

Arch 463
ECS
Fall 2018

Name _____

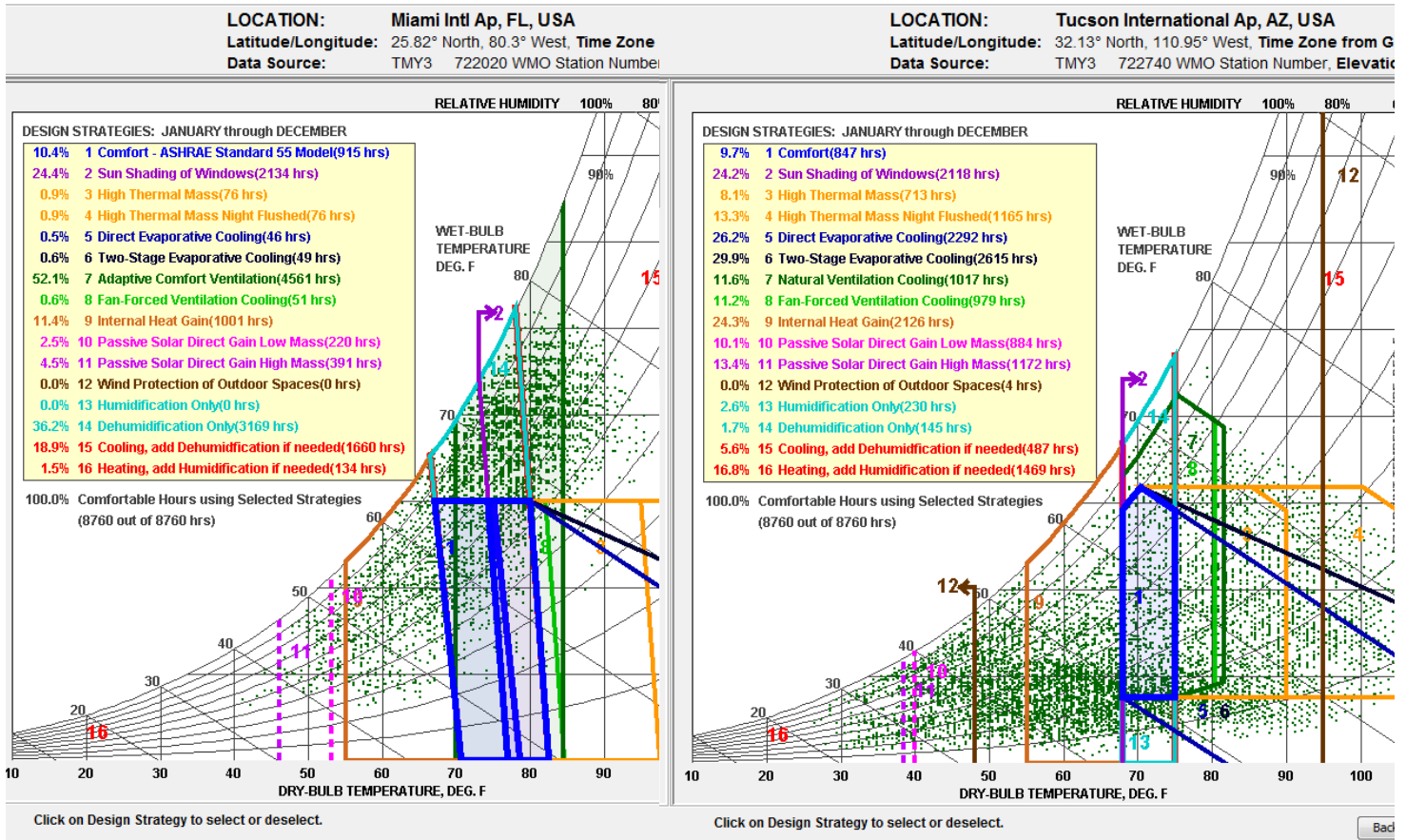
Quiz #2

"Passive Home Moves to Tucson"

For this problem you are the passive design consultant for a family that wants to build a new home in Tucson, Arizona. They are fascinated with the new Miami home designed by Brillhart Architecture, described on page 3, and want one just like it. Your role is to analyze Brillhart's home and to suggest subtle changes to improve its passive performance in its new climate.

