



MODULO SYSTEM

FREEZE



Ventilation system for negative refrigeration cells



edilizia
building

MODULO FREEZE

FREEZER ROOMS



Warehouses and refrigeration cells for conserving food are increasingly common construction types in the industrial food sector. Due to the considerable variety of foods to be stored, there are two types:

- **NEGATIVE CELLS** at low temperatures (-4°C -30°C);
- **POSITIVE CELLS** at medium temperatures (0°C +4°C).

FROST HEAVING/FROST HEAVE



fig. 1) Inside of a freezer room.

The problem detectable in the refrigeration cells is the eventuality that the freezing cold is transmitted through the structure, downwards to the ground and taking the temperature below 0°C. In these situations a process known as **frost heaving or frost heave occurs**, by which the freezing of the soil, saturated with water, causes a deformation, pushing its surfaces upwards. When the water contained in the soil freezes, its volume increases and expands to push equally in every direction. The upwards vertical component of this push risks raising the foundation package, thus deforming the flooring and, consequently, limiting the use of the warehouse or leading to the formation of cracks on the flooring rendering the structure unsafe and unusable. The damages caused by a frozen floor can lead to structural problems in that, upon verifying this situation, may result in the complete demolition of the damaged foundation structure and its restoration. Essentially, at the moment defrosting occurs, the flooring does not return to its original position and the subsequent slow rising ruins the shelving and any automatic pick-up systems beyond repair.

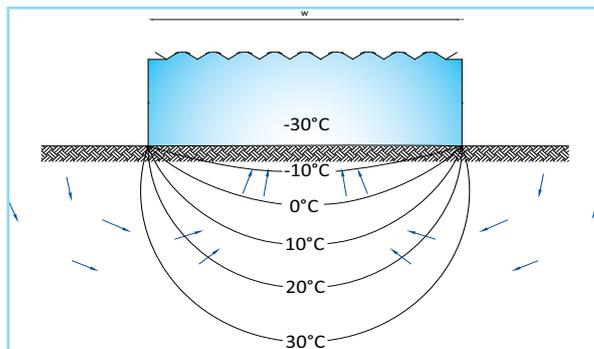


fig. 2) Isothermal chart of the ground below a freezer room.

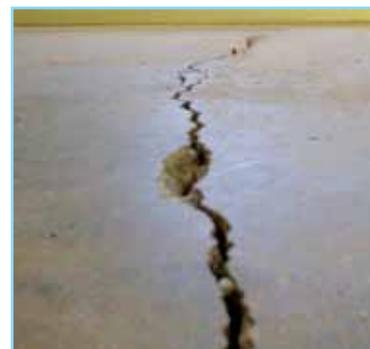


fig. 3) Damage caused by frost heave.

WHY USE MODULO SYSTEM

The refrigeration warehouses can be protected by means of various systems. Producing a **ventilated cavity** between the ground and the last impermeable layer of the cell package is the safest and most economic construction method, able to completely eliminate humidity. It involves a passive system that does not call for complex labour and maintenance interventions. This ventilated cavity can be achieved with the **MODULO SYSTEM®** formwork, which consists of PP (regenerated polypropylene) forms, light and easy to assemble. To guarantee excellent ventilation, connect the crawl space with the outside through the previously created holes in the containment walls. In case the crawl space is divided by intermediate ground beams, all sectors must be interconnected to ensure a correct and continuous airflow. **MODULO SYSTEM®** is fully treadable, therefore the laying of the welded mesh is fast and safe. Thanks to the conformation of Modulo, with its domes and support feet, it is possible to guarantee a high capacity for operating loads whether distributed or concentrated.



fig. 4) Installation of the MODULO FREEZE



fig. 5) Appropriate external ventilation - Holes approx. every 1 m.



fig. 6) Service insertion.



fig. 7) Even ventilation distribution.

