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cobiax

HOW TO COBIAX

The Quick Guide
to Cobiax SL (Slim Line)

HOW TO COBIAX

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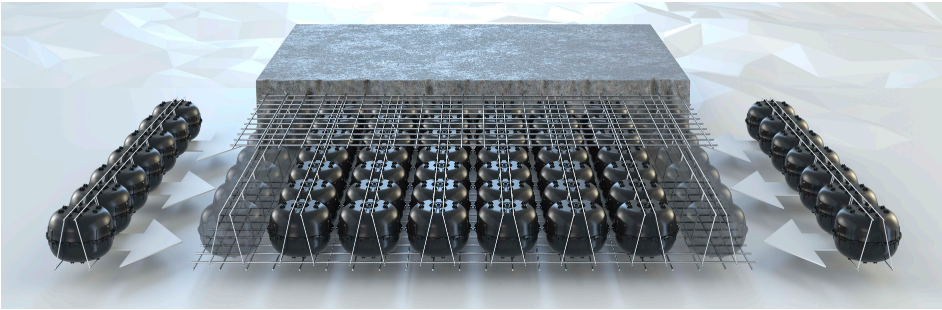
Introduction

This Quick Guide is designed to give you a short introduction to the Cobiax technology. Additional information is available upon request or as a download from cobiaxusa.com.

We strongly recommend the use of our free Cobiax software tool Quick & Light. The Cobiax team will also be happy to answer your questions.

Cobiax SL (Slim line): for slab thicknesses from 8 up to 16 inches



Technology and products

Cobiax technology uses recycled lightweight plastic void formers to replace the heavy concrete inside a slab where it is not required.

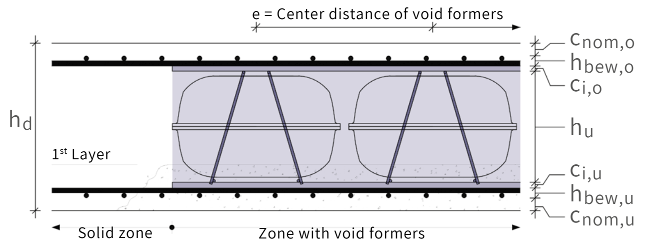
The resulting savings of up to 35% in concrete and weight has a positive effect on the construction of the slab itself (e.g. less deflection, larger spans or thinner slab thickness) and hence on the whole building structure.

Cobiax void former are made of 100% recycled plastic and are placed inside steel reinforcement positioning cages.

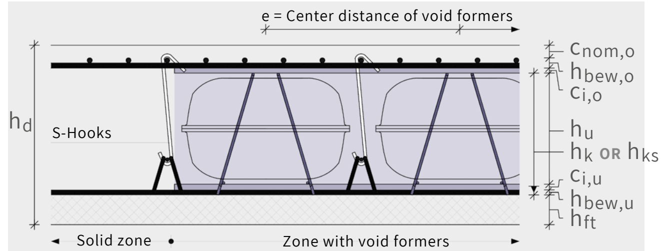
Cross section view

Cobiax SL

Method 1
Cast in Place



Method 2
Semi-prefabricated elements



Guide Specification - Sample

Cobiax USA provides the following submittals: Shop Drawings indicating product, placement with dimensional controls, displaced concrete amount for pour estimates, analysis showing shears, moments, and deflections of the two-way system.

Mechanical, Electrical, and Plumbing Penetrations into the voided slab shall be coordinated with the Structural Engineer. Void form cannot be perforated.

Relocation of void forms from submitted plans shall be approved by the Structural Engineer.

Cobiax void formers are made from recycled plastic. Precautions should be taken to avoid damage during construction. Notify manufacturer and structural engineer of any damaged to Cobiax voids.

Design and detailing

A Cobiax voided slab can be designed and planned by any structural engineer in compliance with the local building code and standards. Slabs designed with Cobiax voids meet the requirements of ACI 318.

1. Slab cross-section and design parameters

After estimating the slab thickness h_d, a suitable Cobiax void former module (support height h_u respectively total height of fixing element h_k or h_{ks}) is selected, taking into account concrete cover c_{nom}, the rebar layers h_{bew} and any intermediate layers c_i (e.g. for additional spacers or concrete core thermal activation) and if necessary, the thickness of the semi-prefabricated element h_{ft}. Additional requirements for the fire resistance have to be taken into account if necessary.

The load reduction of void formers, the associated stiffness factor for the bending stiffness f_{EI} and the shear resistance factor f_V (or the reduced shear resistance $V_{Rd,c,cobiax} = f_V \cdot V_{Rd,c}$) can be found in the table on the next page. Alternatively the free software tool Quick & Light can be used for quick preliminary calculation.

