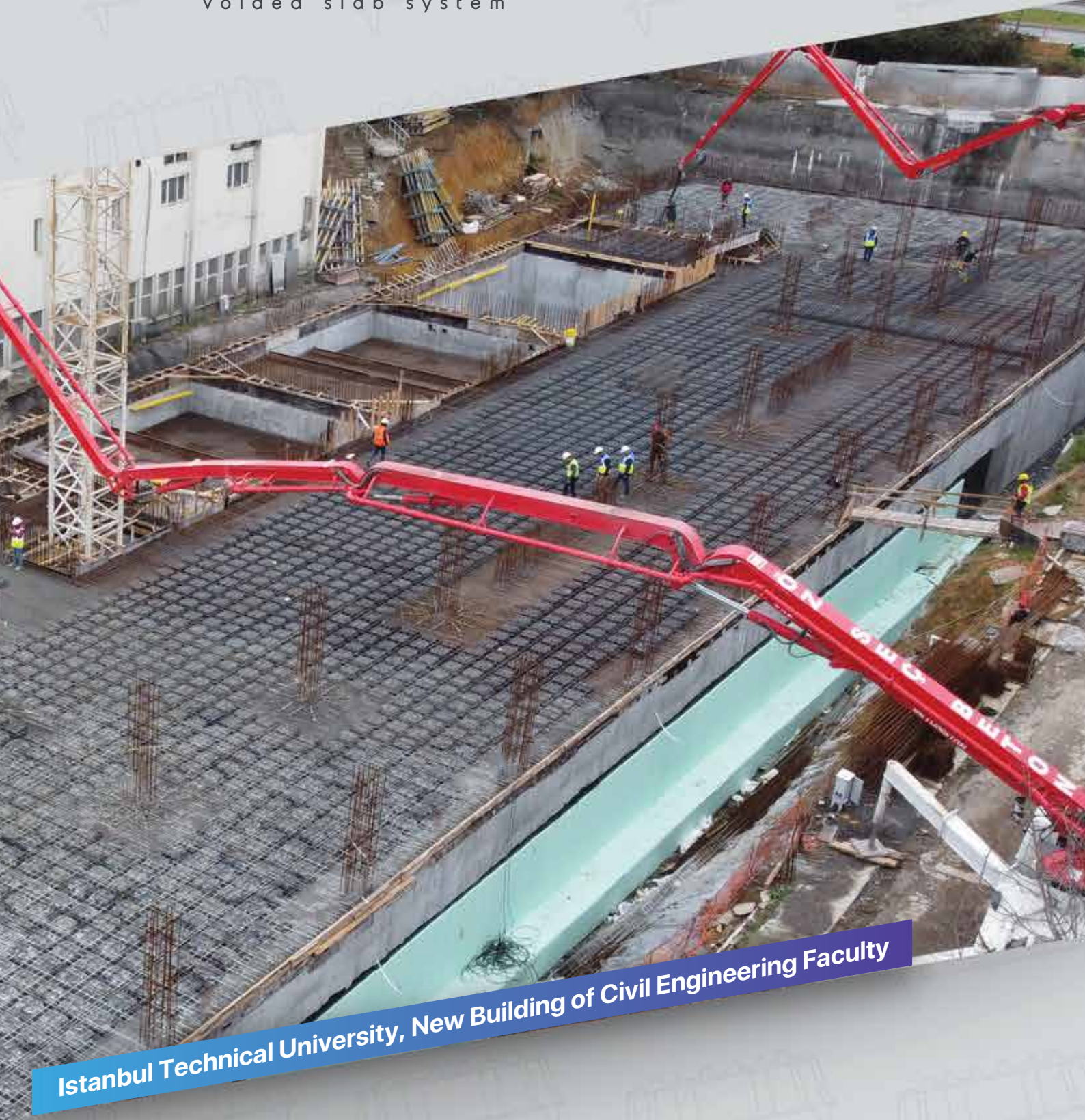


VOLIMAX

voided slab system



volimax.com

LIGHTER, MORE RIGID



Istanbul Technical University, Arı 7 Teknokent

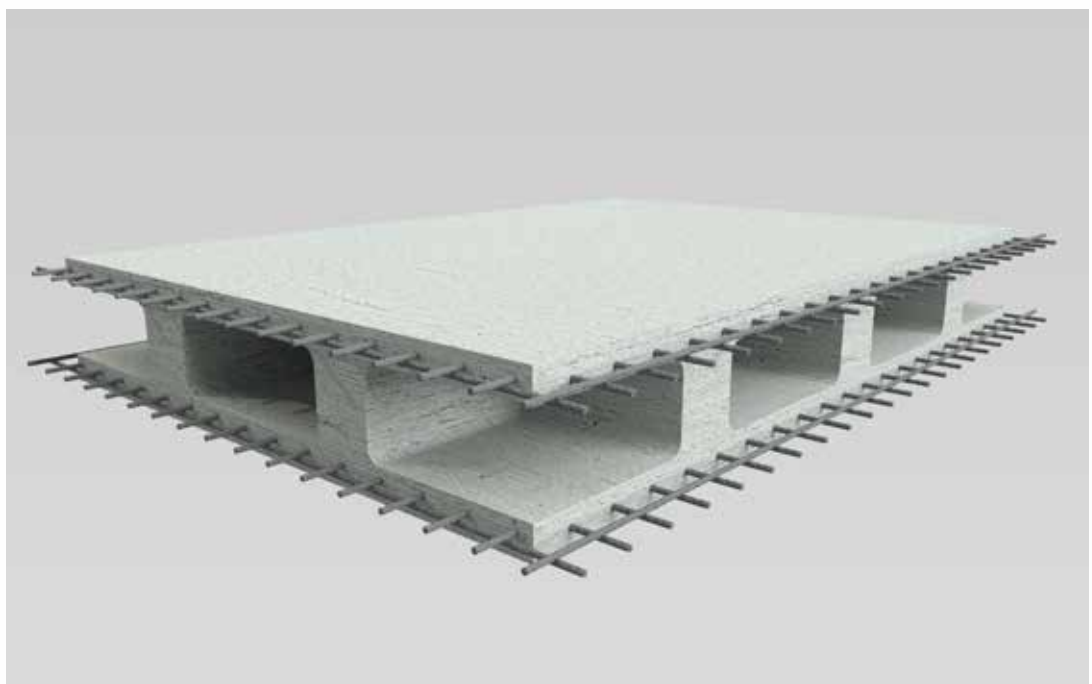


Voided Slab System

A voided slab system reduces the weight and thickness of the slab, increasing the earthquake resistance of the structure without compromising performance attributes of a flat slab.

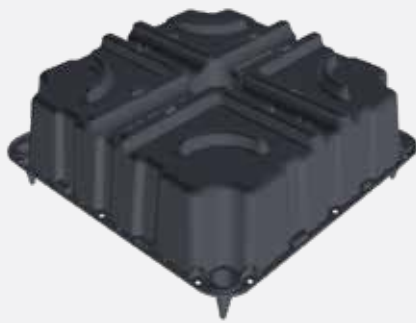
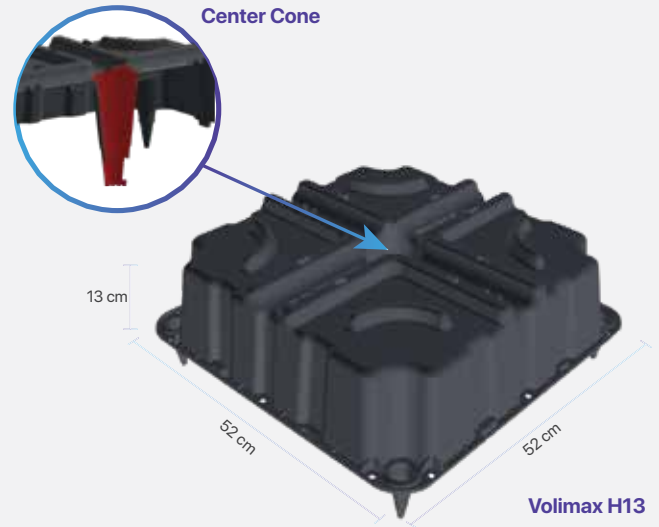
Beamless voided slab distributes the design loads to the four sides, transferring them to the columns/walls or beams.

Voided slab disposable formworks create a matrix of I shaped beams working in both directions of the plane.

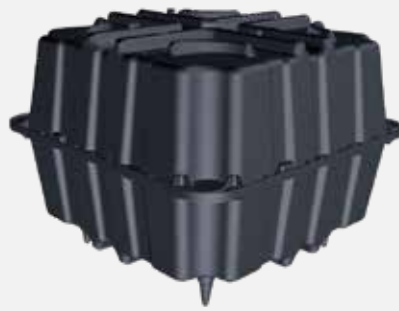