WHY USE GEOBLOCK®

GEOBLOCK® is an innovative product which solves very easily some typical jobsite problems. The product ensures the perfect closing of **MODULO SYSTEM**, forming ground beams extremely quickly and avoiding any trimming of the plastic parts to adjust the forms to plan. **GEOBLOCK®**, made in PP (Regenerated Polypropylene*), is flexible and adaptable to every constructive type. It is available in lengths from 25 to 39 cm, and is combined with **MODULO SYSTEM®** of a height of 13 to 70 cm.

*PP: Flexural modulus 1100 N/mm² - Tensile strength 35 N/mm² - Coefficient of thermal expansion 0.15 mm/m/°C.



fig. 8) Typical application with **GEOBLOCK®**



fig. 9) Example of fill-in around a column.



fig. 10) Modular forming.

ADVISED SITES

Thanks to the experience in the field of freezer cells and to the collaboration with specialist studies in their sizes, Geoplast S.p.A. proposes a range of ideal products. For the excellent production of the ventilated foundation it is recommended to use **MODULO SYSTEM®** with heights including between 20 and 40 cm.

With heights of less than 20 cm the ventilation of the crawl space would be reduced and not effective; while with heights of over 40 cm possible problems of instability could be configured deriving from the raised loads characterised by the refrigerated cell, often dynamic type loads such as wheels for the transport of containers. To increase the solidity of the structure it is advised to introduce stiffening beams approx. every 20 m, through the use of the **GEOBLOCK®** elements. These beams must however guarantee the flow of air in the crawl space through the connection holes.



