Living in the Tropical Landscape – A Visual Toolkit: Old Models for Future Buildings

Thanks to a booming concrete industry in Miami's backyard, the region has developed an almost relentless adherence to building in concrete, such that the idea of building in anything else would seem absurd.

JACOB BRILLHART
University of Miami

There is an unfounded, albeit pervasive, belief that the costs associated with building a residential project in steel and glass would be exorbitant or that it would be too complicated, especially given that there isn't enough skilled labor on hand. Ironically, we have old models, dating back to the 1950s and '60s, of structures made of concrete, wood, steel, and hybrid systems. Simple, rational, efficient, cost-effective buildings that celebrate the tropics, these designs lend feasible and innovative alternatives for future buildings.

South Florida's postwar architects - such as Alfred Browning Parker, Rufis Nims, Robert Bradford Browne, Mark Hampton, Paul Rudolf and Ralph Twitchell, William Morgan, Donald Singer, Gene Leedy, and others - gave birth to a tropical modern school of thought and developed their own regional interpretations of the International Style by turning to local landscape, climate, and materials to inform their designs.

In an era of optimism and experimentation, these architects married building traditions with passive systems, new technologies, and innovative construction techniques. Emphasis on construction methodology was central to their work and became a model for sustainable design in the tropics.

Unfortunately, as a movement, Tropical Modernism spanned only a couple of decades, and not all of the homes survived. There were practical challenges, largely due to the nascent character of the materials used and the cultural context in which they were built. Thermal qualities of glass were next to nothing, insulation technology had not been explored, and the theoretical constructs behind these buildings were competing with the advent of air conditioning.

Nevertheless, the ideas embedded in these designs are particularly applicable in the tropics today. The goals - and perhaps challenges - behind Tropical Modernism are echoed repeatedly in our expanding material discourse, which

has been made current again because of the sustainability movement and emergent technologies. From a practical standpoint, today's higher performing materials (such as thermal insulation and low-emissivity glass) allow the local architect to seriously reconsider these past models for construction.

To illustrate this point, this paper includes:

(01) New drawing research on the material selection and the architectonic assembly of residential architecture built in South Florida's postwar period. As models, these projects display an incredible range of materials and buildings systems. As a critical research vehicle, the drawings provide a contemporary interpretation of the original work. Most importantly, as a visual tool-kit, they serve as a resource for emerging architects looking for innovative design solutions that take advantage of the tropical climate and lessen the impact on the earth.

(02) A Case Study House (my house actually) which my wife and I built on the Miami River in 2013. Looking for some alternative to concrete, I studied the old Tropical Modern models in detail, ultimately turning to a steel and glass superstructure that included inventive details. In choosing steel over concrete, we used more sustainable materials and wasted less; simplified the assembly; and reduced construction time and costs, all the while allowing for increased cross-ventilation and a heightened sense of living within the landscape.

