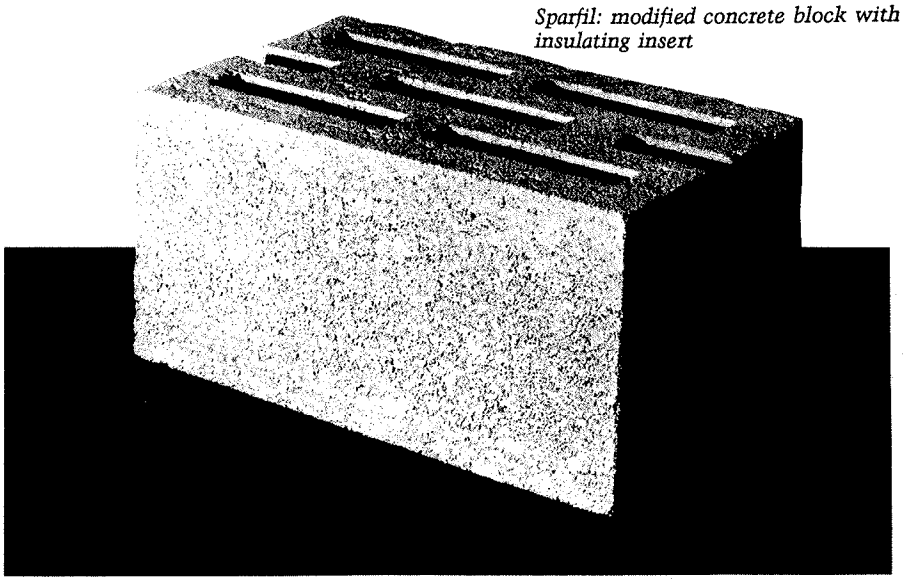


Sparfil: modified concrete block with insulating insert

New Foundations

By Martha G. Van Geem

During the past two decades we have witnessed a progressive trend towards tighter and better insulated homes above grade. Until recently, less emphasis has been put on insulating basements and foundations. Since heat losses generally seek the path of least resistance, this means that a greater share of heat escapes through basements and foundations. With it goes a higher percent of the energy costs.

Innovative ways of insulating basements include concrete blocks with new shapes and insulated cores, and insulation used as permanent formwork for concrete. Both of these approaches combine the load-bearing advantages of concrete and masonry with an insulating material. The thermal mass of the concrete and masonry dampens the effects of extremes in temperatures. This can reduce heating and cooling loads.

Modified Concrete Blocks

One approach to increasing wall thermal resistance (R-value) has been to use a modified concrete block with polystyrene insulation inserts (Table 1). Formbloc and Insulbloc resemble standard two-core concrete masonry but have reduced web areas. IMSI block has two slots as cores; Sparfil has a series of three rows of cores. All four of them, when insulated, have potentially higher R-values than conventional concrete block with insulated cores because of reduced or altered web areas. Concrete webs act as thermal bridges in insulated block. A large amount of heat flows through the webs. Reducing the web area reduces the area of concrete that can serve as a thermal bridge.

The insulating inserts are preformed to fit tightly into the block cores. Inserts are installed either by the block manufacturer before shipment or at the job site.

Sparfil and IMSI walls are dry stacked. A surface bonding portland cement is applied to both sides of the standing wall. Once surface bonding is applied, the walls are fully finished and do not need further preparations.

The Sparfil and IMSI inserts are flush with the surfaces of the block. A mortar joint in a wall constructed of these blocks would have no insulation and is a thermal bridge.

Insul Bloc can be used either as a conventional system with mortar joints or dry stacked with surface bonding. However, Insul Bloc inserts are also designed to be flush with block surfaces so mortar joints would create thermal bridges.

Formbloc is designed to be laid using conventional mortar joints. The insulating inserts extend above and beyond the block surfaces to accommodate the ⅜-inch-thick mortar joints. Therefore, thermal bridging does not occur at the joints.

All four modified blocks have thermal bridging through the concrete web area, even though this web is altered or reduced compared with standard blocks. The manufacturers' thermal resistance values should be based on laboratory hot box test of completed walls (ASTM Designation: C236 or C976) or calculated values using verified methods. Analysis techniques are available to predict wall R-values accurately, but the calculations sometimes underestimate the effect of thermal bridges and overestimate R-values.

Permanent Formwork

Another type of system is permanent concrete formwork using polystyrene or polyurethane blocks as insulation (Table 2). These are essentially the reverse of standard concrete block with the block made of insulation material and concrete used to fill the cores. All poured concrete basements and foundation walls need formwork. These systems do double duty as insulation and as the formwork.

