Environmental Design" Richmond, VA. April, 1996
- Presentation with Dr. Diane Zahm to the annual meeting of Crime Prevention Trainers. Presented "Safer Places - an interactive approach to Crime Prevention through Environmental Design" Blacksburg, VA. April, 1996

Professional Memberships:
- President Architecture Research Centers Consortium 2000 - 2002
- Executive Board Member, Architecture Research Centers Consortium 1996 - 2000
- Tau Sigma Delta, Architecture Honor Society 1993
- Blue Key, National Honor Society 1976

Professional and Academic Service:

Service to an Academic Institution or Professional Association:
- Invited Lecturer: "Some Assembly Required - A History of Residential Prefabrication" presented to the Virginia Center for Architecture, September 25, 2007.
- Keynote Speaker, Member of the Scientific Committee, International Association of Housing Science, XXXV World Congress on Housing to convene September 2007, Melbourne, Australia
- External Reviewer, Kent State University, Department of Architecture, Promotion and Tenure Committee 2006.
- External Reviewer, Mississippi State University, College of Architecture, Promotion and Tenure Committee 2006.
- Co-Chair with Dr. Carlos Martin, "NSF Housing Research Agenda Workshop - Whole House and Systems Interactions". Session Co-Chair, scheduled for February 2004.
- Developed online database of artifacts contained in the Sullivan Collection for Southern Illinois University – Edwardsville Campus.
- External Reviewer, State University of New York at Buffalo, Department of Architecture, Promotion and Tenure Committee 2003.

- Chair, 2002 Design Awards Jury for the West Virginia Society of the American Institute of Architects. Responsible for selecting additional jury members David Salmela, FAIA, David Diamond, AIA and Robert Gerloff, AIA. Responsible for documentation and presentation of jury critique and for presentation of Honor Award, Merit Awards, and Special Citation at WVAIA Annual Meeting, November 2002.
- External Reviewer, North Dakota State University, Department of Architecture, Promotion and Tenure Committee 2002.
- Presented lecture "The Neighborhoods of John Nolen" to attendees of "Building Virginia" the Virginia Society of the American Institute of Architects annual meeting, Richmond, VA, 2001.
- External Reviewer, Texas A&M University, Department of Architecture, Promotion and Tenure Committee 2000.
- President, Architectural Research Centers Consortium (ARCC) 2000 - 2001.
- Co Chair, with Professor James Jones, the annual Spring Research Meeting of the Architectural Research Centers Consortium, Virginia Tech, Blacksburg, VA April, 2001.
- Technical Referee, Architectural Research Centers Consortium joint conference with the European Association of Architecture Educators, Paris, Fr. July 2000.
- Member of the Board of Directors, Architectural Research Centers Consortium (ARCC) 1997 - 2001.
- Invited Moderator: Session IV Internationl meeting of ARCC, Raleigh, NC. April, 1998.
- External Reviewer, Catholic University, Department of Architecture, Promotion and Tenure Committee 1998.
- Co - Chair, National Association of Homebuilders Research Consortium, Virginia Tech, 1992 - 1994
- Chair, Technical Session 12, "Local Communities in Housing Development and Management" XX World Congress on Housing, Birmingham, England, 1992
- Judge & presenter for the annual Townscape Civic Beautification Awards, Blacksburg, Virginia, 1992.
- Presented lecture "Theory in Practice: The Architecture of Herman Hertzberger" to attendees of "Building Virginia" the Virginia Society of the American Institute of Architects annual meeting, Richmond, VA, 1991.

Manuscripts and grant proposals reviewed:

- A.S.P.I.R.E.S. (A Support Program for Innovative Research Strategies) proposal review team 1996 - 1997, 1998 - 1999, 1999-2000. The A.S.P.I.R.E.S. program is a Virginia Tech program that makes grants to faculty for the purpose of enhancing research capability. As a member of the review teams we read, critique, and rank approximately 26 proposals annually for award by the Division of Research and Graduate Studies.

Virginia Tech Committees and Commisssion Service:

- Deans Search Committee for the College of Architecture and Urban Studies 2006.
- University Academic Advisory Committee for update to University Strategic Plan 2005.
- Provost Committee on University Restructuring 2002.
- Peer assessment review group member for Dean John Eaton of the Graduate School 1997-1998.
- University Strategic Planning and Budgeting Committee 1997-1998.
- Commission on Graduate Studies C.A.U.S. Representative, 1989-1993.
- Course Program Criteria Committee - Chair 1990-1992.
- Graduate School Scholarship Committee, 1991-1992.
- Faculty Senate Representative, 1992-1993.
- Faculty Senate Cabinet, 1992-1993.
- Faculty Affairs Committee, 1992-1993.
- Commission on Research, 1992-1993.
- Honor Board, Judicial Panel, 1991.

