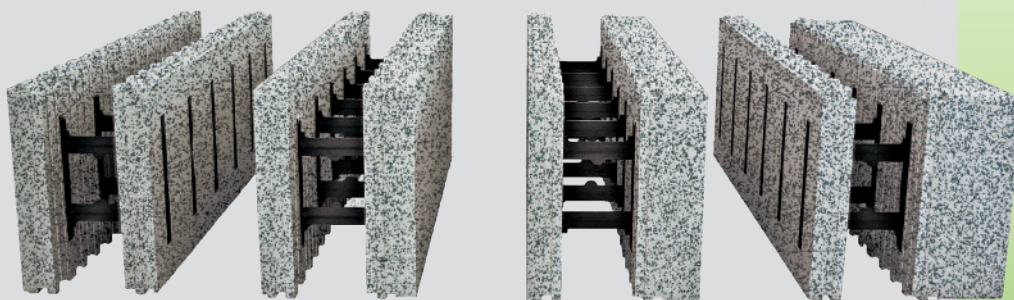




INNOVATIVE
BUILDING
TECHNOLOGY



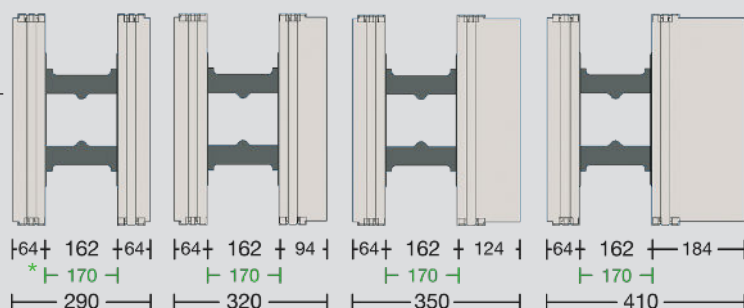
Insulating Concrete Forms for anti-seismic buildings in EPS Twinpor® with high thermal insulation

ICF blocks for reinforced concrete structures for large or small buildings

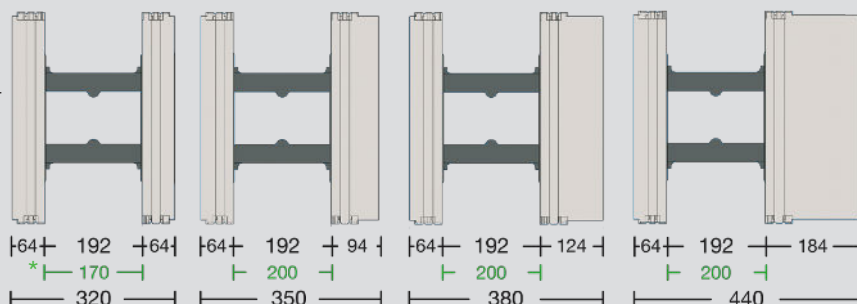
PONTAROLO®
ENGINEERING



Climablock cross section with 16.2cm of concrete space



Climablock cross section with 19.2cm of concrete space



* Nominal values referring to the average thickness of the concrete wall due to the presence of the grooves in the internal surface of the formworks.

Linear elements

Climablock Linear is a stay-in-place formwork made of two panels 120 x 40 cm in TWINPOR® EPS (sintered expanded polystyrene) facing each other and connected by recycled plastic braces that determine the thickness of the concrete layer that can be 16,2 or 19,2 cm (17 - 20 cm nominal). Braces are applied in the production phase and do not need to be assembled in the site.

The internal insulating panel is 6.4 cm thick, while the outside insulating panel can be 6.4 - 9.4 - 12.4 - 18.4 cm.

Outside corner element with no thermal bridge on the wall's change of direction

Concrete formwork in TWINPOR® EPS consisting of two panels forming an angle of 90°. Dimensions of 40 cm high and length depending on the external thickness of the block. The thickness of the internal insulation is 6.4 cm, while that of the outside insulation can be 6.4 - 9.4 - 12.4 - 18.4 cm.

Available in both 16.2 cm and 19.2 cm (17 - 20 cm nominal) concrete cross section. Braces are applied in the production phase and do not need to be assembled in the site.

