



MODULO *System*



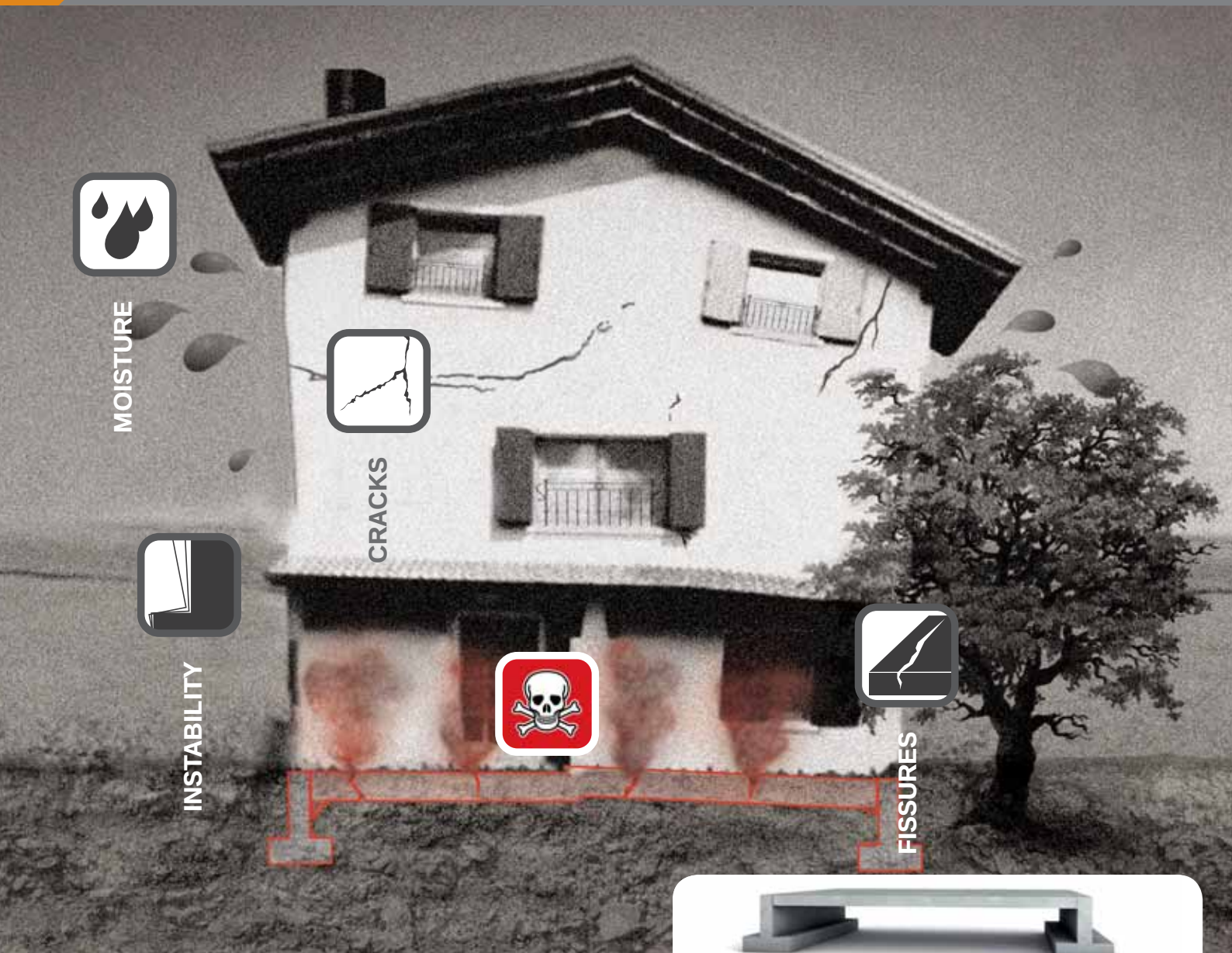
Formwork for ventilated monolithic foundations



edilizia
building

www.geoplast.it

TRADITIONAL FOUNDATION



*WHAT IS **RADON**



The danger of RADON accumulation in a house built on traditional foundations.

Radon is a colourless and extremely volatile gas produced by the decay of uranium U238. Radon gas occurs naturally, and is constantly produced by certain rocks in the Earth's crust. The main source of **Radon gas** is the ground: it seeps through the soil and accumulates into rooms and enclosed places. It is very dangerous as it is carcinogenic: its prolonged inhalation is considered the second cause of lung cancer after cigarette smoke; the risk of cancer development is proportional to the exposure to radioactive gas.

The only protection from **Radon** are ventilated foundations, which making it harmless dilute the gas into the atmosphere outside the building.

MONOLITHIC VENTILATED FOUNDATION

MODULO SYSTEM CREATES MONOLITHIC VENTILATED FOUNDATIONS IN A SINGLE POUR

Modulo System, the combination of **Modulo** and **Geoblock**, makes it possible to pour the foundation and the groundslab in a single operation, creating a monolithic structure that won't crack. A ventilated and monolithic foundation grants high stability and load-bearing capacity, significantly reducing the risks of damage in the case of earthquakes.



