HONORABLE MENTION
BEST CURB APPEAL

Erik Rhodin
Taina Rhodin
Line Company Architects

Phone: 781.647.9800
Email: ERhodin@linecompanyarchitects.com
Website: www.linecompanyarchitects.com
In a major change to environmental policy as of April 2007, private developers are required to estimate the greenhouse gases their large-scale projects will produce and reduce them with measures such as energy-efficient lighting, alternative fuels or commuter shuttles. Large housing developments, office projects and mixed-use development that combine retail, industrial and residential uses will be affected. The Massachusetts Environmental Policy Act requires state agencies to use “all practicable means and measures to minimize damage to the environment” when considering development projects. Buildings worldwide account for more greenhouse gas emissions than transportation or utilities. Residential buildings account for approximately 21% of greenhouse gases.

As we move to a more carbon-constrained world, the submitted design solution will meet customers’ demands in a way that generates fewer carbon emissions. The foundation and building approach to carbon management is to fully understand its exposure to carbon emissions including those linked to energy usage, transportations and logistics and our supply chain. The proposed foundation system is constructed from concrete applied to polystyrene foundation forms from sustainably managed sources. Polystyrene is lightweight, weighing just 5-10% of the weight of typical concrete foundation walls, which means that it can be built on soils with less bearing capacity or brown fields sites with contaminated conditions, due to the reduced excavation requirements.

Our house design and foundation system is positioned to collaborate with designers, builders, developers and government authorities to affect sustainable with attention to: climate-adjusted design, style innovation, building integration and energy efficiency and energy avoidance. Benefits of a carbon management program can provide clients with a science-based carbon footprint rather than a lengthy, inconsistent, costly and onerous LEED certification process.

The McKinsey Quarterly 2007 Number1 evaluated how countries should reduce greenhouse gases. This was a study of the relative economics of different approaches to reducing greenhouse gas emissions. It offers surprising insights for policy makers and business leaders. In a 25-year perspective, power generation and industrial manufacturing industries offer less than half of the potential emissions. Almost 25% of possible emissions reductions in 2030 will result from measures such as better insulation and energy efficient appliances in buildings that carry no life-cycle costs; in affect they come free of charge. McKinsey concluded that almost three quarters of potential to reduce emissions comes from measures that are either independent of technology or rely on mature rather than new technologies.
The basic process of constructing a foundation in the United States has not changed in more than 100 years. Unlike almost every other manufacturing and fabrication industry, the homebuilding sector continues to rely almost exclusively on manual labor to deliver its products. Most other capital and labor-intensive industries have turned to automation as the engine for growth and increased productivity.

The principal business factors in the homebuilding market are price, design, quality, reputation, relationship with developers, accessibility of sub-contractors, location of lots, and availability of customer financing. In the residential property market, construction time for homes depends on weather, availability of labor, material and supplies, and the size of the homes. Using conventional site-built construction, builders in general complete the construction of a home in four months. Applying our system of panelized walls and shallow slab foundations saves on-site builders and developers an average of 20% time to completion. That translates into lower labor, insurance, management and marketing costs.

Financial modeling for a Smart Growth project confirms that this foundation offers a minimum of $5.00 of savings per square foot of foundation floor area, against a well-managed, non-union conventional foundation builder. This is about a 37% savings over a conventional spread footing, foundation wall and slab construction. Indirect savings to the client are identified as increased productivity, a time savings of 10% to complete the job compared with conventional site-built foundation construction. We believe that nonunion, as well as prevailing wage projects fulfilling Davis-Bacon wage requirements can see additional savings.

**The Foundation** system is a frost protected shallow foundation (FPSF) that meets and exceeds the requirements of the Massachusetts Building Code and The International Residential Code (IRC). The significant energy savings and added comfort for the families living in homes installed on this quick and affordable foundation system are proven with years of built projects ranging from single family homes to schools, and office or retail developments. These projects are all built in Sweden where the climate is harsher than most areas of the United States.