- Course Program Criteria Committee, 1989.

College of Architecture and Urban Studies Committee Service:

- Promotion and Tenure CAUS 2005-2009.
- Diversity Committee CAUS 2005-2007.
- Honorifics Committee CAUS 2003-2004.
- Honorifics Committee CAUS 2000-2002.
- Deans Search Committee CAUS 1996-1997.
- Landscape Architecture Peer Review Committee, 1995-1996.
- Environmental Design and Planning Committee, 1994-1996.
- Curriculum Committee, 1991-1993.
- Research and Extension Committee, 1991-2002.
- Community Design Center Advisory Board, 1991-1995.
- Master of Science Advisory Committee, 1991-2003.
- C.A.U.S. 25th Anniversary Steering Committee, 1988-1990.
- C.A.U.S. 25th Anniv. Structure Subcommittee, 1988-1990.

Myers-Lawson School of Construction Committees

- Executive Committee 2005-2007
- Faculty Search Committee 2006-2007
- Honorifics Committee 2006-2007

Department of Building Construction Committees

- Peer Review Committee Member 2006-2007.
- Honorifics - Student Awards and Scholarship Committee 2006-2007

Department of Architecture Committees

- Architecture Peer Review Committee Member 2001-2003.
- Environmental Building Systems Position Search Chair 2000-2001.
- Lathrop Professorship Screening Committee, 2000.
- Architecture & Building Construction peer review committee 1998-2000.

Listing of Thesis projects and Project & Reports Directed

2008 - Architecture

Ashfaw, Belilta — Urban Design in Earth, a Marketplace in Algeria

2007 - Building Construction

Baughman, Angie — Communications Chains and Project Settlements

2007 Architecture

Doan, Patrick — Margins of Engagement, a Montessori School for Houston. Outstanding Thesis Award

Rustenbach, Cristine Potomac Boathouse

Kim, Naun — School for Art and Design, Seoul, Korea.

2006 - Building Construction

Apechong, Ama — Building a Culture of Safety in Ghana

2006 Architecture

Cornell, Rebecca — Aquarium Complex for Portland Maine.

2005 - Building Construction

Edwards, Britni — Increasing Diversity in a Construction Education Program: An Action Plan for the Virginia Tech School of Construction.

2005 Architecture

Wheeler, Sean — Modular Infill, Richmond, VA., Pella Finalist

Graham, Andrew — Neighborhood Center, Roanoke, VA

Macomber, Brittany Mixed-Use Development, NC Production Techniques, Roanoke

Garrity, Alexandra — Urban Center for Art and Music, Pittsburgh, Pella Finalist

Ganey, John	Multi-Use facility, Weaving Space, Atlanta
Frazier, Casey	Re-Settling Place, Pella Prize for Undergraduate Thesis
McInerney, Sarah	Red Wall: A Study of Place Making. Infill housing in the historic Oregon Hill Neighborhood of Richmond, VA.
2004	
Snider, David	Architecture is Life, Life is Architecture. A proposal for a self-build system of housing and recreation buildings for a summer camp, Fairmont, WV.
2003	
Lindsay, Robert	Separation: Artisan Compound on Brush Mountain, Virginia
George Blume	Blue Bonnet Retreat in the Texas Hill Country
Hudson, Derek	The Making of Water, Stone and Light, A Thermal Bath for Eggleston, Virginia
Blanchard, Kelly	Plane and Surface; Urban Infill in the Fan District, Richmond, Virginia
2002	
Arnold, Jessica	Concealing Mechanism; The O. Winston Link Museum at the Norfolk and Western Railroad Terminal, Roanoke Virginia.
Hall, Andrea	Plane and Line, Spatial Layering in Housing, Charlottesville, Virginia
Paulette, Amanda	Neighborhood Reconstructed; DOD base housing in Norfolk, Virginia
2001	
Hilary, Alice	Requiem, A Chapel for Blacksburg, Virginia
Queen, Andrew	Revealing Elements; a Library for Montgomery County
2000	
Gaddis, Valerie	Place Bounded by Circle; a Hospice
Gardoni, Roberto	Approaching Architecture; a Museum for Flight at Cape Hatteras
Mahajan, Pankaj	Space, Working and Living; a mixed use proposal for Roanoke
Oesch, Harold, F.	Towards Re-generative Environmental Design; a low impact house
Sung, Li-Wen	Grid Structure and Space; an addition to Cowgill Hall
Targutay, Toygar	Intermediary of Opposites; a Turkish Embassy for Washington, D.C
Tseng, Hui-Minh	Reality and Imagination; a Place for Blacksburg
Waltz, Chris	At the Waters Edge; the Grid in Coastal Construction
Xu, Jun	Transitions: The design of a courthouse
1999	
Fredrickson, K.	Creating Life in an Urban Space; Mixed use on Main Street
Patel, Kartikay	Inspiration to Illumination
Richards, Bradley	James River Nature Center: a study of context and concept
Rogers, Robin	An Appalachian House; the design and analysis of a solar house
Simino, Sarah	Thoughts on Architecture; a mixed use infill for Blacksburg
Sterne, Christie	Places of the Earth, a Cultural Center for Zimbabwe
1998	
Arnold, Colin	An architectural intervention to the Corcoran Gallery of Art
Flannigan, K.	The Warp and the Weft of Fries, Virginia
Martin, Julia	Appreciating Coincidence
Scofield, Sarah	Threshold; Intermediary Place
Spetsaris, Tony	Structure for Habitation
1997	
Kazebee, Rick	Process of Building; a School in Suburbia
Harris-Amodeo, K.	A House on St. Croix
Weinheimer, John	A place of our own, infill townhouses in Pittsburgh
1996	
Allgair, Peggy	House in Ticino