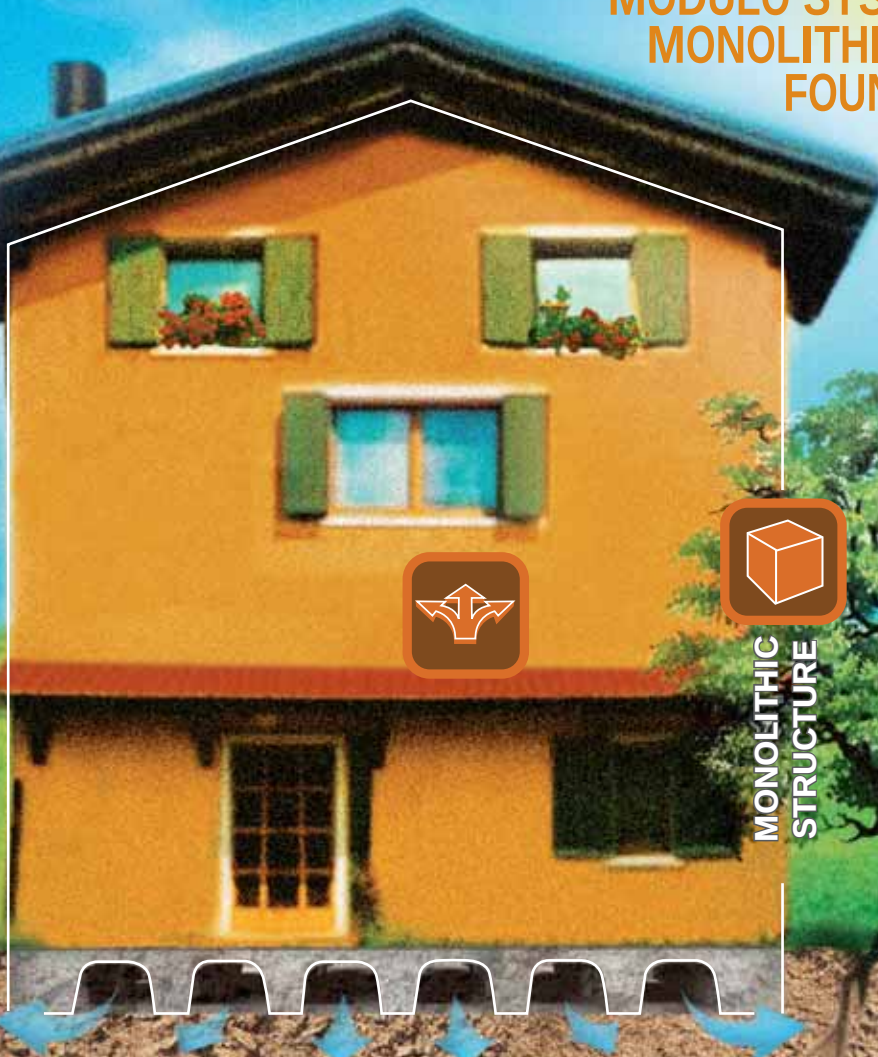
STABILITY



SINGLE POUR



MONOLITHIC
STRUCTURE



The soil is a heterogeneous blend of solid elements, water and air. Water is the element naturally most subject to fluctuations due to variable rainfall patterns, changes in water table level, evaporation and deep infiltration. Groundwater in direct contact with traditional foundations creates unhealthy conditions in the building: infiltrations, moisture, condensation and moulds and fungi; in extreme cases it can lead to the decay of timber structural elements.

A ventilated foundation is **the only solution** for ground moisture

VENTILATED FOUNDATIONS IN ROMAN TIMES

Buildings with ventilated foundation are healthy and safe homes. The Romans understood that it was unhealthy to dwell in direct contact with the soil, so they elevated the floor of their homes to stop moisture and used the hollow space thus created to heat the rooms above. A ventilated foundation is an effective barrier to moisture and **Radon**, the dangerous and carcinogenic gas that accumulates inside buildings.

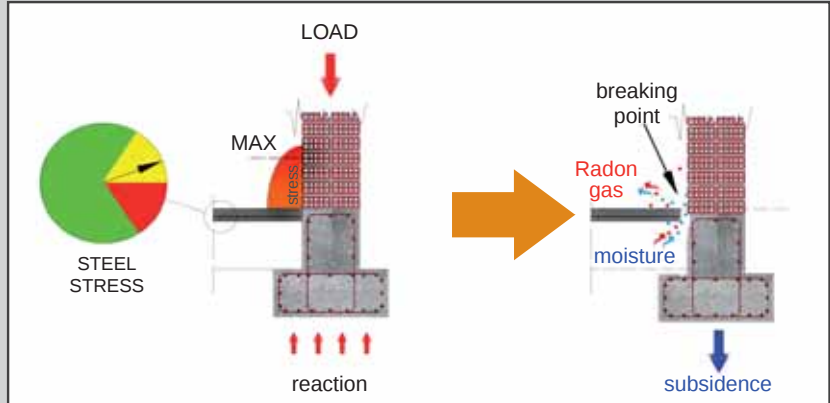


DIFFERENT TYPES OF FOUNDATION

› TRADITIONAL FOUNDATION

When traditional foundations are made the slab and the ground beams are poured in two operations. The load is not well distributed over the slab, which leads to:

- › CRACKS
- › MOISTURE
- › RADON GAS

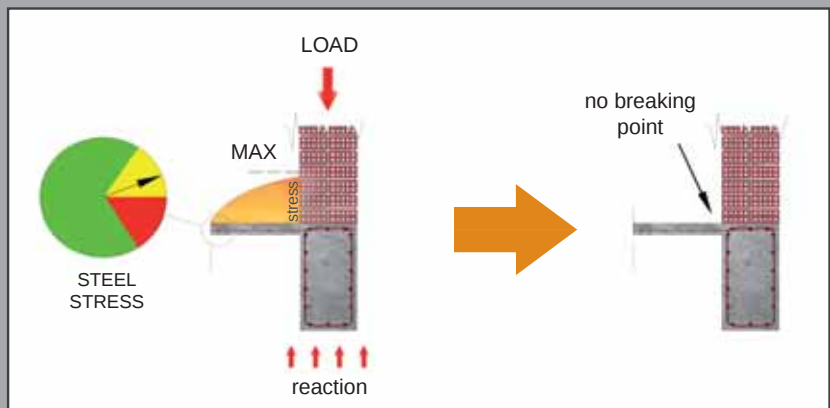


› TRADITIONAL MONOLITHIC FOUNDATION

In a monolithic foundation load is evenly distributed and it remains below the admissible limit. Despite this, the contact between the foundation and the soil causes the rising of:

- › MOISTURE
- › RADON GAS

Even when load is well distributed, stress levels of the steel elements of the foundation are critically high.

