

Arch 464
ECS
Spring 2010

Name _____

Quiz #1

"Can H16 House Inspire Designers?"



Photos, illustrations, and text: *Architectural Record*, April 2008.

The house viewed from the south.

For this problem you are the daylighting consultant for H16 House owners and furniture designers Helmut and Georgia Link. They've decided to use the living area (1 on the floor plan) of the Upper Level of their home as an inspirational design studio for a visionary team of four designers who are tasked with creating furniture for the "Office of the Future." The Links believe that the magnificent view combined with an elegant daylighting solution will increase the team's skill and productivity. Your task is to intervene tastefully with the space and assure that its daylighting is appropriate for office work.

The owners have asked you to critique the existing conditions and to recommend a scheme for improving the daylighting in the space, given their specific workplace layout. The upper floor is glazed on all four sides and has no shading. The east, west and north facades each have one large door that can be opened for cross-ventilation. The roof is covered with photovoltaic panels and offers no opportunity for skylights.

Stuttgart is at 48 degrees North Latitude and has an humid climate with cold winters and muggy summers.

Text and photos as well as architectural drawings are given below and on the following pages to help you understand the building.

By Suzanne Stephens

It's hardly a secret that Germany has long been at the forefront of energy-saving design. Even back in the early Modern days, its health-oriented obsession with getting natural light and cross ventilation into living quarters paved the way for later passive-energy-saving strategies. In the 1920s, "zeilenbau" planning principles, calling for long, narrow housing blocks to be placed in parallel rows on a north-south axis, allowed sun and air to easily penetrate interior spaces. Although the idea itself was not new, the urban scale of its application offered a model for future problem solving.

Today, German architects and engineers are advancing strategies for sustainable design that go far beyond the zeilenbau thinking, as demonstrated by the efforts of Werner Sobek. A structural engineer famous for such adventurous mega-schemes as Sony Plaza in Berlin (2000) and the Suvarnabhumi International Airport in Bangkok [RECORD, August 2007, page 108]—both designed by Murphy/Jahn—Sobek also runs the Institute for Lightweight Structures and Conceptual Design in Stuttgart.

Since Sobek was trained as an architect as well as an engineer, he also likes to design buildings on his own. In 2000, he built a house for himself, named R128, in Stuttgart, that explored a number of sustainable strategies. In 2006, Sobek completed his latest house, H16, for a young family in the village of Tieringen, not far from Stuttgart. The house, which he maintains is fully recyclable with zero emissions and zero energy use, sits atop a knoll, on a 17,028-square-

foot site overlooking the picturesque village. The owner, Helmut Link, whose family business, Interstuhl Büromöbel, a furniture manufacturer, is located in Tieringen, wanted a Modern, flat-roofed house, with a full south-facing view—and no curtains. The town authorities favor the more gemütlich gabled-and-stuccoed residential architecture. But Link, his wife, Georgia, and Sobek persevered. It got approved.

From the slope to the south of the house, one immediately apprehends its straightforward parti. A glass-and-steel volume, approximately 23 feet deep and 56 feet long, devoted to the living, dining, and kitchen areas, rests on a deeper, steel-framed base, containing bedrooms, roomy baths, and an office. Enclosed by charcoal-black, non-load-bearing, precast-concrete panels, this volume is about 31 feet deep and 54 feet long. Operable, double-paned, narrow windows, between 16 inches and 3 feet in width and a little over 8 feet high, bring light and air into these lower-level quarters. A third, beige-precast-concrete volume, linked by a terrace and roof deck, contains the garage and service equipment for the 4,200-square-foot residence.

Like Sobek's earlier R128 House, the steel frame of the H16 design could be erected in five days. It can be dismantled, as well, and either reused in a new structure or sent to the recycling factory. To keep the house's energy use at zero, Sobek installed a geothermal heating and cooling pump system that takes advantage of the soil's temperatures—warmer than air in cold weather, and cooler than air in the summer. Sobek also put 41 photovoltaic (PV) panels on the

04.08 Architectural Record 122 Architectural Record 04.08

roof, with a 9.02 kilowatt-peak yield. Except for the winter, the house needs little utility-company-supplied power. In the summer, Sobek explains, the PV panels produce more energy than needed, so that surplus is fed back into the grid.

