



PDHonline Course C683 (2 PDH)

Solar Hemicycle: Frank Lloyd Wright's Jacobs II Passive Solar House

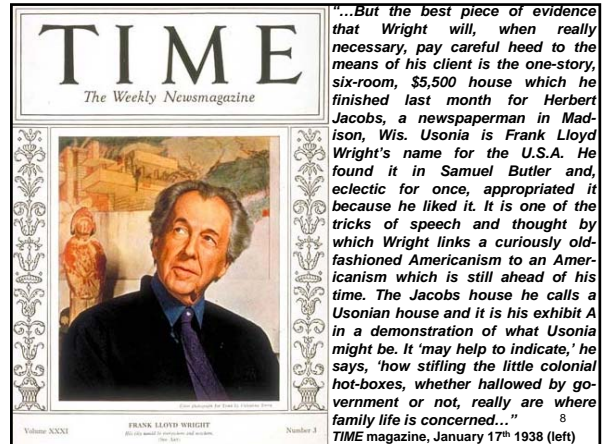
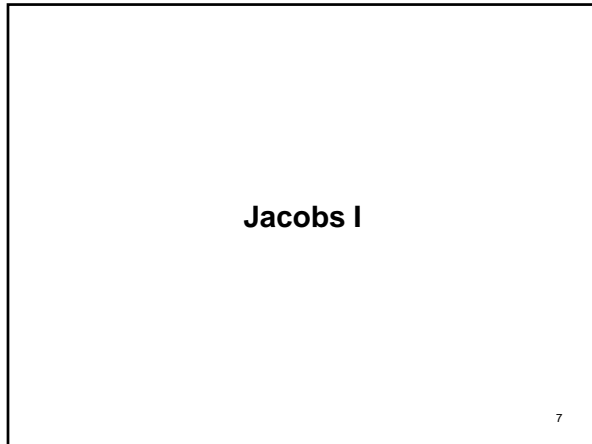
Instructor: Jeffrey Syken

2020

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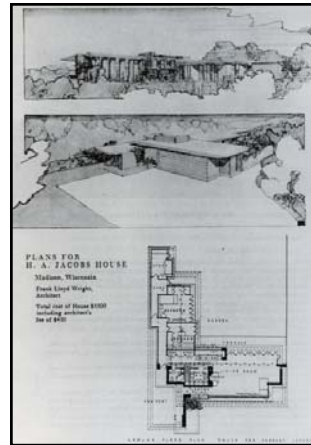
“...But the best piece of evidence that Wright will, when really necessary, pay careful heed to the means of his client is the one-story, six-room, \$5,500 house which he finished last month for Herbert Jacobs, a newspaperman in Madison, Wis. Usonia is Frank Lloyd Wright's name for the U.S.A. He found it in Samuel Butler and, eclectic for once, appropriated it because he liked it. It is one of the tricks of speech and thought by which Wright links a curiously old-fashioned Americanism to an Americanism which is still ahead of his time. The Jacobs house he calls a Usonian house and it is his exhibit A in a demonstration of what Usonia might be. It 'may help to indicate,' he says, 'how stifling the little colonial hot-boxes, whether hallowed by government or not, really are where family life is concerned...'”⁸
 TIME magazine, January 17th 1938 (left)

“Would you really be satisfied with a five-thousand dollar house? What most people really want is a ten-thousand dollar house for five-thousand dollars...A car is not a horse, and it doesn't need a barn...”

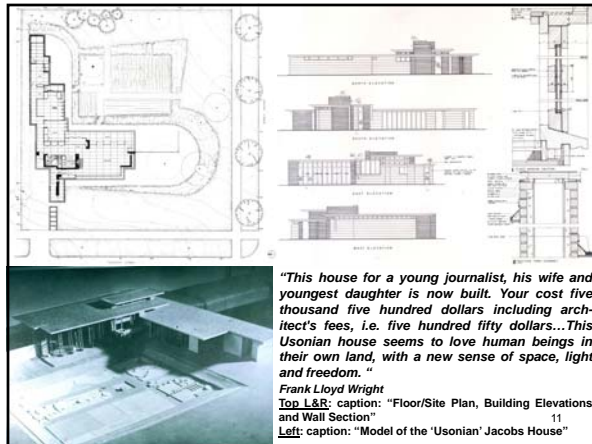
Frank Lloyd Wright
 RE: in the summer of 1936, **Herbert Jacobs** - a newspaper editor from **Madison, Wis.**, visited Taliesin with his wife and asked FLW to build them a “descent” house for \$5K. Fresh from his experience with the Lusk's and Hoult's, he laid down the conditions;

- No bathroom tile;
- No expensive interior cabinetry;
- Radiant heated floors would be used;
- No garage - a “carport” would be provided;
- The bathroom and kitchen would share a plumbing chase;
- Rough lumber would be used to frame and finish the interior walls

FLW signed an agreement to build the house – including his fee – for a guaranteed price of \$5,500, on November 15th 1936.

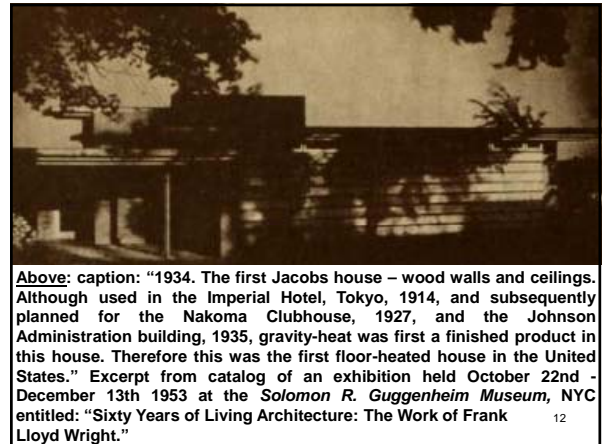


Left: caption: “Architectural sketches and floor plans for the Herbert A. Jacobs residence, known as Jacobs I, at 441 Toepfer Avenue. This was the first of 25 Usonian houses designed by Frank Lloyd Wright, with an affordable design (intended to cost about \$5,000), which the architect dubbed ‘the house America needs.’ The Jacobs residence was also reportedly the first in the country to employ a radiant heating system embedded in the floor. These sketches and plans were published in the January, 1938, issue of Architectural Forum.”



“This house for a young journalist, his wife and youngest daughter is now built. Your cost five thousand five hundred dollars including architect's fees, i.e. five hundred fifty dollars...This Usonian house seems to love human beings in their own land, with a new sense of space, light and freedom.”