Reinforced Voided Slab Section

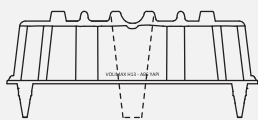
- Width and length: 52×52 cm
- Height:
 - Single-use 10, 13, and 16 cm
 - Double, triple, quadruple use combinations of 10, 13 and 16 cm
- Center cone concrete inspection hole
- Integrated 2 cm concrete spacers
- 7 cm fixed feet, up to 12 cm with extensions
- Made of recycled polypropylene



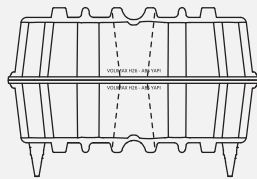
Single Use



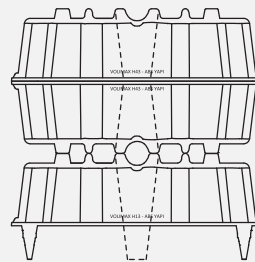
Double Use



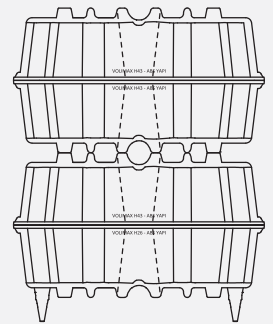
VOLIMAX 52X52
H13



VOLIMAX 52X52
H26



VOLIMAX 52X52
H43



VOLIMAX 52X52
H56

Accessories

Volimax Foot Extensions

Lower slab thickness can be increased to 8, 9, 10, 11 or 12 cm by placing leg extensions on the fixed 7 cm legs.