fig. 11) **Modulo System H20**



fig. 12) **Modulo System H40**

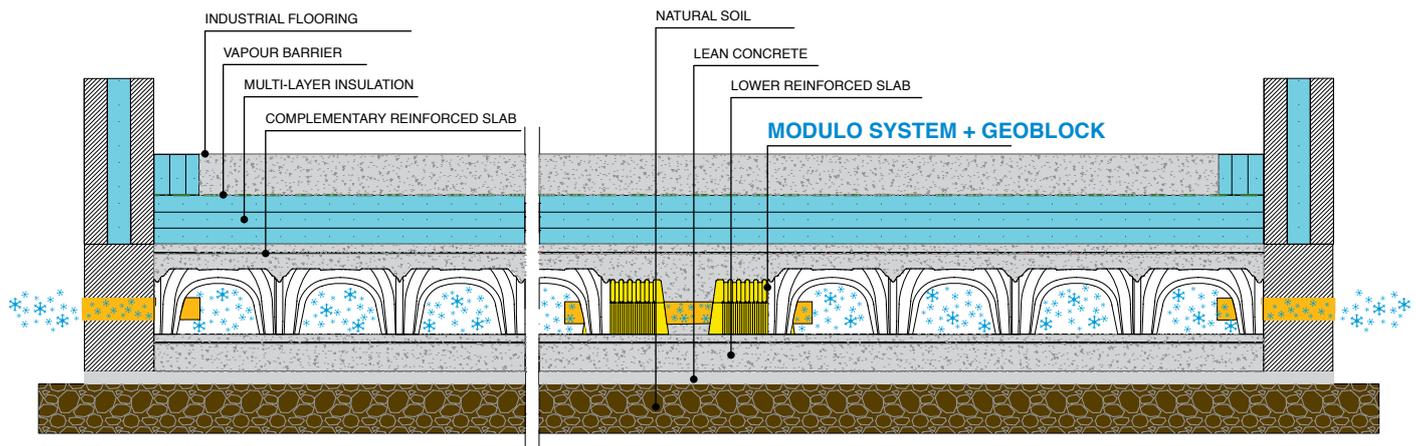
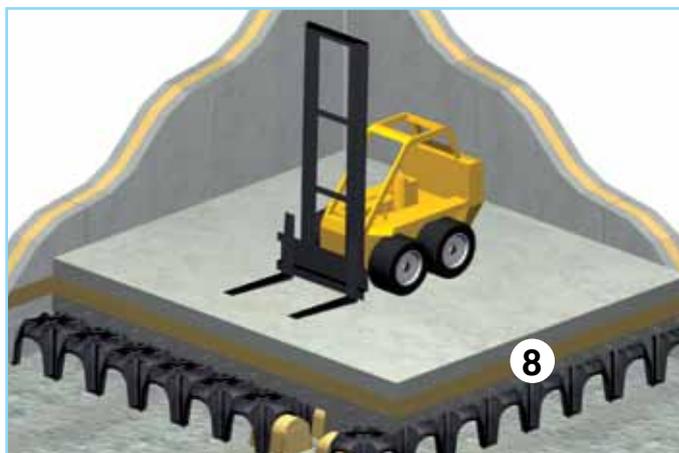
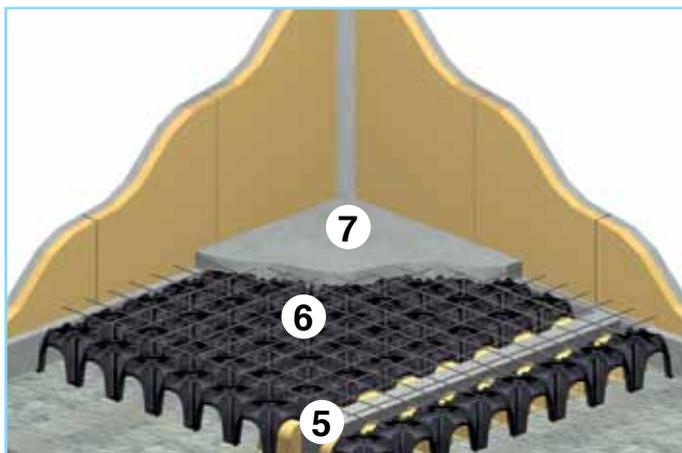
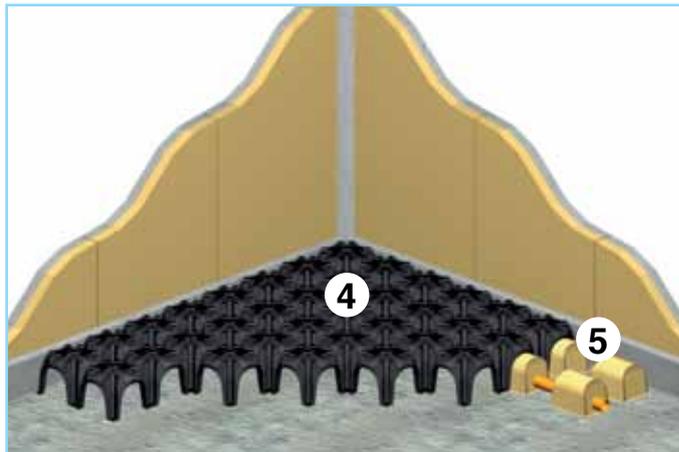
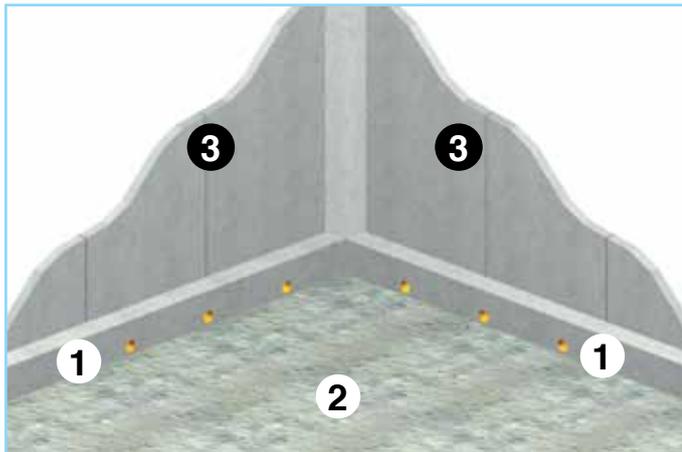


fig. 13) Build-up of a Modulo Freeze system.