Frank Lloyd Wright
 Top L&R: caption: “Floor/Site Plan, Building Elevations and Wall Section”
 Left: caption: “Model of the ‘Usonian’ Jacobs House”



Above: caption: “1934. The first Jacobs house – wood walls and ceilings. Although used in the Imperial Hotel, Tokyo, 1914, and subsequently planned for the Nakoma Clubhouse, 1927, and the Johnson Administration building, 1935, gravity-heat was first a finished product in this house. Therefore this was the first floor-heated house in the United States.” Excerpt from catalog of an exhibition held October 22nd - December 13th 1953 at the **Solomon R. Guggenheim Museum, NYC** entitled: “Sixty Years of Living Architecture: The Work of Frank Lloyd Wright.”



"...He called his modest house 'Usonian,' after the United States. It was a single story built on a monolithic concrete slab and joined to a carport and not a garage. Wright believed that it could be replicated all across the country. His main desire, which no contemporary architects pay any attention to whatever, is shelter for ordinary people...he got it down at one point in 1940 to \$5000 per house for a family with children and a kitchen and gardens...and openness and a real milieu in which it was a highly civilized way to live. He thought about it all the time; he took commissions from the poor as well as from the rich...We're not like that anymore and this was very important in any appraisal of what his work represents because he hasn't had the following that he should have had in respect to shelter..."

Brendan Gill, Writer/Author

13

Above L&R: exterior/interior views of FLW's Usonian (Jacobs I) house

Usonian Fever

14

"Wright's Usonian house, a moderately priced, modernist residence for the everyman, was taking off. In January 1938, Wright's Jacobs residence, the first Usonian house to be completed, was featured in Henry Luce's TIME. The magazine was deluged with inquiries. So many visitors came to see the house that the Jacobs were able to charge a fifty-cent admission, ultimately recouping their entire architectural fee..."

RE: excerpt from *The Fellowship*

15



Left: caption: "1939. The Lloyd Lewis house, near Libertyville was designed for the low humid Chicago prairie. For that reason floors were kept up off the ground. The house is of cypress (walls and ceilings) inside and out. The masonry walls and piers are of pink Chicago common brick. As is usual with these houses, this one is furnished throughout as designed by the architect." Excerpt from catalog of an exhibition held October 22nd - December 13th 1953 at the Solomon R. Guggenheim Museum, NYC entitled: "Sixty Years of Living Architecture: The Work of Frank Lloyd Wright."

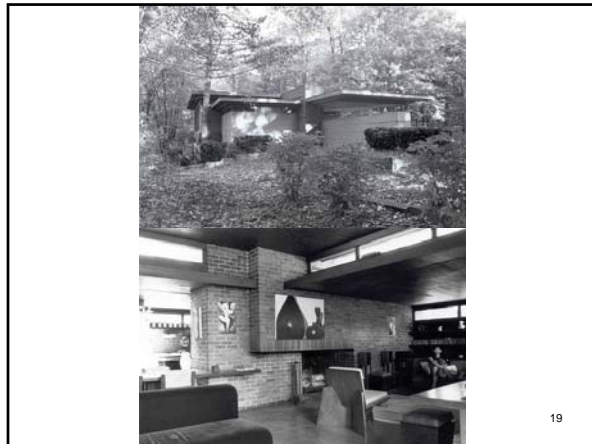
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Above: caption: "1934. Goetsch-Winckler Cottage, Okemos, Michigan, was designed for two teachers at Michigan State College. It was originally part of a group of seven, the remaining six of which were never built because the F.H.A. decided they would not stand up." Excerpt from catalog of an exhibition held October 22nd - December 13th 1953 at the Solomon R. Guggenheim Museum, NYC entitled: "Sixty Years of Living Architecture: The Work of Frank Lloyd Wright." 18



19

“The average builder of the small house doesn’t know how to build an economical house anymore than the average family knows how to live in one...”

Frank Lloyd Wright
 RE: in late 1936, a young, ambitious New York developer regularly visited the construction site of a FLW Usonian house going up in Great Neck, LI, NY. He took note of the cost-effective design;

- No basement;
- No deep foundation;
- An easily standardized modular structure

His name was **Robert Levitt** (of Levittown fame)

20

Part 2

A Solar Hemicycle

21

Jacobs II

22

When compared to other works by master architect *Frank Lloyd Wright*, his second house for *Herbert and Katherine Jacobs* stands out for a number of reasons, foremost among them is its uniqueness - there was no other building like it by FLW up to that time. Although aspects of it can be traced to some of his earlier buildings, the way FLW combined these and other features produced a house without peer. The concept for what FLW called the “Solar Hemicycle” first took shape in the second Jacobs house built between 1946-48. A number of other houses and buildings were projected and built along hemi-cycle (Greek for “half circle”) lines indicating the impact of this design on his later work.

23

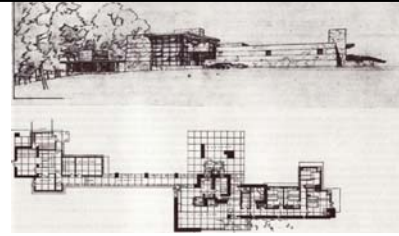
“...Another project, this one small in scale and comparatively low in cost but important in any account of Wright’s exploration of new forms, was a house that Wright designed for Herbert and Katherine Jacobs – the same couple for whom he had designed his first Usonian house, in Madison. After five pleasurable years in Usonia One, the Jacobs decided that they and their three growing children should undertake the experiment of moving to the country. They bought a ramshackle farmhouse, capable of being lived in until the time came when Wright would provide them with plans for a new one; they invited Wright to help them choose a site for the new house, and together they hit upon a nearby hilltop overlooking the open Wisconsin countryside, exposed to bitter winds in winter and the hot sun of summer...”

RE: excerpt from *Many Masks: A Life of Frank Lloyd Wright*

24

Taking FLW's advice to "move out to the country," in November 1942, Herbert and Katherine Jacobs left their first home (*Jacobs I*) in Madison, Wisconsin and moved to a 52-acre farm nine miles west of the city. They had decided to become part-time farmers and thus help the war effort while introducing their children to the pleasures and burdens of farm life, which they hoped would build-up their character and instill a sense of values. As such, the Jacobs had to give up the house FLW had designed for them in 1936; the first "Usonian." Though the Jacobs had been happy living in their Usonian house, they were determined to have FLW design another house for them to be built on their farm property as soon as the war was over. To this end, Herbert Jacobs wrote to FLW about six months after the move (in the spring of 1943) asking the architect to stop by and inspect the site. FLW replied that he would and in July 1943 he arrived at their farm house. After inspecting their land, he selected a site towards the top of a long sloping field. The background was to be an oak woods. The foreground, towards which the house would open to, consisted of rolling hills and valleys south of the site.

25



"...Wright showed us a perspective and floor plan similar to this one in December, 1943, saying we could do much of the construction ourselves, but we decided that it was more elaborate than we felt suited us and that it did not invite the informal way of life we had learned to love in the first house. Though accepted by later clients, the house was never built..."