Inside corner element with no thermal bridge on the wall's change of direction

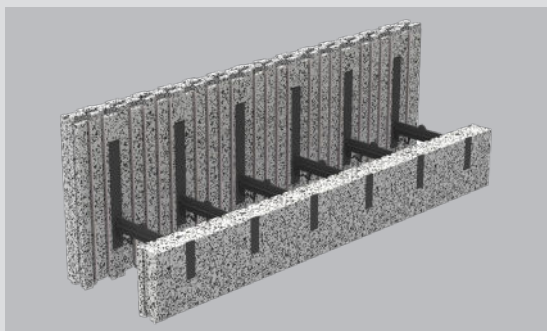
Concrete formwork in TWINPOR® EPS consisting of two panels forming an angle of 90° for concave internal corners. Dimensions of 40 cm high and length depending on the external thickness of the block. The thickness of the internal insulation is 6.4 cm, while that of the outside insulation can be 6.4 - 9.4 - 12.4 - 18.4 cm.

Available in both 16.2 cm and 19.2 cm (17 - 20 cm nominal) concrete cross section. Braces are applied in the production phase and do not need to be assembled in the site.

Variable angle element

Corners with any angle can be easily created with Climablock. The elements can be shaped on site or customized from us on request. The size and thickness of the block are also customizable for the internal and external insulating panels and for the concrete section with both 16.2 cm and 19.2 cm (17 - 20 cm nominal).

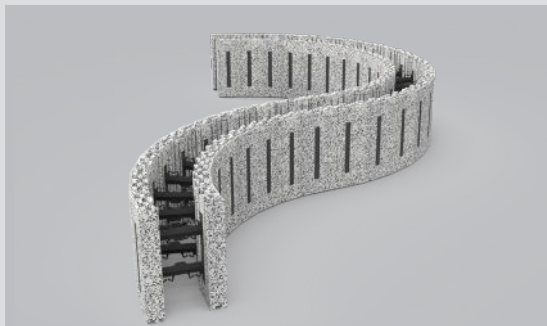
With Assemblable Climablock the concrete cross section can also be 14.2 or 25 cm (15 - 25.8 cm nominal) thick.



Perimeter beam element

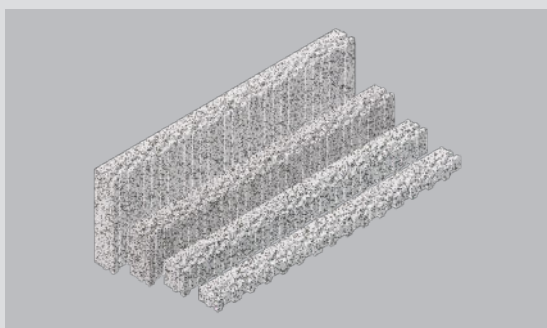
Customized block in TWINPOR® EPS for the construction of the perimeter beam of the raised floors permitting to maintain continuity of the external insulation. The element can be customized by Pontarolo, with an extra cost, or shaped directly on site.

Available with the concrete section with both 16.2 cm and 19.2 cm (17 - 20 cm nominal). With Assemblable Climablock the concrete cross section can also be 14.2 or 25 cm (15 - 25.8 cm nominal) thick.



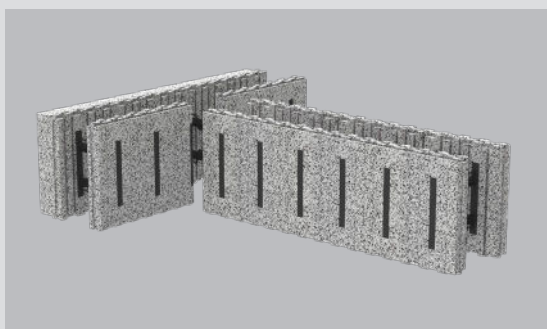
Curved elements

Curved walls of any radius can be easily formed with Climablock. The elements can be shaped on site or customized from us on request. The size and thickness of the blocks are also customizable for the internal and external insulating panels and for the concrete section.



Height variators

Elements in TWINPOR® EPS for the compensation of design heights different from those obtainable with Climablock module 40 cm. The height variators are available in heights of 5 - 10 - 20 and 40 cm. It reduces the amount of waste, save money and time.