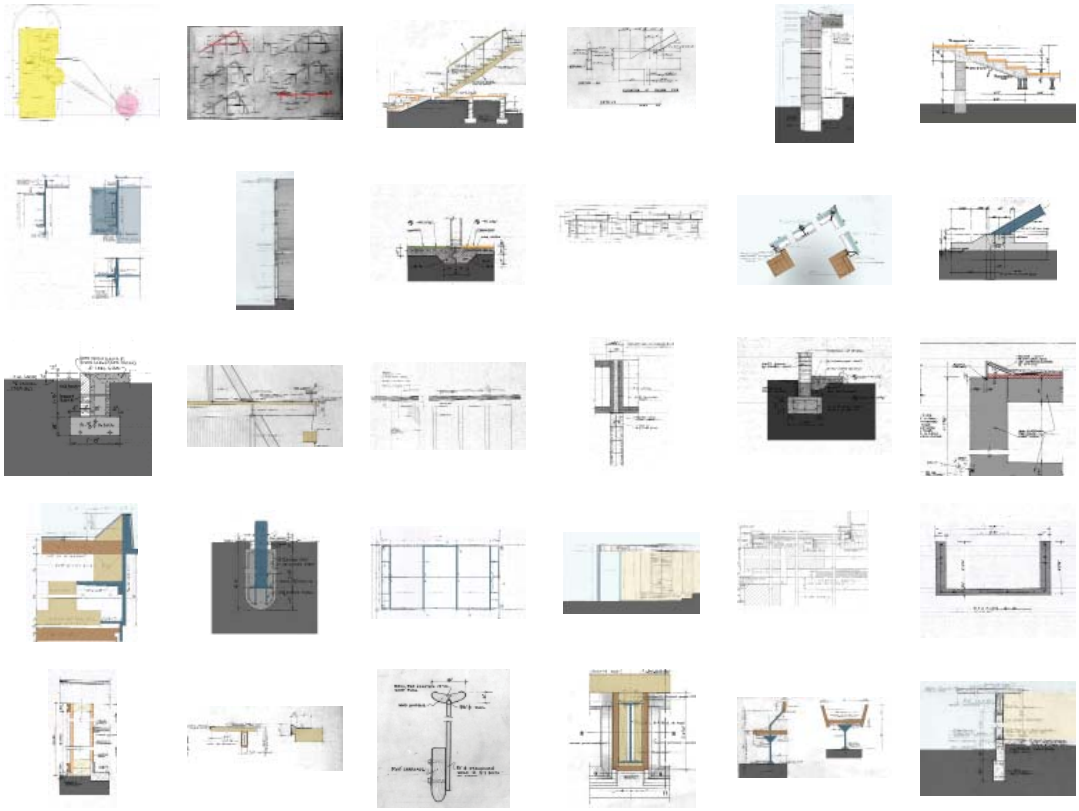
Highlighted herein are three case studies of Alfred Browning Parker's Mass Residence, the Jordan Residence by Mark Hampton, and the McClave Residence by Robert Bradford Browne, which represent a wide range of building systems. These projects also belong to a larger body of research that includes analysis of ten architects from South Florida's postwar period.

THE RESEARCH

It is important to note that, unlike traditional research methodologies, this particular investigation relies on new drawings as the critical research tool. Work began by analyzing the original construction documents from each of the residences and diagramming the design intent. I then re-drafted the construction documents in Autocad to further clarify the actual construction methods. From here, the CAD drawings were turned into digital 3D models for continued investigation of each house to 1) create exploded axonometrics from the digital model to visually illustrate the main structural ideas and 2) create drawings showing the sequential assembly and construction of each house. Lastly, a matrix was produced to systematically catalogue the architectural assemblies and details across all ten projects.

The books *Paul Rudolph: The Florida Houses* by Joseph King, Christopher Domin, and Ezra Stoller, along with *Florida Modern* by Jan Hochstim, began to unpack this subject but what was missing was the hard information on what you need to know to actually build in this way (such as plans, sections, and elevations with actual dimensions; details; material specifications called out; etc as opposed to just photographs). To obtain the original construction documents, I had to pull drawings from the University of Florida Archives, Library of Congress and also met with those architects who were still alive.

The result of this drawing-based research is a visual "toolkit" of materials and assembly for those architects interested in re-thinking old models with new technologies as well as building more sustainably in the tropics.