Herbert Jacobs
RE: excerpt from *Architectural Forum*, January 1948. By the end of 1943, FLW had prepared a design for the Jacobs and they journeyed out to *Taliesin* in early December 1943 to see it. However, it was not what the Jacobs had in mind. They preferred a less expensive house designed specifically for their family needs and appropriate for the exposed, rural site

26

"We saw a floor plan and a perspective drawing of a rather large square-shaped living room area, two stories high, and a low bedroom wing extending out from it, with a bath and a powder room, two small bedrooms, and a large master bedroom with its own fireplace...The enormous living room also had a mezzanine across one end. In the opposite direction from the bedroom wing, a roofed passageway led to a small barn with room for a horse, a couple of cows or steers, and some sheep...It was a fitting estate for a country gentleman and his wife and family"

Herbert Jacobs
RE: as the city grew around them, the Jacobs' had decided to move further out to the country near *Madison*. They rejected FLW's first concept for their second home out of fear of large energy bills from a too-large home (with 13-foot high glass-enclosed rooms) in the exposed country setting of the house. He responded by adapting the same principles developed in *Jacobs I*, but this time expressly oriented to a passively solar heated and naturally cooled design.

27

On February 8th 1944, the Jacobs' were invited to *Taliesin* once again to see the drawings for their house. What FLW showed them on Sunday, February 13th 1944 was an entirely new and original design that was nothing at all like their first Usonian house. In plan it was nothing more than an arc of about 120 degrees (if other features such as the outer walls and two large planters are included, it was a full 180 degrees in width). Inside it would be two stories, 14-feet in height and would spread out along the arc for approximately 88-feet at the rear, or north side, and 60-feet on its front, or south-side. Its interior depth was to be 17-feet. The south wall would be all glass, 48-feet in length, divided between doors and fixed panes. The rear and side walls were to be built of stone, the north-side largely covered by a sloping berm of earth. It was to be a solar house, one that would turn its sheltered back to the cold north winds and invite the sun in through its wall of south facing glass. The idea of a solar house; designed to receive and store heat from the sun, while insulating itself from the cold, was not original with FLW. Architects had been experimenting with solar houses since the late 1930s.

28



"...Wright proposed what he called a solar hemicycle house, which would nestle in a scooped out garden area a couple of feet below grade, with a facade largely of glass facing south and a solid earth berm at its back. All winter long the sun would shine into the half circle of ground-floor living and dining areas and into the bedrooms that shared a mezzanine above those areas; in summer, the broad overhang of the roof would keep the glass in shadow..."

RE: excerpt from *Many Masks: A Life of Frank Lloyd Wright*

29



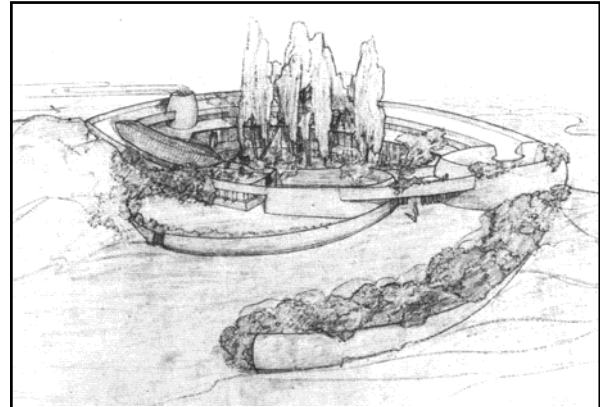
"You are getting another first...Here is the answer to the problem of what to build on a hilltop exposed to the full sweep of the wind. In fact, it is suitable for almost any spot in the country where there is good drainage, for the house creates its own site and its own view..."

Frank Lloyd Wright

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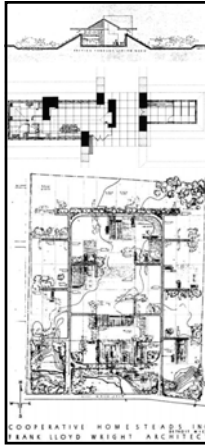


Exactly how FLW got the idea for making the house semi-circular in form is uncertain. He claimed that it was site specific in that the idea came to him when studying the site and trying to figure out how to overcome the problem of the cold winds, especially from the southwest in winter (which would impact the south facing glass walls of a solar house). Others have theorized that FLW's growing fascination with curvilinear forms lay behind the concept. At the time he designed the *Jacobs II* house, he was enmeshed with his plans for the *Guggenheim Museum* in NYC. A more direct source may be his 1943 design; the *Lloyd Burlingham* house in *El Paso, TX*, which consisted of two interlocking arcs enclosing a courtyard protecting the inhabitants from the desert wind and dust. FLW's use of a berm for the north-side of *Jacobs II* was also not original. The idea goes back to his 1942 project for a group wanting to build cooperative housing near *Detroit*. The idea was for the residents to build the walls of their houses themselves from earth made solid by tamping soil into forms. Once the forms were removed, the vertical sides of the earthen berms would be plastered and become the inside walls of their houses. In the case of his *Detroit* clients, FLW apparently was thinking of the berms only as cheap walls that amateurs could build and not as integral parts of a scheme for erecting passive solar houses. ³¹



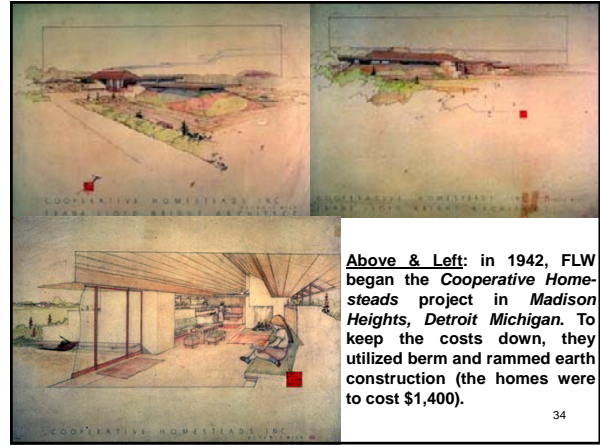
Above: rendering of the never realized *Lloyd Burlingham House* (1942)

32



A group of auto workers, teachers and other professionals in *Detroit, Michigan* formed in the late thirties a cooperative organization for the purpose of buying land in the country and starting construction on a group of moderately priced houses for themselves and their families. Eventually, they purchased a 160-acre farm to begin their venture. Their plans fit in perfectly with FLW's own ideas about decentralization, moderate-cost housing, and leaving the over-crowded city for the country where people could live in harmony with the surrounding landscape. FLW was, at this time, interested in experimenting with rammed earth construction and this project seemed a good place to start. They purchased bulldozers, tractors and other building equipment and drew lots to see which family's house would be the first constructed. Rammed earth walls were formed and a protective roof covering was begun, but WWII intervened. The winter snows came and the incomplete berm walls of the prototype model were washed away. But the project, as conceived in 1942, was the pioneer of rammed earth and earth berm construction. The walls (a.k.a. "earth berms") were to be treated with plaster on the inside surfaces, the outside planted with a variegated pattern of grasses and mosses (a wide overhang would protect the outside berms). Clerestory windows (along the top of the berm walls) would flood the interior with light (FLW would incorporate this feature in his design for *Jacobs II*). ³³

COOPERATIVE HOMESTEADS, INC.
FRANK LLOYD WRIGHT ARCHITECT



Above & Left: in 1942, FLW began the *Cooperative Homesteads* project in *Madison Heights, Detroit Michigan*. To keep the costs down, they utilized berm and rammed earth construction (the homes were to cost \$1,400).

