Solar in the City

This design begins with the assumption that a healthy future requires every home and building not just to conserve and reduce its requirements for power but also produce its own. In the best situation, its production would exceed its use, with the extra available for neighbors. Both these aspects must be addressed.

We feel that the immediate problem for solar is an aesthetic and experiential one, not simply engineering. If solar can be shown to be beautiful, with interesting spaces, then this will capture our imagination and emotions. For a solar future to be entirely embraced, this possibility has to be demonstrated. This is a modest attempt at that elusive quality.

Flexibility

A prototype that can be used on a variety of sites especially that have restraints and variations, is important, especially in a semi-urban setting. Sun angle, lot size and shape, street frontage, all will change, but can the design? This particular solution uses 3 basic components that can be rotated to a variety of orientations and still maintain the basic floor plan and qualities. The necessity for solar panels on a building with a long axis, to account for different relationships to south depending on the site, is that the roof have several parts. These can rotate more easily than a monolithic roof. Rather than a long,"alley" effect, the middle is opened up to provide light and circulation at the center.

Conservation

Substantial reduction in heating and cooling requirements, as well as enhanced comfort are achieved by using advanced materials. The main sections of the house are built from foundation to ridge using Insulated Concrete Forms (ICFs). They have an effective R-value of 32+. In addition to insulating value, they are quiet, strong, and maintain all these qualities much longer than standard framing.

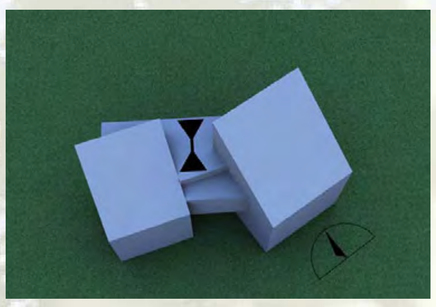
All roofs and the projected living areas use 'Structural Insulated Panels' (SIPs). The roof panels are over 12" thick with an R-Value of the overall cross-section exceeding R-50.

The windows are triple pane as developed by Serious Windows of California. They use a thin film technology that achieves up to R-11.25, without adding weight to the window, keeping the engineering requirements, and thus the cost of the windows low.

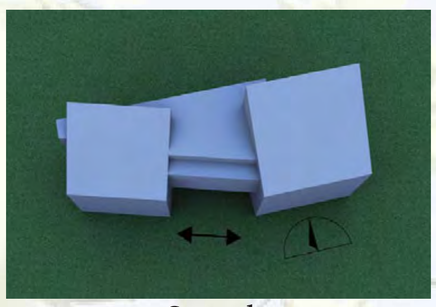
The ICF material has exceptional below grade characteristics. The closed cell foam construction is waterproof in its own right, but with a membrane added, insures that the basement area is bone dry.

Energy Production

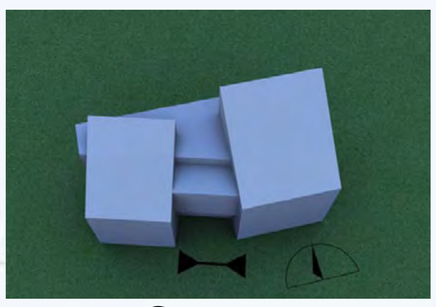
The solar panels are the jewel in the crown functionally and symbolically. Both photovoltaic, and solar hot water panels are used. There is a maximum of photovoltaic panels of ~ (64). With a medium number represented of (56). This exceeds the normal requirements of a single family home, thus providing an income stream as the excess power is sold.