STRUCTURE / ASSEMBLY	MASS RESIDENCE (Alfred Browning Parker)	JORDAN RESIDENCE (Mark Hampton)	McCLAVE RESIDENCE (Robert Bradford Browne)	HORIZON HOUSE (Mark Hampton)
Foundation Subsurface	Concrete Piles	Spread Footing	Concrete Piles	Spread Footing/Slab on Grade
Foundation above Grade	Concrete Joists/4" Concrete Slab	4" Concrete Slab	PreCast Concrete Joists	Slab on Grade
Structural Frame (Primary)	Concrete Grade Beam/Steel Frame	Steel Frame	Heavy Timber	Masonry CMU / Concrete C Channel
Structural Frame (Secondary)	Laminated Wood (con-ser-tex grade 1)	Dimensional Lumber	Heavy Timber	4" Pre-stressed/Precast concrete slabs
Floor Assembly				
Subfloor	Laminated Wood (con-ser-tex grade 1); Concrete 6" slab	Concrete Slab/Mortar Bed	NA	Concrete Slab/Mortar Bed
Insulation	NA	NA	NA	NA
Finished Floor	Quarry Keystone, troweled cement finish, ceramic tile, terrazzo, wood	12"x12" Travertine	24"x24" Precast Polished Concrete Tile, Redwood Decking	Terrazzo, Carpet, Ceramic Tile, Troweled Concrete, Exposed Aggregate, Redwood
Roof Assembly				
Finished Ceiling	Laminated Wood (con-ser-tex grade 1)	Pecan Wood	Bleached Tongue and Groove 2" Wood	Sheetrock Ceiling, Painted Concrete, 1/2"x1/2" Egg Crate Ceiling
Insulation	NA	NA	NA	1/2" Rigid Insulation
Roof Decking	Laminated Wood	3/4" Wood Decking	3/4" Wood Decking over 2"x2" Blocking	4" Prestressed/Precast Concrete Slabs
Waterproof Membrane	Copper Batten Seam, built up ply roof	Built up Roof with Copper Flashing	Built Up Roof Covered with Coral Chips	Built Up 4-Ply Roof
Exterior Wall Assembly				
Exterior Cladding	V-Joint Cypress Siding	Glass Doors, Glass Panels, Cast Brick	Siding Glass and Wood Louvered Doors	1/2" Cement Plaster, 8" Cast Brick, Peachtree Type 321
Wall Substructure	Dimensional Lumber	Steel, Cast Brick	Dimensional Lumber	8" CMU Block, 6" CMU Block, 8" Cast Brick
Insulation	Sheathing Felt	NA	NA	NA
Interior Cladding	Cypress Paneling	Cast Brick, Walnut, Fabric Panel	Sliding Glass Doors, Wood	8" Cast Brick, Sheetrock, Wallpaper, Ceramic Tile
Interior Wall Assembly				
Wall Substructure	Dimensional Lumber	Cast Brick	Dimensional Lumber	2"x4" Wood Studs
Skin/Cladding	Ceramic Tile; Tongue and Groove Red Cypress Wall Paneling	Walnut Fabric Panel, Cast Brick, Glass	Curtains, Tile	Sheetrock, Wallpaper, Ceramic Tile, 1/2" Birch Plywood with Walnut Stain

1

Figure 1: Construction details of several South Florida Architects from 1950s-60s and a matrix of the building systems they used

MCCLAVE RESIDENCE - ROBERT BRADFORD BROWNE (KEY BISCAYNE - 1956)

Built in 1956 in partnership with George Reed, the McClave Residence was designed with simple materials and economical construction strategies to solve environmental problems of South Florida. A large hip roof with exposed timber echoes the ribs and hulls of earlier wood boats. Overlooking Biscayne Bay, the building is raised off the ground 24 inches, has a large wrap-around porch, and an open lanai through the center, separating the living and sleeping areas. (Unfortunately, the house has undergone renovations that make its original design unrecognizable.)

This drawing research for the McClave Residence reveals several interpretations of the structure and assembly. First, it shows us that the structure is the architecture. The drawings highlight the filigree construction – the building's slender members, its weave of louvers and other horizontal or planer non-load bearing elements that separate the inside from the outside. The structural framework contains many voids that create an open yet architecturally defined space. The design also incorporates a secondary layer of "clothing" – insect screens and jalousy windows – which act as a filter and allow the house to breathe. The drawings also outline the vernacular genius of the original design: a large overhanging roof keeps the heat of the sun out and so on. More interestingly, though the substructure (foundation) is made out of concrete (which is a far better option in the tropics), the residence is still understood as a wooden structure. What these drawings also reveal is that there is no insulation, no AC, and very little protection from hurricanes.

