YENİLİKÇİ YAPISAL ÇÖZÜMLER

VOLIMAX

Voided Slab System

Frequently Asked Questions




Version: 01

Volimax – Voided Slab System

Design

By whom is the application and project planning carried out?

As ABS Yapı Elemanları, we can provide all civil engineering services partially or fully for the entire project. However, we can also provide information and support to client's civil engineers through modeling guides, laboratory reports, university reports and sample project designs.

When it comes to the implementation phase, we produce the materials in accordance with the design and deliver them to the construction site on time. We provide application supervision to the formwork and steel teams in the field during the installation of the disposable formworks and the concrete casting. We provide the necessary guidance to all the on-site teams for a correct implementation of the system.

How much concrete and reinforcement can be saved compared to flat slabs?

Slab System (6x7 m column span)	Slab Thickness	Perimeter Beam	Concrete Cons. (m^3/m^2)	Rebar Cons. (kg/m^2)	Rebar / Concrete (kg/m^3)
Voided Slab System	27cm (7+13+7)	N/A	0,23	23,86	103,27
Flat Slab	30cm	N/A	0,30	36,45	120,28

Consumption of concrete and steel reinforcement varies depending on the project. The slab thickness and Volimax disposable formwork height are determined according to the column spans between columns and walls and to the design loads of the project.

If we need to give an approximate ratio, for 6-7 m column spans, the consumption of concrete in the slab decreases by 20-25% and reinforcement consumption by 15-20%. Since this reduction reduces the self-weight of the entire structure, a reduction is also provided in the earthquake loads and loads on the foundation. While the reduction of the earthquake loads provides convenience and material savings in the structural design, the reduction of the loads on the foundation both reduces the foundation thickness and provides great savings in ground improvement costs where needed. By decreasing the self-weight of the structure, additional reductions can be achieved recursively in column & shear wall dimensions. Thus, significant additional savings can be achieved in the total amount of reinforcement.

How much concrete and reinforcement can be saved compared to double direction ribbed (filled / unfilled cassette) flooring?

Slab System (6x7 m column span)	Slab Thickness	Perimeter Beam	Concrete Cons. (m^3/m^2)	Rebar Cons. (kg/m^2)	Rebar / Concrete (kg/m^3)
Voided Slab System	27cm (7+13+7)	N/A	0,23	23,86	103,27
Two-way Ribbed Slab With Filling	30cm (20+10)	h=30 cm	0,22	26,57	122,75

Consumption of concrete and reinforcement varies depending on the project. The slab thickness and Volimax formwork height are determined according to the column spans between columns and walls in the project and account loads.

After the thickness of the floor is determined, it will be designed as a beamless floor, as it is in double-threaded floors, there is no need for stirrup winding at every 70 cm. Therefore, 10-15% of reinforcement savings can be achieved. As the floor loads will decrease depending on the material used as threaded floor filling, optimization can also be made in column-curtain sizes.

As the column span increases, the reinforcement and concrete savings provided by the hollow flooring system will also increase.

Can a shaft gap be left in the flooring?

Installation transitions due to project design, etc. For the cavities with a maximum diameter of 40 cm to be opened later, it is sufficient to remove the molds and to pass the area around the cavity full. For larger gaps, as in any type of flooring, the shaft can be formed by including the gaps in the project and surrounded by the necessary reinforcement.

What type of concrete should be used?

Preferred concrete class varies depending on the project. It is recommended that the concrete consistency should be at least S4 and fine aggregate should be used to ensure that the concrete grade is at least C25 / 30 and the bottom slab is completely filled.

How is the incoming earthquake load transferred from the floor to the curtains?

When designed as a non-beam slab, a zone of approximately "d" (punching zone) around the columns and curtains is passed as a solid slab. Therefore, since there is a solid slab in the junction area of the curtain and slab, the slab transfers the axial loads to the vertical elements with a filled slab, as in the standard slab without beam.

While it is transferred to the beams with only 7-10 cm plate in one direction ribbed (hollow) and ribbed (filled / unfilled cassette) flooring in one direction, in the hollow flooring system, the upper-lower plate (minimum 14 cm) and in the area close to the curtain it is more rigid than it is transferred with the full plate. a flooring is obtained.