A frost protected shallow foundation (FPSF) is a practical alternative to a deeper, more-costly foundation in cold regions with seasonal ground freezing and the potential for frost heave. The International Residential Code® (IRC) includes prescriptive methods for constructing frost protected shallow foundations in heated buildings. By the IRC reference to ASCE 32-01 (American Society of Civil Engineers, Design and Construction of Frost-Protected Shallow Foundations, 2001), FPSFs in semi-heated and unheated buildings that meet the requirements of the IRC may also be designed and constructed.

A frost protected shallow foundation allows builders to construct a structurally sound foundation that is more resource efficient and less costly than a
conventional foundation. The FPSF technology recognizes the thermal interaction of building foundations with the ground. Heat input to the ground from a conditioned building effectively raises the frost depth at the perimeter of the foundation.

The effect of heat from the building is magnified when insulation is strategically placed around the foundation. Frost protection of an insulated foundation also works for an unheated building by conserving ground geothermal heat beneath the building. Unheated areas of homes, such as garages, may be constructed in this manner.

Frost protected shallow foundations are most suitable for slab-on-grade homes on sites with moderate to low sloping grades. Slab-on-grade FPSFs can be installed with one placement of concrete, eliminating multiple inspections and speeding construction time. The method may also be used effectively with walkout basements by insulating the foundation on the downhill side of the house. Frost protected shallow foundations are also useful for remodeling projects because their installation minimizes site disturbance, especially in urban sites with existing environment problems such as brownfields. In addition to residential, commercial, and agricultural buildings, the technology has been applied to highways, dams, underground utilities, railroads, and earth embankments.

**THE BUILDING SYSTEM**

The building is designed as a panelized system using prefinished panels from our partner manufacturer in Sweden. We have used this same system for product delivery to affordable and market rate housing of Boston, Cape Cod and Haiti. Panels are delivered for exterior walls, interior walls, floor cassetts, and roof cassetts. Windows, siding and trim are installed as well as insulation, rain screen and a secondary interior strapped wall of 2x2 or 2x3 for electrical raceway installation on site.

**KEY ASPECTS OF THE PROPOSED FACTORY CRAFTED BUILDING KIT**

**One stop shopping for all components to a complete panel constructed building**

**No Risk** – The developer is at no risk to delivery on time and within the budget, factors of weather and scheduling delays are eliminated.

**Managed process** – We can manage the process from order to delivery of the complete building kit. On site panel assembly is done by local framing subcontractors under our guidance.

**Engineered Lumber** – Naturally slow grown lumber is stress graded, cut to full dimension to form wall blocks in a controlled environment.
**Moisture Content of Lumber** – Building codes in Sweden require that lumber is at or less than 12% moisture content, to reduce settling of walls and floors which otherwise allow tiles and gypsum wall board to crack.

**Insulation** – Thermal and acoustic insulation is non-combustible and has a density of 16kg/m3. Factory fitted snugly between studs, beams and rafters for higher energy efficiency.

**Sheathing Boards** – Made from 100% recyclable wood waste and asphalt, prevents cold bridging, allows the walls to breath and is weatherproof and wind tight.

**Vapor Barrier** – Heavy-duty .2mm provides continuous barrier at exterior walls, roof, and allows electrical installation towards the interior without penetration of vapor barrier.

**Windows** – Swedish Pine, select, slow grown from the north of Sweden, Gori vac double vacuum impregnated, mortise and tendon corners, factory painted and fitted with 4mm tempered triple glazing with 12mm spacing between lights. Noise reduction is 41 dB and window has a 5-year warranty. These triple pane windows with low E glass and Argon gas filled will save over 60% of the energy cost for heating a conventional house using regular double pane windows.

**Exterior Doors** – Exterior doors are fire rated, multi layered using solid wood and veneers with interior frame of rustproof steel plates, double framed wood, 50mm of insulation and guaranteed warp proof for ten years.

