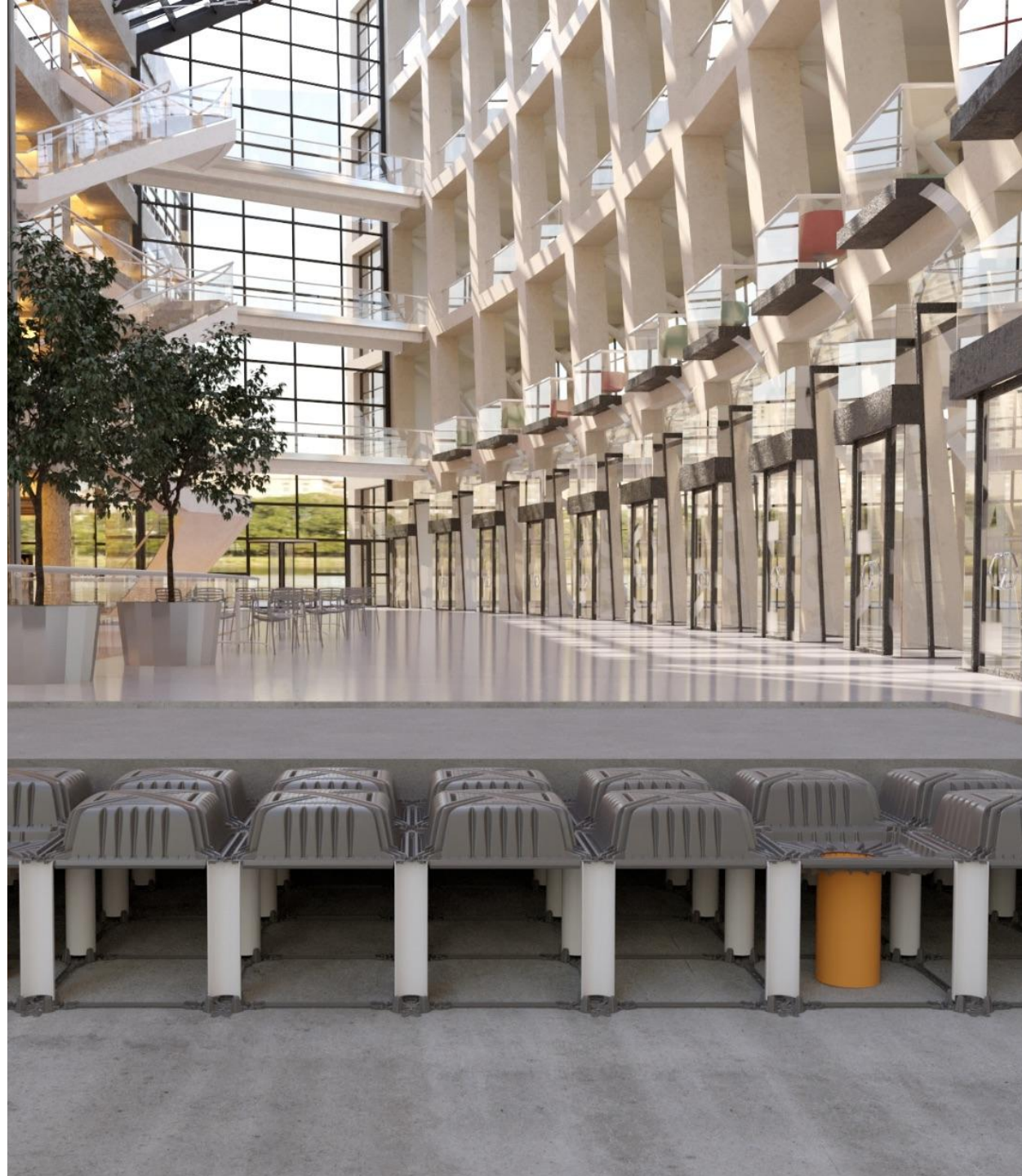
Geoplast Building beyond together

SKYNET

SEISMIC RESISTANT CRAWL SPACE

- EUROCODE COMPLIANT
- ANTI - SEISMIC
- ECONOMIC AND SUSTAINABLE



Geoplast Building beyond together

CONTENTS

- SYSTEM DESCRIPTION
- STRUCTURAL FEATURES
- DATA
- STANDARDS ASPECTS
- COMPARISON
- EARTHQUAKE
- CONSTRUCTION PHASES
- GEOPLAST SERVICE

SYSTEM DESCRIPTION

CONSTITUENT ELEMENTS

Modular disposable formwork system for the construction of bidirectional raised ribbed crawl spaces connected to the foundation by structural circular columns

Skynet formwork 71x71 cm, height 20 cm.

Skynet TX 71x71 formwork, element for the capital at the structural column.