How is its resistance to fire?

Fire resistance depends on slab thickness, bottom and top slab thickness, and concrete cover heights, as in conventional floors. It has been classified as REI 120 as a result of the fire resistance test performed in accordance with the EN 13501-2 standard in the form of 7 cm top plate + Volimax H13 cm + 7 cm bottom plate.

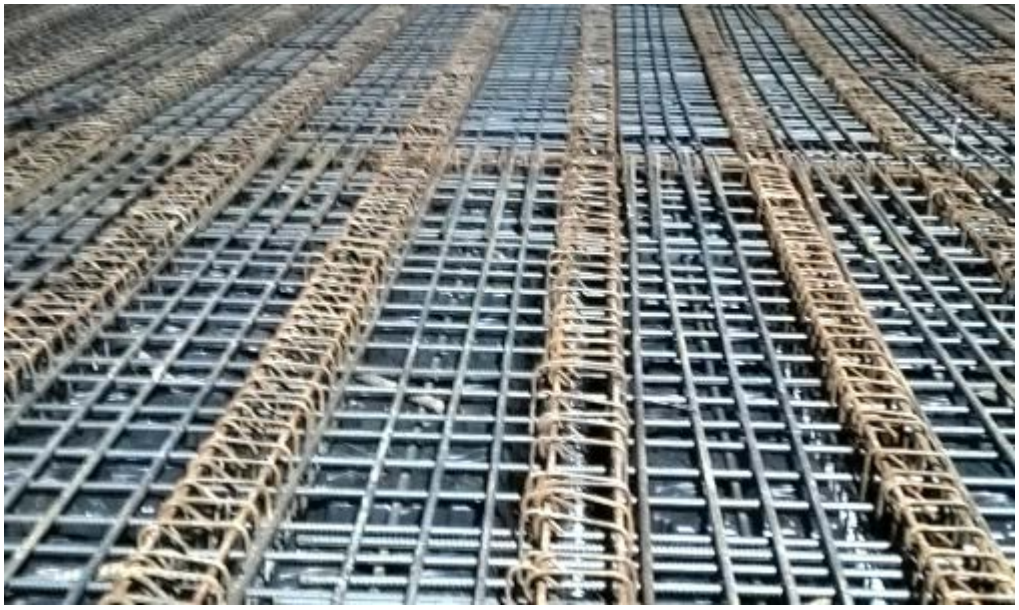
Does it provide sound insulation?

The hollow flooring system created by using Volimax molds contributes to the sound insulation between spaces thanks to the creation of air gaps in the flooring.

Does it provide heat insulation?

Hollow flooring system created using Volimax molds can provide very small amount of heat protection by creating air gaps in the flooring. However, since there is a continuous thermal bridge between the molds, the application of thermal insulation should be done separately.

Can it be used with post tensioning?

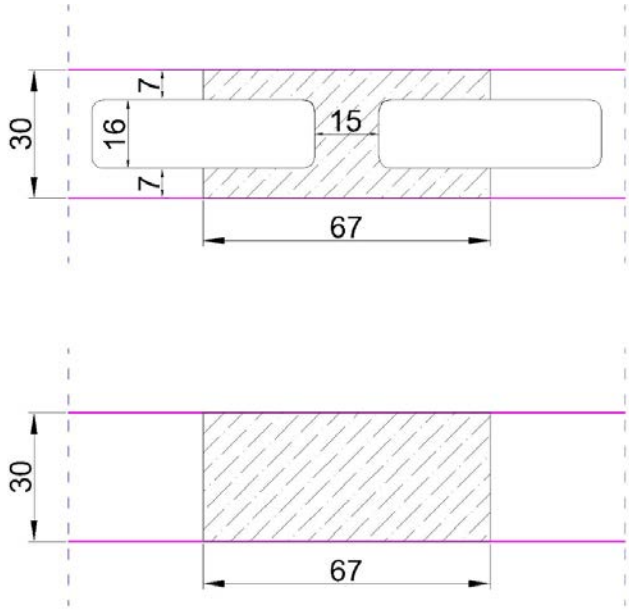


In post-tensioning systems with wide openings, when used between post-tensioning ropes; By creating a gap between the carrier ropes, it provides the lightening of the flooring and the relaxation of the post tensioning ropes. Therefore, it can also reduce the floor cross section.