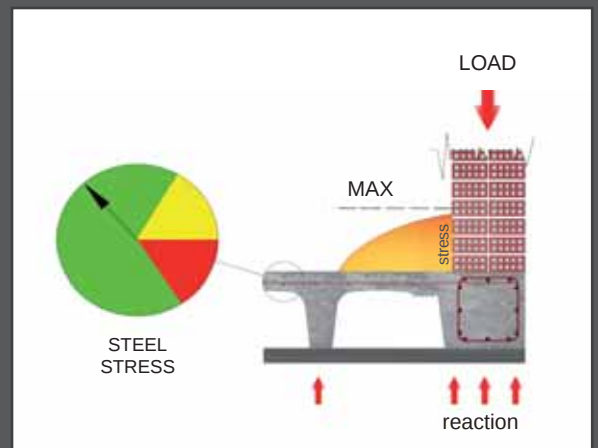
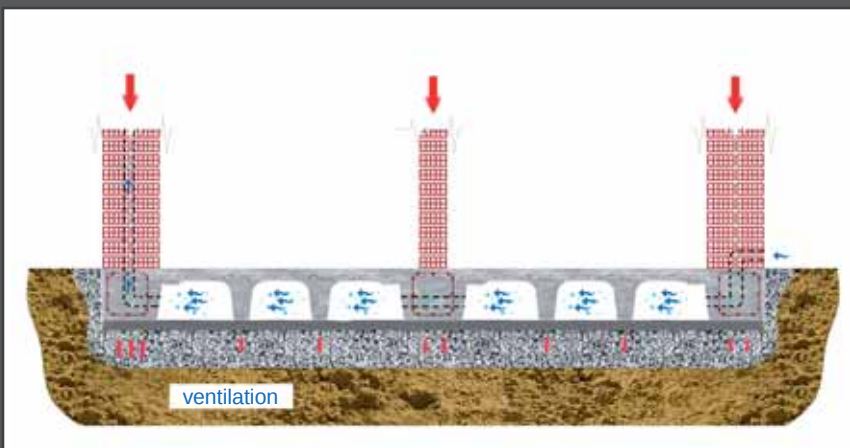


› MODULO System: VENTILATED MONOLITHIC FOUNDATION

A **VENTILATED MONOLITHIC** foundation is the solution that combines the advantages of a monobloc structure and a ventilated one. The load is distributed uniformly and remains under the breaking limit. The greater distance from the point of force application decreases steel and slab stress.

- › NO CRACKS OR STRUCTURAL FAILURES
- › NO STEEL STRESS
- › NO MOISTURE RISE

- › NO RADON GAS
- › VENTILATION OK

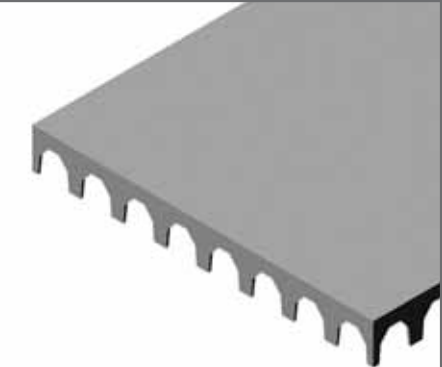


TECHNICAL DATA

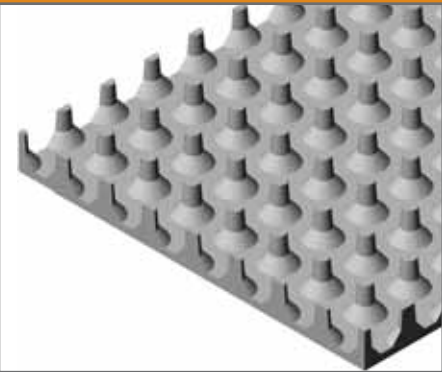
LOAD CHART FOR MODULO 50 x 50

TYPE OF LOAD	Overload kg/m²	Min. slab thickness cm	Lean mix cm	Screed thickness cm	Pressure on the soil kg/cm²	Rebar	
						mm	maglia cm
RESIDENTIAL	2,000	4	0		1.753	ø 6	20 x 20
			5		0.601		
			10		0.300		
	5,000	4	5		1.428	ø 6	20 x 20
			10		0.714		
			5	10	0.427		
INDUSTRIAL	15,000	5	10	25	0.345	ø 8	20 x 20
	25,000	10	10	25	0.574	ø 8	20 x 20
	40,000	15	15	30	0.599	ø 8	20 x 20

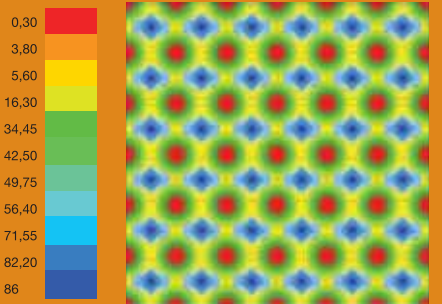
BEHAVIOUR ANALYSIS OF THE REINFORCED CONCRETE STRUCTURE