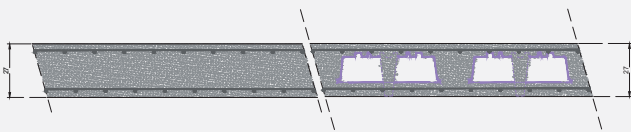
Volimax Spacer

Spacers can fix the distance between the formworks to 10, 12, 14, 16, 18 or 20 cm.



Vs. Flat Slab

Can reduce the weight of the building by up to 30% compared to flat slabs.

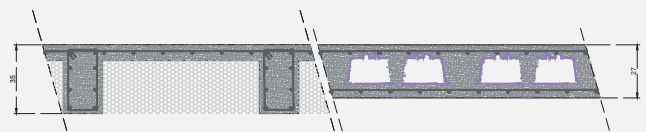


Sample comparison table:

Slab System (6x7 column span)	Slab Thickness	Perimeter Beam	Concrete Cons.	Rebar Cons.
			m ³ /m ²	kg/m ²
Voided Slab System	27 cm (7+13+7)	N/A	0,23	23,86
Flat Slab	30 cm	N/A	0,30	36,45

Vs. Two Way Ribbed (Waffle) Slab

Increases the earthquake resistance of the structure by creating a more rigid diaphragm and saves on floor height. It also completely eliminates fire risks in EPS fillings.



Sample comparison table:

Slab System (6x7 column span)	Slab Thickness	Perimeter Beam	Concrete Cons.	Rebar Cons.
			m ³ /m ²	kg/m ²
Voided Slab System	27 cm (7+13+7)	N/A	0,23	23,86
Two Way Ribbed (Waffle) Slab	30 cm (20+10)	h=30 cm	0,22	26,57

Architectural Advantages



- Larger span between columns
- Reduction in slab thickness
- Gains from floor height
- Reduction in shear wall dimensions
- Optimization of shear wall size
- Flexibility in column location
- Reduction in number of columns
- Flat and continuous ceiling
- Sound insulation

Structural Advantages



- Working in two directions (biaxial)
- Reduction in building self-weight
- Reduction in displacements
- Reduction in loads on the foundation
- Reduction in earthquake impact

Cost Advantages



- Casting in situ
- Shorter construction time
- Reduction in concrete consumption
- Reduction in rebar consumption
- Easy to use
- Ease of material logistics; less storage space, more efficient transport

HOW TO MODEL VOIDED SLAB SYSTEM?



When modeling a voided slab system, first the cross-sectional value (moment of inertia, unit volume and cross-sectional area) of the I section formed by disposable formworks are calculated. Equivalent section coefficients are obtained by comparing voided slab cross section values with flat section values. The voided slab model is created by multiplying these coefficients with relevant parameters such as effective section stiffness, modulus of elasticity and concrete unit volume weight in the structural design software used.

Modeling steps:

1. Determine parameters for flat (full) slab.
2. Calculate voided slab equivalent coefficients.

Calculation of equivalent coefficients:

Flat slab cross-section features with the same geometry as the voided slab cross-section features are determined and the following features of the 2 slabs are proportioned:

Section Area Factor: $A_{\text{voided}} / A_{\text{full}}$

Concrete Volume Factor: $V_{\text{voided}} / V_{\text{full}}$

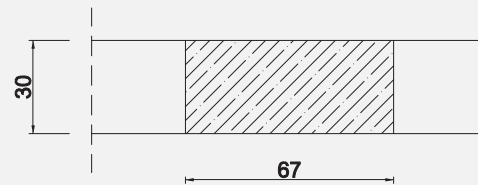
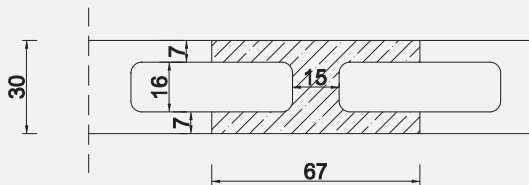
Moment of Inertia Factor: $I_{\text{voided}} / I_{\text{full}}$

These ratios are used by multiplying effective section stiffness in the code.

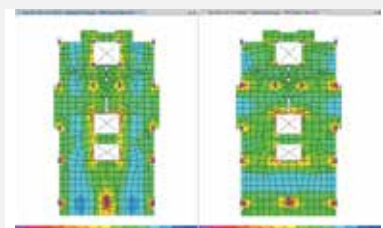
3. Construct dead and live load combinations.
4. Do the preliminary design.
5. Check the slab thickness by inspecting moment diagrams.
6. Check the punching zones by inspecting shear diagrams.