Conen, Ute	Entrance = Eingang
Ganey, Sean	Life on the Streets; Rebuilding Community in America's Cities
Lacher, Kria	Blenco Glass Gallery
1995	
Mingin, Wendy	Two Projects, a Comparative Study of Housing
Sheppard, Dave	Armstrong Cork Factory adaptive re-use
1994	
Breitschmid, M.	Architecture as a creative will in the a-tectonic aesthetic order : (an architecture-theoretical inquiry according to Friedrich Nietzsche's concept of order)
Conrad, Patricia	A Proposal for a House
Craig, Phil	An Oceanographic Research Laboratory
Goodling, Todd	Compression and Release, Enclosure and Transparency
1993	
Jenkins, Chris	Chapel in Southwest Virginia Tech
Grier, Sarah	Time Rendered Form
Malgliolio, Joseph	An Exploration of Architectural Process in an Audubon Building
Tarman, Scott	Constructive Clarity in a Fire Station
1992	
Dean, Craig	Form and Order; Investigations into Architecture +the Architectural
Light, Barry	An Act of Making Form; an addition to Cowgill Hall
Mott, Jennifer	Putting the pieces together : the parts and the whole of student housing, Lexington, VA.
Ulbrich, Brian	An Assemblage of Parts
1991	
McCall, Ronald	Transformation; a Change of Order and the Growth of Form
Tiecher, Peter	Contextual Variations
Varner, Steve	Student Housing
Wall, Marie	A Conversation
Welch, Sara	Between Solid and Void
Zirkle, Don	Integral pieces : an elemental approach to architecture
1990	
Morphew, Kirk	Dialectic
Yue, Sam	Developing a dialogue between old and new : North Carolina University Center for Art and Architecture

Thesis Advisory Committee membership, masters and doctoral candidates

2008 Building Construction	
Shell, Brandon	Moisture Protection Systems Application Failure
Rigby, Ellie	Sustainable Products for Historic Preservation
2008 Architecture	
Delgado, Christina	Life between Walls, Urban infill Daylight Strategies
Yun, Gal	Micro-Housing
2005	
Olbina, Svetlana	Decision Making Framework for the Selection and Design of Shading Devices. Ph.D. Awarded 2005.
Hopkins, Steven	Acts of Liturgy, a proposal for a Catholic Church in Blacksburg, VA.

