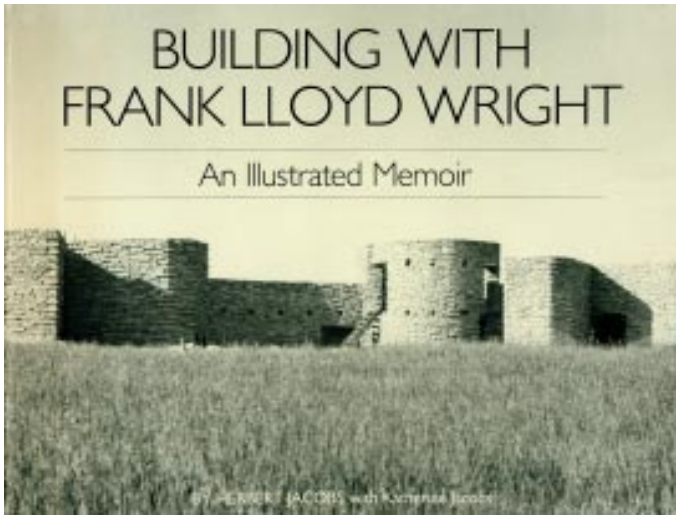
Arch 464
ECS
Spring 2006 Name_____

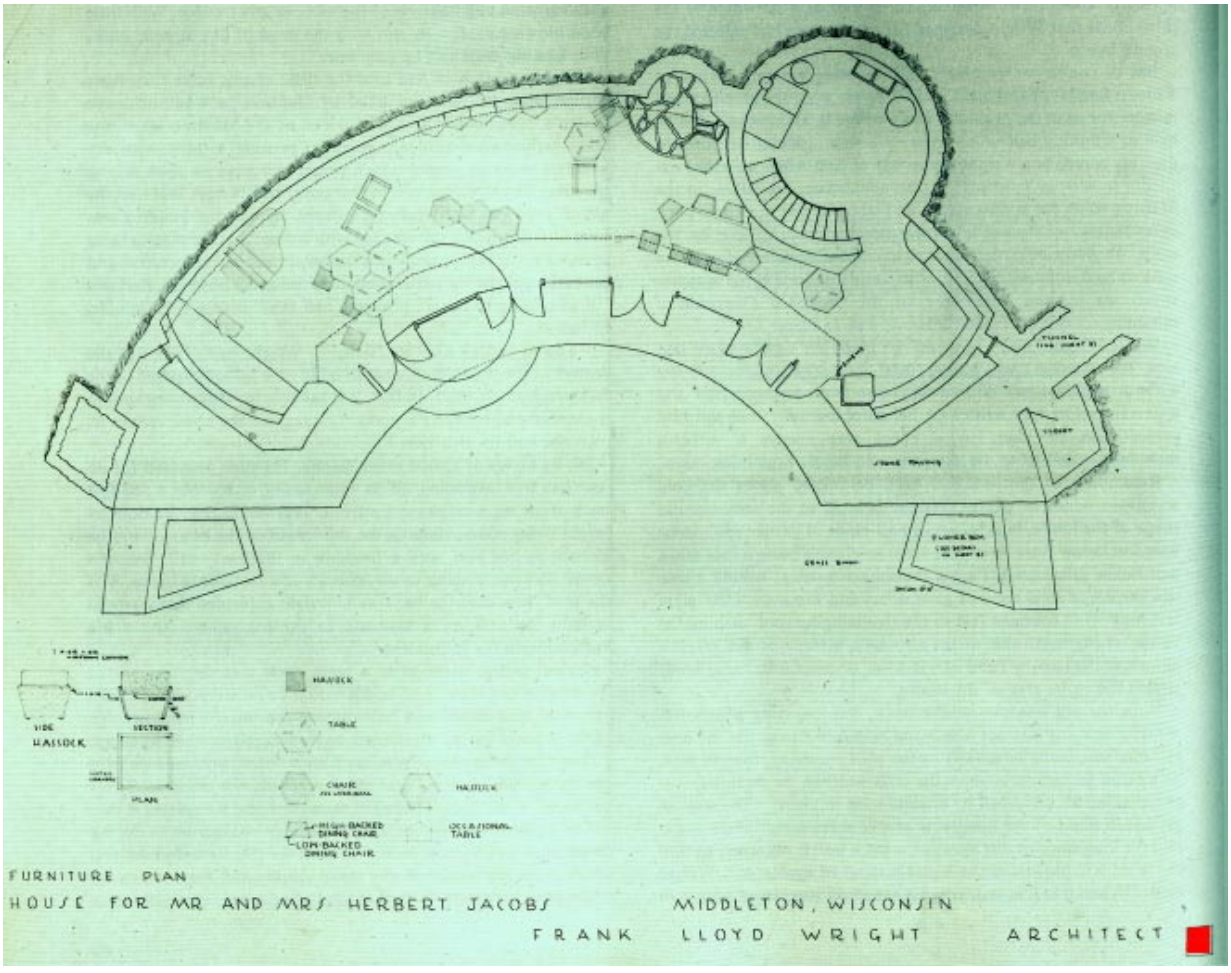
Quiz #3

"It's Wright; make it Sustainable"

For this problem you are a green architecture consultant who is evaluating Frank Lloyd Wright's 1948 Solar Hemicycle House (aka Jacobs II) for its potential to become a modern sustainable home.

The house was built to its day's energy code (none), but featured a hydronic radiant slab heating system. It has no insulation in walls, ceiling, or floor. All the windows, many operable, are single pane glazing. The large suburban site is essentially flat except where Wright carved out the sunken garden and piled up the berm. The drive is gravel and ends at a carport far from the house.