Equivalent section calculation for a 30 cm thick slab:

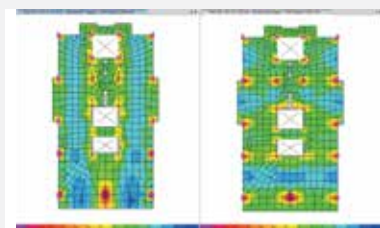
7 cm lower slab +Volimax H16 + 7 cm upper slab		
Void width	52,00	[cm]
Void height	16,00	[cm]
Rib width	15,00	[cm]
Min. lower slab thickness	7,00	[cm]
Min. upper slab thickness	7,00	[cm]
Calculation area width	67,00	[cm]
Calculation area height	30,00	[cm]
Calculation section area (A)	1.178	2.010 [cm²]
Calculation area volume (V)	101.670	134.670 [cm³]
Moment of inertia (I)	133.001	150.750 [cm⁴]
Equivalent slab thickness	22,65	30,00 [cm]
Section area factor ($A_{\text{voided}} / A_{\text{full}}$)	0,586	[-]
Concrete volume factor ($V_{\text{voided}} / V_{\text{full}}$)	0,755	[-]
Moment of inertia factor ($I_{\text{voided}} / I_{\text{full}}$)	0,882	[-]



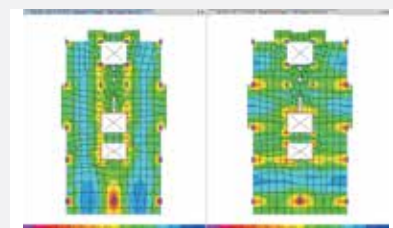
Span m	Dead Load kg/m²	Live Load kg/m²	Ribbed Slab cm	Flat Slab cm	Voided Slab cm	Volimax Height cm	Equivalent Slab cm	Weight Reduction	Rigidity Coefficient
6x6	200	500	7/30	27	27	13	20,5	24%	0,91
7x7	200	500	7/32	30	29	13	22,6	22%	0,92
8x8	200	500	7/40	30	30	16	23,6	25%	0,88
9x9	200	500	7/42	36	36	16	28,8	20%	0,93
10x10	200	500	7/45	40	40	26	27,1	32%	0,78
12x12	200	500	7/55	50	50	32	35,3	30%	0,80
6x9	200	500	7/42	30	30	16	23,6	25%	0,88
6x12	200	500	7/50	40	40	26	27,2	32%	0,79
8x12	200	500	7/55	46	45	29	31,5	30%	0,79
14x14	200	500	7/65	50	50	32	35,0	30%	0,80
14<	Please contact our technical department.								



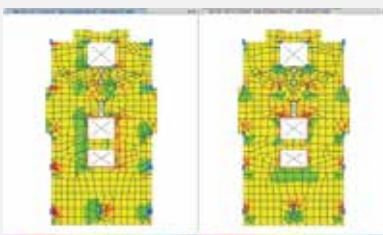
Voided Slab - Moment Diagram
M11 & M22 (kN/m)



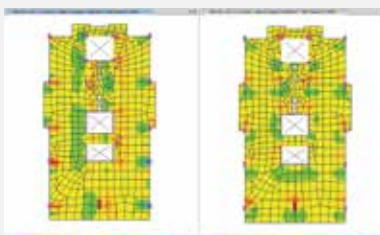
Flat Slab - Moment Diagram
M11 & M22 (kN/m)



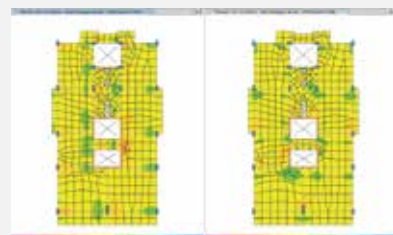
Ribbed Slab - Moment Diagram
M11 & M22 (kN/m)



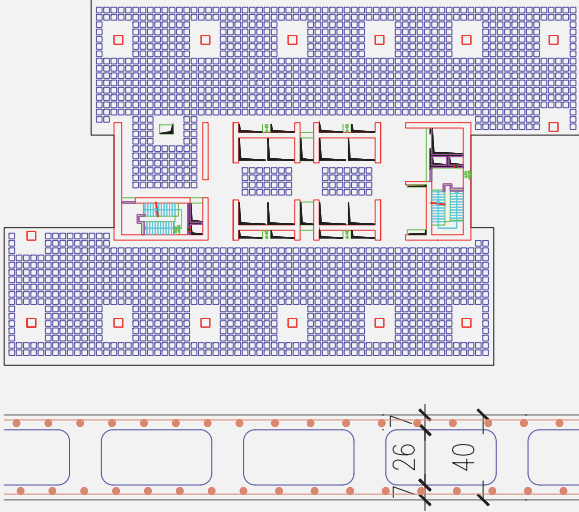
Voided Slab - Shear Diagram
S13 & S23 (MPa)



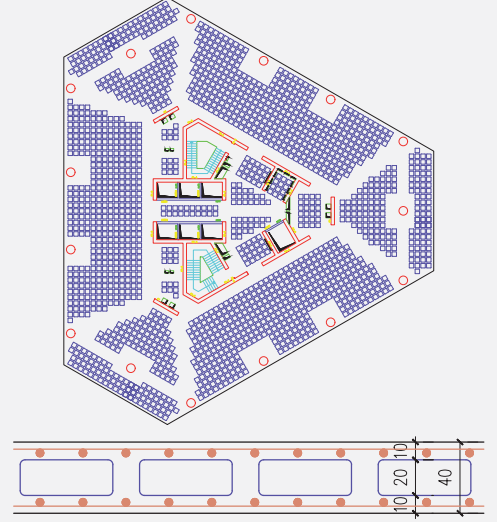
Flat Slab - Shear Diagram
S13 & S23 (MPa)



