

Arch 463
ECS
Fall 2016

Name _____

Quiz #2

"Re-Transplanting Wright"

For this problem you are the passive design consultant for a ceramicist who has purchased the plans for a typical house in Frank Lloyd Wright's Cooperative Homesteads project and one acre in a remote area near Grand Junction, Colorado. The site is essentially flat and is without trees. The artist wants to live and work in the house. Her studio will be equipped with a small wood-fired kiln for firing clay and porcelain works. Since the site is remote, no electric and gas utilities, nor water and sewer service is available. The artist wants the building to employ passive techniques for heating and cooling. Because the building was designed for a different era and a different climate, your role is to analyze it for suitability for today's technologies and its new climate and to recommend appropriate changes.

Building Program History. The Cooperative Homesteads project for autoworkers near Detroit, Michigan, was designed in 1942. For this project Wright designed a bermed house where earth was excavated from a surrounding sunken garden and rammed against the house to form grassy banks. These berms deflected winds and provided low cost, heavy insulation. Each house was to stand on one acre of land. The plan is economical, with grouped services, generous livingroom, and no wasted circulation space. Bedrooms and a bath are on the west end. Kitchen and dining are integral to the generous livingroom. The livingroom leads past the only floor-to-ceiling glazing to the entrance and carport, which doubles as a porch. Beyond this, at a lower level (four steps down), is the workshop and storage area.

Building Features. The building is slab-on-grade with poured-in-place concrete walls to window height. The windows are all operable and the combination flat/hipped roof has 4-foot overhangs. Sill height is five feet and the flat ceiling is at seven feet. Several large, tall concrete masses anchor the corners of the carport and form the guest closet and hearth.

Climate Context. The designed-for site near Detroit is in a temperate climate typified by cold, cloudy winters and hot, humid summers. The new climate in Colorado is a temperate climate typified by cold, partly sunny winters and hot, arid summers. Winters are dry and sunny with short periods of snow cover. Summer afternoon highs are usually in the nineties with low humidity and continual breezes.

READ EVERYTHING FIRST!



Source: Sergeant, John; Frank Lloyd Wright's Usonian Houses; 1976.

TEMPERATURE RANGE
California Energy Code

LOCATION: Grand Junction Walker Field, CO, USA
Latitude/Longitude: 39.13° North, 108.53° West, Time Zone from Greenwich -7
Data Source: TMY3 724760 WMO Station Number, Elevation 4839 ft

LEGEND

- RECORDED HIGH - *
- DESIGN HIGH -
- AVERAGE HIGH -
- MEAN -
- AVERAGE LOW -
- DESIGN LOW -
- RECORDED LOW - *
- COMFORT ZONE -

DESIGN HIGH: Residential

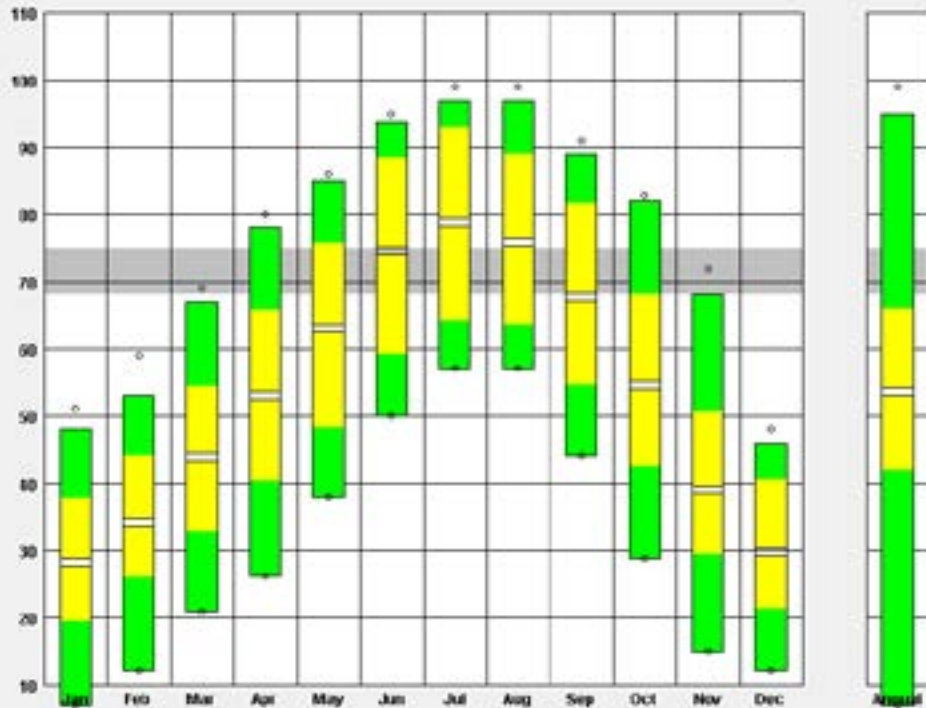
- 1% of Hours Above
- .5% of Hours Above
- 0% of Hours Above