How is it modeled?

Modeling and controls of the Volimax hollow flooring system, in general, without beam slab. It is similar to the stem. In our "Modeling of Hollow Slab System in Different Structural Analysis Programs According to TS500", detailed information is available on how to model the preferred computer programs Ide-Static, Sta-4CAD, Probina, Sap2000, Etabs and Safe today.

Generally, the articles regulated in the new earthquake regulation TDBY 2018 for non-beam floors are also valid for the hollow floor system. It must be checked with the finite element method.



Boşluklu Döşeme Hesap Şablonu				
Kör kalıp modül genişliği	kg	52	[cm]	
Kör kalıp modül yüksekliği	ky	16	[cm]	
Diş genişliği	tg	15	[cm]	
Alt tabla kalınlığı	ta	7	[cm]	
Üst tabla kalınlığı	tu	7	[cm]	
Modül genişliği	b	67	[cm]	
Modül yüksekliği	d	30	[cm]	
		Boşluklu	Brüt	
Modül kesit alanı	A	1178	2010	[cm^2]
Modül hacmi	V	91406	134670	[cm^3]
Modül atalet momenti	I	133001	150750	[cm^4]
	A/1m	1758	3000	[cm^2]
Eşdeğer tabla kalınlığı	te	20,4	30,0	[cm/m^2]
	I/1m	198508	225000	[cm^4]
Kesit alanı çarpanı	kA	0,586	[-]	
Beton hacmi çarpanı	kV	0,679	[-]	
Atalet momenti çarpanı	kI	0,882	[-]	

When modeling hollow slab, the section equivalent mechanical properties are calculated and multiplied by the effective section stiffness in the regulation. The ratio of the hollow module unit cross-sectional area to the gross module cross-sectional area is taken as the cross-sectional multiplier, the ratio of the hollow module volume to the gross module volume as the concrete volume factor, and the ratio of the hollow module moment of inertia to the gross module moment of inertia as the factor of inertia.

What should be the minimum and maximum spacing of the molds?

The spacing of the molds varies according to the axle distance between the columns and the walls and the account loads, as well as the height. However, it is recommended that the concrete should be at least 10 cm in order to penetrate the molds.

In TS500 11.4.4.2, "There must be at least 3 openings for non-beam flooring." says?

These rules are valid in order to apply the method of moment coefficients. These rules do not apply to the finite element method.

TS500 11.4.4.2 - Moment Coefficient Method

Beamless slabs that meet all of the conditions listed below can be calculated with this approximate method. The method is only valid for vertical load analysis.

a) There should be at least three openings in each direction.

b) The ratio of long edge to short edge should not be more than 2.0.

c) The difference between the openings of neighboring plates in any direction should not be more than 1/3 of the long span.

d) The eccentricity of any column from the frame axis should not be more than 1/10 of the span in the moment calculated direction.

e) The ratio of live load to permanent load should not be more than 2.0.

Does the ratio of "ln / 20" have to be in a single span slab?

Deflection calculation may not be required if it complies with these rules. In other cases, deflection should be calculated. There is a deflection calculation requirement for non-beam slabs.

Does the core curtain have to be at the center of the project in order to model the hollow slab?

Hollow slab modeling is not much different from beamless slab. Having the core in the middle increases the torsional rigidity of the structure. In order to increase the torsional stiffness that decreases in the structures where the core is not in the center, the hanging outer frame beam can be made if the architecture allows, or the outer frame beam designed with the same thickness as the floor can be connected to the columns and curtains. As a result of this design, the structure will still be twisted, but as the plastic deformation capability will increase, it behaves more ductile.

Application

How much do Volimax molds weigh? How does he come to the job site?

The heights of the molds are in the range of H10-H32 cm, and the weight varies between 1 and 3 kilo / piece. The molds come to the field nested with pallets and can be transported to floors with pallets. There are 400 molds in 1 pallet, which covers a floor area of approximately 250 m2.