INSTALLATION METHOD



1. Pouring the perimeter foundation beams by providing the holes for ventilating the crawl space according to the directions of the plans supplied by **Geoplast** (pitch and diameter).
2. Produce a slab in reinforced concrete with a thickness suited to the anticipated loads.
3. Realize the side closing structure and the cover.
4. Install the **MODULO SYSTEM**[®] forms by following all of the directions supplied by the Geoplast technical plans without, in any case, performing cuts and trimmings unless authorised.

5. Through the use of **GEOBLOCK**[®] or **FERMAGETTO** elements, produce some stiffening beams, making sure that tubes to provide ventilation between different sectors of the crawl space.
6. Lay the welded mesh directly above the **MODULO SYSTEM**[®]: the geometric conformation of **MODULO SYSTEM**[®] and **GEOBLOCK**[®] makes the concrete cover sufficient to embed the steel completely in the pour.
7. Perform the pour of the foundation beams and the slab in a single operation following the instructions provided by **Geoplast**, taking care to adequately vibrate the concrete.
8. Then install the subsequent finishing layers of the refrigerated cell (insulation + flooring), placing control joints in the concrete.

MODULO SYSTEM SPECIFICATION

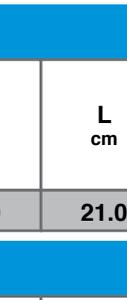
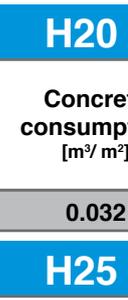
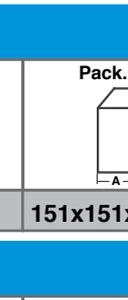
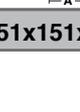
Formation of an aerated crawl space inclusive of an upper slab in r.c. by positioning on a preformed plain of mutually connected modular elements in regenerated polypropylene type **MODULO SYSTEM**[®] by **Geoplast S.p.A.**, with a squared base and variable height according to the project, with a dome shape, or series of lowered domes, equipped with at least 4 planes of reference for the laying and correct positioning of the welded mesh in order to avoid any depressions close to the support feet of the framework. The modules, mutually connected, will be fit for receiving the pour of concrete with a minimum resistance class C20/25, and will form a series of pillars in a two-way square matrix. The resulting crawl space will be used a squared matrix wheel base in two directions. The resulting plumbing void will be used for the passage of systems in general and/or the ventilation of the foundation. The side closings will be produced with **GEOBLOCK**[®] extendable type elements fit for compensating all measurements of project to produce a single laying of a slab foundation and stiffening beams.

The price includes:

- Supply and installation of thickness as specified by the project.
- At the discretion of the Josite Manager, holes and/or trenches can be formed for the ducting and/or tubing passage before the installation of the forming system.
- The flooring will be ventilated by forming holes with a minimum diameter of 80 mm on the perimeter walls at a distance of about one every metre, complete with possible PVC connection tubing and the external grills in stainless steel equipped with an anti-insect mesh in plastic material. The aeration holes, for sufficient ventilation, will preferably be placed at a higher altitude to the south of the buildings (warmest side) as opposed to the north (coldest side). In the event that there are crawl space portions inside the foundation beams, this must be connected with external or perimeter portions.
- Supply and installation of the **MODULO SYSTEM**[®] and **GEOBLOCK**[®] type system composed of lost formwork in regenerated propylene.
- Supply and installation of the welded mesh required to resist to the live loads as specified.
- Pour the overlaying slab with concrete of the resistance class specified by the project, with or without the use of a concrete pump.
- Vibrate the pour.