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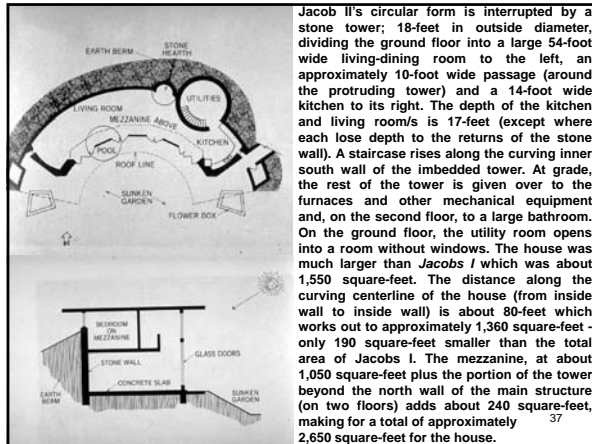


It appears FLW extracted the idea of making houses in the form of arcs of a circle from the *Burlingham House* and *Jacobs II*, but in none of them did he also incorporate the solar elements; the earthen berm, the two story wall of glass and the south facing glass front wall. He designed a house in 1950 that was built by *Thomas Keys* at *Rochester, Minnesota* that had a berm on three sides but was not intended to be a solar house (above L&R). There were other houses built following hemicycle lines including the *Marting House* in *Akron, Ohio* (1947), the *Meyer House* in *Galesburg, Michigan* (1948), the *Laurent House* in *Rockford, Illinois* (1949) and the *Pearce House* in *Bradbury, California* (1950). Although not solar, these other attempts were demonstrative of FLW's growing interest in a flowing architecture, free from the right angle. In the designs offered to *E.L. Marting*, FLW simply offered the same design as *Jacobs II* (with a reversed plan and minor changes). ³⁵

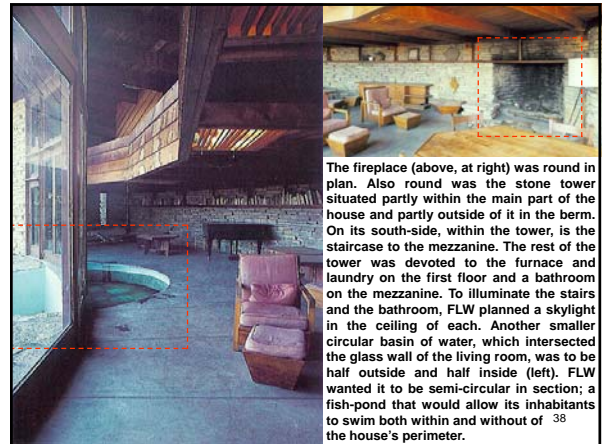


Top Left: the *Curtis Meyer House*
Top Right: the *Laurent House*
Left: the *Wilbur Pearce House*

36



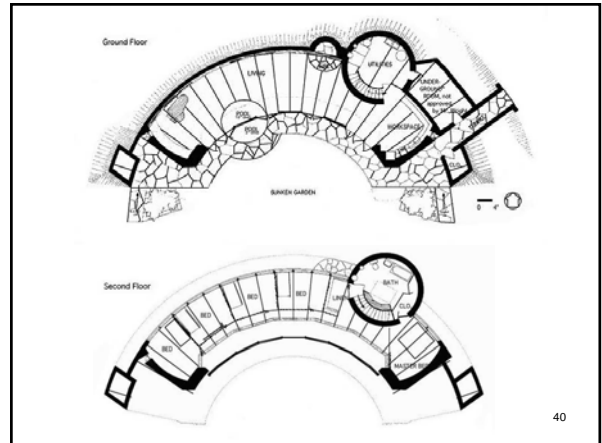
Jacob II's circular form is interrupted by a stone tower; 18-feet in outside diameter, dividing the ground floor into a large 54-foot wide living-dining room to the left, an approximately 10-foot wide passage (around the protruding tower) and a 14-foot wide kitchen to its right. The depth of the kitchen and living room/s is 17-feet (except where each lose depth to the returns of the stone wall). A staircase rises along the curving inner south wall of the imbedded tower. At grade, the rest of the tower is given over to the furnaces and other mechanical equipment and, on the second floor, to a large bathroom. On the ground floor, the utility room opens into a room without windows. The house was much larger than *Jacobs I* which was about 1,550 square-feet. The distance along the curving centerline of the house (from inside wall to inside wall) is about 80-feet which works out to approximately 1,360 square-feet - only 190 square-feet smaller than the total area of *Jacobs I*. The mezzanine, at about 1,050 square-feet plus the portion of the tower beyond the north wall of the main structure (on two floors) adds about 240 square-feet, making for a total of approximately 2,650 square-feet for the house. 37



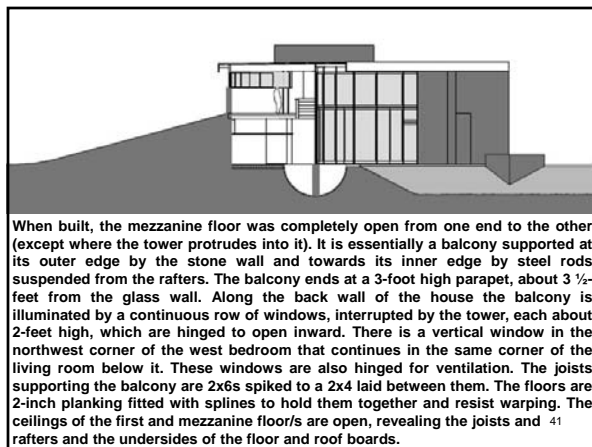
The fireplace (above, at right) was round in plan. Also round was the stone tower situated partly within the main part of the house and partly outside of it in the berm. On its south-side, within the tower, is the staircase to the mezzanine. The rest of the tower was devoted to the furnace and laundry on the first floor and a bathroom on the mezzanine. To illuminate the stairs and the bathroom, FLW planned a skylight in the ceiling of each. Another smaller circular basin of water, which intersected the glass wall of the living room, was to be half outside and half inside (left). FLW wanted it to be semi-circular in section; a fish-pond that would allow its inhabitants to swim both within and without of the house's perimeter. 38