2004	
Starkey, Jennifer	House of Screens, A proposal for residential development in active agricultural production fields
VanGilder, Joyce	Promenade down the Slope. A riverside multi-use proposal for Fairmont WV.
Nossen, Patricia	S+M=L. A proposal for convertible apartment infrastructures on Chicago's South Side.
Wang, Mian	Urban Frame. A Convention Center for Colombia, South Carolina.
2003	
Ali, Ahmed	Silence, Darkness and Light: The Grand Egyptian Museum.
2002	
Cosco, Phillip	Primitive and Modern Space in Observatories, Fairmont, WV.
Jones, Emma	Lessons from Place, A House on Caicos Island
Christopher, Todd	Zoomorphic Form; Mariners Museum for Wilmington, N.C.
Tarel, Tracey	The In-Between; Transitional multi-use infill for Blacksburg, VA.
Bushnaq, Dawn	Construction and Intuition: A House in Ellett Valley, VA
Nossen, Patricia	Transforming Place, Adaptive Apartment Housing in Chicago, IL.
Brown, Marcus	Color, Light and Room; a Museum for Rothko, Blacksburg, VA.
2001	
Miller, Bill	Martin Luther King Memorial: What do these stones mean to you?
Organsky, Jennifer	Along the Rivers Edge: A Bed and Breakfast Residence
2000	
Abdul-Hassan, N.	Mixed use development for Kuwait City, Kuwait
Del Castillo, Jorge	Habitable Walls, Courtyard Homes in Urban Places
Bengel, Karen	Sensual Architecture: Project for a Thermal Bath at Warm Springs
Cundiff, Derek	Mediation: A replacement elementary school for Roanoke, VA.
Ebert, Doreen	4 walls +: Urban Infill Housing, Roanoke, VA.
Kubo, Atsuko	Between Synergy and Synesthesia: Mixed use development for Hakodate, Hokkaido, Japan
Li, Xin	A Library for Blacksburg, VA.
Pressick, Garrett	Transparency: A Martime Museum for Norfolk, VA.
Kang, Jennifer	Waltz on the Seine: A sculpture Gallery for Paris.
1999	
Bingham, David	Response to the Sun: Passive Solar Design Strategies
Faulring, Lynn	The Remains of a Place: Adaptive Re-Use of an Historic Warehouse.
Flick, Don	Intrinsics: An Exploration in Tectonic Expression - A Montessori School
Gehringer, Paul	Transformations: An Arts Center for Narrows, Virginia.
Harvey, John	Transparency in the Urban Context: a study on the complexity of transparent pieces. Mixed Use Development for McKeesport, PA.
Smith, Colin	Brush Mountain Ranger Station An Exploration of Structure
Strandberg, David	Potters House, Blacksburg, VA.
Toth, Alice	A Thread of Continuity: New Construction in Historic Contexts.
Tyupkina, Maryana	Learning in Architecture: Mixed Use Development in Blacksburg, VA.
Lugo, Mayte	Architecture as a Transition Space: Entertainment Complex for Blacksburg, VA.
Mayfield, Jeff	Newport Sanctuary and Community Center.
Zhu, Qi	A Discussion of Two Design Approaches in Architecture

1998

Dubbs, Benedict	The Making of the In-between: A Rowing Club in Philadelphia.
Fleming, Jonathan	Descendents: Research in Architecture: An Addition to Michelangelo's Luarentian Library
Freeman, Phillip	Residing: House on a Mountain Plateau.
Latulippe, Michael	An Architecture of a wall: Infill Townhouses
Lee, Sung, Ju	Layers for communition : low-rise, high density apartments in-between urban and suburban
Malofiy, Michael	Order and Flexibility: their coexistence as architectural principle: High Density Low Rise Housing
Massey, William	Bay House and Related Projects
Sakimoto, Hideki	Relations: A Center for International Students, Blacksburg, VA.
Swappach, Andrea	A Projection of Space in Reality and Virtuality: A Museum for Film in Kihl, Germany
1997	
Curd, Dwayne	An architecture between zero and one: Meditation Center in Montgomery County.
Foster, Kendall	Dialog between opposites
Hannaway, Timothy	Seeing, Feeling, Remembering: The Making of an Appalachian Place.
Haverstic, Lindell	The Substantive: A Dormitory Facility for a Private College.
James, Geoff,	Cross-Cultural Exchange and The Infinite Place: A Postal Facility for Pembroke, VA.
Kredell, Steve	Seeing Through a Wall: A Mixed Use Facility for the Corporate Research Center.
Margarella, Jonah	Festival art Gallery: Exhibition Space for the People of Baltimore
Martinez, Yamilette	Findings: Relationships of old and new, past and present
Mendez, Clarissa,	Of Surface and Shadow. Proposal for a new School of Architecture, San Juan, PR.
Posten, Steve	Place in the middle landscape: A City Center for Christiansburg, VA.
Wolf, Bettina	Revealing Essence
1996	
Flueckiger, Urs	Premanufactured housing, or, Living in 6 1/2 ounces of pure architecture
Schmiedke, Brad	Distillation: A Family Compound in Floyd, VA.
Simmons, Katrina	Evolving with the Sun.
1995	
Bieker, Louis	Somewhere between place and direction: Housing for Stuart, VA.
Ficken, Heidi	Designing for Community
Parola, Patricia	Settings to Live: High Density Low Rise Housing for Washington D.C.
Stallings, Brad	Station points : a place in the world
1994	
Bond, Easom	A House of Many Rooms.
McManus, Joe	Unbuilding architecture : a non-normative exploration
Michelmann, R.	Design within an urban frame : a school for palimpsest Alexandria, Virginia
Oakley, Glenn	Fragment to foundation : photographic observation and tonal drawing as a point of beginning for architectural design
Spencer, Ned	The Sacred Way: A Cathedral for Virginia Beach.
Sutton, Jane	Between the Ocean and the Bay.
1993	
Ehmann, Christine	A Dream of the Sacred: Quarry as Meditation Center
Gupta, Smita	From Memory to House.