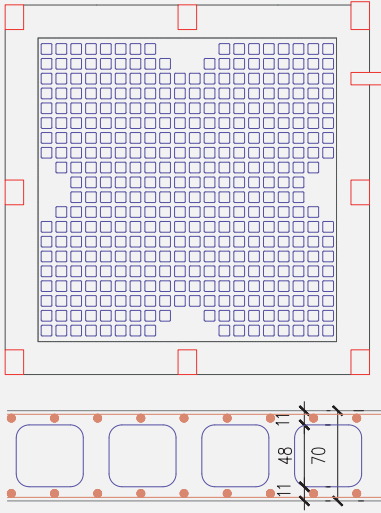
Ribbed Slab - Shear Diagram
S13 & S23 (MPa)



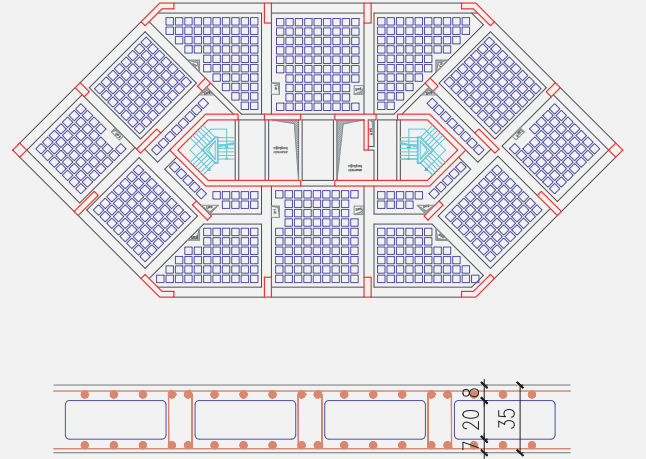
İTÜ Arı 7 Teknokent, İstanbul



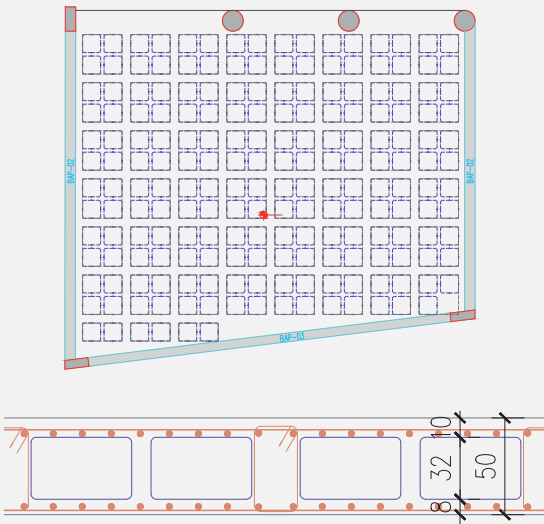
Avrupa Konutları Kale Ofis, İstanbul



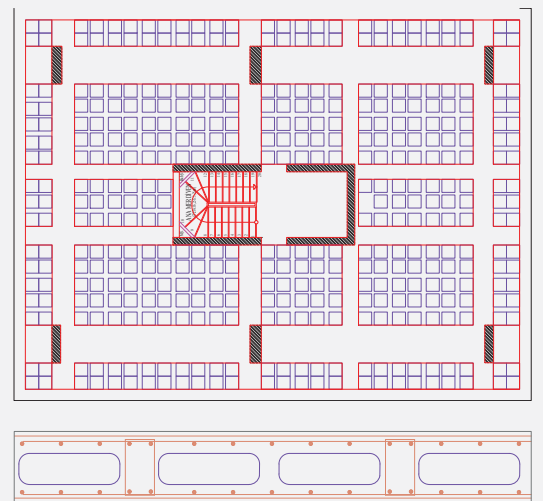
Emaar Square, İstanbul



Marmara Kule, İstanbul

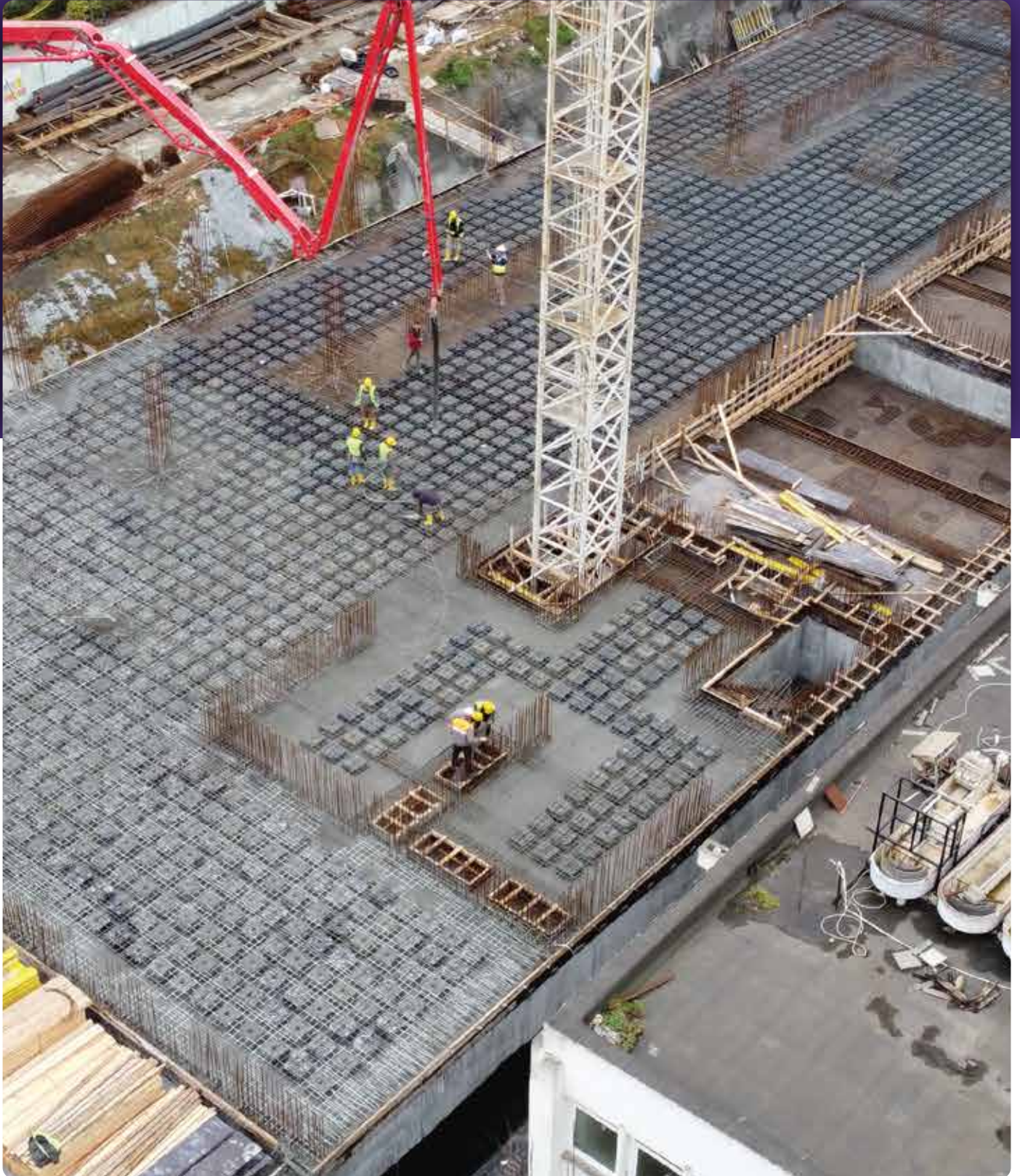


Feneryolu Konut Projesi, İstanbul



Erenköy Konut İnşaatı, İstanbul

REFERENCE PROJECTS





BIM Storage Building

volimax.com

📍 Isparta, Turkey





Elginkan Elementary School

📍 Silivri, Turkey

volimax.com

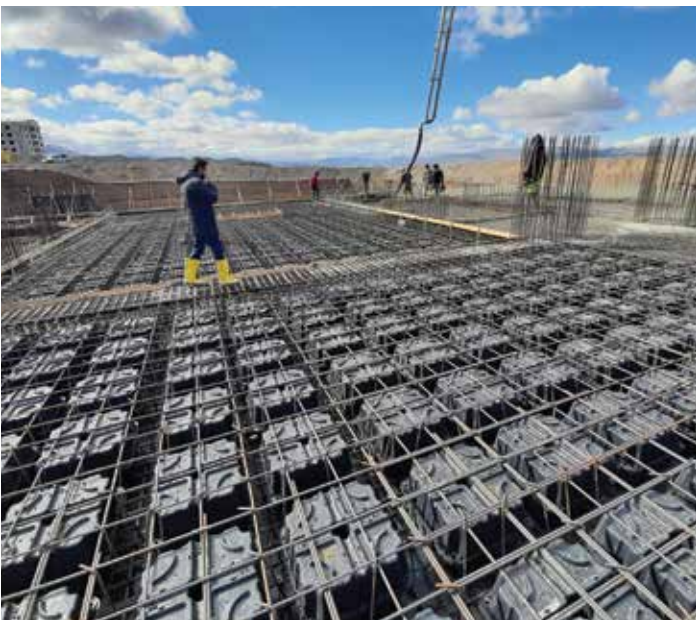




School Project

volimax.com

Erzurum, Turkey





Residential Project

volimax.com

📍 Istanbul, Turkey





Konyalı Mosque

volimax.com

📍 Istanbul, Turkey









Residential Project

volimax.com

📍 Istanbul, Turkey





VILLA PROJECTS VOIDED SLAB SYSTEM





Villa Çeşme

📍 Izmir, Turkey

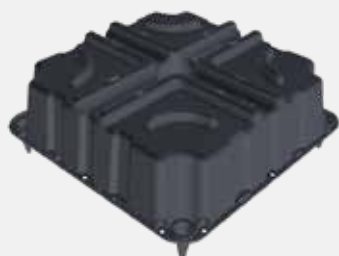
volimax.com





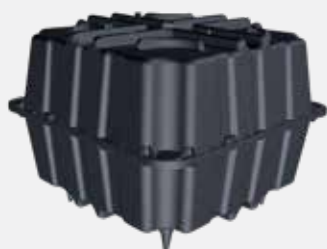






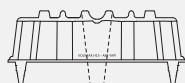
Single Use

Product Type	Formwork Dimensions	Formwork Height	Lower Slab Thickness	Space Between Formworks	Axial Space Center to-Center	Formwork Consumption	Concrete Savings		Concrete Consumption w/o Upper Lower Slabs