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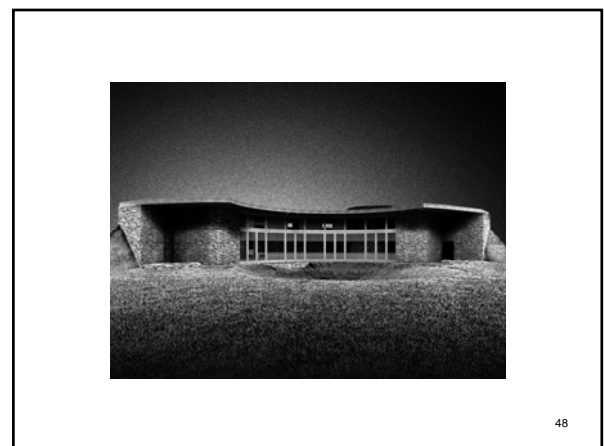
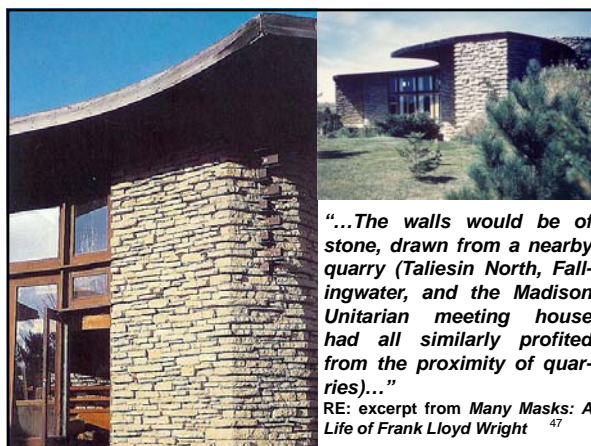
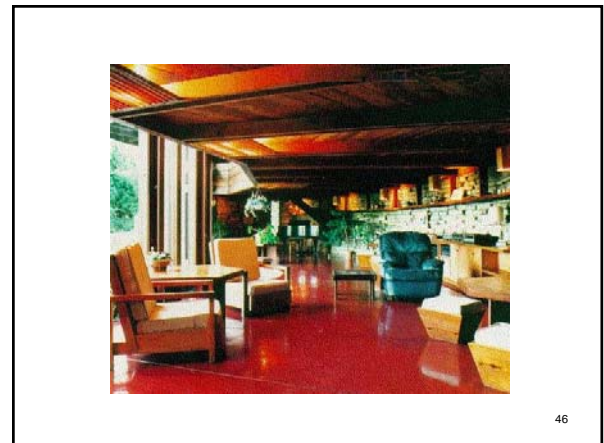
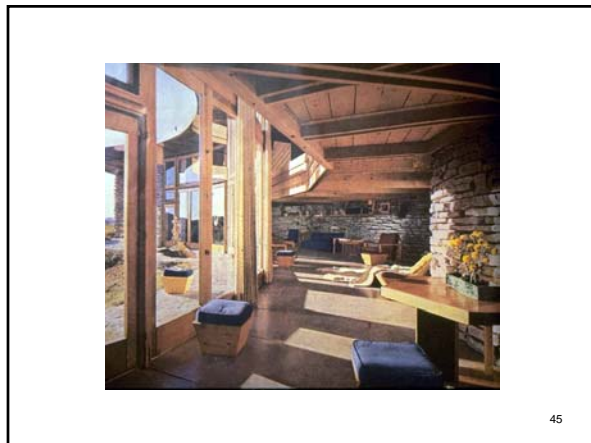
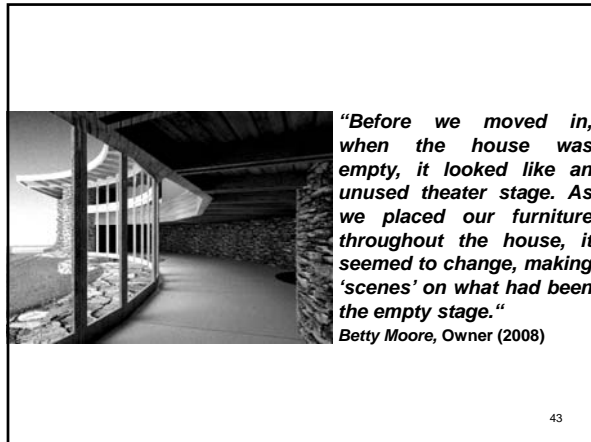
When built, the mezzanine floor was completely open from one end to the other (except where the tower protrudes into it). It is essentially a balcony supported at its outer edge by the stone wall and towards its inner edge by steel rods suspended from the rafters. The balcony ends at a 3-foot high parapet, about 3 1/2-feet from the glass wall. Along the back wall of the house the balcony is illuminated by a continuous row of windows, interrupted by the tower, each about 2-feet high, which are hinged to open inward. There is a vertical window in the northwest corner of the west bedroom that continues in the same corner of the living room below it. These windows are also hinged for ventilation. The joists supporting the balcony are 2x6s spiked to a 2x4 laid between them. The floors are 2-inch planking fitted with splines to hold them together and resist warping. The ceilings of the first and mezzanine floor/s are open, revealing the joists and rafters and the undersides of the floor and roof boards. 41



Top: caption: "The mezzanine balcony walkway gave splendid views of the rolling countryside, as well as access to the bedrooms. The simple construction of the balcony parapet and the one-by-twelve reinforcing boards for the rafters show plainly."

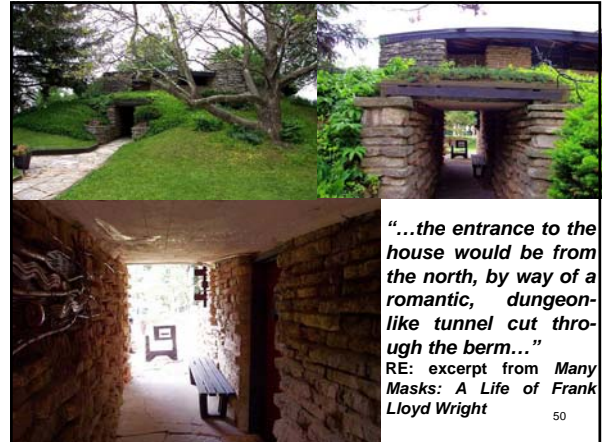
Bottom: caption: "The slanting wall boards in the bedrooms, of one-by-twelve pine boards held together by a three-inch overlap, without studding, varied the horizontal pattern of the other woodwork. Entrances of four bedrooms, including the end one, appear here. The master bedroom is at the opposite end of the balcony."