2

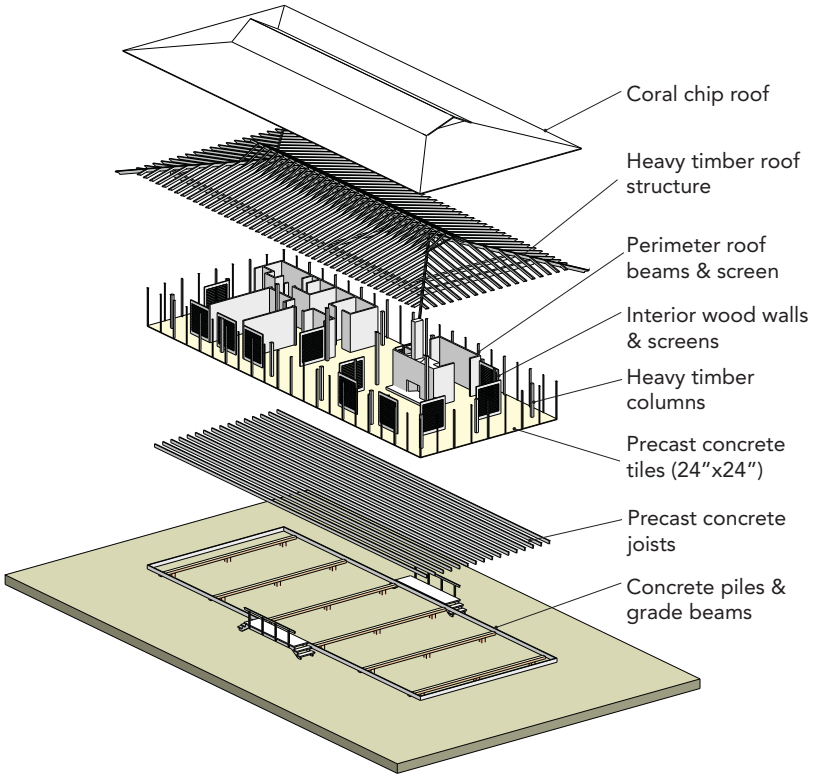
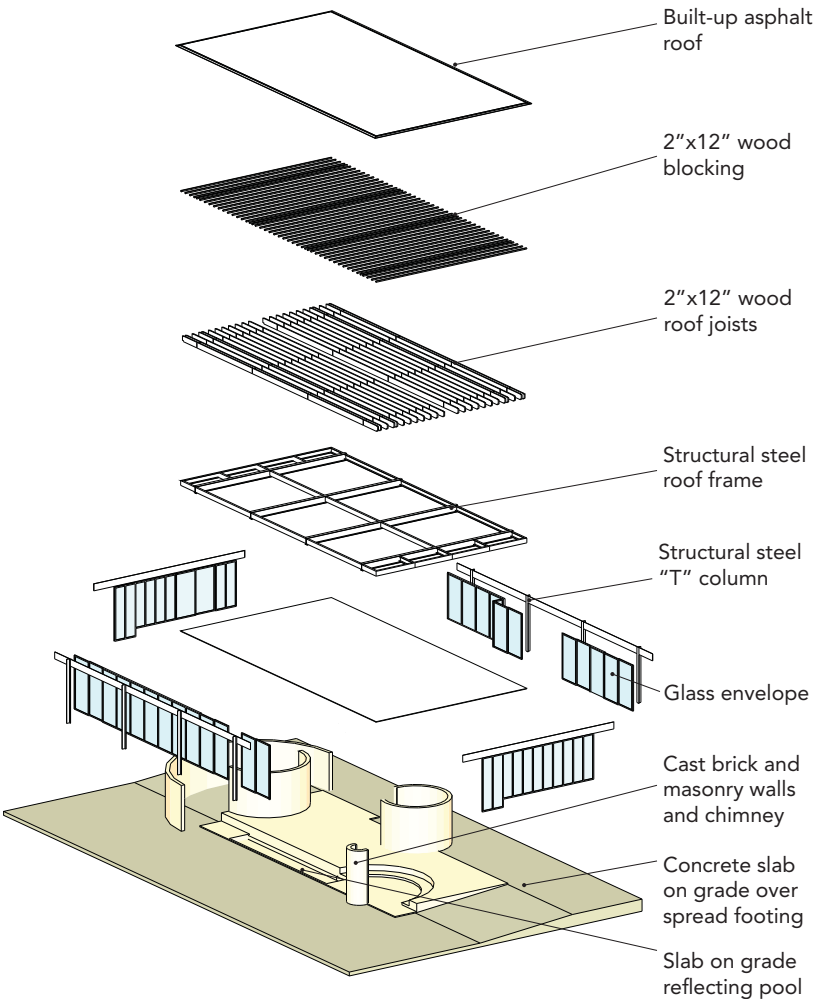


