

HIGH-PERFORMANCE BUILDING ENVELOPES NEW PREFAB SYSTEMS FOR FACADES AND ROOFING DELIVER MULTIPLE BENEFITS, WITH SOME PROVIDING THERMAL INSULATION WHILE HARVESTING SOLAR ENERGY



Located in pastoral Prince Edward County, in southeastern Ontario, the newest home by eco-residence specialists Solares Design Build features a super-insulating envelope. Its predominant construction materials – concrete-filled Durisol blocks and a slab floor – provide thermal mass, keeping the interior at a constant, comfortable temperature. For supplemental insulation, the designers coated the blocks with a continuous layer of spray foam. “It was almost like turning the house into a Thermos,” explains Solares principal and co-founder Christine Lolley. During winter days, southern sunlight warms the concrete walls and floor, which slowly release their stored heat at night. In summer, the roof overhang protects the interior from direct sun, and the concrete absorbs any excess heat from the air. Proving the system’s effectiveness, during a –25°C cold snap last winter the interior stayed at a cozy 18°C – even before the mechanical heating system was hooked up. As for this summer, Lolley predicts cool conditions inside County Trail House. “We haven’t designed a house that has needed air-conditioning yet,” she says. solares.ca

In the latest and most innovative envelopes, the material makeup components do double or triple duty as structure, insulation and finish. The most effective sandwich forms, structural insulated panels, are made of insulation glued between wood, drywall or cement board that deliver exceptional thermal performance. What’s more, many companies custom-cut panels to fit building plans, making for rapid construction and considerable on-site labour savings.

Other hybrid systems pair flat or corrugated metal sheets with insulation, creating sturdy, airtight units. They come in many finishes, and some allow architects to attach brick and terracotta panels. Meanwhile, with insulating concrete forms made of foam or cement, builders can erect hollow skeleton walls, reinforce them with steel, and fill them with poured concrete. The units remain in place as insulation, and their exposed surfaces can be easily finished with plaster or stucco.

Building envelopes can also be engineered to actively harness and control solar energy. Thin-film solar cells laminated directly onto glass result in semi-transparent facades that generate electricity. Solar-thermal systems concealed behind metal panels discreetly harvest heat, reducing the energy used to heat air and water for building services. A more passive solution, louvres and sunscreens form an integral part of the building skin, allowing for automatic or manual control of light and heat gain.

Prefabricated components may cost more than traditional solutions. But in the long run, these high-performance, energy-efficient building envelopes outperform old-style structures.

ELSA LAM

AVAILABILITY

AF	AFRICA
AS	ASIA
AU	AUSTRALIA
EU	EUROPE
NA	NORTH AMERICA
SA	SOUTH AMERICA
UK	UNITED KINGDOM
ME	MIDDLE EAST
WW	WORLDWIDE

INSULATING CONCRETE FORMS

ICFs provide formwork for poured concrete, then are left in place to serve as insulation. Compared with conventional concrete walls, which require skilled masons, they save on labour and materials.

Durisol Instead of polystyrene, Durisol blocks are made of recycled wood fibre from truss factory scraps bonded with cement. They arrive ready to be stacked and filled with reinforcing steel and concrete, and can be nailed or screwed like regular plywood, and coated with interior and/or exterior finishes.

NA AS EU durisolbuild.com

IntegraSpec’s ICFs are interlocking foam boards cut on a table saw, then installed with slide-in-place spacers in a choice of widths. Vertical ridges act as drainage channels on the outside, and allow the concrete to bond strongly to the panels from the inside.

NA integraspec.com

American PolySteel combines polystyrene sheets with recycled steel or plastic ties in its Cradle to Cradle-certified ICFs. Once erected, the forms are filled with a concrete mix incorporating up to 50 per cent fly ash, minimizing the use of energy-intensive cement.

NA polysteel.com

VariantHouse’s foam ICFs use Neopor, an engineered material with heat-reflective microscopic graphite flakes. Targeted for DIY home builders, the blocks are equipped with naps and grooves that click in place like Lego. Once assembled and filled with concrete, they form an insulated wall with no thermal bridges.

NA EU varianthouse.com

Logix provides a full range of ICF panels manufactured in factories across North America. Corner forms resolve potentially troublesome connections, while accessory blocks – height adjusters, end caps, half-height blocks and transition panels – reduce on-site labour. The foam panels come in a range of thicknesses, allowing for customized insulation levels.

NA logixicf.com

STRUCTURAL INSULATED PANELS

SIPs consist of two sheets of oriented strand board made from chipped wood particles that sandwich an insulating core, often made of ozone-safe expanded polystyrene. Some use polyurethane foam or compressed straw instead.

Thermocore Dense polyurethane (the foam commonly used in cushions and pillows) gives Thermocore’s product better fire resistance and insulation compared with thicker polystyrene versions. The units are custom manufactured to specific plans, complete with window, door and electrical box openings, minimizing on-site material waste and speeding up construction.

NA thermocore.com

Premier Building Systems For earning LEED points, Premier makes sandwich panels incorporating recycled-content foam cores and FSC-certified exterior skins on request. Treated with human-safe borate, a natural mineral, they’re protected from mould and burrowing insects.

NA pbspanel.com

Emercor While most SIPs are finished with oriented strand board, Emercor offers alternative facing materials, such as plywood, cement board and drywall. The product family includes sturdy foundation wall panels, all-in-one roofing and insulated garage ceilings.

NA emercor.com

Murus’s polyurethane SIPs come with tongue-and-groove foam edges and a lock-in-place plastic connection system, assuring tight, precise joint alignment. A horizontal chase embedded in the foam core makes electrical installation a snap; also available in precut panels.

NA murus.com

Thermapan’s pre-insulated, moisture-resistant panels streamline construction of residential and small commercial buildings. Different thicknesses provide a range of R-values, from lightweight modules used in the Caribbean to heavy-duty versions deployed in the Arctic Circle.

NA thermapan.com

Agriboard Instead of foam, Agriboard’s insulating core consists of straw compressed under high pressure and heat, without adhesives. The boards incorporate agricultural waste from local wheat and rice farms, much of which was burned previously. The company precuts panels for floors, roofs and structural walls.

NA agriboard.com