42





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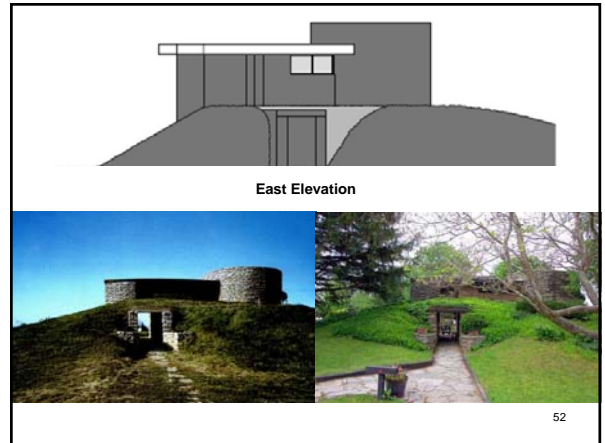


“...the entrance to the house would be from the north, by way of a romantic, dungeon-like tunnel cut through the berm...”
 RE: excerpt from *Many Masks: A Life of Frank Lloyd Wright*

50

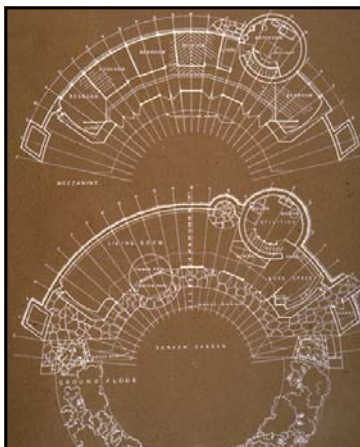
FLW's solution to the problem of entering the house was quite inventive. Faced with a high berm on the north-side (actually, the front of the house) he decided to penetrate the berm on the east-side of the house with a tunnel. The tunnel seems to have been the accidental result of FLW's wanting to link the house with a barn that *Herbert Jacobs* intended to build north of the house by means of a covered weather-proof passageway. After Jacobs objected to the idea, FLW eliminated all of it except the part that would pass through the berm. The solution never solved the problem of making clear to the visitor exactly where the entrance was located. FLW presented his clients with the problem of finding their front door (a common feature in many FLW buildings).

51



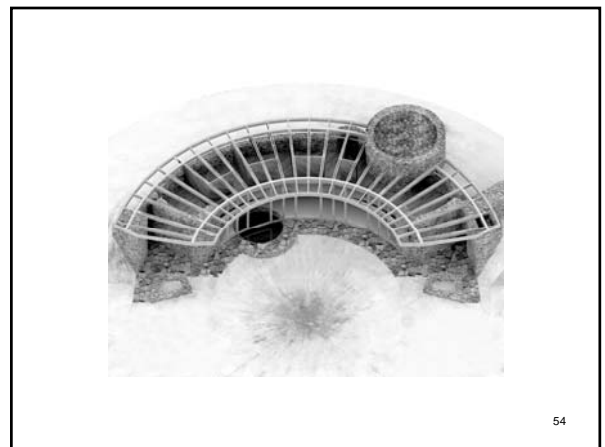
East Elevation

52



As early as 1902, FLW had used a unit system or modules for laying-out a building (it was a method for providing the building with a consistent scale). In *Jacobs I*, the device was intended to assist in the construction of the house. Zinc strips inserted into the grid lines (troweled into the concrete pad) would mate with grooves cut into the bottom of the board walls and also would show graphically where the brick walls were to be placed. After *Jacobs I*, FLW used the system fairly consistently in the many slab floor buildings he designed. He called for lines to be troweled into the cement slab of *Jacobs II*, but the system there wasn't based on closed units, rectangles, squares, hexagons or triangles. Instead, he proposed scoring radial lines (at six-degree intervals) into the concrete: lines running from the center of the circle of which the house was a part, beginning at a center point located about 28-feet directly south of the glass wall. Presumably, they gave guidance for setting the roof rafters. However, their purpose seems to have been to clarify the system employed in laying out the house.

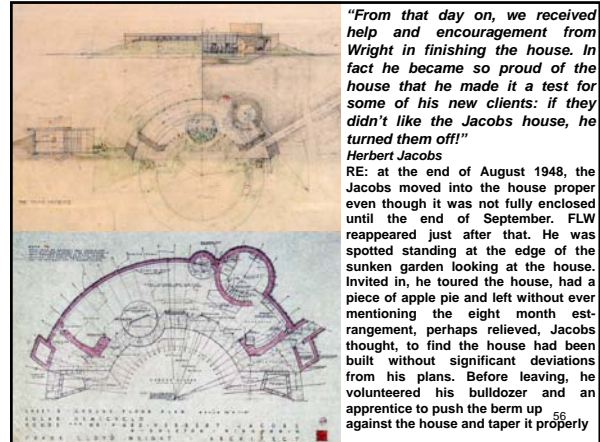
Left: Ground (bottom) and Mezzanine 53 (top) floor plans showing radial lay-out lines



54

"...Throughout the final years of the war, Jacobs pleaded with Wright for working drawings and specifications, and Wright kept putting him off with what Jacobs later described in his memoirs as 'masterly one-liners...variations on the theme that he would be over to see us as soon as he could find the time and that he greeted us affectionately.' It wasn't until the late summer of 1946 that Wright dropped in unexpectedly at the Jacobs' farmhouse and after a meal in which he downed no fewer than seven biscuits dripping with homemade butter, helped them to stake out the foundations for the new house..."

RE: excerpt from *Many Masks: A Life of Frank Lloyd Wright*. The Jacobs liked the plan and ordered working drawings. They paid the first installment of \$250 of FLW's fee towards the end of March 1944. Then they waited. Wright finally showed up some two and one-half years later on August 23rd 1946 to stake out the location of the new house and lay out the road to it. Even so, the Jacobs still had no plans. In fact, Jacobs never revealed exactly when preliminary plans or working drawings arrived, only that he eventually received two sets of plans. On October 14th 1946, a few of FLW's apprentices arrived with a bulldozer to hollow out the sunken garden in front of the house, move the earth from the house site and pile it up for later use in the berm and to build a road to the house. FLW had been offended by a trivial remark Jacobs made in his amusing account of his experiences after moving to the country entitled: *We Chose the Country*. To FLW, it was a major affront and all contact between architect and client was immediately terminated. The result was that the Jacobs were left to build the house alone. The loss of FLW did have one positive effect; it allowed them to make minor changes when they built the house without fear of being lectured by the controlling architect.



"From that day on, we received help and encouragement from Wright in finishing the house. In fact he became so proud of the house that he made it a test for some of his new clients: if they didn't like the Jacobs house, he turned them off!"

Herbert Jacobs
RE: at the end of August 1948, the Jacobs moved into the house proper even though it was not fully enclosed until the end of September. FLW reappeared just after that. He was spotted standing at the edge of the sunken garden looking at the house. Invited in, he toured the house, had a piece of apple pie and left without ever mentioning the eight month estrangement, perhaps relieved, Jacobs thought, to find the house had been built without significant deviations from his plans. Before leaving, he volunteered his bulldozer and an apprentice to push the berm up against the house and taper it properly

Sweat Equity



"...With the Jacobs themselves mixing and pouring concrete, laying up stone, and putting down floors, the house reached a habitable stage by 1948. They had hoped the house could be built for five thousand dollars, especially with all the 'sweat equity' (as it later came to be called) that they had contributed, but knowing Wright they were not surprised when the total cost amounted to something over twenty thousand dollars..."