	cm	cm	cm	cm	cm	pcs/m ²	m ³ /pcs	m ³ /m ²	m ³ /m ²
Volimax H10	52x52	10	7-12	12	64	2,44	0,024	0,059	0,041
				14	66	2,30		0,055	0,045
				15	67	2,23		0,054	0,046
				16	68	2,16		0,052	0,048
				18	70	2,04		0,049	0,051
				20	72	1,93		0,046	0,054
Volimax H13	52x52	13	7-12	12	64	2,44	0,028	0,068	0,062
				14	66	2,30		0,064	0,066
				15	67	2,23		0,062	0,068
				16	68	2,16		0,060	0,070
				18	70	2,04		0,057	0,073
				20	72	1,93		0,054	0,076
Volimax H16	52x52	16	7-12	12	64	2,44	0,032	0,078	0,082
				14	66	2,30		0,074	0,086
				15	67	2,23		0,071	0,089
				16	68	2,16		0,069	0,091
				18	70	2,04		0,065	0,095
				20	72	1,93		0,062	0,098
Volimax H20	52x52	20	7-12	12	64	2,44	0,039	0,095	0,105
				14	66	2,30		0,090	0,110
				15	67	2,23		0,087	0,113
				16	68	2,16		0,084	0,116
				18	70	2,04		0,080	0,120
				20	72	1,93		0,075	0,125

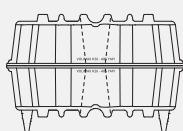


Duble Use

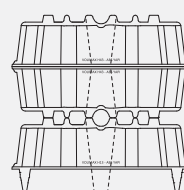
Product Type	Formwork Dimensions	Formwork Height	Lower Slab Thickness	Space Between Formworks	Axial Space Center to-Center	Formwork Consumption	Concrete Savings		Concrete Consumption w/o Upper Lower Slabs