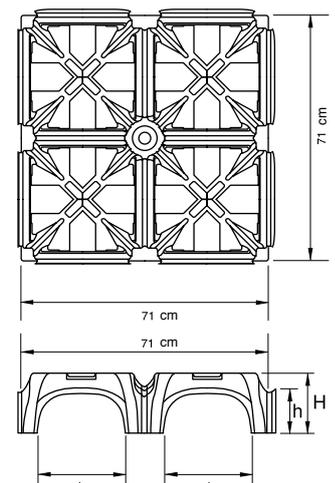
All of the fees, also for provisional works necessary for supplying the work perfectly to standard, are also included.

MODULO FREEZE TECHNICAL DATA

	H20						
	Dimensions cm	h cm	L cm	Concrete consumption [m³/m²]	Pack. dim. 	No. pieces	m² per pallet
	71x71	14.0	21.0	0.032	151x151x250 cm	300	150
	H25						
	Dimensions cm	h cm	L cm	Concrete consumption [m³/m²]	Pack. dim. 	No. pieces	m² per pallet
	71x71	19.5	26.0	0.033	151x151x235 cm	360	180
	H27						
	Dimensions cm	h cm	L cm	Concrete consumption [m³/m²]	Pack. dim. 	No. pieces	m² per pallet
	71x71	21.0	26.0	0.035	151x151x235 cm	360	180
	H30						
	Dimensions cm	h cm	L cm	Concrete consumption [m³/m²]	Pack. dim. 	No. pieces	m² per pallet
	71x71	24.0	23.5	0.042	151x151x250 cm	300	150
	H35						
	Dimensions cm	h cm	L cm	Concrete consumption [m³/m²]	Pack. dim. 	No. pieces	m² per pallet
	71x71	29.0	26.0	0.045	151x151x240 cm	360	180
	H40						
	Dimensions cm	h cm	L cm	Concrete consumption [m³/m²]	Pack. dim. 	No. pieces	m² per pallet
	71x71	34.0	26.0	0.050	151x151x265 cm	300	150

LOAD CHART

Intended use	Accidental loads	Slab thickness	Total loads	Base thickness	Ground pressure	Reinforcement
	kN/m²	cm	kN/m²	cm	kg/cm²	mm/cm x cm
Refrigeration cell warehouse	40.00	8	47.0	0	6.00	2 x ø6/20 x 20
				10	0.75	
				20	0.26	
	50.00	10	57.50	0	7.26	2 x ø6/20 x 20
				10	0.93	
				20	0.28	
	60.00	10	77.50	0	9.80	2 x ø8/20 x 20
				10	1.25	
				20	0.38	
	80.00	12	88.00	0	11.0	2 x ø8/20 x 20
				10	1.42	
				20	0.43	