“T” cross element

EPS TWINPOR element for creating the “T” intersection between Climablock walls. The elements are easily shaped directly on site by cutting the linear elements as needed. The intersection is also possible between elements with different concrete thicknesses and insulation. The elements, once shaped, must be suitably fixed to guarantee a correct concrete casting.



Closing cap

The closing cap element in TWINPOR® EPS is designed to vertically close the ends of the Climablock blocks. The application is easy and fast thanks to the shaped sides of the cap that can be easily inserted in the block's grooves.

Climablock® support service

The company provides a complete assistance service to help you design and install the Climablock system. We only require the building plan in .ifc, .pln, .pdf .dwg or .dxf format to the e-mail address: **assistenza@pontarolo.com**.

Our technical department will help you choose the block that best suits your needs and will assist you in the design and construction phase.

We remind you that Pontarolo offers a free software for calculating the transmittance and verifying the Glaser diagram: **www.calcolodellatrasmissione.com**

Climablock® system

Climablock® is the result of a deep research of comfort, safety, healthiness and energy saving developed by Pontarolo Engineering.

To meet the anti-seismic, acoustic and insulation regulations of buildings in force in Italy, the Climablock system becomes essential to obtain a performing result. The system is based on a complete range of formwork consisting of two EPS panels facing each other and kept at a distance by recycled plastic (PP) braces incorporated in the EPS panels. The blocks, mutually connected to each other through the joints, create a formwork suitable for receiving the concrete casting and to remain in place as insulation, forming load-bearing walls that integrate, in a single solution, the elevated thermal insulation of EPS TWINPOR® and the mechanical strength of concrete.

Building with EPS blocks is the ideal system for “sustainable” construction; considering that EPS is composed of 2% of material and 98% of air.

Regarding the energy consumption of the building, Climablock is a winner over other building systems. It is produced in high performance TWINPOR® EPS, with a black and white formula that improves insulation performance and ease the installation during very bright days and prevents the deterioration due to the direct sunlight exposure.

Climablock is easy to use, speeds up the construction time and ease the installation of utilities and finishes. Guarantees a reduction in the cost of maintenance, energy consumption and management.



Safety and sustainability

Significant reduction in energy consumption in both summer and winter: buildings made with Climablock have both passive and inertial behavior.

PASSIVE: large thicknesses of insulation, excellent in winter to contain heating consumption;

INERTIAL: considerable mass walls which is guaranteed by the concrete. Excellent behavior during hot summer season, reducing cooling needs, thanks to the excellent value of periodic thermal transmittance and the action of the heat wave phase shift and damping, obtained by the special stratigraphy of the wall;

ANTI-SEISMIC: The reinforced concrete Climablock walls are structures that comply with anti-seismic regulations;

ACOUSTICS: Climablock walls guarantee noise reduction values respectively, for the dividing walls between the housing units of **52.3 dB**, higher than the **50 dB** required by the Italian legislation, and for the facades, considering an opening area of 18% of the total and windows with average acoustic performance ($R'w = 39dB$), a value of **45.1 dB** higher than the 40 dB required by law.

Climablock® winning system

With Climablock it is possible to build small or tall constructions, such as condominium and multi story buildings, thanks to the variable internal thickness of the load-bearing wall in reinforced concrete, that can comply to the project structural requirements.

QUALITY: high performance of the structure ensured over time;

EASY: no skilled labor is required for installation of the system. Utilities can also be installed easily by the technicians with no extra assistance;

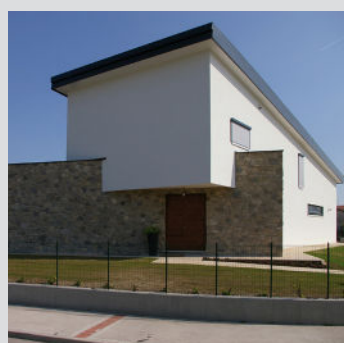
PRACTICAL: it does not require large equipment or special tools;

FAST: one square meter of finished wall requires 30 to 50 minutes of manpower. Time is determined by the complexity of the construction;

SAFE: building with Climablock is safe and does not fatigue workers. Each block in fact weighs about 3 kg;

ECONOMIC: no other system ensures thermal, acoustic and seismic performances, at the cost of Climablock;

MORE LIVING SPACE: Thanks to the reduced thickness of the walls, compared to other systems with the same insulation, Climablock guarantees a bigger walkable area inside the building.