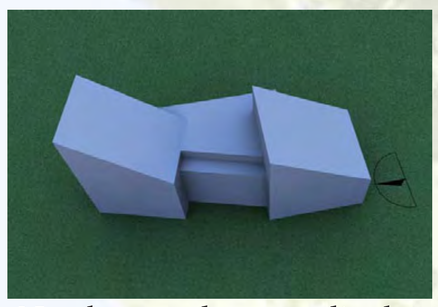
Twist



Stretch

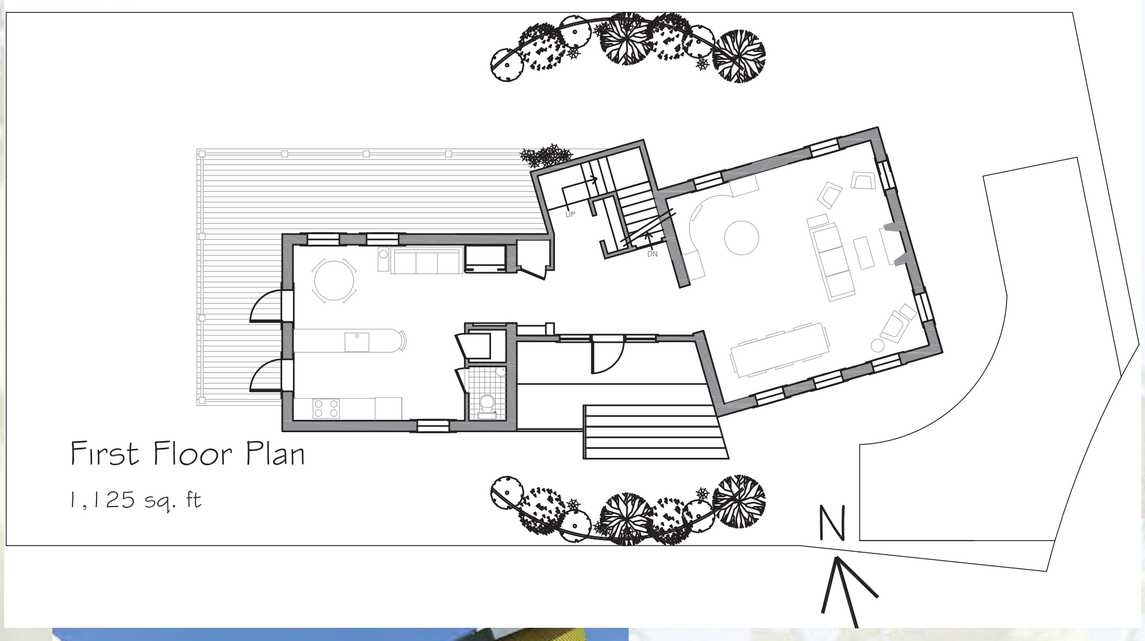


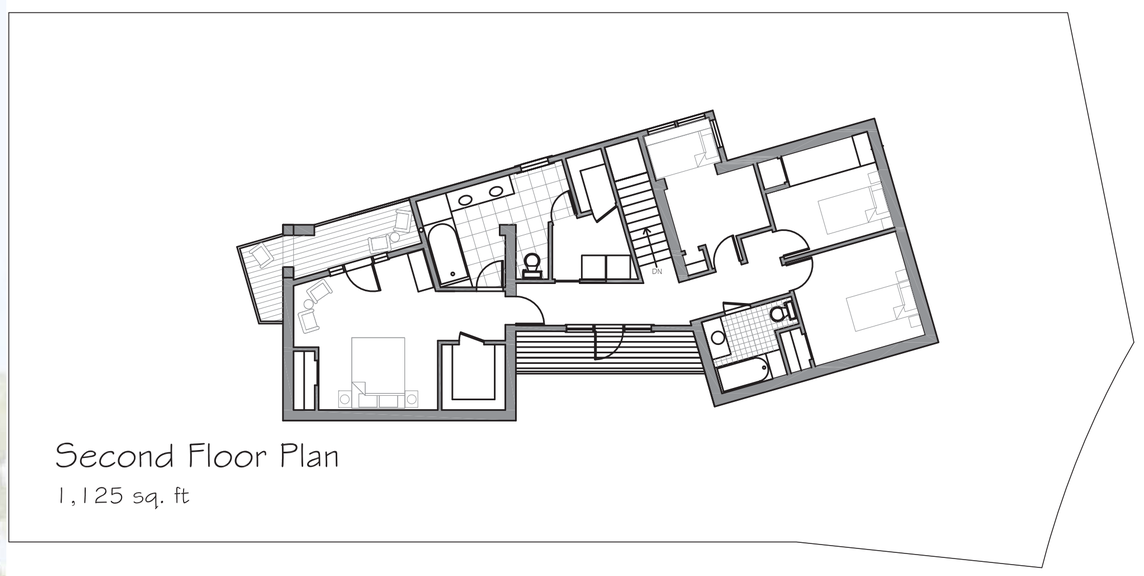
Compress



North turned perpendicular

With changes in lot, size requirements and southerly direction, the basic components can respond.



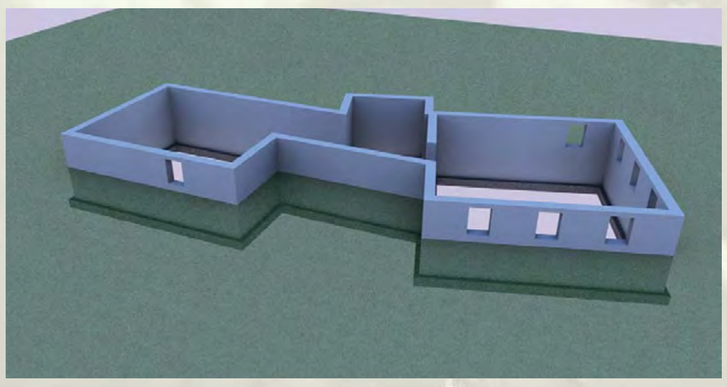


Cost
Because both the SIP and ICF construction is a non-framing construction method, the building can be pre-engineered, and in the case of the SIPs, all the panels are cut off-site by computer, and delivered to the site via flatbed, and assembled by the their own teams. This allows design flexibility with the costs more in line with that of standard construction.

Maintenance
Since all the exterior materials are impermeable and manufactured products, fiber-cement clapboard siding, (with a 30 year guarantee on the paint), fiber-cement panels, metal standing seam roofs, fiberglass framed windows, PVC and fiber trim, there is nothing to warp, rot or split or require periodic maintenance.

Water
The ICFs, combined with the membrane material can be used to create clean, below grade, thermally protected cisterns where roof drainage can be collected, and used to handle all toilet flushing requirements, which is typically 2/3 of the water consumption in a normal home. The area under the deck, rather than being stick-framed would be built as an ICF cistern, with decking on top of a waterproofed SIP top.

Flexability and Using the Ground Level
The basement has been placed half in, half out of the ground. This allows for lower excavation costs, less trouble with water table issues, and from a design perspective allows full-sized windows and taller ceiling heights. When the foundation material (ICFs (see below), the basement is transformed into a light-filled, bone dry potential living space.



Solar is an imperative, but also an opportunity. It is an expression of neighborliness, towards each other, to nature, for the Nation, for Northampton.

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