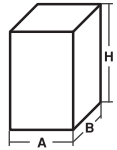
View from above of the model



View from below of the model



Tension state of the MZZ plate, top view

	MODULO H3	MODULO H6	MODULO H9
Dimension	50 x 50 cm	50 x 50 cm	58 x 58 cm
Clear Span h	2.1 cm	4.5 cm	7 cm
L	5.5 cm	5.4 cm	14.5 cm
Max Ø of single tube	20 mm	40 mm	70 mm
Max Ø of two tubes	20 mm	20 mm	60 mm
Concrete consumption (flush with the top of MODULO)	m³ 0.004 m²	m³ 0.009 m²	m³ 0.010 m²
Pallet size			
	A x B x H (cm)	120 x 102 x H220	120 x 102 x H220
	Pcs. per pallet	720	720
	m² per pallet	180	240

MODULO SYSTEM: MODULO + GEOBLOCK



GEOBLOCK creates cost savings and assures the safe execution of monolithic ventilated foundations.

MODULO System, the combined use of **MODULO**, **GEOBLOCK** and **FERMAGETTO**, creates savings and provides important technical advantages.

MODULO

The formwork for monolithic ventilated foundations **MODULO** creates a monolithic ventilated foundation. Its shape forms a slab on a matrix of small pillars: this solution provides high structural strenght to the building. The sanitary void protects from moisture and dangerous Radon gas. **MODULO** is available in different heights (from 3 to 70 cm). **MODULO SYSTEM** makes it possible to pour the foundation beams and the groundslab in a single operation, considerably reducing forming time. A single pour means extra safety and stability.

THE ADVANTAGES OF MODULO System

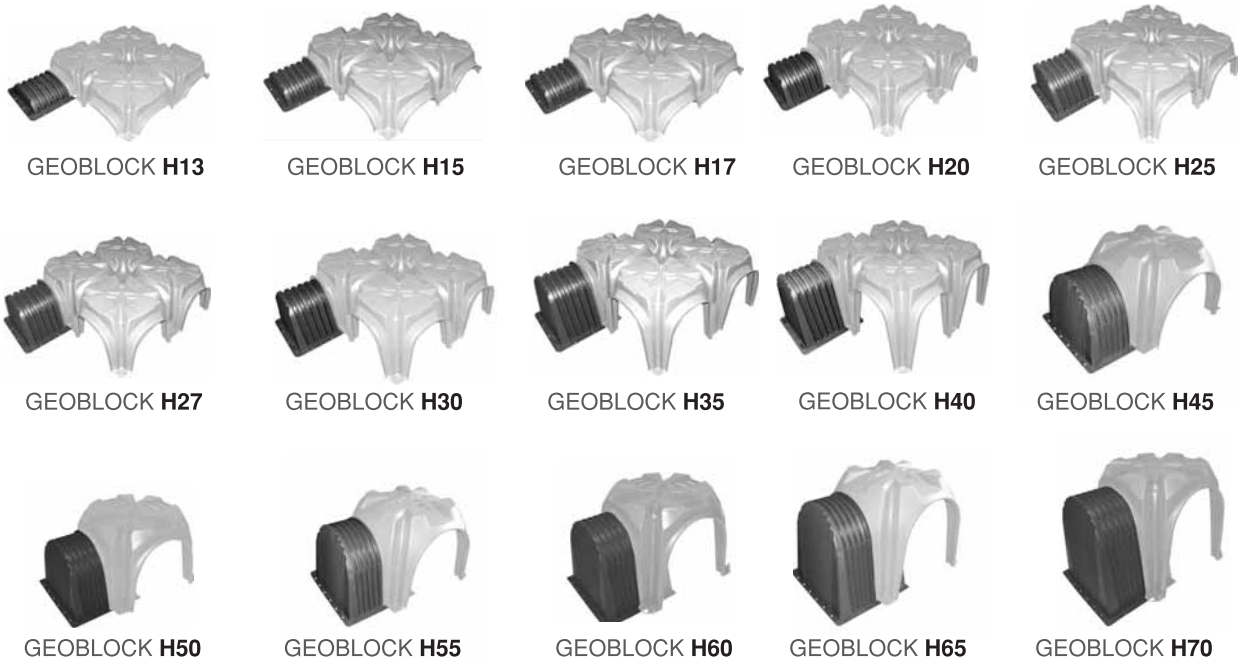


- **SINGLE POUR OF SLAB AND FOUNDATION BEAMS**
MODULO SYSTEM is used to create a monolithic structure with high load-bearing capacity, stability and excellent seismic resistance.
- **ELIMINATION OF TRADITIONAL FORMS**
- **VENTILATION**
Protects the whole structure from moisture and disperses Radon gas.
- **INCREASES THE FOUNDATION LOAD-BEARING CAPACITY**
- **REDUCES THE AMOUNT OF MATERIALS REQUIRED**
- **THERMAL INSULATION**
Control of natural convection airflow.
- **EASIER MAINTENANCE AND ACCESSIBILITY OF PLUMBING AND ELECTRIC SYSTEMS**