Ease and speed of construction of Climablock® system



Start the first layer starting from the corners and continue with the linear blocks



Insert the reinforce steel as per project design which will form a grid of horizontal and vertical re-bars

If necessary, install the closing caps



Or install the wood window frames



Proceed up with the layers of blocks till the required height and fix the alignment system to Climablock



Adjust the vertical alignment before casting. Use an S4 concrete (thixotropic type, max inert grain size 20 mm)



Making the raised slabs, the continuity of the external insulation is not interrupted, thus avoiding thermal bridges; moreover, the edge of the raised slabs beams is already prepared



The utilities can be easily installed by the electricians or plumbers in the EPS layer, easily using a hot knife



The block braces allow to fix the drywall directly on the internal wall, with no need of the aluminum structure



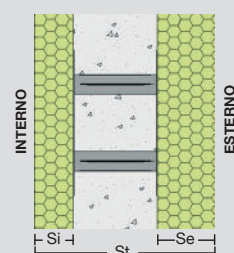
The external finishing can be done as a standard EIFS system

Performance of the Climablock® system

TRANSMITTANCE VALUES AND THICKNESSES OF CLIMABLOCK WALLS

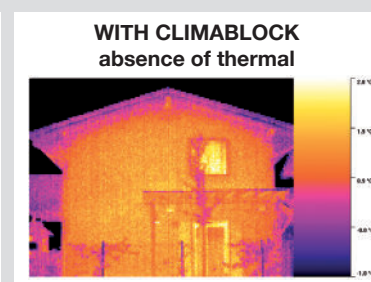
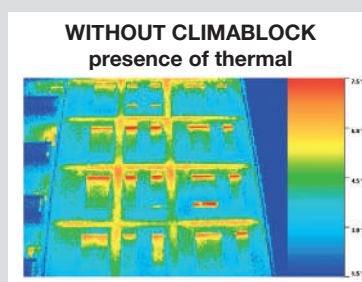
The thermal transmittance values have been calculated considering the declared thermal conductivity (λ_D) of the material.

BLOCCO CLIMABLOCK IN EPS TWINPOR				
Internal EPS thickness (S_i) + external (S_e)	6,4 + 6,4	6,4 + 9,4	6,4 + 12,4	6,4 + 18,4
Declared thermal conductivity (λ_D) [W / mK]	0,0316 (0,032)	0,0316 (0,032)	0,0316 (0,032)	0,0316 (0,032)
Transmittance U [W / m²K]	0,247	0,200	0,168	0,127
Total thickness (S_t) with setto 14,2 cm concrete	270	300	330	390
Total thickness (S_t) with setto 16,2 cm concrete	290	320	350	410
Total thickness (S_t) with setto 19,2 cm concrete	320	350	380	440
Total thickness (S_t) with setto 25,0 cm concrete	378	408	438	498

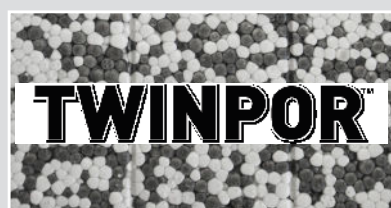


S_i = Climablock Internal EPS thickness (mm)
 S_e = Climablock external EPS thickness (mm)
 U = TRANSMITTANCE: The amount of energy (heat) that passes, in a second, a square meter of wall subjected to a temperature difference of one degree centigrade. The transmittance depends on the characteristics of the materials of the wall and not to its thickness: the lower the value of the transmittance, the more the wall is thermally insulated

S_t = Total wall thickness (mm)



Technical characteristics of the materials



TWINPOR TWINPOR is a new EPS composition formulated and tested by Pontarolo Engineering Spa with better performance: an optimal mix of white and “carbon Black” EPS beads which increases the insulating properties of the product, leading to λ values similar to graphite polystyrene (GPS), while overcoming its problematic installation when in direct solar exposition.