DESIGN LOW: Residential

- 1% of Hours Below
- .5% of Hours Below
- 0% of Hours Below

TEMPERATURE RANGE:

- 30 to 110 °F
- Fit to Data



GROUND TEMPERATURE (MONTHLY AVERAGE)

LOCATION: Grand Junction Walker Field, CO, USA
Latitude/Longitude: 39.13° North, 108.53° West, Time Zone from Greenwich -7
Data Source: TMY3 724760 WMO Station Number, Elevation 4839 ft

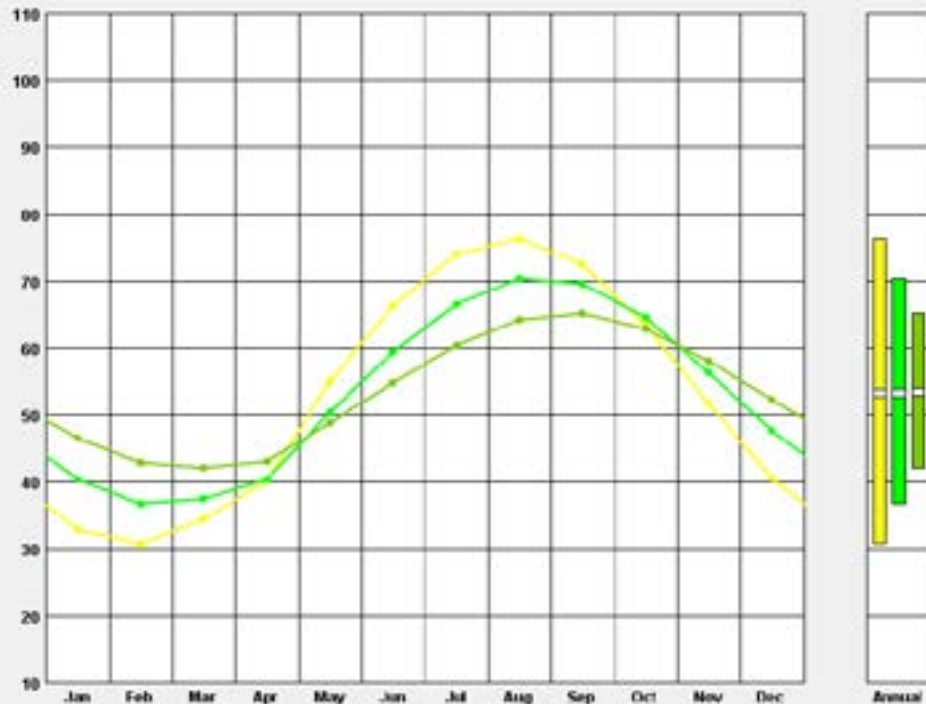
LEGEND

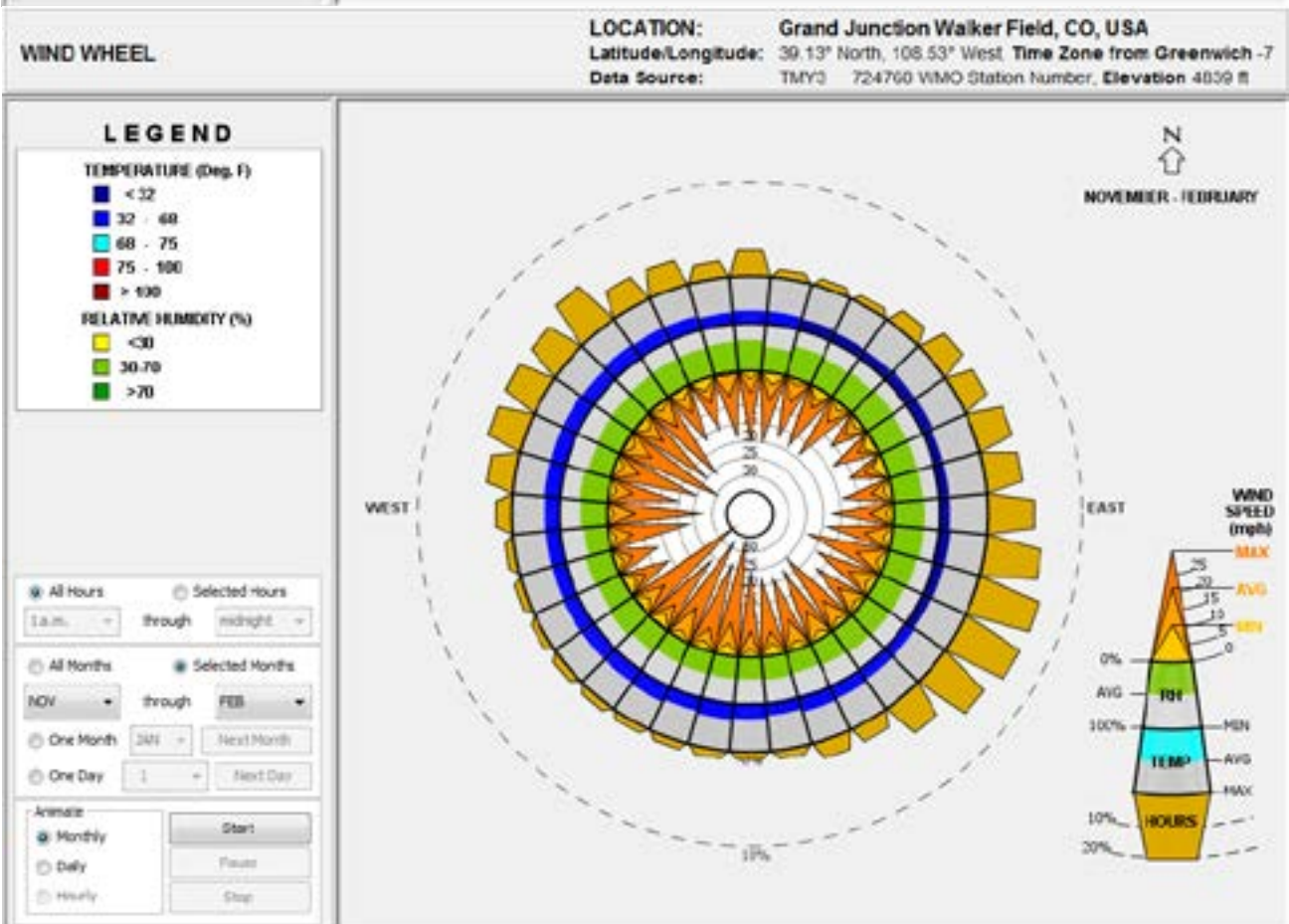
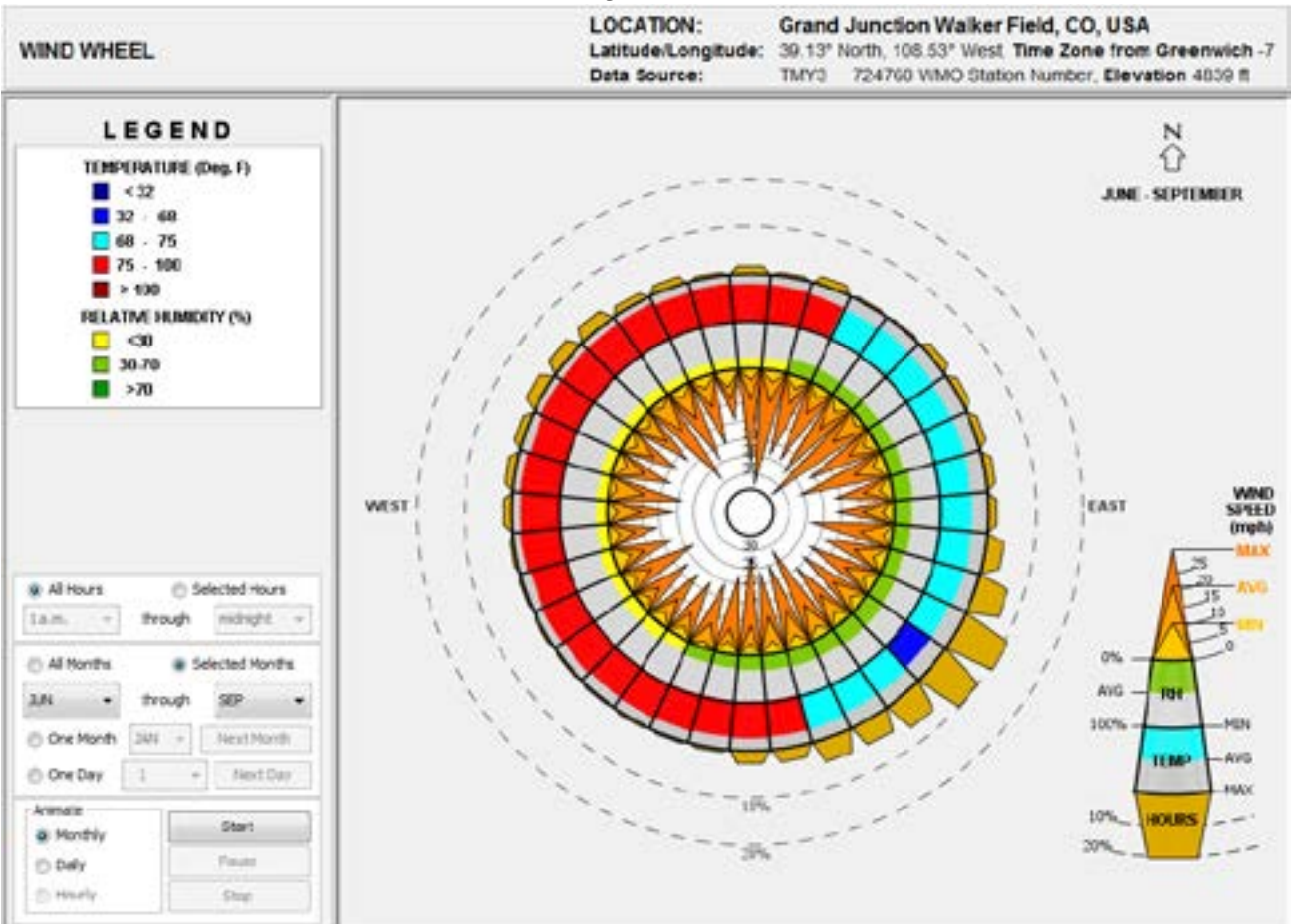
DEPTH (feet)