Perkins, Ann	The franchise gas station : a study of agenda, subtext, and consequence
Tucker, Diane	A town for 3000 people : a high school in Bowie, Maryland
1992	
Husebo, John	The search for a sculptural paradigm : the design of a pedestrian bridge
Kosmal, Gregorz	Function Revisited
Tsai, Binghuan	A museum of nature and science : the shaping of forms
1991	
Brewster, Bill	A Rural Fire-station.
King, James	A Dichotomy of Presence.
Klooster, John	A Room for Man.
Landes, Brenda	The Making of the Pieces.
Liu, Men-Chou	A Library for Crystal Springs.
Murphy, Jack	Hockey Arena for Roanoke
Worrledge, Tom	The Spiral in Architecture: A Church for Blacksburg.
1990	
Bracey, Karen	Implications of tort law on professional liability in the design and construction industries
Cogger, Doug	Four Houses in a Row.
Conrad, Carolyn	A Place Called School.
Gammon, Karen	Stables
Grimm, Ronald	A concert hall for Pittsburgh : responding to Panther Hollow
Huggins, Jeremy	Definition of a threshold
Lettieri, Lisa	The architecture of masts
Marquardt, Vince	Architecture : the making
Nemes, Linda	Relevance of ambiguity
1989	
McKinney, Robert	A movement from fragments to the incomplete
Murphy, John	Material Accommodation: An Ice Arena for Blacksburg
1988	
Masker, Scott	Intention

Doctoral Committee Membership:

Platt, Terry	Department of Wood Science and Forest Products, completed, 2000.
Yun, Ping-Wang	Department of Civil Engineering.
Michael Beaty	Environmental Design & Planning program, Prelims completed 2001.
Sami Al-Masalha	Environmental Design & Planning program, Prelims completed 2003.
Svetlana Olbina	Environmental Design & Planning program, Prelims completed 2003.
Manoj K. Mishra	Environmental Design & Planning program
Qian, Chen	Environmental Design & Planning program, Prelims completed 2006
Victor Quagraine	Environmental Design & Planning program, Prelims completed 2006
Roby Robinson	Environmental Design & Planning program
McCoy, Andrew	Environmental Design & Planning program, Prelims completed 2007

Listing of Completed Professional Commissions:

In Association with James Ritter, Architect

- Fellowship Building & Grounds, Unitarian Universalist Fellowship of the New River Valley, Blacksburg, VA. Associated Architect (design, construction) Constructed 1991.

As Independent Practioner:

- Turtle Lake Cabin, Marcell, Minnesota; restoration, modernization and addition to 1907 log cabin. Project design 1995 project construction 1995 - 2001.

- Griffith residence remodeling, Kingsport, Tennessee; “gut to structure” demolition and reconstruction of 3,800 s.f. house on the Holston River. Project design 1990, construction 1990 - 91.
- Pfieffer addition, Blacksburg, Virginia, family room, bedroom addition to 1940’s residence, constructed 1989.
- O’Brien residence, Blacksburg, Virginia; design and construction of affordable housing prototype. constructed 1989.

As Partner, Twichell, Thompsen, Martens, O’Brien

- St. Andrews Hospital Congregate Housing Bottineau, North Dakota; an adaptive re-use of a 1937 hospital into HUD Section 202 congregate housing. Responsible for physical / financial feasibility, design, construction, construction observation. Constructed in 1986 - 87.
- Rolla Community Hospital remodeling, Rolla North Dakota; remodeling of 1960’s hospital wing from acute care to long term care. Responsible for physical / financial feasibility, schematic design, construction documents. Constructed 1987.
- Interstate Seed Small Business Incubator, Fargo, North Dakota; adaptive re-use of historic industrial complex. Responsible for physical / financial feasibility, schematic design. Constructed 1988.
- R&R apartment complex, West Fargo, North Dakota; a master plan, prototype 20 & 24 unit apartment development and site planning for a 220 unit rental development. Responsible for design, contract documents. Constructed 1986 - 1989.
- Stern Brothers Apartments, Fargo, North Dakota; a four unit infill prototype for the residential core area of Fargo. Schematic design 1986, constructed 1989.
- Park Company Apartments, Fargo, North Dakota; an eight unit infill prototype for the residential core area of Fargo. Schematic design, construction documents 1986, constructed 1986.
- Twichell, Thompsen, Martens, O’Brien offices, Fargo, North Dakota; lease-hold improvements for firms offices. Project designer, project architect. Constructed 1985.
- Upper Nine office condominium, Fargo, North Dakota; Eleven thousand square foot prototype for The Upper Nine mixed-use development. Project Designer, Project Architect. Constructed 1985.
- Upper Nine Residential Condominiums, Fargo, North Dakota; twelve-unit residential cluster development. Project Master Planner, Project Designer, Constructed 1985 - 1987.
- American State Bank & Trust Co. Williston, North Dakota; addition and remodeling to property adjacent to main banking structure. Project designer, project architect, constructed 1984.
- First Bank Fargo remodeling, Fargo, North Dakota; interior remodeling of twenty-two thousand square feet of banking and operations space, analysis, removal and replacement of failed exterior stone cladding. Project designer, project architect, constructed 1982 - 83.
- First Bank Fargo Skyway link, Fargo, North Dakota; linkage of downtown skyway system around and through existing bank structure. Project designer, project architect, constructed 1983.