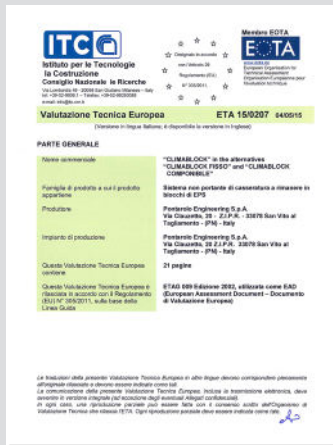
Moreover, with a look to the environment, a minimum of 10% of recycled secondary material is added to obtain products that comply with the italian **Minimum Environmental Criteria (Ministerial Decree 11.10.2017)**.

	Features	Coding according to UNI EN 13163	Value	Unit of measure	Norm
Requirements according to UNI EN 13163	Thermal conductivity λ_D declared at 10 °	λ_D	0,0316 (0,032)	W(m·K)	EN 12667
	R_D thermal resistance	R_D		(m²·K)/W	EN 12667
	• 64		2,00		
	• 94		2,95		
	• 124		3,90		
	• 184		5,80		
	Length	L	± 3	mm	EN 822
	Width	W	± 2	mm	EN 822
	Thickness	T	± 2	mm	EN 823
	Orthogonality	S	± 1/1000	mm/mm	EN 824
	Planarity	P	5	mm	EN 825
	Reaction to fire		E	Euroclasse	EN 13501
Others	Compression stress at 10% deformation	CS(10)	≥ 150	kPa	EN 826
	Long-term water absorption by total immersion	WL(T)	≤ 3,5	%	EN 12087
	Water vapor diffusion resistance factor	μ	30÷70	–	EN 12086
Others	Limit temperature of use		75	° C	
	Coefficient of linear thermal expansion		0,065	mm/mK	

Braces: black recycled and recyclable plastic braces incorporated into the block.

The braces are used as a support for the internal finishing that can be screwed directly with a pulling resistance of 100 kg.

A guaranteed and certified high-quality system



A system with no moisture

WHY SHOULD THE EXTERNAL INSULATION BE THICKER THAN THE INTERNAL?

To make sure you don't have mold and condensation in the house!

Condensation and widespread mold usually are formed in a wall because of the wrong stratigraphy and positioning of the insulation on the wall.

HOW DO YOU UNDERSTAND THE CORRECT POSITIONING OF THE INSULATION?

With the Glaser diagram

(www.pontarolo.com/ITA/pro-cbk03ca.html).

The Glaser diagram consists of two lines called “relative humidity curve” (Pr) and “saturation pressure curve” (Ps). These lines, positioned over the wall stratigraphy must never intersect. If it happens, condensation will form at the intersection point.

Climablock walls are been verified with this excellent tool and, most of the times (depending on the climatic zones), the external insulation thickness must be greater than the internal one.

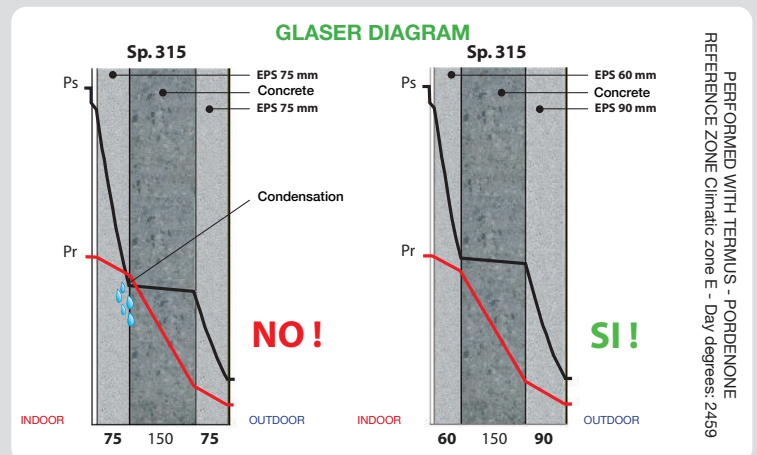
Our technical office can advise you on this matter.