Tucson Context. A flat, barren site between a golf course to the south and a large shopping mall surrounded by an asphalt parking lot on the north has been purchased for the new home. The new site is 100' x 100' with site boundaries running true N-S and E-W.

Climate Context. For a naturally ventilated house in Miami or Tucson indoor comfort can be attained almost 100% of the time by using the proper passive strategies described below (but different strategies are needed). Wind roses for March through October (critical cooling months) for the two cities are on page 2.



READ EVERYTHING FIRST!

WIND WHEEL LOCATION: **MIAMI, FL, USA**
 Latitude/Longitude: 25.8° North, 80.27° West, Time Zone from Greenwich -5
 Data Source: TMY2-12839 722020 WMO Station Number, Elevation 6 ft

LEGEND

TEMPERATURE (Deg. F)

- < 32
- 32 - 68
- 68 - 75
- 75 - 100
- > 100

RELATIVE HUMIDITY (%)

- <30
- 30-70
- >70

All Hours Selected Hours

1 a.m. through midnight

All Months Selected Months

MAR through OCT

One Month JAN Next Month

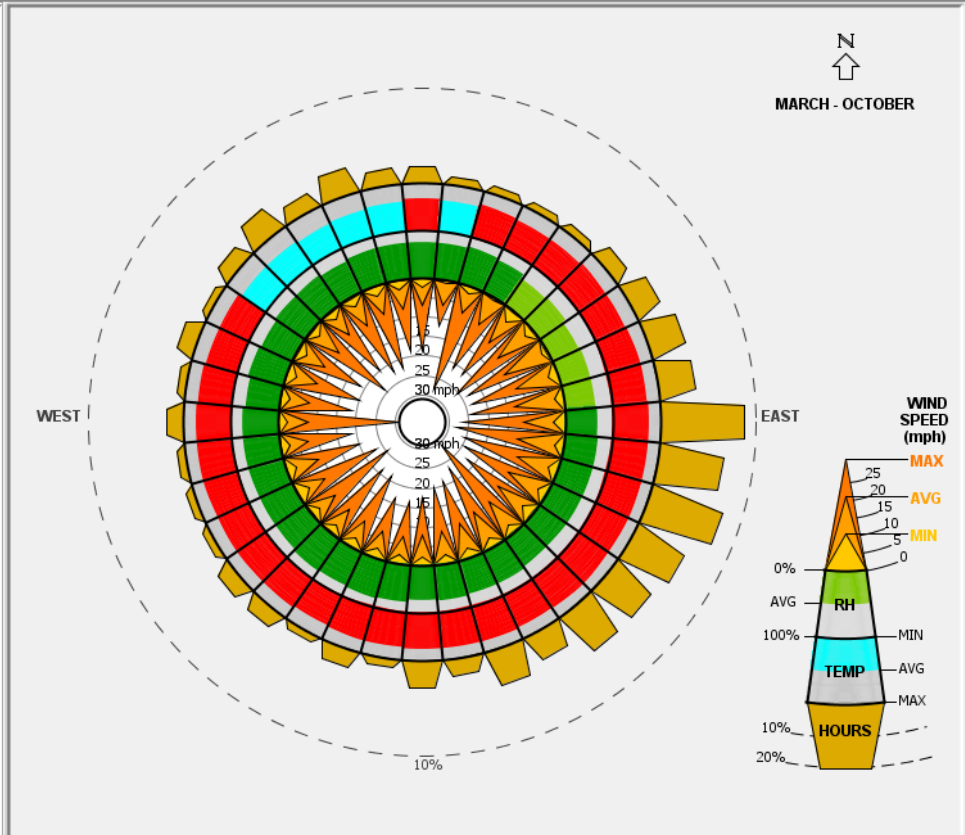
One Day 1 Next Day

Animate

Monthly Start

Daily Pause

Hourly Stop



WIND WHEEL LOCATION: **Tucson International Ap, AZ, USA**
 Latitude/Longitude: 32.13° North, 110.95° West, Time Zone from Greenwich -7
 Data Source: TMY3 722740 WMO Station Number, Elevation 2549 ft

LEGEND

TEMPERATURE (Deg. F)

- < 32
- 32 - 68
- 68 - 75
- 75 - 100
- > 100

RELATIVE HUMIDITY (%)