REFERENCES



fig. 14) PADOVA • Refrigeration cell 5320 m²



fig. 15) PADOVA • Refrigeration cell 5320 m²



fig. 16) REGGIO EMILIA • Refrigerated Warehouse 6240 m²



fig. 17) REGGIO EMILIA • Refrigerated Warehouse 6240 m²



fig. 18) BRESCIA • Refrigerated Warehouse 5815 m²



fig. 19) BRESCIA • Refrigerated Warehouse 5815 m²



fig. 20) BRESCIA • Refrigerated Warehouse 5815 m²

REFERENCES



fig. 21) DZIATOSZYN – Polonia • ANITA Refrigerated Warehouse 5450 m²



fig. 22) DZIATOSZYN – Polonia • ANITA Refrigerated Warehouse 5450 m²

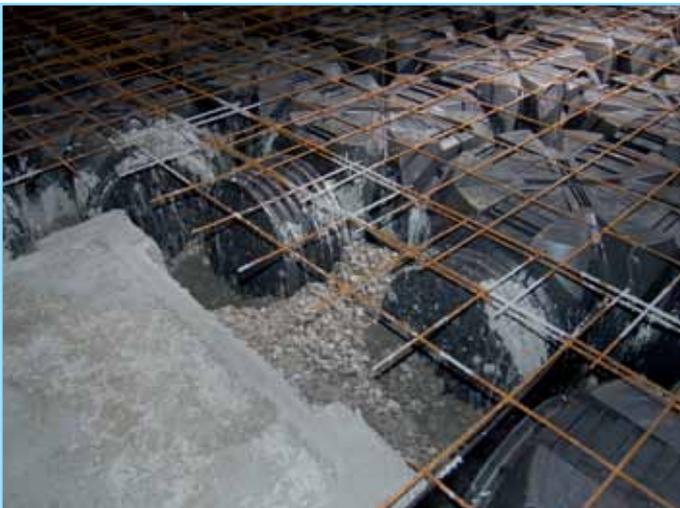


fig. 23) PADOVA • Refrigeration cell 5970 m²



fig. 24) PADOVA • Refrigeration cell 5970 m²



fig. 25) TORINO • Refrigeration cell 5310 m²



fig. 26) TORINO • Refrigeration cell 5310 m²

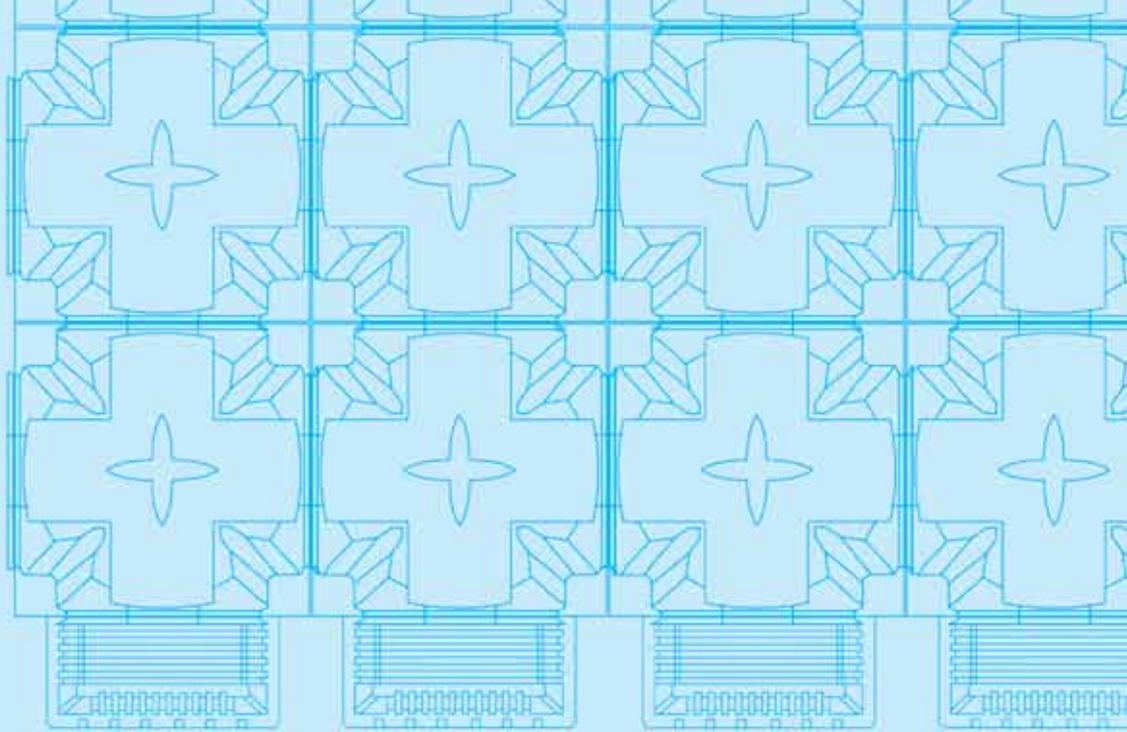
The information reported in the catalogue is purely indicative and subject to normal variations due to the production cycle.

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ASSEMBLY HANDBOOK AND TECHNICAL SPECIFICATIONS

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