MODULO H13	MODULO H15	MODULO H17	MODULO H20	MODULO H25	MODULO H27	MODULO H30	MODULO H35
71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm
7.5 cm	9 cm	11.5 cm	14 cm	19.5 cm	21 cm	24 cm	29 cm
23.5 cm	22 cm	24.5 cm	21 cm	26 cm	24.5 cm	23.5 cm	26 cm
70 mm	75 mm	110 mm	140 mm	190 mm	210 mm	230 mm	230 mm
60 mm	70 mm	100 mm	100 mm	120 mm	120 mm	120 mm	120 mm
m³ 0.020 m²	m³ 0.027 m²	m³ 0.028 m²	m³ 0.032 m²	m³ 0.033 m²	m³ 0.035 m²	m³ 0.042 m²	m³ 0.045 m²
151 x 151 x H225	151 x 151 x H225	151 x 151 x H226	151 x 151 x H250	151 x 151 x H235	151 x 151 x H235	151 x 151 x H250	151 x 151 x H240
360	360	360	300	360	360	300	360
180	180	180	150	180	180	150	180

GEOBLOCK: IT MAKES THE DIFFERENCE

GEOBLOCK is available for every size of **MODULO** from **H13** to **H70**



FERMAGETTO

IS USED TO BLOCK OFF THE SIDE OF **MODULO**, AVOIDING GROUT-LOSS INTO THE SANITARY VOID.

Available for **MODULO** height 13 to 40 cm.

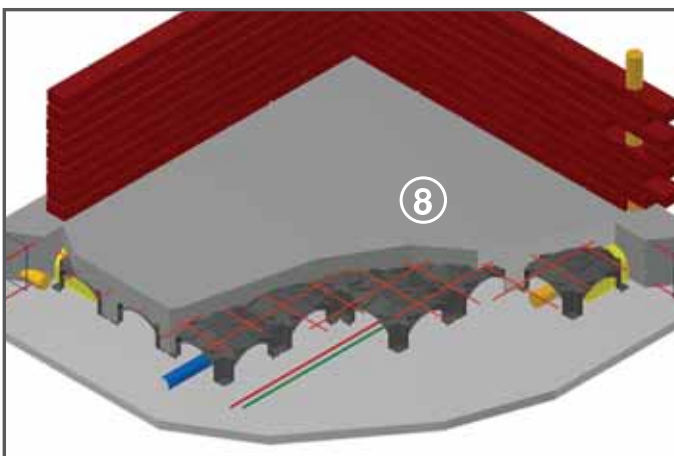
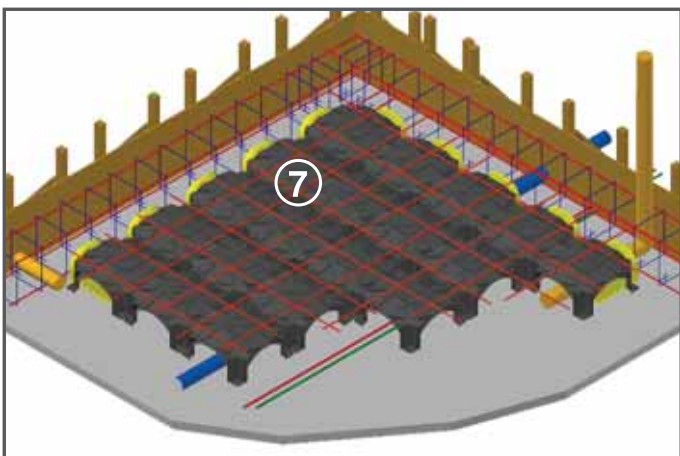
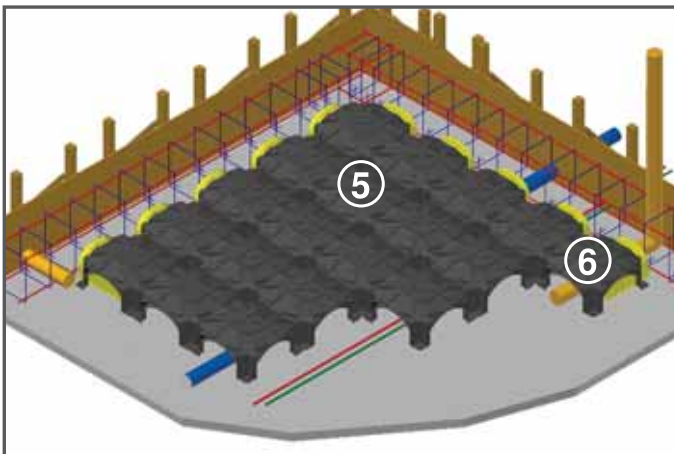
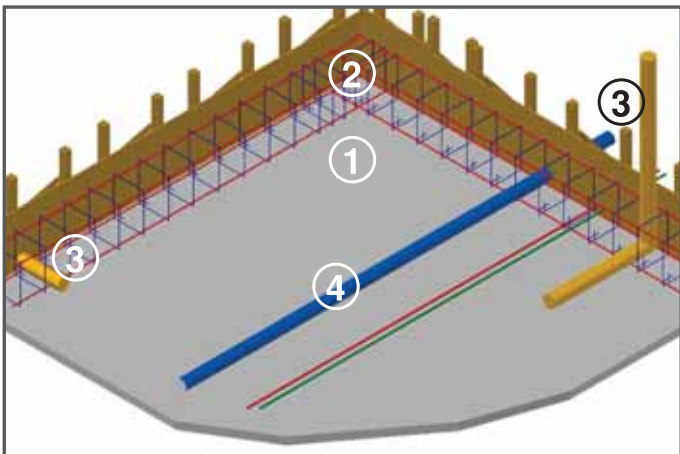