- <30
- 30-70
- >70

All Hours Selected Hours

1 a.m. through midnight

All Months Selected Months

MAR through OCT

One Month JAN Next Month

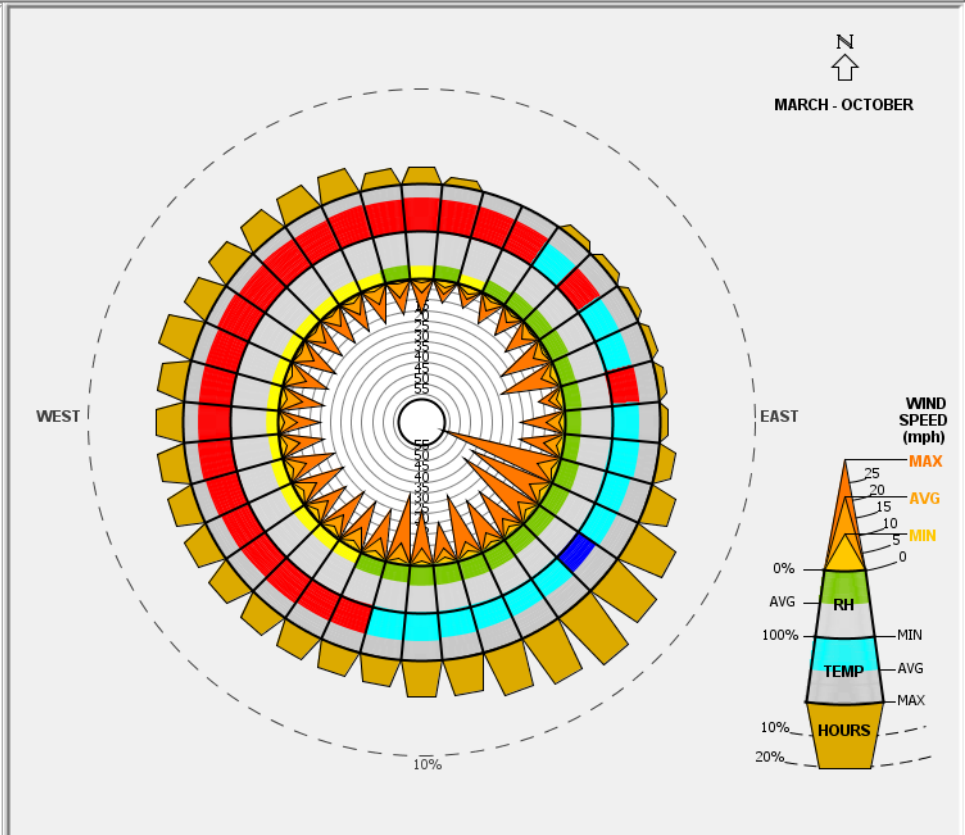
One Day 1 Next Day

Animate

Monthly Start

Daily Pause

Hourly Stop



Brillhart House

Brillhart Architecture

Miami, Florida

Architectural Record September 2015

For a house in a lush Miami precinct, Brillhart Architecture explores a vernacular modernist idiom.

By Suzanne Stephens

Regional variations on International Style architecture helped evolve a subtly rich Midcentury Modernism in the United States. From William Wurster in San Francisco to Paul Rudolph in Sarasota, Florida, young postwar architects inventively adapted residential designs to particular climates and materials.

Jacob Brillhart, an architect and teacher, and his wife, Melissa, a trained architect, continue to improve on that legacy in Miami. The energy-efficient, one-story, 1,500-square-foot house that they built for themselves in the city's downtown sits on a narrow lot amid towering oak and palm trees. Because the property is close to the Miami River, the firm, Brillhart Architecture, elevated the single story 5 feet off the ground to meet flood regulations.

The most distinctive feature of the simple, pristine house is the 7.5 foot deep front porch, where folding louvered shutters screen a 50-foot-long glass East wall (repeated on the West, but without the shutters). The steel and glass structure incorporates a robust variety of woods: ipé for the exterior siding, fascia, and columns; red cedar for the shutters; and white oak and cypress for floors and decking—plus dimensional lumber for short structural spans. Instead of resorting to reinforced concrete, as is popular in hurricane-prone South Florida, the couple decided to address building-code requirements and climate concerns in other ways. For example, they specified 9/16-inch thermal glass, much safer in high winds than the typical 1/16-inch glass used back in the heyday of Miesian pavilions. Icynene spray foam and rigid insulation prevent moisture buildup in the walls and the roof: even the elevated floor is formed of plywood, insulation, and plywood deck on top of 2-by-8-inch wood joists and steel beams.