Figure 2:Photo of McClave Residence (Photo Credit: Steven Brooks) *with* Exploded Axonometric at Right

JORDAN RESIDENCE - MARK HAMPTON (LAKE WALES, FL - 1956)

Unlike the McClave residence, the owners of this building have kept it in great working order. The house is a glass box nestled among life oaks on the banks of Crooked Lake. Hampton was working with rectangular and circular geometries, where circular elements define the space and slip, spin and rotate in and around a very delicate steel frame. The program is broken down into five circular zones, the conversation pit, the fireplace, a bathroom and bath court, kitchen, and detached carport.

These drawings demonstrate Hampton's rigorous structural module. Divisible by four, the plan begins with 4 foot sliding glass doors and windows that directly set into 16' structural steel bays. Once this grid was established, Hampton was able to surgically go in to compose the placement and geometries of his cast brick walls. This project also deploys different environmental strategies than the McClave Residence. The foundation is slab on grade. The house rests right on the ground as if it is one with the earth, and in lieu of a large overhang, the long walls of glass have been inset to create protection from the sun. Also of note is a sophisticated and sublime use of materials. Hampton balances the cool nature of steel, brick and glass with warm pecan wood ceilings and walnut doors throughout the interior.



3

Figure 3: Photo of Jordan Residence (photo credit: T Davis Jr.) and Exploded Axonometric at Left

MASS RESIDENCE - ALFRED BROWNING PARKER (LAKE WORTH, FL - 1956)

Unlike the McClave residence, the owners of this building have kept it in great working order. The house is a glass box nestled among life oaks on the banks of Crooked Lake. Hampton was working with rectangular and circular geometries, where circular elements define the space and slip, spin and rotate in and around a very delicate steel frame. The program is broken down into five circular zones, the conversation pit, the fireplace, a bathroom and bath court, kitchen, and detached carport.

These drawings demonstrate Hampton's rigorous structural module. Divisible by four, the plan begins with 4 foot sliding glass doors and windows that directly set into 16' structural steel bays. Once this grid was established, Hampton was able to surgically go in to compose the placement and geometries of his cast brick walls. This project also deploys different environmental strategies than the McClave Residence. The foundation is slab on grade. The house rests right on the ground as if it is one with the earth, and in lieu of a large overhang, the long walls of glass have been inset to create protection from the sun. Also of note is a sophisticated and sublime use of materials. Hampton balances the cool nature of steel, brick and glass with warm pecan wood ceilings and walnut doors throughout the interior.