Because of the mountain location, air-conditioning is not much of a problem, although in hot weather water from the soil is pumped to the roof to cool it off. But to make sure that cross ventilation will quickly keep the upper level comfortable in warm weather, Sobek designed the glass panels, 7 feet 8 inches by 11 feet, to slide back on three sides. The panels' triple glazing, with a metal-coated plastic film and argon-gas filling, ensure that the interior stays cozy in the winter. Yet the transparency of the glass is not diminished, as is the case with fritted glass, and light transmission is limited to 64 percent, which mitigates annoying glare.

In many ways, the design of the house and its site on the crest of a slope overlooking the town brings to mind Ludwig Mies van der Rohe's Tugendhat House (1930) in Brno, Czech Republic. The Tugendhat parti called for private areas to be level with the road, so that visitors descended a stair down to the living and dining areas opening onto the garden view. Mies designed the window wall, facing the downward slope of the garden, to slip into the ground so as to bring in cool air during warm weather. The H16 House, however, reverses the placement, and it is not built into the slope: "We didn't want to disturb the ecosystem," says Sobek. "And if the house is surrounded by soil, you

can't control humidity." So Sobek created a retaining wall of limestone and detached the house from the hillside with a moatlake space.

Even with these differences between Sobek's design and Mies's more lavish masterwork, the clarity and simplicity of Sobek's concept, and its integration with nature, bolster the lineage between the two. And although the house doesn't feature Mies's famous furniture, it does include pieces selected from the Interstuhl Büromöbel office lines, strikingly Miesian in their own right. Clearly, the clients of H16, who knew of the R128 House, supported Sobek's progressive intentions. With one exception: Sobek did not want to install a wood-burning fireplace, since it emits carbon dioxide. The Links, however, argued that on a cold, wintry day there is nothing better than to snuggle up in front of a warm fire. So Sobek created a nonstructural, cylindrical column to contain a fireplace in the living room. And the clients are right: Going green shouldn't be too punitive. ■

Project: H16 House, Tieringen, Baden-Württemberg, Germany
Architects: Werner Sobek Engineering and Design—Werner Sobek, principal; Sven von Boetticher, Alexandra Sixt, Markus Buschmann, Hormoz Houshmand, Rüdiger Engelhardt, design team

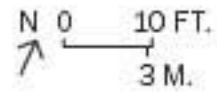
SOURCES
Steelwork, facades, roof, metal-and-glass curtain wall: Basler Metallbau BmBH
Concrete: R. Bayer Beton and Terrazzogruppe
Chairs, tables: Interstuhl Büromöbel



- 1. Living area
- 2. Dining/kitchen
- 3. Master bath
- 4. Master bedroom
- 5. Bedroom
- 6. Office



LOWER LEVEL



View from living area east toward head of stairs and kitchen area.



Above. View of the east facade, which houses the kitchen/dining area.

Right. View of the north facade from beneath the deck.



