

## Notes on Constructing a Daylighting Model

### Model Materials

We used materials as follows

- \* Base — 1/2" honey comb board available from Charrette was strong and, above all, light weight; available in 32" x 48" sheets. Craft facing/brown color gives appropriate furniture and floor reflectance. Cut with table saw or long bladed utility knife.
- \* Roof— same material as above. Can be painted without undue movement. We edge-banded the roof with 1" x 1/4" pine to create a light-tight "shoebox" lid attachment. Glue fixed wooden "buttons" and used rubber bands to hold roof down tightly.
- \* Exterior walls — used 1/4" Gaterboard available from Charrette. Advantage is that it is a durable material and will accept repeated removal and replacement of a tight fitting roof. Cuts cleanly on table saw and needs painting black to eliminate translucency. Alphaltic wood glue works best.
- \* Trusses — used 1/8" x 1/16" and 1/16" x 1/16" strips of bass wood available from Charrette.
- \* Windows — 1/4" foam core is probably best for window walls. 1/4" resolves as 6" wall thickness for 1/2" scale model. Gaterboard is too difficult to cut. Cardboard is not sufficiently stable (we used cardboard for the south wall but the changing humidity caused the thinner cardboard membrane to buckle unacceptably).

We cut the largest aggregate rough openings we were likely to model and used aluminum foil tape face with white masking tape as masks to reduce the size of that opening as required.

Initially, we covered the base rough opening with a screen of charcoal fiberglass fly-screen mesh and a sheet of clear mylar. The black screen mesh transmitted 57% of incident light, however, we subsequently realized that this transmission number was significantly reduced (we think) for light not normal to the plane of the rough opening — even though our initial test revealed higher angles of incidence reduced transmissions by only about 15%). We initially accepted this transmission reduction as equivalent to the reduced

transmission caused by both the high-performance glazing, the glazing frame opacity, plus a small factor for accumulation of dirt etc.

We finally modeled the glazing using the Southwall Technologies 'Solaris' film in lieu of the screen-mesh and mylar, and resized the base rough opening.

\* Top light: We cut the largest opening, through the honey comb core material. We lined the opening with white cardboard and create the curb height . then use polystyrene blocks to systematically reduce the opening through the array of test size light well openings. The Styrofoam is best cut on the table saw which gives greatest precision and then painted with latex white paint to model reflectance and to provide slightly greater opacity. The paint also reinforces the Styrofoam to make it more tolerant to repeated removal and insertion. In the case of top lighting we installed the Southwall Technologies 'Solaris' film at the ceiling plane which allowed us to adjust the light well opening size (by various combinations of the foam blocks) more rapidly . We used white contact tape, or foil tape overlaid with masking tape, to attach the Solaris film.

### Accessory Items

The following materials are useful accessories for jury rigging and implementing adjustments on the fly:

- \* 3M Contractor's tape, 'Pony' clips
- \* Foil-faced tape: very sticky but still repositionable, opaque to light, highly reflective surface, good for masks and for simulating specular reflections.
- \* White masking tape. Useful for overlaying aluminum foil tape to create a diffuse reflective surface.
- \* T headed pins (which I found in Mary's sewing draw) Easy to insert and remove, long stems allow for fixing through considerable thickness of material. These pins work extremely well with the honey comb core base and roof and with the foam core walls.

## Tips and Techniques

The following techniques were found useful:

- \*Use Archicad to print portions of the elevation plan etc. of the building at 1/2" scale, particularly interior elevations which can be contact adhesive fixed to the appropriate walls. The same for creating window openings. Print that portion of elevation, fix it wall and cut the glazed opening.
- \* Use bar claps to attach the wooden edge stripping to the removable roof panel.
- \* Locate an opening (or openings) for taking interior photographs. Cut lens size opening where appropriate with a hole saw. My Nikon (on f22 and macro) with a tripod and very slow (1/2 sec??) shutter speed worked well.
- \* Install a panel opposite the photograph port such that the configuration data and time of day and year being modeled can be written on a "shooting board" and displayed in the field of view.