4

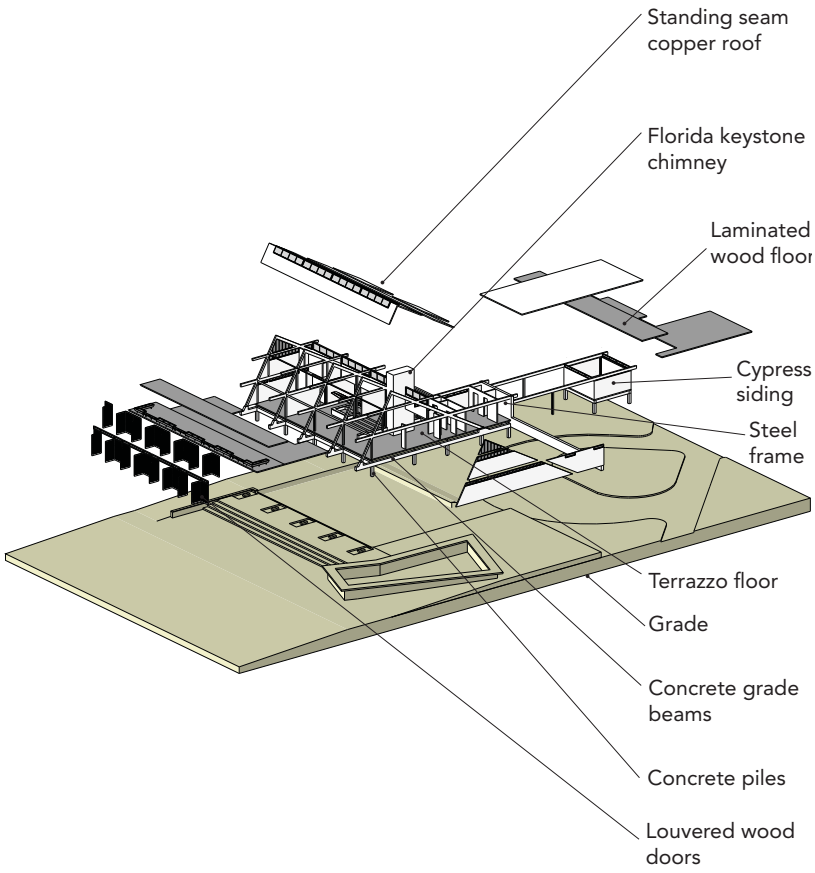


Figure 4: Photo of Mass Residence (Photo Credit: Ezra Stoller) *with* Exploded Axonometric at Right

BRILLHART HOUSE - JACOB AND MELISSA BRILLHART (MIAMI, FL 2014)

The design for our house relies on a back-to-the-basics approach – specifically studying old architectural models that care about good form but are also good for something. Each design decision was organized around four central questions that challenge the culture for building big: what is necessary; how can we minimize our impact on the earth; how do we respect the context of the neighborhood; and what can we really build?

Some answers came from a place with which we are already intimately familiar – the seemingly forgotten American Vernacular, and more specifically, the Dog Trot, which for well over a century, has been a dominant image representing Florida Cracker architecture. The small, simple, and practical building is both modest and rich in cultural meaning. It attempts to maximize efficiency, space, and energy; relies on vernacular building materials; and celebrates the balmy breezes. The principles of Tropical Modernism also offered direction. The architects building in South Florida's postwar period turned to local landscape, climate and materials to inform their designs, marrying building traditions with passive systems, new technologies, and innovative construction techniques. In that same spirit, we sought an alternative to the use of concrete and concrete only, instead exploring steel and glass as the superstructure. As a result, we wasted fewer materials, simplified the assembly, and reduced construction cost and time, all the while allowing for increased cross ventilation and a heightened sense of living within the landscape.

Elevated five feet off the ground, the project includes 100 feet of uninterrupted glass – 50 feet spanning the full length of both the front and back sides of the house, with four sets of sliding glass doors that allow the house to be entirely open when desired. The house also includes 800 square feet of outdoor living space, with both front and back porches and shutters along the front facade for added privacy and protection against the elements. These details, and the position of the house, which is at the center of a 330-foot long lot, allow the house to meld seamlessly with the site's dense and lush native landscaping. With interior and exterior spaces fused together, the experience is that of a floating tropical refuge.

The goal of integrating these elements was to try to join found-poetic form and new folk architecture to collectively convey a contemporary, non-sentimental, and pragmatic building language that resuscitates the Ancient, celebrates the Modern, and foresees an architecture without big style.