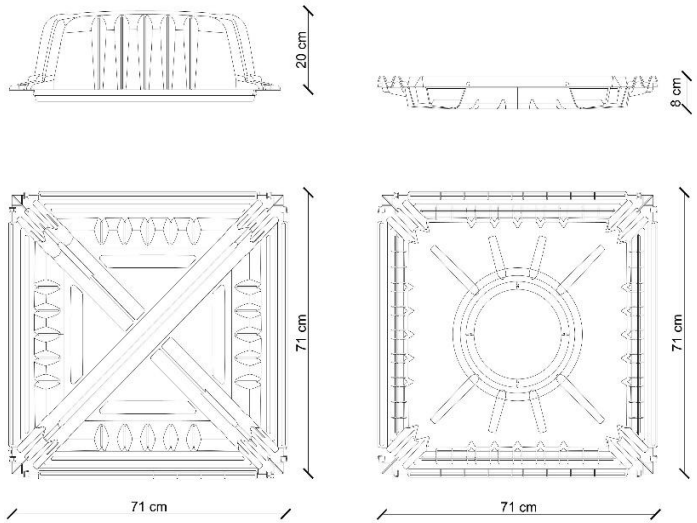
Support base and leg centering during laying.

Spacer element interconnected between the bases to ensure proper vertical alignment of the system.

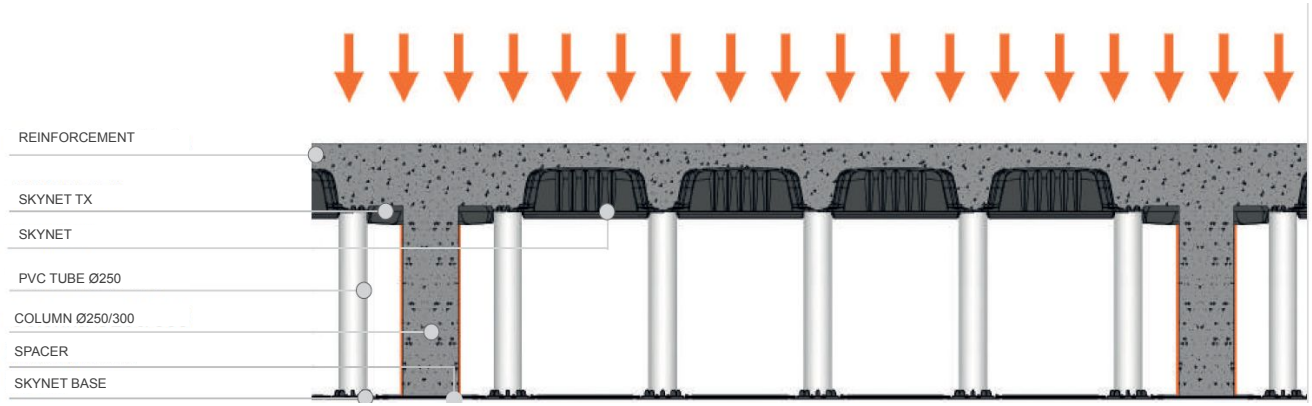
Support tubes system for the variable height columns support. The 125-mm-diameter tubes are used to support the formwork during erection as disposable propping. 250 or 300 mm tubes function as support and as formwork for the structural column of the system.

SYSTEM DESCRIPTION

TECHNICAL DATA



There are two types of formwork in the system, the Skynet formwork and the Skynet TX. The former is used to form the lightened part of the slab, while the latter is to connect the formwork assembly with the column and thus forming the capital (concrete filled area)



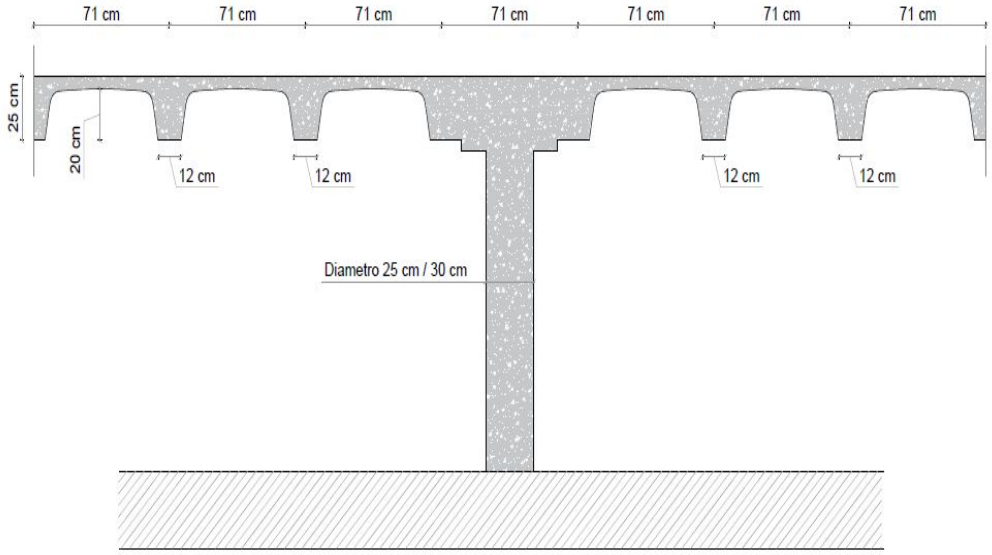
The special shape of the Skynet formwork has been designed to shape lightweight ribbed slab that are efficient in terms of concrete and steel consumption, even under heavy loads.