Rings for Modulo H65 and H70



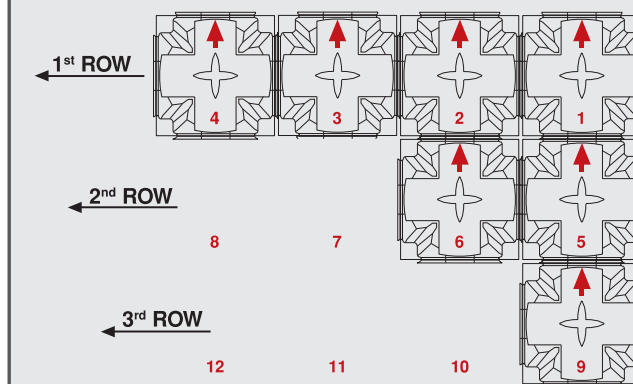
MODULO H40	MODULO H45	MODULO H50	MODULO H55	MODULO H60	MODULO H65	MODULO H70
71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm	71 x 71 cm
34 cm	36 cm	41 cm	46 cm	51 cm	56 cm	61 cm
26 cm	50 cm	51 cm	52 cm	52 cm	53 cm	53 cm
220 mm	360 mm	400 mm	440 mm	440 mm	460 mm	460 mm
120 mm	220 mm	220 mm	240 mm	220 mm	240 mm	260 mm
m³ 0.050 m²	m³ 0.064 m²	m³ 0.076 m²	m³ 0.078 m²	m³ 0.079 m²	m³ 0.084 m²	m³ 0.083 m²
151 x 151 x H265	151 x 151 x H230	151 x 151 x H230	151 x 151 x H225	153 x 153 x H230	151 x 151 x H230	153 x 153 x H240
300	300	300	240	240	240	240
150	150	150	120	120	120	120

HOW TO CREATE A VENTILATED FOUNDATION



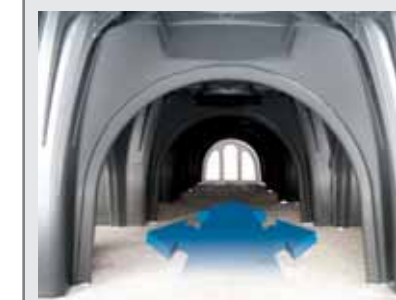
1. Prepare a lean concrete base of thickness as required by the load on the foundation. The foundation reinforcement is placed above this lean concrete base;
2. Prepare the perimeter foundation of the pour;
3. Place the ventilation tubes through the ground beam reinforcement for connection between different sections of the ground slab;
4. Place all pipes and services as per design (plumbing, cables, etc.);
5. Place the **Modulo** forms, without cutting any of the pieces;
6. Use **Geoblock** to close any gap between **Modulo** and the foundation beams. **Geoblock** closes the arches of **Modulo** avoiding any grout loss, and automatically forms the ground beams.;
7. Place the wire mesh directly above **Modulo**; connect it with the foundation steel. The shape of **Modulo** and **Geoblock** ensures the required concrete cover.
8. Perform a single pour of the foundation beams and the groundslab; the concrete should be adequately vibrated.

MODULO IS INSTALLED PLACING THE PARTS IN ROWS FROM RIGHT TO LEFT AND FROM TOP TO BOTTOM. THE ARROWS ON THE FORMS MUST ALWAYS POINT AWAY FROM THE INSTALLER.



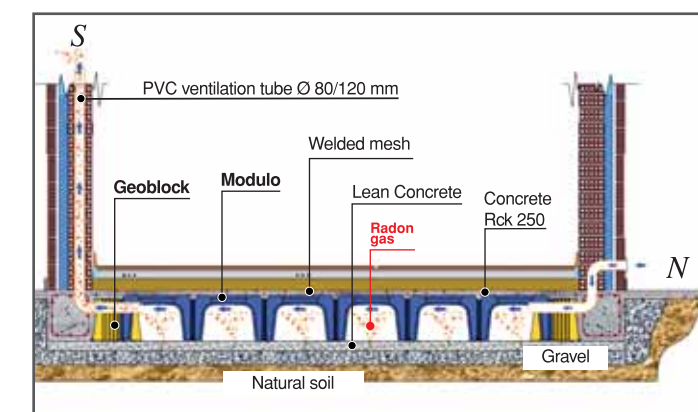
- The fully overlaying lip makes **MODULO** quick and easy to install.
- **MODULO** can be placed over partially prepared surfaces.
- **MODULO** is fully treadable.

HOW TO CREATE A VENTILATED MONOLITHIC FOUNDATION

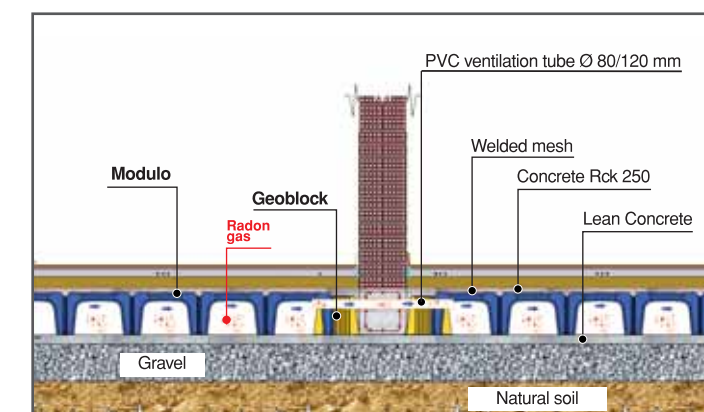


NATURAL OR FORCED VENTILATION UNDER THE WHOLE SLAB

To have an effective ventilation of the foundation it is necessary to connect the sanitary void to the outside: this is done creating openings of diameter 80/120 mm in the perimeter beams of the foundation every 3.5 to 4.0 m; the required connection PVC pipes and metallic anti-intrusion grids must be considered. The ventilation openings must be placed at a higher level on the southern face of the building (warmer side) vs. the northern face (colder side), so that a stack effect is naturally created. Any portions of the sanitary void separated by foundation beams should be connected to each other by openings as described above.