Working with the technically improved materials for the one-story cottage, the couple not only stayed true to the nature of materials and vernacular architecture but also advanced the cause of Regional Modernism. And living in the jungle-like growth appeals to the couple. “It just gets better and better,” says Melissa.



East façade

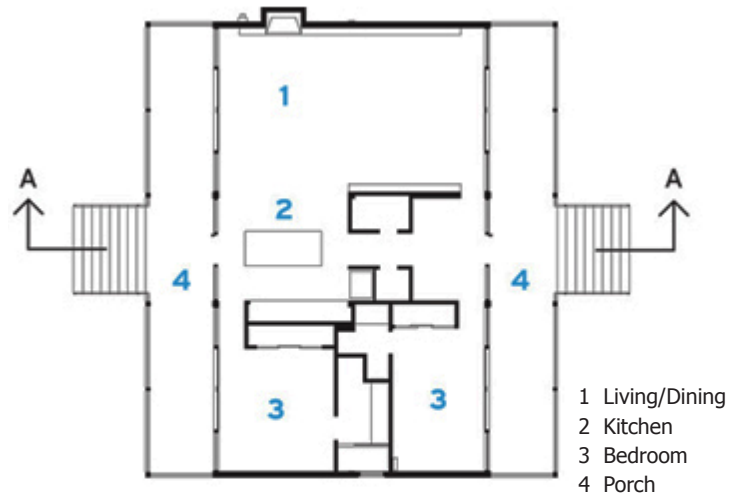


West façade

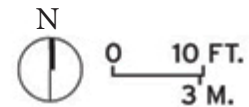
4 points

Analysis

1. Here are plan and section of the Brillhart house. Identify three passive cooling strategies used in the design. Critique each one based on its effectiveness in Miami and in Tucson.



FLOOR PLAN



SECTION A - A



3 points

Tucson Building Design

3. Respond to these three passive building design issues.

A. Draw the new north arrow for the Tucson site and explain how the new north supports your passive strategies.



B. Design a stack ventilator to assist the cross-ventilation on calm days. Show it in plan and section. Explain how it works.



C. Explain your strategy for passive solar heating

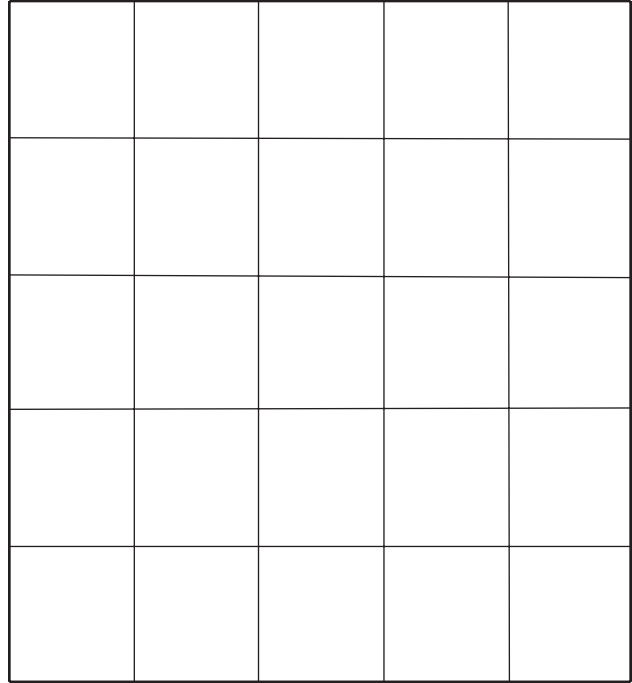


The shaded east-facing porch (in Miami) and window wall. The west-facing porch doesn't have the louvred doors. It does have the louvred walls on the north and south edges.

3 points

Tucson Site Design

2. The site is completely flat and barren. On the site plan below show where you'd place and orient the 30' x 50' (45' x 50' including the porches) dwelling and where you'd plant olive trees to support your passive design goals. Explain your decisions!



100' x 100' site divided into 20' x 20' squares. North is up.

1 point

Extra Credit: Explain and illustrate a microclimatic wind effect that occurs on the Tucson site.