STRUCTURAL CHARACTERISTICS

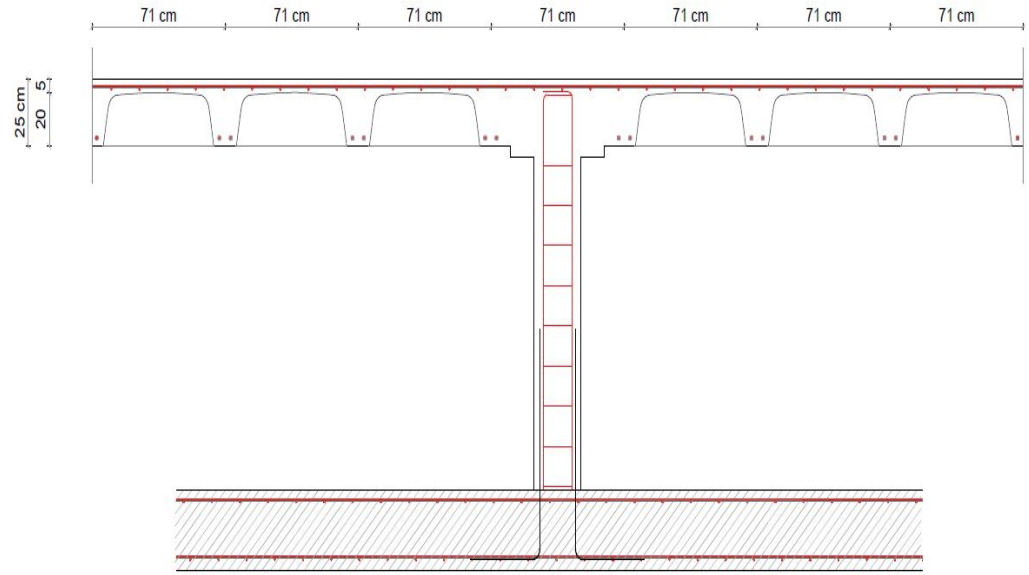
TECHNICAL DATA

The crawl space created with Skynet is very similar to a real slab, with top reinforcement, bottom reinforcement (joists), structural column reinforcement. Possible stirrups if required.

TYPOLOGICAL REINFORCEMENT DETAIL SECTION

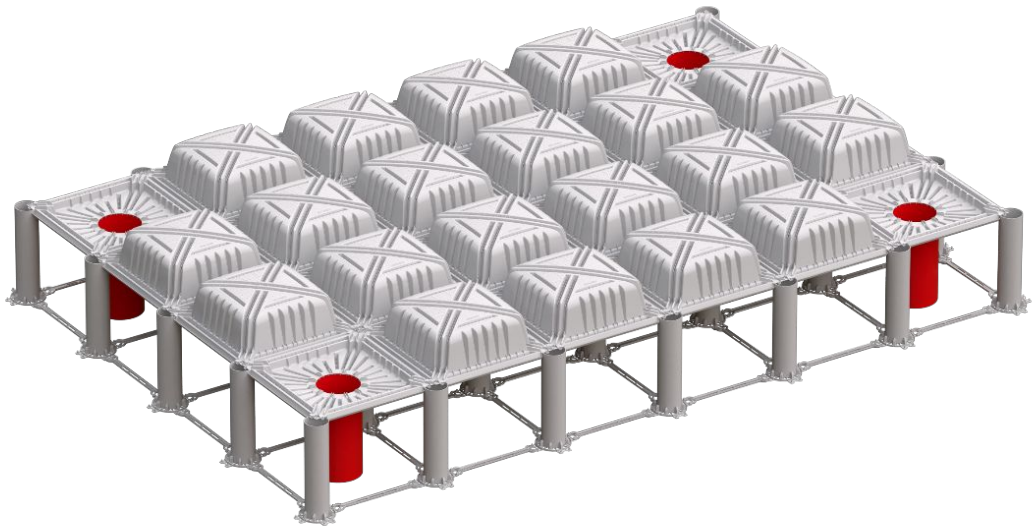


TYPOLOGICAL SECTION CONCRETE STRUCTURE

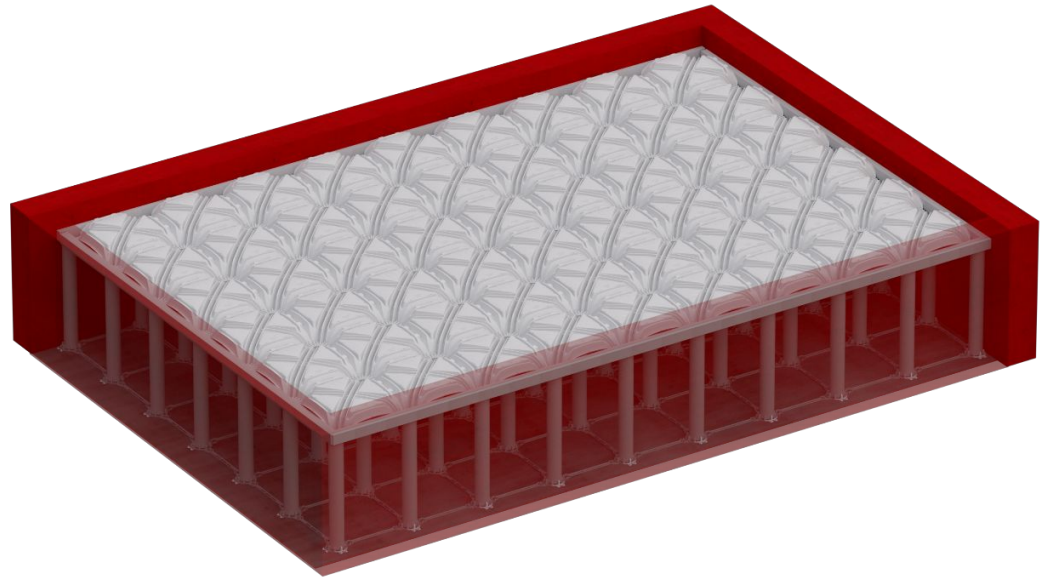


STRUCTURAL CHARACTERISTICS

SEISMIC BEHAVIOUR - CONCEPTUAL COMPARISON WITH ELEVATOR AND SIMILAR SYSTEMS



SKYNET system - the elements resistant to horizontal forces are the columns, i.e. the structures directly realized by the formwork system.