- The 400, Fargo, North Dakota; adaptive re-use of National Trust landmark building into HUD Section 8 elderly apartments & restaurant. Author of successful nomination to the National Register of Historic Places, design of restaurant. Constructed 1982.
- Pioneer Manor, Fargo, North Dakota; new construction of 46 Elderly apartment units in six story structure. Responsible for project design, constructed 1981.
- St. Aloysius Apartments, Lisbon, North Dakota; adaptive re-use of 1890’s

Listing of Classes Taught and Student evaluations of instruction (on 4.0 scale)

Term — Course Number and Title (G) Graduate course, credit hours (U) Undergraduate course
(no evaluations Spring 07 due to 4.16.07)

Term	Course Number	Title	Responses	Evaluation
2007				
Fall 2007	ARCH 3015	Architecture III Design Studio (24 U)	19	3.60
Fall 2007	ARCH 3045	Building Assemblies	45	3.42
Fall 2007	BC 1214	Building Assemblies	52	3.83
Spr. 2007	BC 1224	Introduction to Building Const. (95 U),	n.a.	n.a.
Spr 2007	BC 3116	Building Cultures (45 U)	n.a.	n.a.
Spr 2007	ARCH 4516	Architecture V, (2 U)	n.a.	n.a.
Spr 2007	ARCH 4524	Thesis Documentation, (2 U)	n.a.	n.a.
Spr 2007	ARCH 5994	Research and Thesis, (1 G)	n.a.	n.a.
2006				
Fall 2006	BC 1214	Introduction to Building Cons. (170 U)	135	3.84
Fall 2006	BC 5984	History of Construction (1 U, 9 G)	10	4.00
Fall 2006	ARCH 4515	Architecture V, (2 U)	n.a.	n.a.
Fall 2006	ARCH 5994	Research and Thesis, (1 G)	n.a.	n.a.
Spr. 2006	BC 1224	Introduction to Building Const. (U),	56	3.893
Spr. 2006	BC 4444	Capstone Project (U,G),	n.a.	n.a.
2005				
Fall 2005	BC 1214	Introduction to Building Const. (110 U),	60	3.529
Fall 2005	BC 5984	History of Construction (4 G),	4	3.75
Spr. 2005	ARCH 3016	Architecture III Design Studio (U)	19	4.00
Spr. 2005	ARCH 3054	Building Analysis. (U)	19	N.A.
Spr. 2005	ARCH 3046	Building Assemblies (U),	18	3.90
Spr. 2005	ARCH 4524	Thesis Documentation (U)	7	4.00
Spr. 2005	ARCH 4516	Archictecture V Thesis (U)	8	4.00
2004				
Fall 2004	ARCH 3015	Architecture III Design Studio (U),	22	4.0
Fall 2004	ARCH 3045	Building Assemblies (U),	21	3.95
Fall 2004	ARCH 4214	Ornament and Architecture (U),	4	3.75
Fall 2004	ARCH 5134	Ornament and Architecture (G),	4	3.75
Spr. 2004	ARCH 3016	Architecture III Design Studio (U)	23	3.82
Spr. 2004	ARCH 3016	Building Analysis. (U)	27	3.44
Spr. 2004	ARCH 3046	Building Assemblies (U),	23	3.83
2003				
Fall 2003	ARCH 3015	Architecture III Design Studio (U),	32	3.88
Fall 2003	ARCH 3045	Building Assemblies (U),	34	3.84
Fall 2003	ARCH 4214	Ornament and Architecture (U),	3	n/a
Fall 2003	ARCH 5134	Ornament and Architecture (G),	6	n/a
Spr. 2003	ARCH 5516	Arch & Systems Lab (G), 6	14	3.64
Spr. 2003	ARCH 4766	Building Technology (G), 3	40	3.90