	cm	cm	cm	cm	cm	pcs/m ²	m ³ /pcs	m ³ /m ²	m ³ /m ²
Volimax H23	52x52	23	7-12	12	64	2,44	0,052	0,127	0,103
				14	66	2,30		0,120	0,110
				15	67	2,23		0,116	0,114
				16	68	2,16		0,112	0,118
				18	70	2,04		0,106	0,124
				20	72	1,93		0,100	0,130
Volimax H26	52x52	26	7-12	12	64	2,44	0,056	0,137	0,123
				14	66	2,30		0,129	0,131
				15	67	2,23		0,125	0,135
				16	68	2,16		0,121	0,139
				18	70	2,04		0,114	0,146
				20	72	1,93		0,108	0,152
Volimax H29	52x52	29	7-12	12	64	2,44	0,060	0,146	0,144
				14	66	2,30		0,138	0,152
				15	67	2,23		0,134	0,156
				16	68	2,16		0,130	0,160
				18	70	2,04		0,122	0,168
				20	72	1,93		0,116	0,174
Volimax H30	52x52	30	7-12	12	64	2,44	0,063	0,154	0,146
				14	66	2,30		0,145	0,155
				15	67	2,23		0,140	0,160
				16	68	2,16		0,136	0,164
				18	70	2,04		0,129	0,171
				20	72	1,93		0,122	0,178
Volimax H32	52x52	32	7-12	12	64	2,44	0,064	0,156	0,164
				14	66	2,30		0,147	0,173
				15	67	2,23		0,143	0,177
				16	68	2,16		0,138	0,182
				18	70	2,04		0,131	0,189
				20	72	1,93		0,124	0,196
Volimax H33	52x52	33	7-12	12	64	2,44	0,067	0,163	0,167
				14	66	2,30		0,154	0,176
				15	67	2,23		0,149	0,181
				16	68	2,16		0,145	0,185
				18	70	2,04		0,137	0,193
				20	72	1,93		0,129	0,201