System	Description	Manufacturer	Wall Thickness	Advertised R-Value
Formbloc	Concrete block with reduced web area, rigid polystyrene inserts and metal cross-wires	Formbloc, Inc., P.O. Box 546, Concord, NH 03301 **Circle No. 85**	8" or 12"	N.A.
Insul Bloc	Concrete block with reduced web area and molded polystyrene inserts	Insul Block Corp., 55 Circuit Avenue, West Springfield, MA 01089 **Circle No. 86**	8", 10", or 12"	5 to 10
IMSI	Concrete block with reduced web area and molded polystyrene inserts	Insulated Masonry Systems, Inc. 7234 East Shoeman Lane, Suite 1, Scottsdale, AZ 85251 **Circle No. 87**	8" or 12"	18 or 27
Sparfil	Concrete block with multiple cores and molded expanded polystyrene inserts	Sparfil Inernational, Inc, 840 Division Street Box 626, Cobourg, Ontario K9A 4L3, Canada **Circle No. 88**	8", 10", or 12"	13.5, 18.5, 24.5

Table 1. Concrete blocks with nonstandard-sized cores

System	Description	Distributor	Wall Thickness	Advertised R-Value
Argisol	Interlocking blocks comprised of polystyrene panels held together by metal plates	Structural Energy Systems, Inc. 11380 Prosperity Farms Road, Suite 101, Palm Beach Gardens, FL 33410 **Circle No. 89**	10"	19
Ener G Block	Interlocking blocks comprised of closed-cell polyurethane	Creston Technology, Inc., P.O. Box 1589, Kent, WA 98035 **Circle No. 90**	8"	29 to 33
Foam Form	Interlocking blocks comprised of polystyrene panels held together by wire mesh	Southwest Foam-Form, Inc. 5150-F Edith, NE, Albuquerque, NM 87107 **Circle No. 91**	9¼" or 11"	22 or 23
Isoform blocks	Interlocking polystyrene	Therma Manufacturing, 1435 Koll Circle, Suite 111, San Jose, CA 95112 **Circle No. 92**	10"	18
Poly-Crete	Interlocking blocks comprised of polystyrene panels joined together by reinforcing wire	Arizona Polytech Corp., 101 South 30th Street, Phoenix, AZ 85034 **Circle No. 93**	9" or 11"	17 or 20
Styro-Crete	Interlocking blocks comprised of polystyrene panels held together by wire mesh	Energy Efficient Structures, Inc., Route #3, Box 132, Markesan, WI 53946 **Circle No. 94**	9"	20
Thermal Wall	Interlocking blocks comprised of polystyrene panels held together by plastic ites	Energy Construction Consultants, P.O. Box 2495, Naperville, IL 60566 **Circle No. 95**	6", 8" or 10"	20+
		RVG/Thermal Wall, P.O. Box 261, Chatham, NY 12037 **Circle No. 96**	4", 6", 8", 10" or 12"	20+

Table 2. Polystyrene or polyurethane blocks used as insulation and concrete forms. Block interiors are filled with cast-in-place concrete.

The Foam Form, Poly-Crete, and Styro-Crete systems are 9- or 11-inch-thick blocks, 16 inches high and 48 inches long. The blocks are made of interlocking polystyrene panels held together by wire mesh. Concrete is placed between the insulating panels.

Ener G Block is a two-core, 8x8x16-inch polyurethane block that resembles a standard masonry unit. Blocks are interlocking and are placed in a running bond. Concrete is poured into the cores.

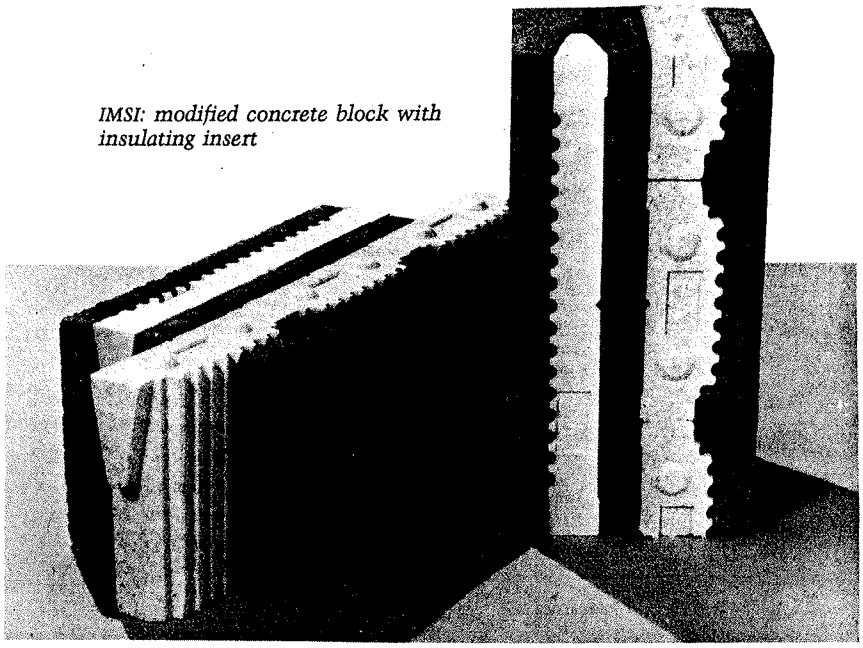
The Isoform system is constructed using 10-inch-thick polystyrene blocks, 10 inches high, 39 inches long, with four square cores. Concrete is poured in the four cores.