Example of monolithic aired foundation



Example of connection between sections of the slab

HOW TO CORRECTLY JOIN THE FORMS

To correctly join **Modulo** parts simply superpose the female and the male U-lips of the forms. **Modulo H55, H60, H65** and **H70** cm have additional coupling features on the feet and on the U-lips which add further stability to the forms during the pour.



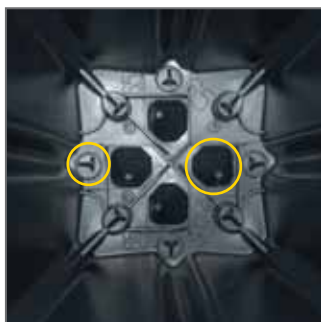
Make sure that the parts are perfectly joined and form an even surface without openings between the forms.
(Modulo H 55-70)



Vertically connect the feet.
(Modulo H 55-70)



Always check that the feet of **Modulo** are correctly joined.
(Modulo H 55-70)



The final assembled configuration must look like the picture, all the feet must be firmly on the ground.
(Modulo H 55-70)



During installation always hold the parts with the arrow imprinted on the top pointing away from yourself.



The length of **Geoblock** can be adjusted according to the project requirements.

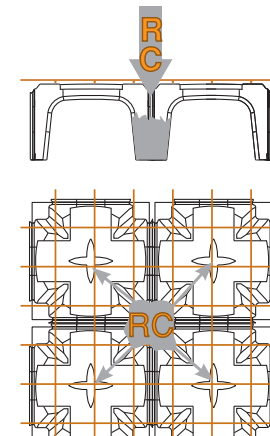
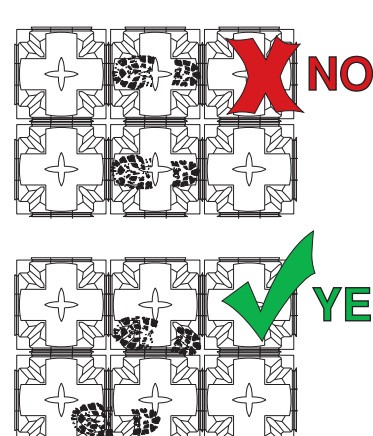


For a correct installation of **Modulo** please follow instructions.



It is possible to adjust the length of **Geoblock** sliding it underneath **Modulo**.

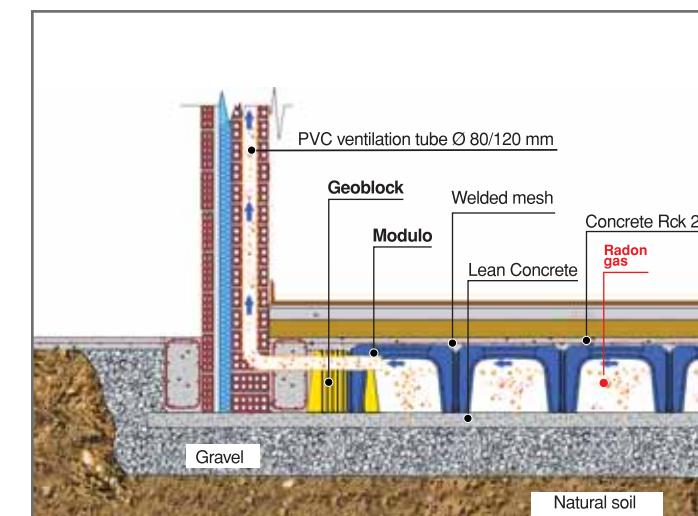
RECOMMENDATIONS FOR A CORRECT POUR



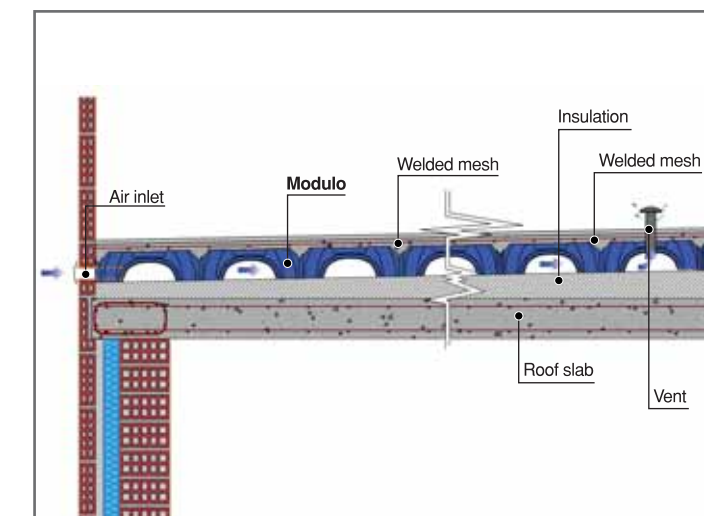
As soon as a few square meters of **Modulo** have been installed it is possible to walk on the forms, as long as the operators do not tread in the centre of the domes. Once the welded mesh is in place it is possible to walk over the whole surface.

When a concrete pump is used it is advised to pour from a max. height of 20 cm above the forms. The pillars must be filled with concrete before the slab is poured.

Do not begin the pour before the welded mesh is in place; make sure that the forms are all correctly placed. During the hot season it is advised to pour during the cool hours of the day, or otherwise to wet the forms before the pour.