ELEVETOR system and similar systems available on the market: assigns the seismic resistance directly to the perimeter supporting structures or to any PIER and WALLS that must be specifically provided for in the design of the structure.

DATA

COMPARISON OF STEEL CONSUMPTION BETWEEN TECHNOLOGIES

SKYNET

Concrete consumption for a system H tot 150 cm with varying load and structural span between columns. Column diameter 25 cm with top slab thickness 5 cm

STEEL CONSUMPTION [kg/m^2]

LOADS [kN/m^2]		SPAN [m]			
SDEAD	**LIVE**	**3.54 m**	**4.25 m**	**4.96 m**	**5.65 m**
2.00	**2.00**	8.98	9.58	11.14	13.71
2.00	**4.00**	11.01	11.90	13.79	16.47
2.00	**6.00**	15.36	14.20	15.69	19.72

ELEVETOR MAX

Concrete consumption for a system H tot 150 cm under varying loads. Column diameter 12.5 cm

LOADS [kN/m^2]		SPAN [m]
SDEAD	**LIVE**	**No columns**
2.00	**2.00**	10.4
2.00	**4.00**	12.4
2.00	**6.00**	10.4

SKYNET REQUIRES A BIT MORE STEEL THAN ELEVETOR SYSTEM FOR LONG SPANS AND INCREASING LOADS.

DATA

COMPARISON OF STEEL CONSUMPTION BETWEEN TECHNOLOGIES

SKYNET

Concrete consumption for a system H tot 150 cm with varying load and structural span between columns. Column diameter 25 cm with top slab thickness 5 cm

CONCRETE CONSUMPTION [m^3/m^2]

LOADS [kN/m^2]		SPAN [m]			
SDEAD	**LIVE**	**3.54 m**	**4.25 m**	**4.96 m**	**5.65 m**
2.00	**2.00**	0.124	0.115	0.110	0.106
2.00	**4.00**				
2.00	**6.00**				

ELEVETOR MAX

Concrete consumption for a system H tot 150 cm under varying loads. Column diameter 12.5 cm

LOADS [kN/m^2]		SPAN [m]
SDEAD	**LIVE**	**No columns**
2.00	**2.00**	0.128
2.00	**4.00**	0.128
2.00	**6.00**	0.138

USING SKYNET OFFERS SIGNIFICANT CONCRETE SAVINGS IN MANY LOW-MEDIUM LOADED APPLICATIONS.

STANDARDS ASPECTS

The idea behind SKYNET is to design structural crawl spaces and elevations in accordance with the most common structural standards calculations, such as EUROCODICE, ACI, British Standard and Technical Standards for Construction 2018 (Italy).

Compliance with the regulations imposed by the regulations is ensured by the geometries that the Skynet formwork system gives to the various components of the crawl space.

Eurocodes

aci
American Concrete Institute®
Advancing concrete knowledge

NTC 2018
NORME TECNICHE
PER LE COSTRUZIONI

STANDARDS ASPECTS

SUMMARY OF THE REQUIREMENTS FOUND IN EN 1992-1-1

SLAB REINFORCEMENT

The minimum amounts of reinforcement for the ribbed slab can be from the requirements for beams in § 9.2.1. The largest dimension h must not be greater than 4 times the smallest dimension b. (§ 9.5.1)

COLUMN REINFORCEMENT

Longitudinal [9.5.2]:

- It is recommended that reinforcing bars have a diameter not less than 12 mm
- It is recommended that minimum amount of longitudinal reinforcement must be not less than As,min.
  Recommended value $A_{s,min} = \frac{0{,}10N_{Ed}}{f_{yd}}\ or\ 0{,}002A_c$
- It is recommended that in circular columns, the number of longitudinal bars must be no less than 4

Transversal [9.5.3]:

Stirrups spacing, $S_{cl,tmax}$ minimum value between

- 20 Ømin longitudinal reinforcement
- Dim. minimum column (25 cm o 30 cm)
- 40 cm

COMPARISON

	SKYNET SYSTEM	ELEVETOR SYSTEM
SLAB	RIBBED SLAB • Joist width 12 cm • Joist spacing 71 cm • Structural height: 25 cm minimum (20+5)	FULL CONCRETE SLAB Slab minimum thickness 12 cm. Need minimum top and bottom reinforcement, no single mesh.
COLUMNS	BENDING AND COMPRESSION AND SHEAR • Structural columns Ø250 or Ø300 mm • Longitudinal reinforcement • Transversal reinforcement: Circular stirrups or continuous helical stirrups • Resistance to horizontal loads and against earthquake (shear and bending moment)	AXIAL LOAD ONLY • Insufficient diameter to be compared to a "structural" element • Only effective for vertical loads • Difficult to insert transverse reinforcement
RESTRAINT	CONNECTED TO FOUNDATION • Fixed bars (existing structure) • Starter bars (ex novo project)	CONNECTED TO FOUNDATION Solution that does not require connection to the foundation.