5

Figure 5: Brillhart House, Miami, FL 2014

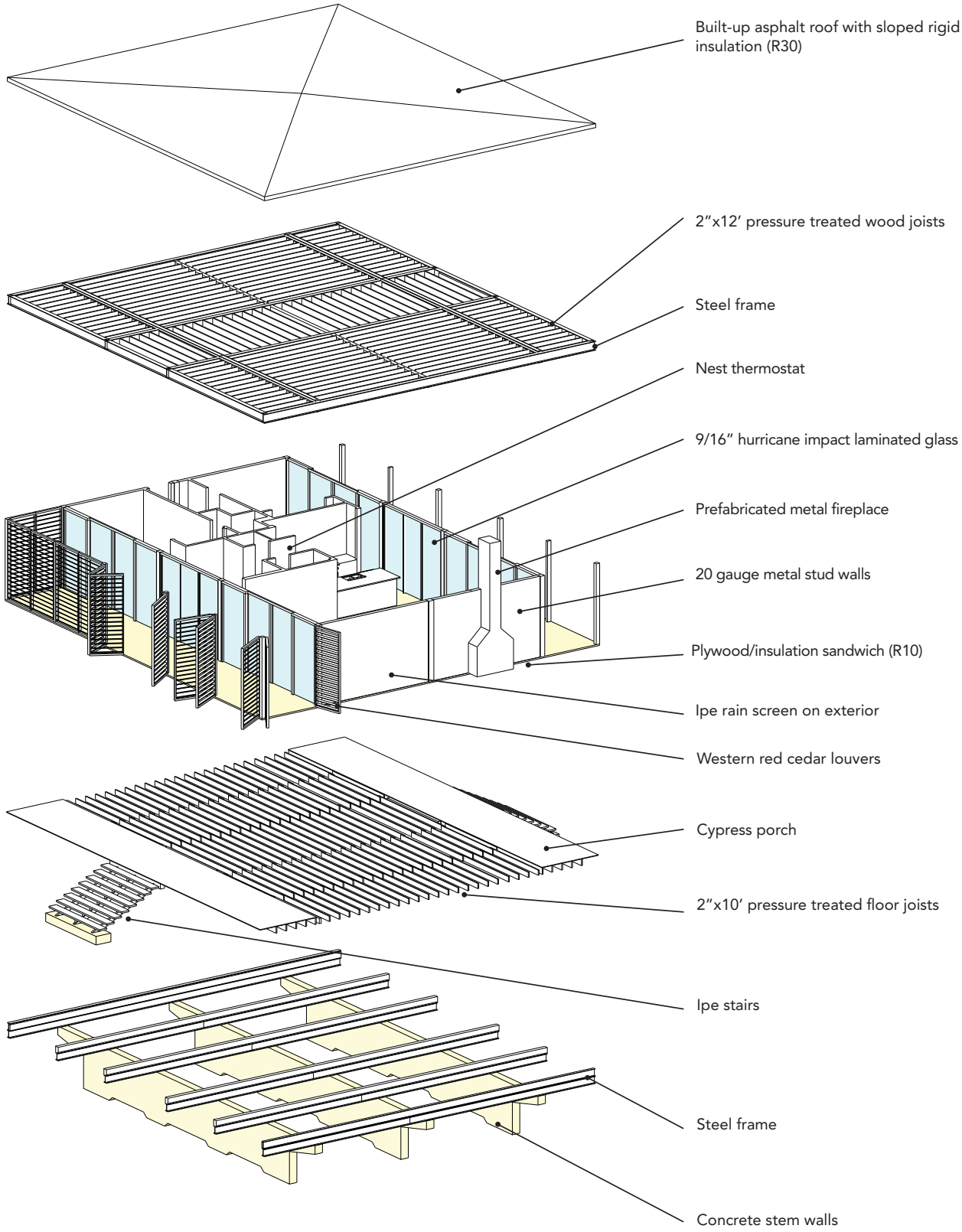
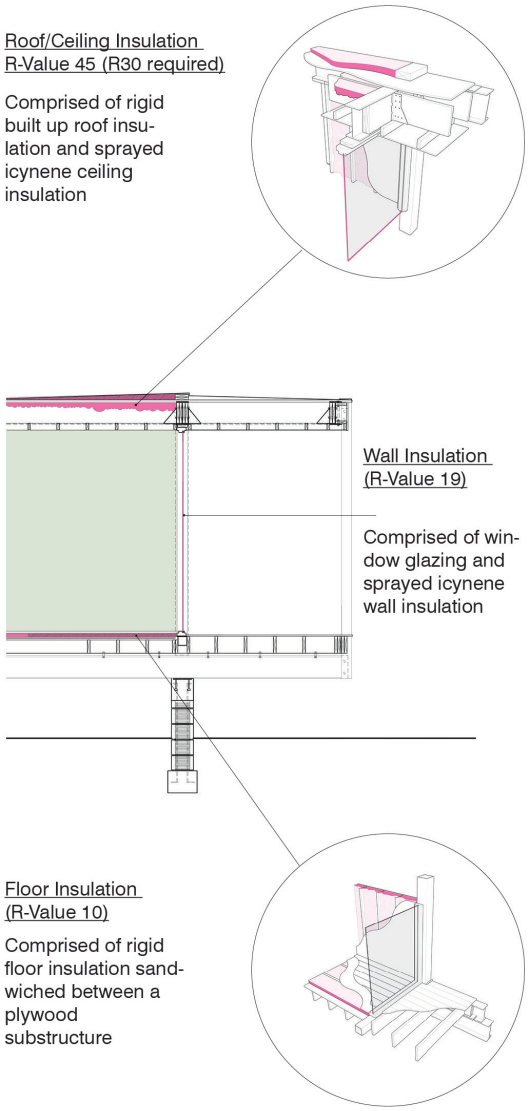