RE: excerpt from *Many Masks: A Life of Frank Lloyd Wright*
Above: caption: "Reminiscent of a medieval fortress, this 'solar hemicycle house' in Middleton, Wis. was designed by Frank Lloyd Wright for Mr. & Mrs. Herbert Jacobs in 1944. Construction began two years later. Photo taken during construction in July 1948."

Part 3

An Organic House

Wright's Ideal

"...Whatever fresh interest Wright did bring to bear on domestic work in the last decade of his life was applied...to unusual sites or clients who stood out sufficiently to capture his imagination. Increasingly he talked of organic design and the organic home. An organic building arose uniquely from its site, its climate, its client's needs, its budget, and the intent of the client/architect relationship. It became less a repetition of an architectural idea and more an interaction of architect and client's wishes and skills. Some houses began to realize Wright's ideal, formulated in the early years of the century, that there should be as many different types of houses as there are people...."

RE: excerpt from Frank Lloyd Wright's Usonian Houses

61

"...Begun in 1944 but not finished until 1948 due to war shortages, Jacobs II is a passive solar design. The sun enters through south-facing windows in winter, helping to heat the building. In summer, when the sun is high in the sky, an overhanging roof shades the windows...A heated concrete floor originally provided primary winter toastiness. An artificial berm, created from earth removed from the front of the house, banks its rear. The interior is signature Wright, with his trademark low ceilings, open floor plan and limestone walls...although the square footage is actually quite small (2,162 square feet), it contains some 400 tons of stone..."

University of Wisconsin – Madison News, May 2008

62

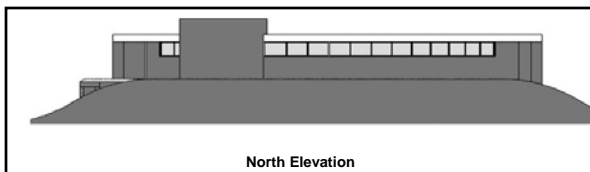
"...Here, 30 years before the 'energy crisis,' was an instructive attempt to develop a 'low-energy' architecture, deriving a lyrical form from the need to obtain maximum solar heat and protection from northern winds..."

RE: excerpt from Frank Lloyd Wright's Usonian Houses. In *Jacobs I*, every part was related to a modular grid. Set on a heated concrete slab laid over sand, it had board walls and a flat roof and faced the rear yard and garden through walls made of glass doors (to save money). For *Jacobs II*, FLW combined these features for use in an entirely different kind of house; a solar house. He used the same elements of *Jacobs I*, though in this case the architect's overall goal was to produce what would otherwise be an expensive, artistic house built of stone, concrete, wood and a small amount of metal. The stonework alone (even though the Jacobs assisted the farmer-masons who worked only when free from farming chores) still cost \$3K – about half the cost of *Jacobs I*.

63

When FLW brought together an earthen berm, a gradually curving house plan bounded by stone walls on three sides and an immense wall of glass facing south on the fourth side (the latter protected by deep overhangs) he created something unknown in his previous work and without peer in the work of his contemporaries. In doing so, FLW also combined his "Solar Hemicycle" with features that the Jacobs would have recognized. The floor was to be a concrete slab heated by hot water circulated in pipes beneath it. The house was to have a flat roof sloped to drain onto the berm. The glass wall was to consist entirely of doors and fixed panels, all containing glass. The few walls in the house, intended only to enclose the bedrooms, were to be made entirely of boards. High windows, forming a rectangular frieze under the eaves of the north-side, were intended to illuminate and ventilate the bedrooms. FLW had used similar windows in *Jacobs I* of 1936.

64



North Elevation



65



West Elevation



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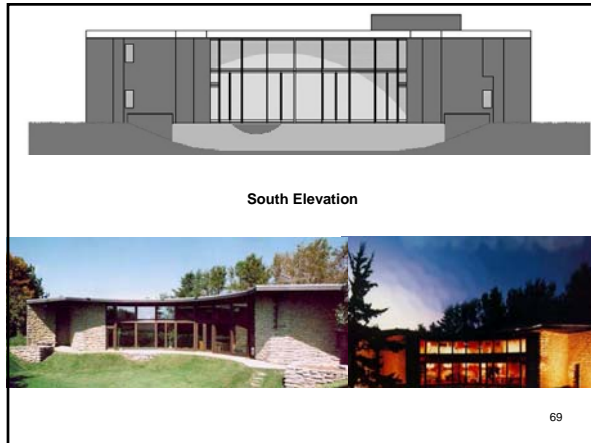
FLW conceived *Jacobs II* as an arc of a circle, thus allowing the berm on its north-side and the stone walls at either end to screen the house from winds blowing from the northwest through the northeast. Furthermore, he conceived of the berm not only as a way of protecting the house from northern winds but as part of a scheme to cause winds from the southwest though south to southeast to blow over the south front of the house rather than on it. His idea was to lower the floor of the house 1½-feet below grade, then excavate a circular garden in front of the house to 4½-feet below grade, thus forming a bowl of dead air which, together with the berm at the rear, would encourage winds from the southern quadrants to lift and blow over the house. The architect even claimed that in windy weather, Jacobs could stand in front of the glass wall and light his pipe with ease. After the house was finished, Jacobs confirmed that Wright's prediction proved true.

67



The Solar Hemicycle is semicircular in plan, featuring a single concave arc of fourteen-foot high glass spanning the two stories both vertically and horizontally and opening southward to a circular sunken garden and the Wisconsin prairie beyond. The north, east and west sides are bermed up to the height of the clerestory windows on the second floor, protecting the house from cold winter north winds, while the sunken garden in front combines with the rear smooth berming to create an air pressure differential that deflects snow and wind up and away from the large south-facing windows. The second floor is a five-bedroom balcony suspended from the roof joists and hence, does not require obstructing support from below.

68



South Elevation

69

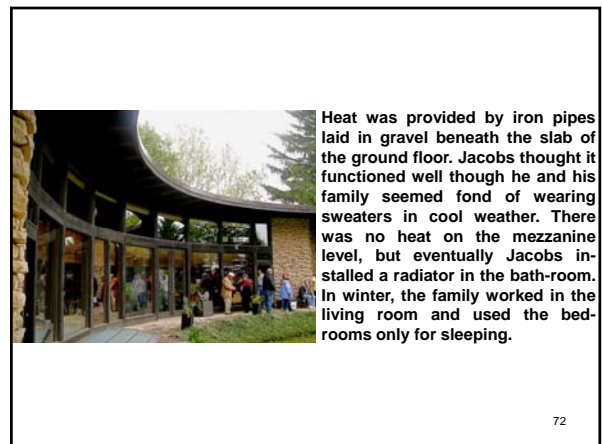


70

"...The house did indeed accommodate itself well to extremes of heat and cold, as Wright had assured the Jacobs it would, and he took pride in driving friends and clients over from Taliesin to have a look at it, arriving without warning at any hour of the day or night. As the Jacobs well understood, a house that Wright designed remained everlastingly his, and the owners of it were in practice mere custodians..."