Listing of Classes Taught and Student evaluations of instruction (on 4.0 scale)

Term	Course Number and Title (G) Graduate course, credit hours (U) Undergraduate course		Responses	Evaluation
2002				
Fall 2002	ARCH 5515	Arch & Systems Lab (G), 6	18	3.67
Fall 2002	ARCH 4765	Building Technology (G), 3	39	3.87
Spr. 2002	ARCH 5516	Arch & Systems Lab (G), 6	12	3.19
Spr. 2002	ARCH 4766	Building Technology (G), 3	20	3.93
2001				
Fall 2001	ARCH 5515	Arch & Systems Lab (G), 6	14	3.69
Fall 2001	ARCH 4765	Building Technology (G), 3	32	3.93
Spr. 2001	ARCH 4766	Building Technology (G), 3	29	3.83
Spr. 2001	ARCH 5516	Arch & Systems Lab (G), 6	14	3.7
2000				
Fall 2000	ARCH 4765	Building Technology (G), 3	33	3.73
Fall 2000	ARCH 5515	Arch & Systems Lab (G), 6	14	4.0
Spring 2000		On Study Leave		
Su2 2000	ARCH 5756	Advanced Design Lab (G), 6	16	3.87
1999				
Fall 1999	ARCH 5515	Arch & Systems Lab (G), 6	12	3.92
Fall 1999	ARCH 4765	Building Technology (G), 3	38	3.89
Spr. 1999	ARCH 5516	Arch & Systems Lab (G), 6	9	4.0
Spr. 1999	ARCH 4766	Building Technology (G), 3	19	3.95
Spr. 1999	ARCH 5984	Design of Habitat for Humanity House (G), 3	12	3.67
Spr. 1999	ARCH 4304	Construction of Habitat for Humanity House (U), 3	30	3.67
Su2 1999	ARCH 5756	Advanced Design Lab (G), 6	17	3.75
Su2 1999	ARCH 4766	Building Technology (G), 3	8	N.A.
1998				
Fall 1998	ARCH 5515	Arch & Systems Lab (G), 6	13	3.77
Fall 1998	ARCH 4765	Building Technology (G), 3	28	3.74
Fall 1998	ARCH 5984	Construction of Habitat for Humanity House (G), 3	4	3.65
Fall 1998	ARCH 4304	Construction of Habitat for Humanity House (U), 3	18	3.65
Spr. 1998	ARCH 5516	Arch & Systems Lab (G), 6	11	3.45
Spr. 1998	ARCH 4766	Building Technology (G), 3	30	3.73
1997				
Fall 1997	ARCH 4414	Arch. Systems Integration (U), 3	1	N.A.
Fall 1997	ARCH 5515	Arch & Systems Lab (G), 6	26	3.46
Fall 1997	ARCH 4765	Building Technology (G), 3	38	3.8
Spr. 1997	ARCH 5516	Arch & Systems Lab (G), 6	15	3.71
Spr. 1997	ARCH 4766	Building Technology (G), 3	19	3.83
Spr. 1997	ARCH 4304	Teaching in Architecture (G), 3	1	N.A.
1996				
Fall 1996	ARCH 5755	Advanced Design Lab (G), 6	4	3.0
Fall 1996	ARCH 5515	Arch & Systems Lab (G), 6	12	3.8
Fall 1996	ARCH 4765	Building Technology (G), 3	26	3.87

Listing of Classes Taught and Student evaluations of instruction (on 4.0 scale)