Figure 6:Exploded Axonometric of Brillhart House

MATERIAL ASSEMBLIES / INNOVATIONS

With today's advances in thermal qualities of glass and insulation we were able to use the Tropical Modern concepts alongside current Florida Building Code requirements. To meet and/or exceed the required R-Values, we included insulation on all six sides (icynene and rigid insulation) as well as 9/16" thick thermal glass. We also had to design new assemblies in the process. For one, the new Florida Building code just came out with requirements to insulate the floor if elevated. As this is a new requirement, we had to develop an entirely new detail - creating a sandwich with plywood underneath and on top of a layer of rigid insulation. Meanwhile, in order to achieve the R-Value on the roof and accommodate a slight slope, we designed a similar but inverse concept - installing tapered rigid insulation on the roof, with a layer of plywood underneath followed by icynene below.

The R-value is a measure of thermal resistance used in the building and construction industry. It is expressed as the thickness of the material divided by the thermal conductivity. The higher the number, the better the building insulation's effectiveness. The design for the roof insulation resulted in a R-Value that exceeded what was required.



7

Figure 7: Material Innovations and Assemblies

CONCLUSION

In conclusion, to quote professor Rocco Ceo from his Drawing as Research publication, "the goal of this research is to produce new visual scholarship in the forms of drawings and models that potentially affects currently held interpretations of the work, by showing us something never before seen. Drawings are broadly defined as acts of construction, therefore digital models, which typically involve drawing in their production, are also considered drawn documentation."

So what happens when we look at these buildings in this new format and when we start to cross compare?

1) In today's building environment, if you say you are building in anything other than concrete – ie with steel or glass – people think this sounds completely extravagant or outrageous. How are you going to do that? It's got to cost a fortune! Will the building department ever approve it? In reality, when you break the systems down used by these architects, you realize that they are designing very systematically, using a grid or module. The Parker House uses a simple 30/60/90 degree triangle; there are perfect 16 foot bays of steel in the Jordan Residence and the Horizon house also relies on a strict understanding and adherence to precast concrete products. They also prove you do not need a computer algorithm to be an innovative designer. These architects engaged new building and construction technologies using a t-square, pencil and paper.

2) There is also an inherent logic to the material selections they used. Their buildings are widely built out of off the shelf materials, reassembled in innovative ways, to produce an outcome that appears custom.

As previously stated, unfortunately there were practical challenges to those homes that pioneered the tropical modern movement -- largely due to the nascent character of the advancement of materials and the cultural context in which they were built. Thermal qualities of glass were next to nothing, insulation technology had not been explored and so on. The theoretical constructs behind these buildings were also competing with the advent of AC. While some of the buildings had air conditioning, they weren't designed to run ALL the time, and none of the buildings included herein relied on insulation.

The next stage of research would be to run the energy calculations – using today's building materials to prove that these old models are successful.

As a final note, the goal is that these drawings may serve as a resource for architects who are trying to resurrect a past construction strategy that have been seemingly forgotten by some of the construction industry.

REFERENCES

Domin, Christopher, and Joseph King. 2002. Paul Rudolph: the Florida houses. New York: Princeton Architectural Press.

Hochstim, Jan, and Steven Brooke. 2004. Florida modern: residential architecture 1945-1970. New York: Rizzoli.