On the Edge of Failure
Unflat Pavilion

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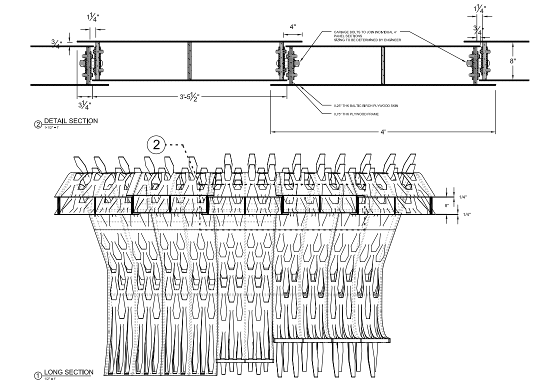
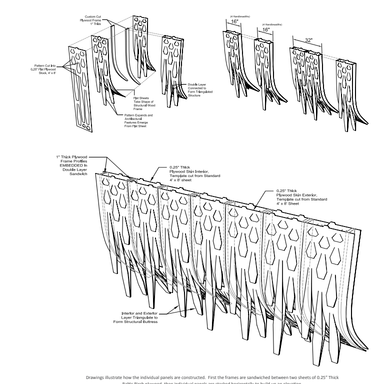
The Unflat-Pavilion is a large-scale inhabitable pavilion designed and constructed based on the observation of a certain materials ability to behave, in this case plywood's ability to flex. A small full-scale mock-up was conducted to demonstrate a range of positions for a thin plywood membrane digitally perforated and then flexed to allow flaps to open up in relation to bending. Great effort was taken to scale up this range of behaviors, first as small sized objects, and then again at the scale of building form. Careful observations and iterative studies led to a relative definition translated into digital form which was able to link the tangential strain relief pattern with the bent position of the membrane.

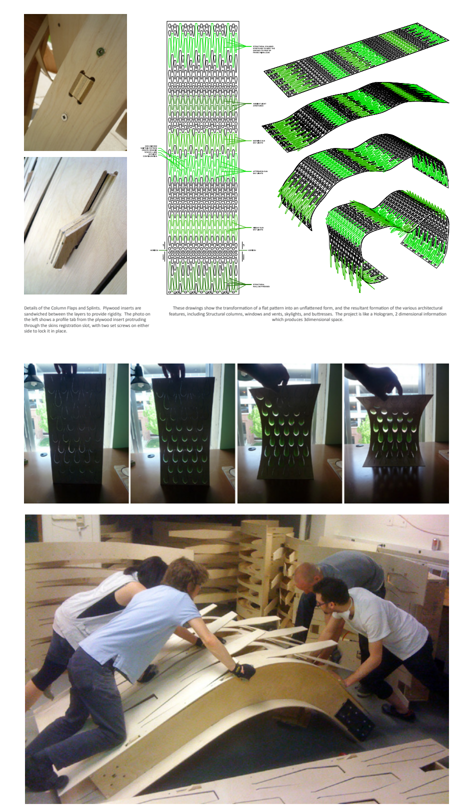
The physical flexing of material became the generator of the pavilion's shape. Careful study of flexing occurred at a small scale, after which the design development phase increased the scale of this behavior to the size of an inhabitable pavilion where it was merged with a familiar house section shape. Various advanced modeling and analytic software were utilized in support of the design, with an anticipation of material behavior present from the beginning.

The house section was revised several times based on the physical ability to bend plywood into its shape. What results is a mediated shape, a negotiated condition blended from the specific geometry, and the plywood's ability to define that shape based on the physical behavior of material. Several times the section needed to be redrawn based on the observed bending radius of materials at various scales, and then finally at full scale, based on the specific wood-species of tree used. Materials were tested for their ability to be both flexible enough to bend and also rigid enough to support load. Indeed multiple species of woods were tested, Merranti, Lauan, Douglas Fir, Flat Sawn-Ash, Italian Poplar, Okoume, and finally settling on Baltic Birch. Several of the discarded species were able to bend to the shape of the pavilion, but were too flimsy to support load.

As a result of preliminary mock-ups and prototypes, this pavilion project is different from many other projects in that the material doesn't' go through the standard flattening procedure of manufacturing. Typically even complex shapes and forms are rationalized into flat planes - a process called panelization. These panels are then arranged on site to build up complex geometries, but at the scale of the panel, everything is flat. This pavilion pioneers a flat-to-form fabrication methodology, which links the unflattening of parts to the demands of structure and shape. The Unflat Pavilion never goes through the flattening process, rather flat sheets of material are precut and go directly into the field where they are literally unflattened into shape. This process is contrasted with the conventional stick framing of wood construction. The curvature of the skin produces feedback which redefines the shape of the frame and the configuration of apertures, requiring physical building to arrive at a negotiated final form, somewhere between design and building.







MATERIAL STUDIES
Several species of wood were evaluated for their ability to bend and form shapes. Initially small scale studies and prototypes were conducted to observe the potential of ordinary materials.
Concept of Flexure demonstrated through patterning and the physical flexibility of thin baltic birch ply.