Can molds be walked on?

As a result of the loading tests performed at different points by using 55 mm diameter metal plates on Volimax molds, it has been obtained that the plastic can carry up to 240 kg on average without the top reinforcement. After the load was removed, the material was restored and fracture was not observed.

After the upper reinforcement is laid, the load on the Volimax formworks will be a distributed load, and the carrying capacity will be sufficiently increased. It is recommended to water the molds before walking on them and pouring concrete under high air temperature conditions.

How does concrete pouring take place?

Concrete pouring takes place in two stages. In the first stage, the feet of the molds are completely closed and the molds are cast from the ribs (ribs). Following the concrete, vibrator is applied. During the vibrator application, it is ensured that the concrete flows to fill the bottom of the molds by observing from the conical space in the middle of the molds. For the second stage, care should be taken not to set the concrete in the expected time and not to form cold joints. Between the two stages there should be a time interval of 1 hour or more, depending on weather conditions. In the second stage, the molds are completely filled, brought to the floor level and the flooring is completed with the gauging process.

General

Why ABS Yapı?

As ABS Yapı, we have been leading the introduction of new products and new construction techniques to the Turkish construction industry since 2011. Our team we have established for this purpose is the most knowledgeable and experienced people in Turkey in their fields. The richness and diversity of our references are our own proof of how seriously we take our work.

Why "disposable formwork"?

This is the first time to define the group to which new products belong, in addition to the "blind mold" we also considered alternative names; crate mold, drum mold, disposable mold, dead mold… After extensive evaluations, we decided on the "blind mold". In doing so, we based ourselves on the term "blind frame", which is known and frequently used in all construction sites. Likewise, "blind frame" describes the consumable material that determines the boundaries and size within the wall so that the main door or window can be installed, and if it is not, the door or window cannot be attached.

Where is it produced?

All of the products are produced in Turkey. For polypropylene raw materials ready for injection, we also have different suppliers from within Turkey.

How long do blind molds remain intact in concrete?

The main purpose of the elements used as blind formwork is to shape the concrete. The main carrier is the reinforced concrete structure formed after casting. After casting, the Volimax mold will not function, but will remain there for the entire life of the structure.

What is the decay condition of the molds under concrete?

Since the blind molds are not exposed to sun and weather conditions, there is no rotting. The blind molds will remain intact throughout the life of the building.

What is the shelf life of the products? So can't I buy it and stock it?

Of course it can be stocked, but should not be left in sunlight for a long time.

What is the lead time?

We keep the most frequently used types of Volimax in stock in our warehouse. Our normal production capacity for large projects is 800 pieces per day.

Do your products earn LEED certification points?

Yes; Our products meet Leed score criteria in many areas such as logistical advantage and recycling of plastic. For detailed information, request the "LEED Score Chart" of the relevant product.

Why is the color black?

Recycled polypropylene plastic raw material can be in a wide variety of mixed colors, so "carbon black" is mixed into the melt to ensure integrity and avoid confusion and black color is obtained.

What is the raw material of the products?

All of our products are made of recycled polypropylene.

Does it melt from the heat of the concrete?

Polypropylene softening temperature is over 80 degrees. In order to create such a temperature in wet concrete after casting, very serious thicknesses are required. Such an application is also beyond the scope of blind molds.

Price

What are the prices of Volimax molds?

The slab thickness and Volimax formwork height are determined according to the column spans between columns and walls in the project and account loads. Prices vary depending on the determined Volimax height. Molds can be used in two different ways, single and double. Molds are priced on the basis of pieces, they are generally designed as 1.6-2 pieces / m2. You can contact us for detailed information.

How much is the application labor cost?

In terms of labor cost, placing the blind molds on the floor molds is definitely easier than the hollow blocks and at worst it will be similar to the hollow blocks foam. Since the blind molds are intertwined, they can be easily transported to the application area with the help of a crane or manually. Since there is no need for reinforcement between the blind forms in many designs, they can be placed on the lower reinforcement easily and extremely quickly. The only labor-related density may occur when attaching the blind formwork to the bottom reinforcement, but it must be evaluated together with other savings.