SEISMIC ISSUES

EXAMPLE SKYNET SISMA

Elastic behavior, behavior factor q=1
Location: L'Aquila (AQ)

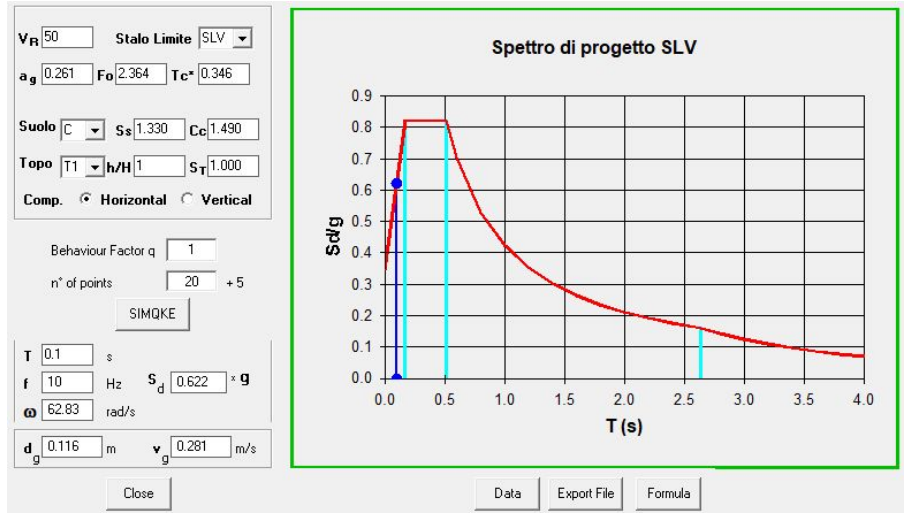
Permanent load: 2.00 kN/mq
Live load: 2.00 kN/mq (cat. A)

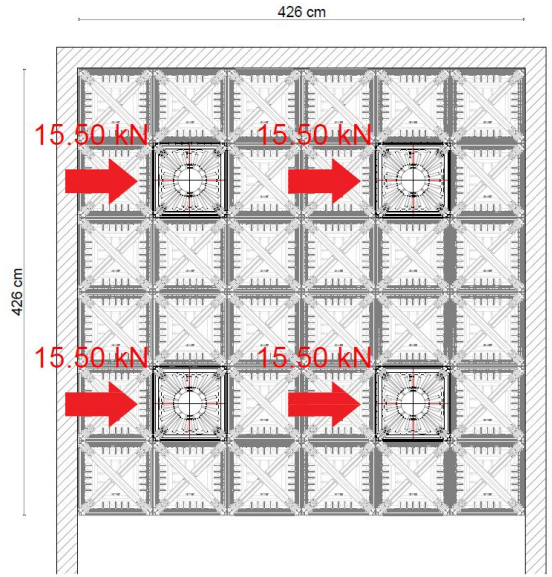
An oscillation period of 0.1 s is estimated, which is consistent with rigid behaviour as the structure is proximally connected to the foundation.

The spectrum gives a design acceleration of Sd(T)=0.662 g

Considering a system of 4.26x4.26 m and 4 columns, a seismic force of:

$$F=\frac{(Sq(T)*Wtot)}{n^{\circ}\ columns}= 15.50\ kN$$



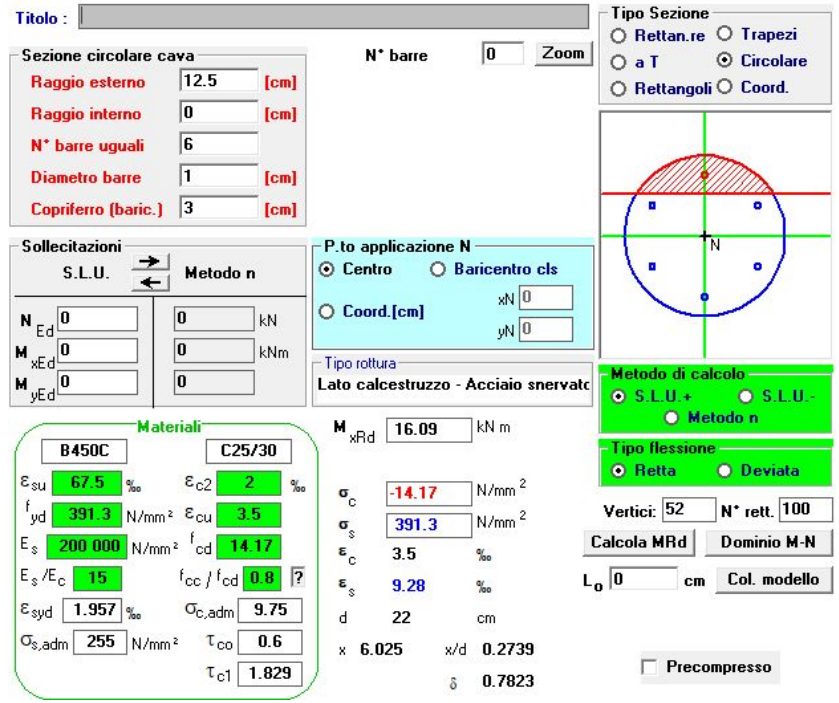


SEISMIC ISSUES

EXAMPLE SKYNET SISMA

SYSTEM HEIGHT: 100 cm

Ved column base: 15.5 kN
Med column base: 15.5 kNm

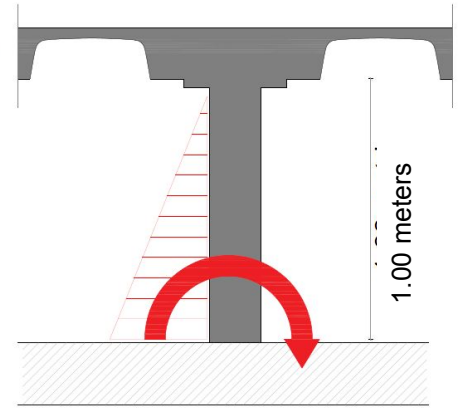


<u>SEISMICALLY EVALUATED SYSTEM ESTIMATED CONSUMPTION</u>

Average consumption: 0.114 m3/m2

Steel consumption estimation: 8-10 kg/m2

Seismic column shear
Ved=15.50 kN



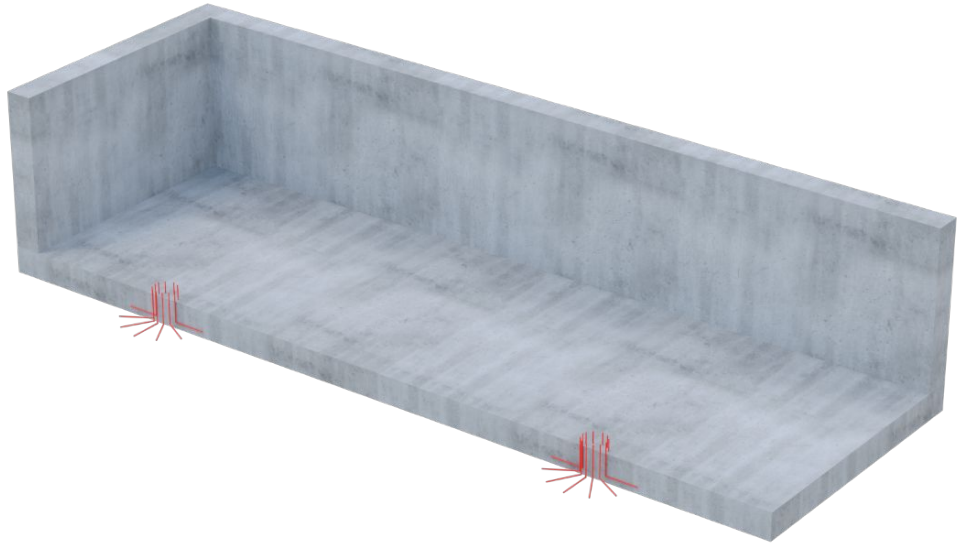
Bending moment
Med=15.50 kNm

** The data presented here are derived using simplified and approximate, but reliable, methods for assessing material consumption.*

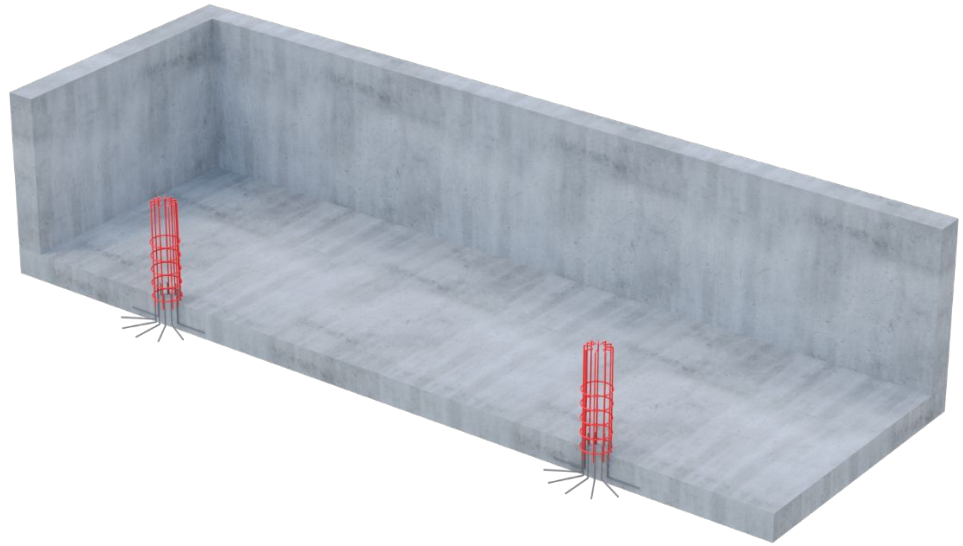
INSTALLATION

EXECUTIVE PHASES ON NEW CONSTRUCTION

STEP 1
Creation of the slab foundation with reinforcing bars placed before the casting of the foundation or fixed subsequently.