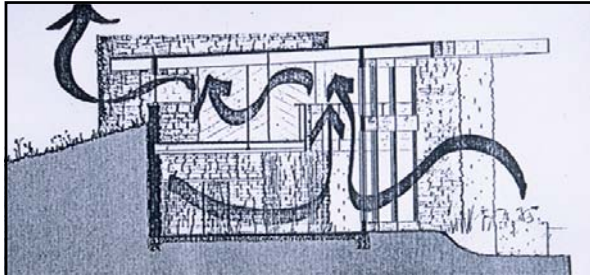
RE: excerpt from *Many Masks: A Life of Frank Lloyd Wright*. Solar Hemicycle houses are semi-circular by nature to take advantage of the sun's varying heights at different times of the year.

71



Heat was provided by iron pipes laid in gravel beneath the slab of the ground floor. Jacobs thought it functioned well though he and his family seemed fond of wearing sweaters in cool weather. There was no heat on the mezzanine level, but eventually Jacobs installed a radiator in the bath-room. In winter, the family worked in the living room and used the bedrooms only for sleeping.

72

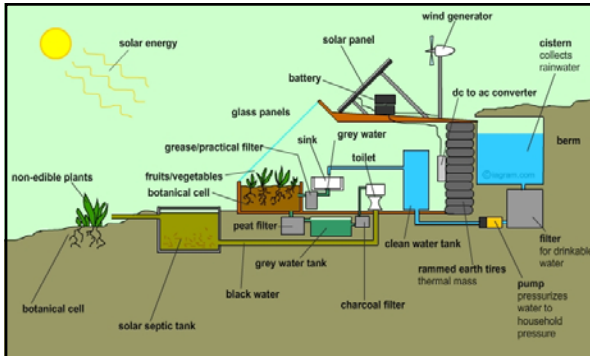


The interior lower level features a concrete floor slab for direct absorption and conversion of the incoming radiant solar energy. Imbedded within the floor is a radiant boiler-heated system for back-up heating that emulates and supplements the solar-heated floor. All interior walls are *Wisconsin Limestone*, providing an irregular and enhanced mass surface area for thermal energy exchange and interior temperature stabilization. There are no dividing walls throughout the entire width of the ground floor, allowing for air and heat distribution evenly throughout. The front of the balcony is pulled away from the south glazing by several feet, enabling the solar-heated air from below to rise up onto the second floor and into the bedrooms over the full balcony width. The air return of this convective loop is completed by a large circular stairwell connecting the two floors.

73

Summertime natural cooling was aided by the shade provided by the cantilevered roof eaves over the south-facing glass as well as by the external earthen berm and interior exposed thermal mass. Daytime “stack effect” ventilation and nocturnal cooling were promoted by the operable glass doors in the south facade and the continuous band of operable clerestory windows along the entire upper portion of the north wall. The semicircular plan reduces the solar gain by about 8% in comparison with a straight south-facing plan, but the semi-circle provides support for the north wall, which reduced construction costs, while the bermed arc served to channel cold winds around and away from the south glazing to reduce heat loss. The semicircular shape also provides a sense of separation and even gives visual privacy as one moves along the arc through the interior undivided spaces (a.k.a. “phantom partitions”). The house is recognized as the first passive solar house and is the basis of the passive solar designs for modern-day “Earthships.”

74

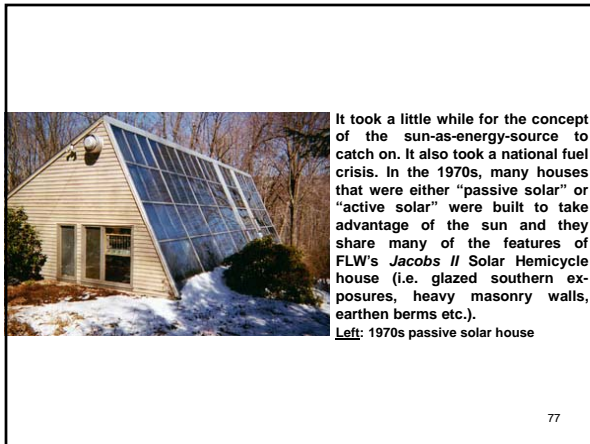


Above: transverse section through a typical modern-day Earthship design

75



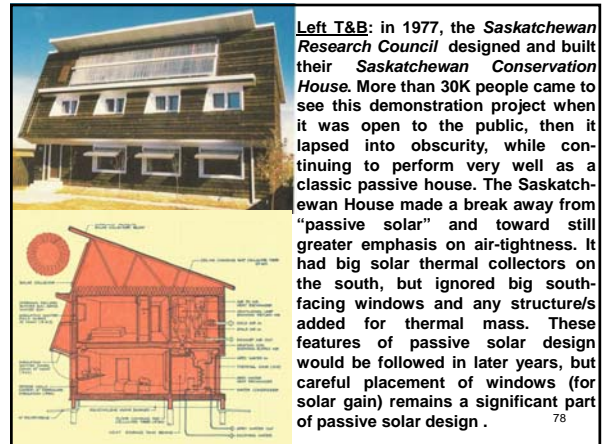
76



It took a little while for the concept of the sun-as-energy-source to catch on. It also took a national fuel crisis. In the 1970s, many houses that were either “passive solar” or “active solar” were built to take advantage of the sun and they share many of the features of FLW’s *Jacobs II Solar Hemicycle* house (i.e. glazed southern exposures, heavy masonry walls, earthen berms etc.).

Left: 1970s passive solar house

77



Left T&B: in 1977, the *Saskatchewan Research Council* designed and built their *Saskatchewan Conservation House*. More than 30K people came to see this demonstration project when it was open to the public, then it lapsed into obscurity, while continuing to perform very well as a classic passive house. The Saskatchewan House made a break away from “passive solar” and toward still greater emphasis on air-tightness. It had big solar thermal collectors on the south, but ignored big south-facing windows and any structure/s added for thermal mass. These features of passive solar design would be followed in later years, but careful placement of windows (for solar gain) remains a significant part of passive solar design .

78

"It has not lost its fascination for us. It took us at least a year to get the full experience of its unique design, its relation to the outdoors, the movement of the sun and its penetration of the house in different seasons. The fascination never pales."

Betty Moore, Owner (2008)

79



80