2. First run of structural calculation

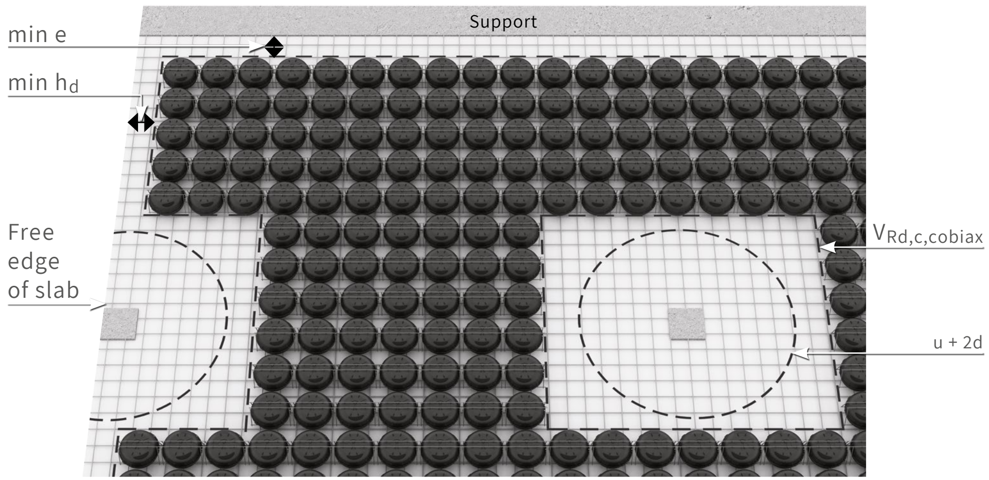
The calculation of a Cobiax voided slab is to be done in similar manner as that of a conventional concrete slab, taking into account these 3 input parameters. With the first run of the structural calculation the load reduction and the reduced stiffness is applied for the whole slab.

A consideration of the shear forces leads to the determination of the required solid zones. Areas with $V_{Ed} > V_{Rd,c,cobiax}$ must remain without void formers. In areas of punching shear it is necessary to check whether the solid zone extends beyond the critical circular cross section or the last row of shear links by at least the dimension $2d$. Otherwise the solid zone must be enlarged accordingly. Additionally, a solid zone must be provided along linear supports with a width equal to at least the centre distance e of the void formers.

At the free edge of a slab a solid zone with the width of h_d has to be provided.

3. Second run of structural calculation

The dead load and if necessary, the bending stiffness are adjusted (back to full dead load and stiffness) in the solid zones without void formers and a second, final run of structural calculation has to be done.



Approx. 50% to 80% of the slab area is fitted with void formers (according to the different structural configuration)

4. Detailed design check

Casting the concrete in two layers (to prevent uplift of the void formers) or the use of semi prefabricated elements requires a design detail check for the transfer of horizontal shear forces in the joint between both concrete layers considering the reduced bonding area due to the void formers (see software tool Quick & Light).

Execution on site

- **The contractor installs the Cobiax void former modules according to the Cobiax layout drawing between the top and bottom reinforcement layers using a fixed distance device (to ensure required minimum spacing). Cast-in-place as well as semi-prefabricated or prefabricated solutions are possible.**

- **With the cast-in-place solution (Method 1) the void formers are usually secured against buoyancy uplift by casting the concrete in two separate layers. After the first concrete layer (approx. 3 to 5 in thick only in the area of the void formers) has hardened, the balance of the concrete is placed completing the slab. This can be done within a few hours, depending on the temperature, weather conditions and concrete properties. Another solution to prevent buoyancy is to strap the voids directly to the form-work.**

- **With the semi prefabricated solution with Cobiax modules pre-installed at the precast plant (Method 2); buoyancy is not an issue since the Cobiax voids are anchored to the precast slab panel. Once the precast panel(s) are placed on the form-work and any additional rebar installed as required to provide flexural continuity between panels, the concrete topping can be placed on-site to finish the slab.**

- **Cobiax can be combined with post-tensioning and/or in-slab heating and cooling elements.**

Application data

Cobiax SL

			SL 100-120	SL 120-140	SL 140-160	SL 160-180	SL 180-200	SL 200-220	SL 220-240	SL 240-260	SL 260-280
Volume displacement	h_{cx}	cf / ft²	0.17	0.21	0.25	0.28	0.32	0.35	0.38	0.41	0.44
Associated weight reduction (150 psf)	g_{cx}	psf	26	32	37	42	47	52	57	61	66
Support height	h_u	in	4.7	5.5	6.3	7.1	7.9	8.7	9.4	10.2	11.0
Min. slab thickness (Assuming #5 T&B/EW)	$h_{d,min}$	in	**9**	**10**	**11**	**11.5**	**12.5**	**13**	**14**	**15**	**15.5**
Max. slab thickness	$h_{d,max}$	in	16	17	17	18	19	20	20.5	21	22
Min. slab thickness to void top/bottom	$d_{2,Hk,min}$	in	2.25								
Distance from void to upper edge of installation element	$h_{dis,o}$	in	0.4								
Distance from void to lower edge of installation element	$h_{dis,u}$	in	0.4								
Limit of slab thickness for calculation of $V_{Rd,c,cobiax}$	$h_{d,grenz}$	in	30								
Shear factor (with $h_{d,min}$)	f_V	-	0.5					0.45		0.4	
Stiffness factor (with $h_{d,min}$ and centric position)	f_{EI}	-	0.95	0.93	0.92	0.91	0.90	0.89	0.89	0.89	0.88
Concrete min. f'c		psi	4,000 - 8000								
Maximum aggregate		in	0.75								
CO_2-Emission reduction		lbs / ft²	2.25	2.66	3.28	3.69	4.10	4.51	4.92	5.33	5.73
Associated area per installation element		ft²/pc	7.91								

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