Term	Course Number and Title (G) Graduate course, credit hours (U) Undergraduate course		Responses	Evaluation
Fall 1996	ARCH 4304	Crime Prevention Through Environmental Design - Safer Places	2	3.5
Fall 1996	ARCH 4304	Teaching in Architecture	2	N.A.
Spr. 1996	ARCH 5756	Advanced Design Lab (G), 6	1	N.A.
Spr. 1996	ARCH 4766	Building Technology (G), 3	51	3.84
1995				
Fall 1995	ARCH 4765	Building Technology (G), 3	50	3.6
Fall 1995	ARCH 5894	Final Examination	1	N.A.
Fall 1995	ARCH 4304	Crime Prevention Through Environmental Design - Safer Places	9	N.A.
Spr. 1995	ARCH 4016	Architecture II (U), 6	1	N.A.
Spr. 1995	ARCH 4766	Building Technology (G), 3	39	3.7
Spr. 1995	ARCH 5894	Final Examination	1	N.A.
1994				
Fall 1994	ARCH 5515	Arch & Systems Lab (G), 6	23	N.A.
Fall 1994	ARCH 5515	Arch & Systems Lab (G), 6	23	N.A.
Fall 1994	ARCH 4765	Building Technology (G), 3	33	3.8
Spr. 1994	ARCH 5516	Arch & Systems Lab (G), 6	23	3.7
Spr. 1994	ARCH 4766	Building Technology (G), 3	23	3.3
1993				
Fall 1993	ARCH 5515	Arch & Systems Lab (G), 6	24	N.A.
Fall 1993	ARCH 5515	Arch & Systems Lab (G), 6	24	N.A.
Fall 1993	ARCH 4765	Building Technology (G), 3	31	3.8
Fall 1993	ARCH 4984	Housing & Affordability (U), 3	14	3.5
Fall 1993	ARCH 5984	Housing & Affordability (G), 3	6	N.A.
Spr. 1993	ARCH 5516	Arch & Systems Lab (G), 6	20	N.A.
Spr. 1993	ARCH 4766	Building Technology (G), 3	21	3.8
1992				
Fall 1992	ARCH 5515	Arch & Systems Lab (G), 6	21	2.75
Fall 1992	ARCH 4755	Bldg. Env. Systems (G), 3	27	N.A.
Spr. 1992	ARCH 5516	Arch & Systems Lab (G), 6	25	3.0
Spr. 1992	ARCH 5716	Arch & Urbanism Lab (G), 6	13	N.A.
Spr. 1992	ARCH 4766	Building Technology (G), 3	3	N.A.
Spr. 1992	ARCH 5116	Media & Environment (G), 2	9	N.A.
Spr. 1992	ARCH 5116	Media & Environment (G), 2	9	N.A.
Su1 1992	ARCH 4765	Building Technology (G), 3	27	3.68
Su2 1992	ARCH 4766	Building Technology (G), 3	23	3.8
1991				
Fall 1991	ARCH 5515	Arch & Systems Lab (G), 6	15	3.5
Spr. 1991	ARCH 5756	Advanced Design Lab (G), 6	1	3.67
Spr. 1991	ARCH 5516	Arch & Systems Lab (G), 6	21	3.5
Spr. 1991	ARCH 5716	Arch & Urbanism Lab (G), 6	3	3.67

Listing of Classes Taught and Student evaluations of instruction (on 4.0 scale)

Term	Course Number and Title (G) Graduate course, credit hours (U) Undergraduate course		Responses	Evaluation
Spr. 1991	ARCH 4766	Building Technology (G), 3	29	3.7
Spr. 1991	ARCH 5116	Media & Environment (G), 2	8	N.A.
Spr. 1991	ARCH 5116	Media & Environment (G), 2	8	N.A.
Su1 1991	ARCH 4765	Building Technology (G), 3	29	N.A.
Su2 1991	ARCH 4766	Building Technology (G), 3	31	N.A.
1990				
Fall 1990	ARCH 5755	Advanced Design Lab (G), 6	2	N.A.
Fall 1990	ARCH 5515	Arch & Systems Lab (G), 6	23	3.9
Fall 1990	ARCH 4765	Building Technology (G), 3	28	N.A.
Spr. 1990	ARCH 5716	Arch & Urbanism Lab (G), 6	8	N.A.
Spr. 1990	ARCH 4766	Building Technology (G), 3	20	3.5
Su1 1990	ARCH 4765	Building Technology (G), 3	4	3.48
1989				
Fall 1989	ARCH 5755	Advanced Design Lab (G), 6	2	3.42
Fall 1989	ARCH 5715	Arch & Urbanism Lab (G), 6	10	3.42
Fall 1989	ARCH 4765	Building Technology (G), 3	23	N.A.
Fall 1989	ARCH 5515	Arch & Systems Lab (G), 6	21	3.4
Spr. 1989	ARCH 5716	Arch & Urbanism Lab (G), 6	8	3.26
Spr. 1989	ARCH 4766	Building Technology (G), 3	20	3.4
Su1 1989	ARCH 4765	Building Technology (G), 3	4	N.A.
Su2 1989	ARCH 4766	Building Technology (G), 3	3	N.A.
1988				
Fall 1988	ARCH 4765	Building Technology (G), 3	32	3.23
Spr. 1988	ARCH 5713	Arch Syst Laboratory (G), 6	17	3.60
Spr. 1988	ARCH 4063	Building Assembly (G), 3	13	3.5
Su2 1988	ARCH 4063	Building Assembly (G), 3	16	N.A.
1987				
Fall 1987	ARCH 4765	Building Assembly (G), 3	18	3.47