STEP 2
Positioning of column reinforcement, including vertical longitudinal bars and circular or helical stirrups.

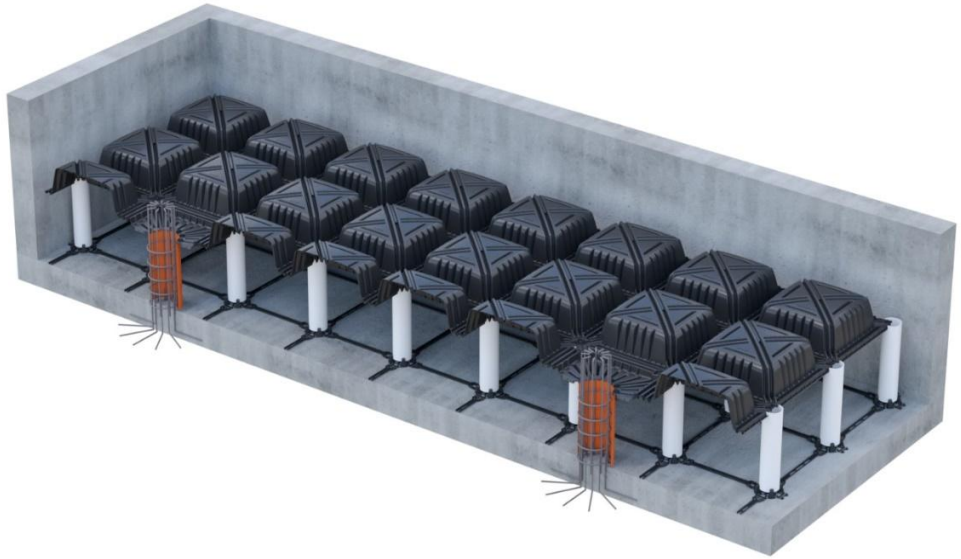


N.B.: The position of the slab stirrups will be defined in the structural project drawn up by the structural engineer on the basis of the formwork installation carried out by UT Geoplast. In the case of Skynet insertion on an existing structure, it will be sufficient to joint the stirrups into the existing foundation.

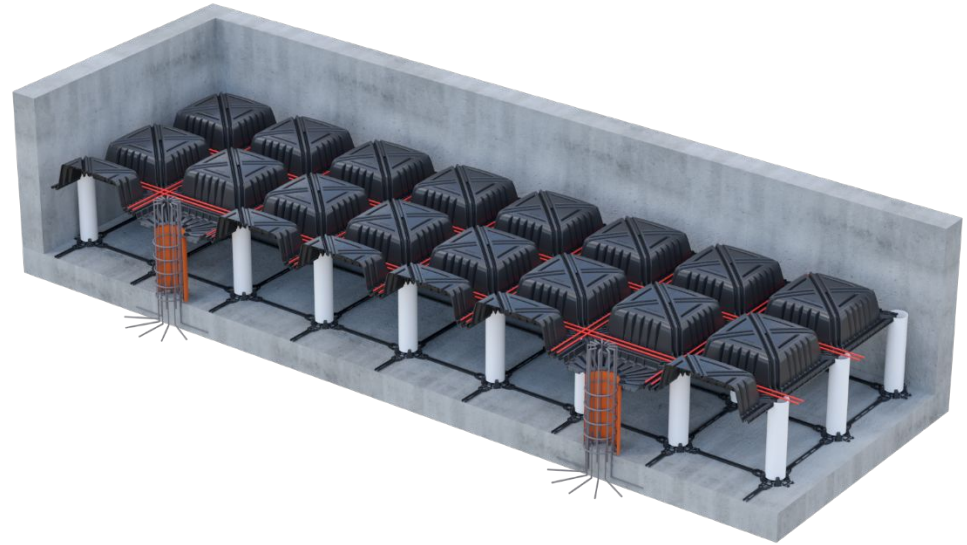
INSTALLATION

EXECUTIVE PHASES ON NEW CONSTRUCTION

STEP 3
Positioning Skynet formwork system starting from the column tubes and then proceeding with tubes, bases and spacers.



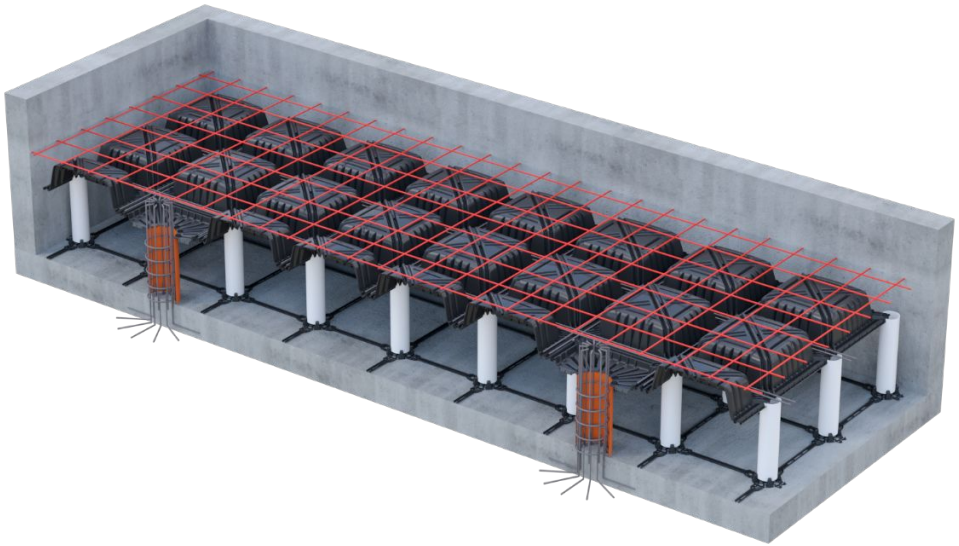
STEP 4
Positioning the bottom reinforcement of the slab within the joists.