FREE CALCULATION: : Pontarolo provides free software to calculate the transmittance and create the Glaser diagram of the walls. To use it, visit www.calcolodellatrasmissione.com

A high-quality system

There are few precautions to be taken for the correct execution of a construction with Climablock system:

- Do not store Climablock blocks outdoor or in areas exposed to direct sunlight for very long periods;
- Proceed with the installation according to the design instructions and scrupulously follow the points on the check-list that is delivered together with the product or can be downloaded from the website www.pontarolo.com;
- Check the vertical alignment of the walls to ensure their correct position. It is important to carry out this operation just before the casting phase, in order to not incur in any movement due to temperature changes.
- Repeat the operation to check the vertical alignment also after casting;
- Apply the appropriate finishing as soon as possible in order to cover the EPS from direct sunlight. This will allow to avoid a prolonged exposure of the EPS to solar rays (UV) which cause the natural disintegration of the EPS beads and the formation of a dusty layer on the surface and to limit any thermal expansion phenomena even though, for the EPS, is equal to only 0.065 mm / mK. Any retreat, within what is indicated, is absolutely natural and do not compromise the performance.

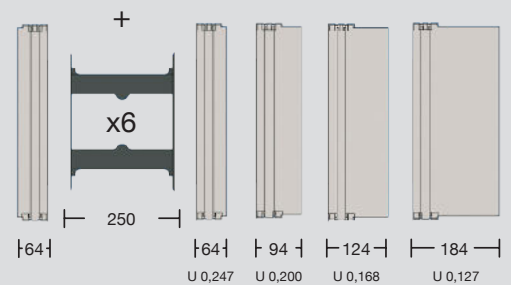
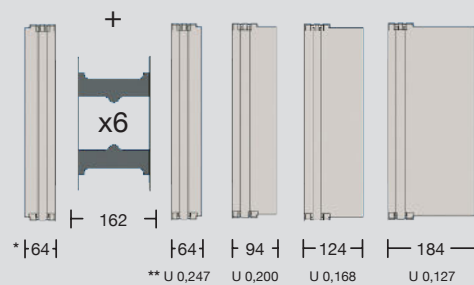
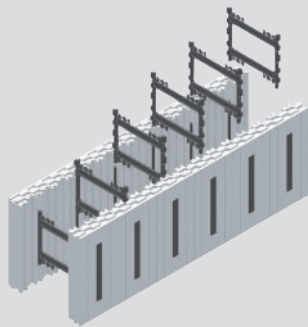


Internal conditions: Temperature 20 ° - Relative humidity 52% - Adductance 7.7
External conditions: Temperature -5 ° - Relative humidity 57.5% - Adductance 25

Glaser diagram made on walls of equal thickness with different distribution of the insulation.

Assemblable Climablock®

Casting of concrete in the Assemblable Climablock formwork



*Measurements expressed in millimeters (mm)
**U - Transmittance (W/m²K)

For a correct and effective execution of the concrete casting in the Assemblable Climablock formworks, it is recommended to:

- Use thixotropic concrete with mechanical strength indicated by the project design, of the S4 type (ie belonging to the consistency class defined as fluid and such that, in the test relating to the lowering of the cone, resulting slump values between 160 and 180 mm). The diameter of the aggregates must include a maximum value of 16 mm;
- Do not add water in order not to alter the mechanical resistance characteristics and increase the degree of fluidity;
- Use an extension pump hose having an adequate diameter to be inserted inside the formworks without hitting the polypropylene connection braces;
- Cast using the extension pump hose inside the formwork the closer to the starting height of the masonry as possible, and then proceed by lifting it up while the formworks are filling up.

The vibration operation of the concrete inside the formwork can take place in two ways:

EXTERNAL VIBRATION

Vibration practiced from the outside using a wooden board or thickness using a percussion instrument, performed at the visible webs of the formwork.

INTERNAL VIBRATION

Vibration inside the formwork by specific immersion, with the use of a diameter not exceeding 5 cm.

However, this operation must be carried out with the appropriate warnings, proceeding with care and caution, making use of all the necessary time



Climablock® the perfect solution for swimming pools!

The Climablock system can also be used for the construction of residential and public swimming pools.

With the use of Climablock it is possible to obtain a continuous reinforced concrete structure of any shape and size with high mechanical resistance values and, thanks to the insulating properties of polystyrene, to maintain the water temperature constant. An improvement of 3-4°C was registered compared to swimming pools built with traditional systems.