**Interior Doors** – Interior doors made up of solid wood and veneers glued and finished to prevent warping and fitted with special hinges in solid brass or stainless steel with snap in hardware, multiple choices of tempered glazing, rebated or non rebated frames, sealing strips and architrave’s with five year warranty.

**Sub-floor** – Heavy duty ‘Green’, 7/8” boards are fitted tongue and groove, glued and screwed to provide stable squeak-proof surface. Product is environmentally approved in Sweden that has very strict environmental codes.

**Clapboard** – Exterior pine clapboards are “structural” ship-lapped and fastened onto strapping which provides a natural breathing space (rain screen) between it and the sheathing. Clapboards are factory primed.

**Rain screen design** – The entire exterior wall is built out on vertical strapping allowing a natural vented space behind the clapboards.

**Mold and mildew control** – No mold, mildew and decay fungi with this well ventilated exterior wall that can breathe.

**Cost Savings** – Reduced construction cost due to Factory Assembly and prefabricated wall elements built in a controlled environment.

**Construction Timesaving** – Field assembly of pre-manufactured wall elements reduces labor and supervision time at the construction site.
Energy Efficient – Exterior wall elements (ten inches thick) as specified have a higher R-value (R-30) and building tightness than conventional “stick built” construction thus substantially reducing heating and cooling costs, as well as reducing consumption of global fossil fuels and their negative impact on burning those fuels. This product is well above Energy Star specifications.

“Green” Building product – All Environmentally friendly construction material. All wood is harvested from carefully managed sustainable forests. The Swedish National Board of Forestry has imposed a new Forestry Act with tighter regulations on the treatment of the forestry stock. Typically two young trees are planted when one mature tree is harvested. Young trees absorb more CO2 than mature trees, thus helping the environment.

Quality Control – Superior overall finished product due to engineered construction fabrication drawings and factory assembly in a controlled environment to simpler erection on site.

Proposed roof assembly panels with an R-77

Proposed triple glass windows installed in panels having an U value of 1.3/sq.meter. Pull trusion fiberglass at exterior with wood interior.
Proposed alternative triple glass window have same U values. Factory painted wood windows.

ARCHITECTURAL DESIGN SUBMISSION:

The competition submission is a four bedroom home with about 1400 sq.ft. of usable area and a gross area of 1700 sq.ft. The fourth bedroom is off of and behind the master bedroom so that it can either serve as a fourth bedroom, nursery room or extension of the master bedroom. The design is based on a slab on grade installation using our recommended polystyrene forms faced with a prefinished concrete surface. As there is no basement in this solution, which could be added if needed, we provide the added value space of the insulated attic with shed dormers for gaining additional height and usability. The area of the attic is over and above the gross and net areas. The ground floor offers a kitchen with easy access to the two family areas.
FRONT ELEVATION
Scale 1/4" = 1'-0" or 1:50
ICE & WATER SHIELD

3/4" PLYWOOD SHEATHING

VENTING SPACE

BATT INSULATION

ROOF RAFTERS @ 24" O.C.

Vapor barrier

STRAPPING 1x2

FIELD INSTALLED

10" ±
TYPICAL PANEL ASSEMBLY

ROOF SECTION VIEW

1 1/2" = 1'-0"
Use group R-3 buildings are governed by 780 CMR Chapter 3600.0.

780 CMR 3604.0 addresses foundations for Use Group R-3 one and two family dwellings and multiple single family dwellings. All buildings in conformance to 780 CMR 310.5 are to have foundations constructed in conformance to 780 CMR 3604.0.

3604.3.3 Insulated footings: Footings for heated buildings with slab-on-ground foundations are not required to extend below the frost line when protected from frost by insulating methods prescribed by Figure 3604.3.3a and Table 3604.3.3. Materials used below grade for the purpose of insulating foundations against frost shall be labeled as complying with ASTM C 578.
Building the foundation

Placing the L-shaped element.

The elements are connected with the LC-Set Wedge.

3 layers insulation. Plumbing. Floor heating system.
Inhouse plumbing and rebar mesh

Slab poured and completed.

Floor heating central.