Illustrations from Building with Frank Lloyd Wright *and* Frank Lloyd Wright's Usonian Houses.

Solar-Hemicycle Houses

A new type of plan-form appeared in Wright's work that linked the new development with the original kit Usonians. The ramped earth banks or insulating berms of the project for the autoworkers' cooperative homesteads of 1942 were combined in the same year with a curved form of house, which was glazed along its south side to receive sunlight. Wright called it the "solar-hemicycle."

The concept took shape in the second Jacobs house, designed in 1943 and built in 1948–1949.[74] The Jacobs family, now requiring five bedrooms, again provided Wright the opportunity for an architectural advance. The site at Middleton, Wisconsin, was to the west of Madison and the earlier Usonian. From the north, the direction of the coldest winds, the house appears to be a natural hillock, with outcropping native rock typical of the region. In reality it is a grassed bank against the curved rear wall of the house, which is built of stone, and capped by high-level bedroom windows and the roof. Entry is via a stone tunnel through the bank to the sunny interior garden. The fully glazed south facade of the house curves around this. The stair, chimney, and services are concentrated within a stone drum near the entrance and workspace. The interior contains a 40-ft livingroom visually linked through a curved double height to the bedrooms and their access gallery above.

Essentially the house forms one room, which is in turn an integral part of the sunken garden outside. This interpenetration is made complete by a circular pond placed beneath the glazed wall so that fish can swim inside or out. Construction is by daring use of wooden structure: 12- by 1-in. boards span from the north facade to the mullion posts of the glazed south wall, to which they are placed to form radiating double beams, bolted on either side. From these, the entire bedroom gallery is suspended on ¾-in. steel ties. The bedroom walls are made of lapped boards laid diagonally with no framing. The Jacobses did about half the construction, with Mr. Jacobs acting as "both contractor and supervisor."[75] Here, 30 years before the "energy crisis," was an instructive attempt to develop a "low-energy" architecture, deriving a lyrical form from the need to obtain maximum solar heat and protection from northern winds.[76]

The house as it appeared nearly two years after constuction. The sunken garden is in the foreground..

The northern berm rises almost to the level of the mezzanine windows. The sunken garden to the south, the concave shape of the house, and the slope of the roof and berm combined to produce high pressure pocket of still air that protects the house from winter's prevailing SW winds.

Critique

1. Point out three features of the design that work toward sustainability. Explain why they are effective for a single family residence in Wisconsin.

3 points

1

Curved south facade exposed to midday winter sun.

2

Sun penetration at midday in winter.

3

Improvements

4 points

2. Suggest four improvements to the building that would make it more sustainable and could be integrated with the existing site and building. Explain each of your suggestions. Use sketches and diagrams to make your intentions clear.

Entry tunnel viewed from north.

1

2

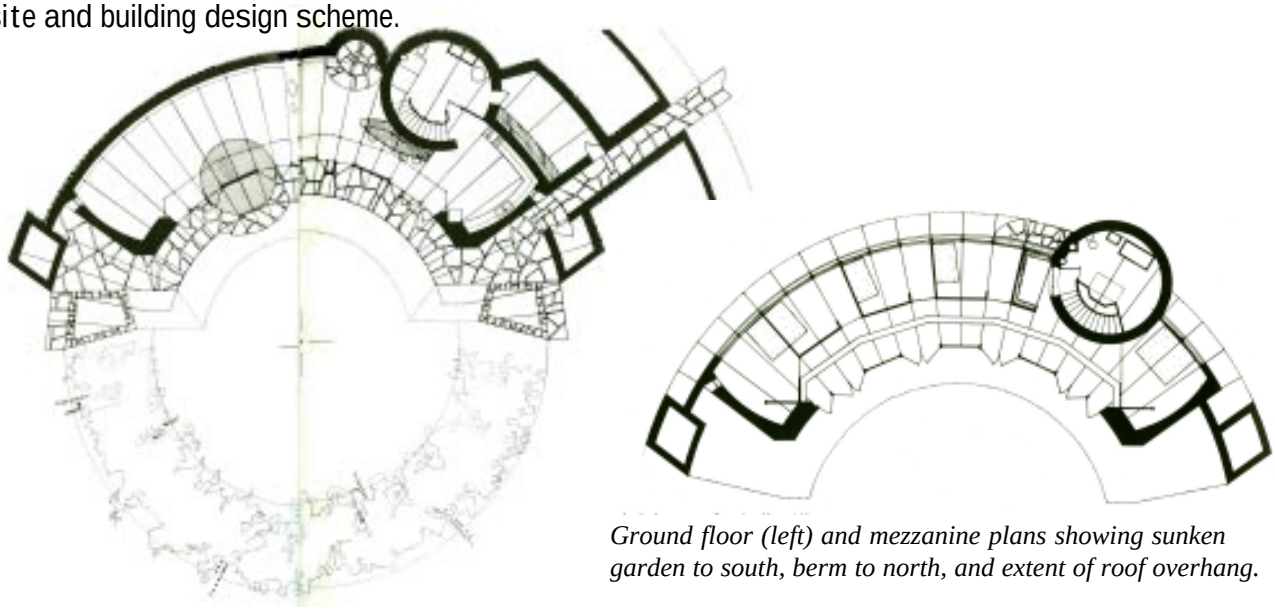
3

4

Site Energy

3 points

3. Propose two appropriate systems for generating site energy that would reduce the building's contribution to greenhouse gas emission and show how these can be integrated into the site and building design scheme.



Ground floor (left) and mezzanine plans showing sunken garden to south, berm to north, and extent of roof overhang.