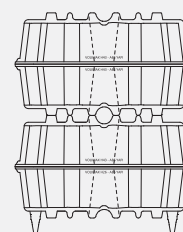
VOLIMAX 52X52
H13



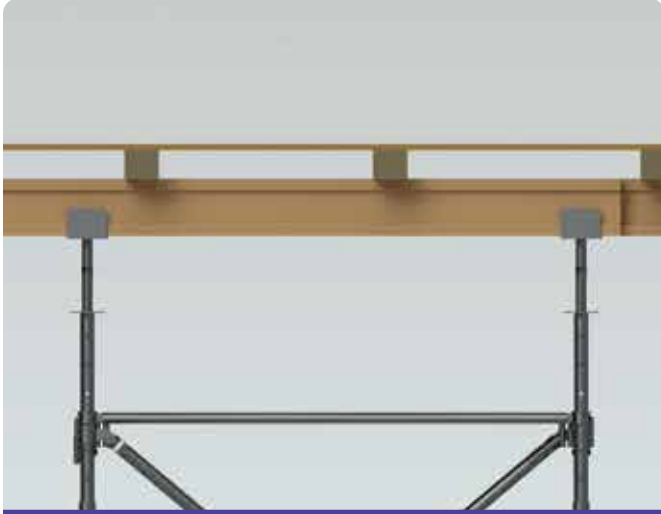
VOLIMAX 52X52
H26



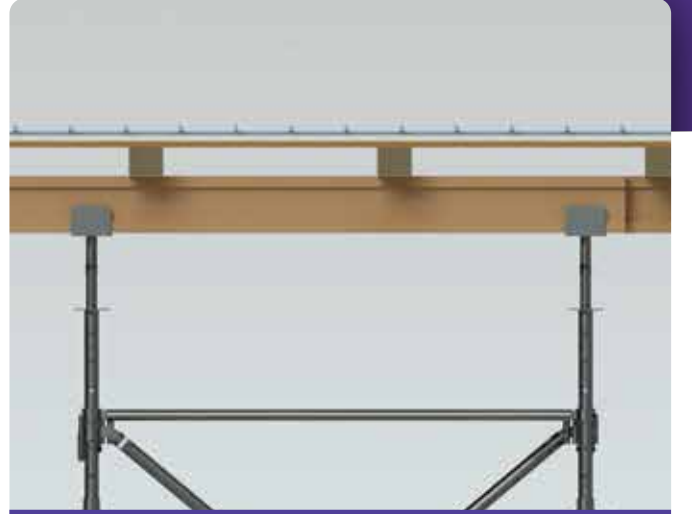
VOLIMAX 52X52
H43



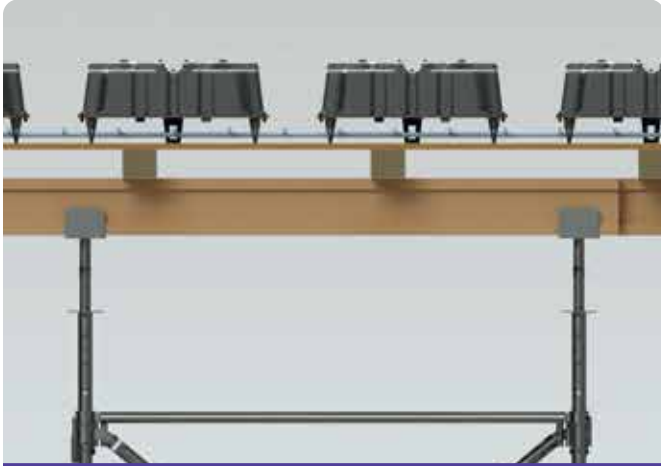
VOLIMAX 52X52
H56



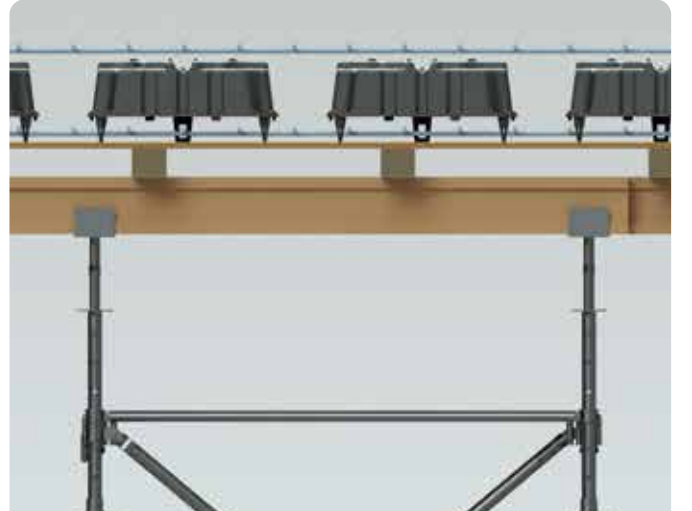
1. Install formwork and scaffolding suitable for concrete casting.



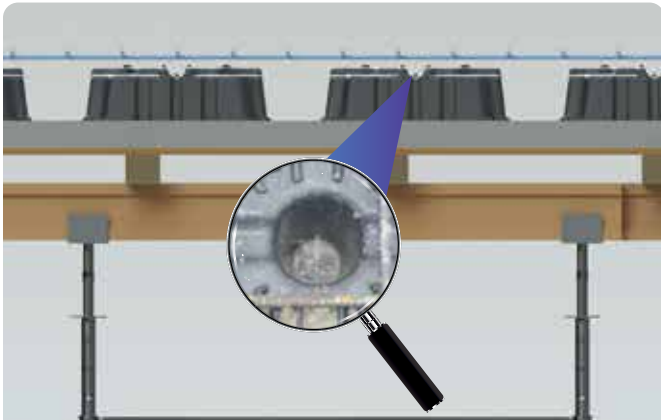
2. Place lower rebars.



3. If exists, mount corner and middle leg extensions and place the Volimax disposable formworks according to project, at the appropriate gaps. Tie the units to the lower rebar with construction wire through the holes on the sides. Otherwise, the units may move during concrete pouring.



4. Place upper slab rebars on top of the Volimax units and prepare the system ready for concrete casting.



5. The concrete must have at least a slump class of S4. Start casting the concrete at a corner of the slab and in the first stage, cast the entire slab area until the feet of the disposable formworks and the periphery of each unit is closed with concrete (at most half the height of the unit). Check the concrete flow inspection cone during casting. Make sure that the concrete goes under each unit.



6. Finish casting in a second phase, when the concrete is slightly plasticized or when the units are fixed in concrete. Level the surface as per requirement.

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INNOVATIVE STRUCTURAL SOLUTIONS



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Project Videos