- 1.64
 - 6.56
 - 13.12
- (Surface is freshly mown grass.)

TEMPERATURE RANGE:

- 30 to 110 °F
- Fit to Data





4 points

Analysis

1. Point out four (4) passive heating and/or cooling strategies of Wright's design that are suitable for the new client and climate. Fully explain why each is suitable with words and sketches.

1

2

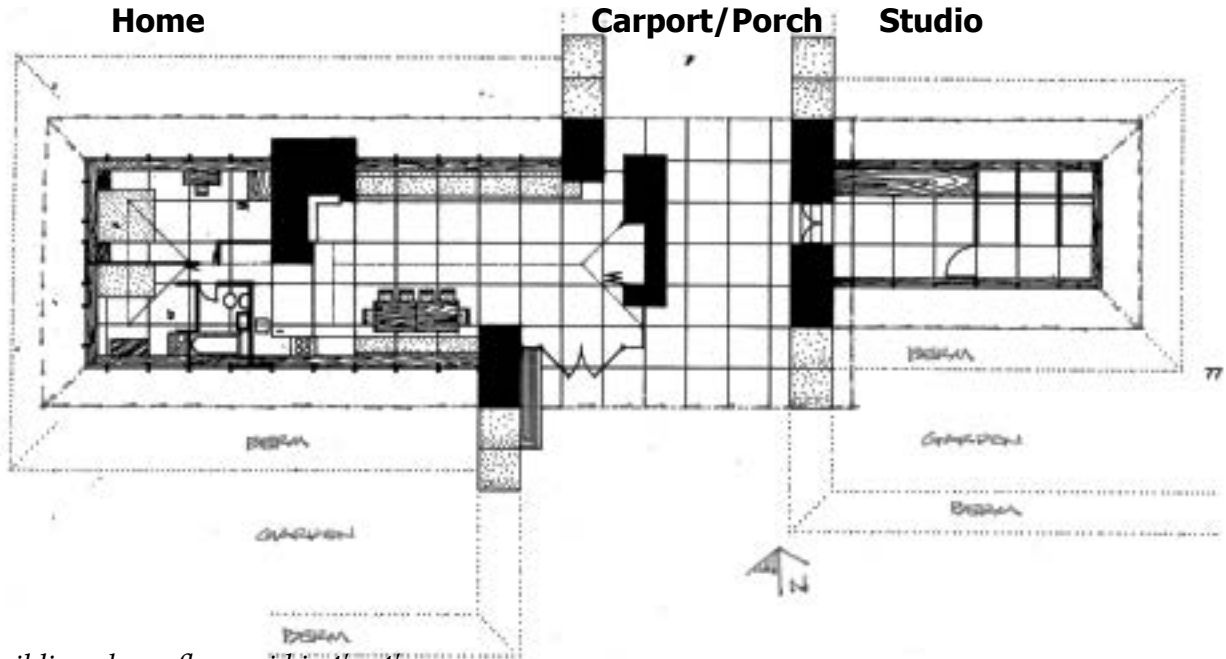
3

4

3 points

Site Design

3. The site is in a completely unwooded level grassland. By adjusting (or not) the north arrow on the building plan below show how you'd orientate the dwelling on the site to support your passive design goals. Explain your decision citing pertinent climate information and building design features!



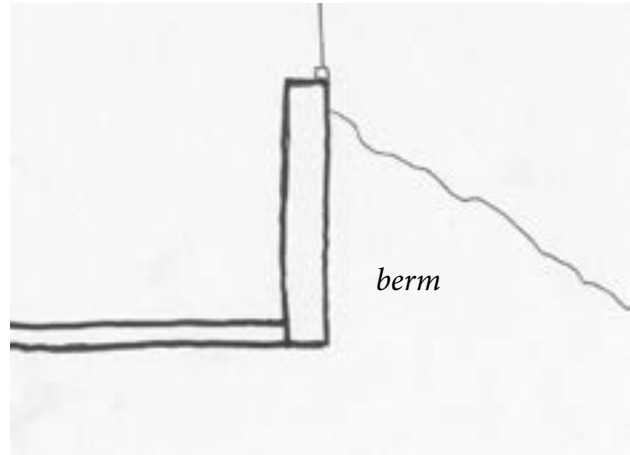
Building plan—floor grid is 4' x 4'.

3 points

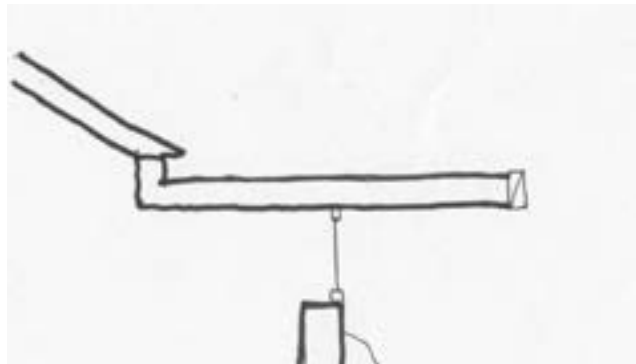
Building Design

4. Respond to these three questions on passive building design.

A. Sketch an improved detail for the originally uninsulated concrete slab and wall. Explain why it's an improvement.



B. Sketch an improved detail for the four-foot overhangs. Explain why it's an improvement.



C. Specify appropriate glazing for the operable windows. Explain why it's an improvement over the originally single-pane glazing.