The Argisol block is also 10 inches thick, 10 inches high, and 39 inches long. The outer polystyrene insulation face is 2½ inches thick. The inner face is 2 inches thick. The two faces are held in place by galvanized steel ties.

Thermal Wall System is constructed of two 2-inch-thick, 12-inch-high, 40-inch-long interlocking polystyrene panels held together with plastic ties to create wall thicknesses from 4 to 12 inches.

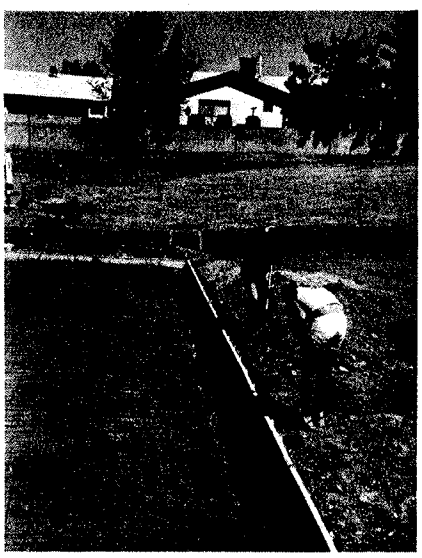
The systems are delivered as preassembled blocks except for the Thermal Wall System, which comes with polystyrene panels used as external faces separate from ties used to hold panels together. This system is fabricated at the site. Ease of assembling and placing blocks needs to be weighed against the initial costs. Argisol provides the most specialty items, such as corner blocks and lintel sections, to make erection easy. Systems that accept 8 or 9 feet of concrete in one lift may save money by reducing the required number of concrete pours.

Wall interiors are generally finished with drywall. Exteriors can be finished with a variety of cementitious coatings.



IMSI: modified concrete block with insulating insert

Poly-Crete: the first course of the wall system



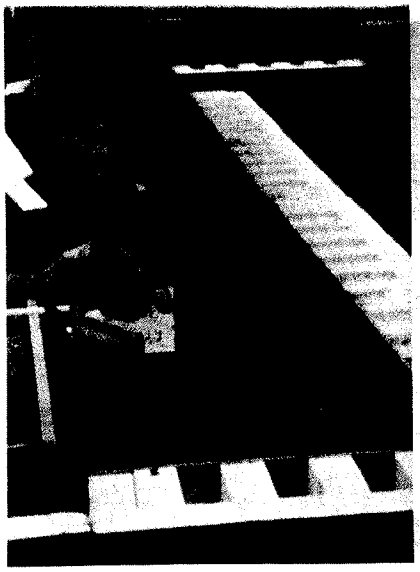
System 150: insulated slab edge with exterior protective coating

Above-grade exterior insulation must have a protective coating against ultraviolet degradation, weathering, and physical abuse.

The outer faces of insulation give these systems relatively high R-values. Polystyrene insulations generally have an R-value of 4 or 5 per inch. Therefore,

System	Description	Distributor	Wall Thickness	Advertised R-Value
Sherman Wall System	Polystyrene panels with openings for cast-in-place concrete columns	McGill, Smith, Punshon, 119 W. Main Street, Amelia, OH 45102 **Circle No. 97**	13″	40
Superior Walls	Insulated concrete panel and concrete stud wall system	Advanced Construction Technologies, 537 South Main Street, Nazareth, PA 18064 **Circle No. 98**	10½″	N.A.
Thermomass	Concrete-insulation-concrete sandwich panel wall with fiberglass ties	Composite Technologies Corp., 525 East Second Street, Ames, IA 50010 **Circle No. 99**	10″	10

Table 3. Insulated panel wall systems



Sherman Wall: concrete column system

a system with 2 inches of polystyrene on each face will have an R-value from 16 to 20. Metal ties or wire mesh that extend into the outer layers of insulation will act as thermal bridges and decrease the R-value of the system. Remember, R-values should be based on ASTM hot box text methods or on an analysis method that accurately accounts for thermal bridges.

Other Wall Systems

Sherman Wall Systems and Superior Walls are concrete column systems with insulation spanning between columns. The Thermomass Wall is a sandwich panel wall (concrete-insulation-concrete) with fiberglass ties connecting the concrete panels. (Table 3).

Thermal Form and System 150 are polystyrene panels with a protective exterior coating for use as forms and permanent insulation for stem walls or slab edges (Table 4). These systems are generally placed on the exterior concrete face. An exterior coating is provided to protect the insulation.

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System	Description	Distributor	Wall Thickness	Advertised R-Value
System 150	Insulated forms for concrete foundations comprised of extruded polystyrene panels with a PVC outer coating	Gentrex Corporation, 104 East Ave. K-4, Suite B, Lancaster, CA 93535 **Circle No. 100**	N.A.	8
Thermal Form	Insulated forms for concrete slab edges or stem walls comprised of extruded polystyrene with a protective coating	Thermal Form, Inc. 701 East 4th Street, Perris, CA 92370 **Circle No. 101**	1½", 2" or 3"	7.5, 10 or 15

Table 4. Insulated slab edge systems