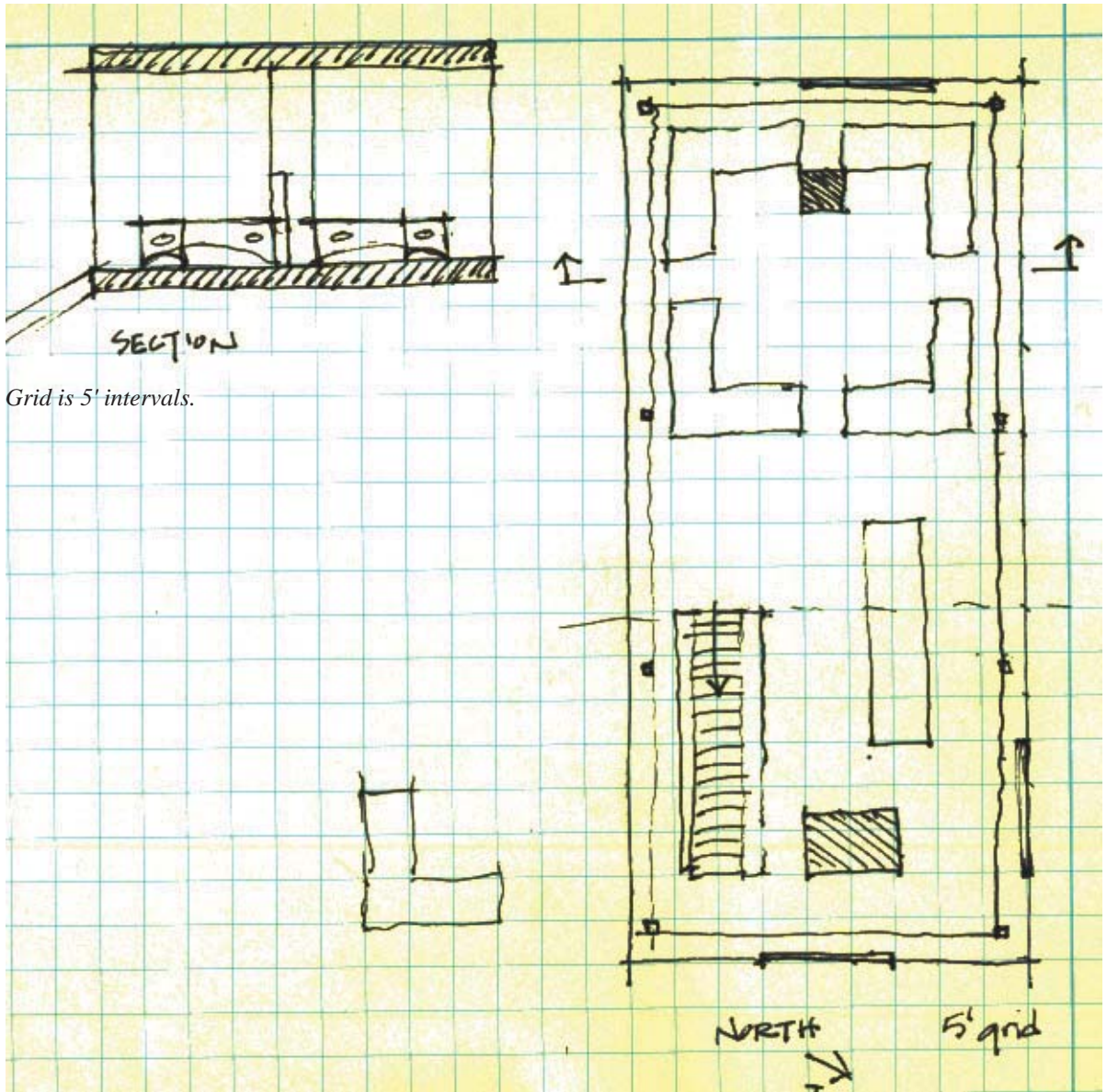
3 pts 1. Citing the text on page 2 and visual evidence in the photos and plans, describe three (3) lighting and comfort problems posed by the current state of the design of the design office to-be.

3 pts 2. Describe three (3) daylighting strategies that could make the space more appropriate for design office work.



Looking west into the living area from the top of the stairs.

4 pts 3. Helmut Link has sketched a plan and section of his intended use of the space. (see page 6). Suggest and defend your suggestions for shading treatment for the three walls of the living area (south, west, and north). You have a choice of four different shading strategies and you may only use three, one on each of the exterior walls of the living area. The choices are: 1) an exterior perforated metal screen that allows only 10% of the solar light and heat to penetrate, but preserves the view; 2) an insulated, translucent Kalwall replacement glazing scheme that provides superior insulation and 50% light transmittance; 3) interior operable blinds that can be adjusted to block direct sun and admit daylight; 4) a light shelf that extends to the exterior and into the interior to shade and redirect light to the ceiling; and 5) no shading. Illustrate your design intentions in plan and section and on any of the photos as appropriate. Show where each designer's two flat screen monitors should be placed on the 15' by 15' L-shaped workstations.



Grid is 5' intervals.