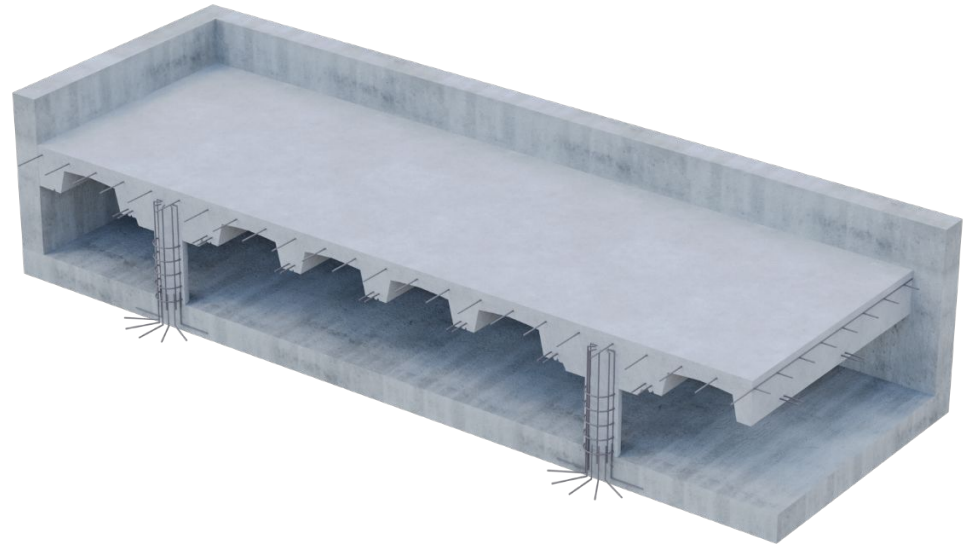
INSTALLATION

EXECUTIVE PHASES ON NEW CONSTRUCTION

STEP 5
Positioning of the upper reinforcement as welded meshes or bars. Subsequent positioning of shear reinforcement inside the joists if required by the calculation.

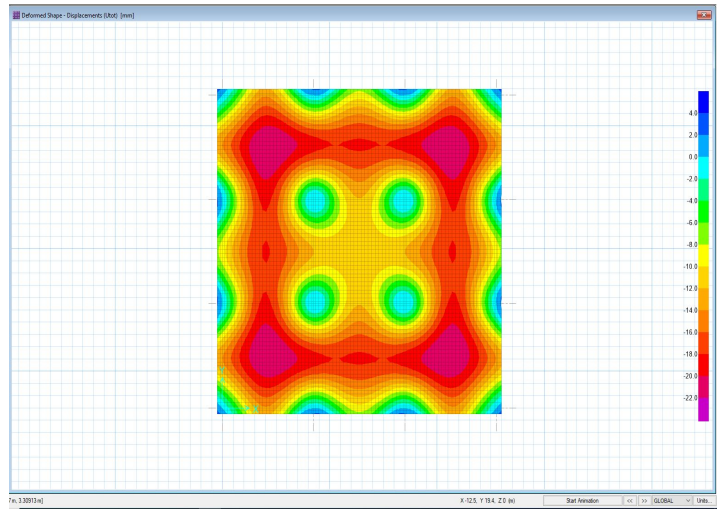


STEP 6
Placing concrete casting as required in the executive drawing and technical data sheet.

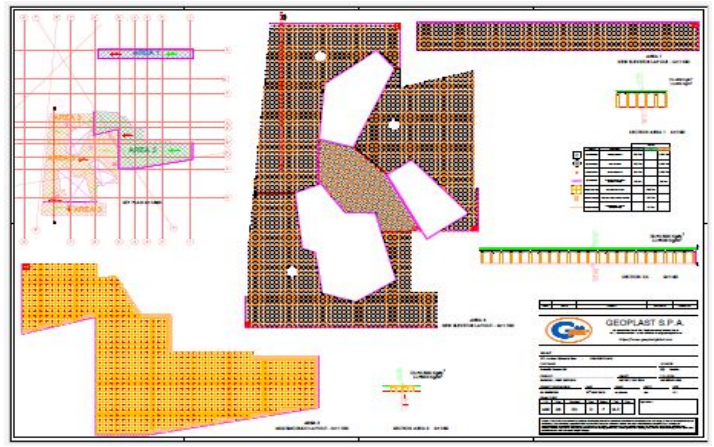


GEOPLAST SERVICE

- DRAFTING REPORTS FOR STANDARD AND CUSTOMISED LOAD CASES ACCORDING TO CUSTOMER REQUIREMENTS



- GRAPHIC DRAWINGS FOR LAYOUT DEVELOPMENTS



- ON-SITE SUPPORT DURING THE LAYING PHASE

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