Example of aired foundation with reinforced sub-grade



Example of ventilated roof



Example of installation of ventilation tubes through foundations beams for connection between sections of the ground slab

CONSTRUCTION CONTRACT - TECHNICAL SPECIFICATION

Construct a sanitary void and the reinforced concrete groundslab above it by pouring concrete onto regenerated polypropylene (*) lost formwork type **MODULO**®, manufactured by Geoplast S.p.A., Italy; each **MODULO**® element has a square base of 50x50, 58x58 or 71x71 cm, with the shape of a dome or a series of domes, of height as required by the designer. The top surface of **MODULO**® is designed to correctly place the welded mesh and to support the pour of concrete min. resistance class Rck 250; the interconnected forms will create a series of domes and pillars in a bidirectional square matrix.

The sanitary void created is suitable for the passage of services and/or the ventilation of the foundation. The sides will be blocked-off using the extensible elements type **GEOBLOCK**® which are designed to allow the single pour of foundation beams and groundslab.

(*) Regenerated Polypropylene (PP): Flexural modulus 1100 N/mm² - Tensile strength 35 N/mm² - Coefficient of thermal expansion 0,15 mm/m/°C.

Execution:

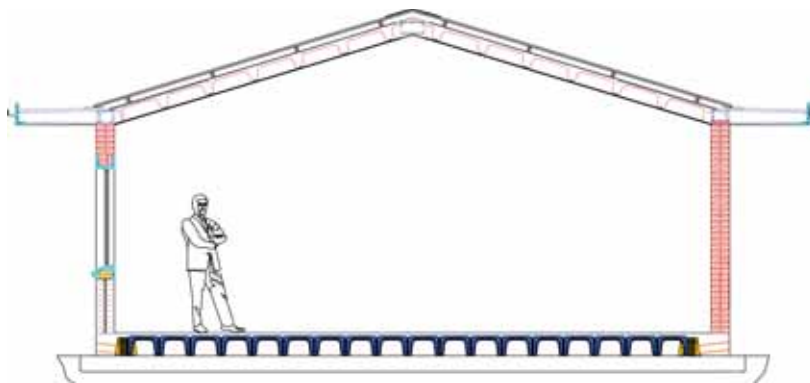
- A) Pour a slab of lean concrete of the thickness specified by the project design.
- B) If required by the Project Management, holes for services shall be made and references shall be traced before the forms are put in place.
- C) Ventilation of the foundation is provided by openings of Ø 80/120 mm every 3.50 / 4.00 m in the perimeter structures, connected to the sanitary void with PVC pipes. The openings shall be protected from pest intrusion by metal grids. To achieve best results the vents shall be placed at a higher level on the southern face of the building (warmer side) than on the northern face (colder side). Should groundbeams divide the groundslab in sectors, these should be interconnected by pipes.
- D) Install the elements type **MODULO**® and **GEOBLOCK**® in regenerated polypropylene as required by the project design.
- E) Place the reinforcement (welded mesh) as required by the project design.
- F) Pour concrete of resistance class and performance in the amount required in order to fill the voids created by the forms, creating a series of pillars, and the top slab of the thickness required by the project design, with or without the aid of a concrete pump.
- G) Vibrate the concrete pour.

All ancillary services and structures required for a workmanlike execution must be included.

FOR OUR CUSTOMERS

CUSTOMER
SERVICE

Example of a design with **MODULO SYSTEM**



Our **Technical Dept.** is always available for design assistance, providing the solution that makes best use of the characteristics of **Geoplast** products.

Send your project to: ufficiotecnico@geoplast.it

Disclaimer: the values shown in this brochure are for guidance only. They are not meant to be used for design criteria. Their use and reliance thereon for any purpose by anyone is entirely voluntary and at the sole risk of the user. GEOPLAST is not responsible for any loss, claim, or damage resulting from their use.

CUSTOMER SERVICE: PROJECT DEVELOPMENT

Send your projects in DWG format to ufficiotecnico@geoplast.it

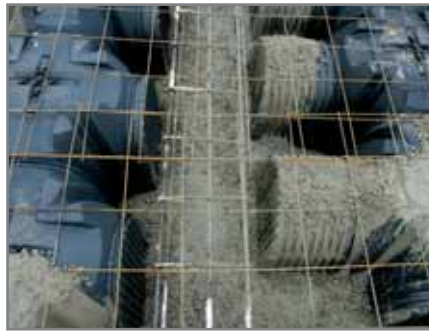
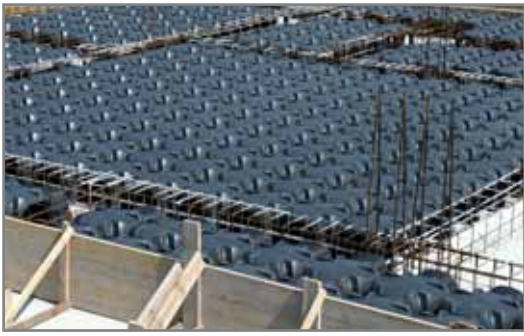
CERTIFICATION

MODULO is a product certified by
TEST REPORT 1019X/9/001
issued by **TECHNOPROVE** - Vicenza

ASSEMBLY HANDBOOK AND TECHNICAL SPECIFICATIONS

Available in our website www.geoplast.it in the "Area Download" section





MODULO System: TECHNOLOGY AT YOUR SERVICE





GEOPLAST S.p.A.

Via Martiri della Libertà, 6/8 - 35010 Grantorto (PD) - Italia
Tel +39 049 9490289 - Fax +39 049 9494028
e-mail: geoplast@geoplast.it - www.geoplast.it



Authorized dealer: