INTL - EN • 01|21 • 6th edition

HOW TO COBIAX

Contact:

Heinze Cobiax International GmbH
Eupener Straße 35
32051 Herford
Germany

international@cobiax.com

Global Contact:
info@cobiax.com

cobiax.com

cobiax

HOW TO COBIAX

The Quick Guide
to Cobiax CLS

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 cobiax.com.

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

Technology and products

Cobiax technology uses recycled lightweight plastic structural 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 span or thinner slab thickness) and hence on the whole building structure.

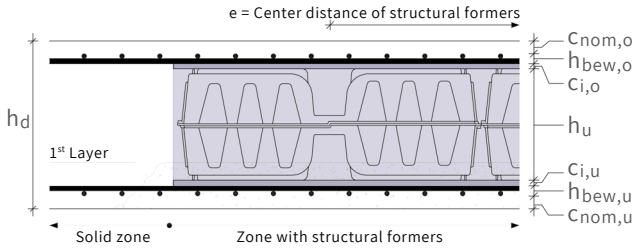
The internationally patented Cobiax CLS structural formers feature a uniform base area of 60 x 60 cm and are made from 100% recycled plastic.

Cross section view

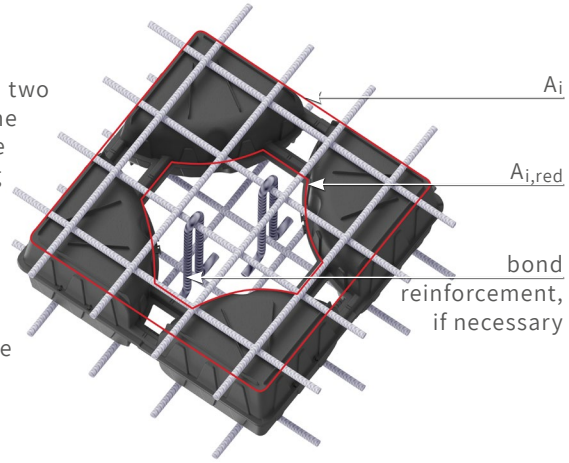
$h_{d,min} \leq h_d \leq h_{d,max}$

Method 1
In-situ casting

$h_u \leq h_d - (c_{nom,o} + h_{bew,o} + c_{i,o} + c_{nom,u} + h_{bew,u} + c_{i,u})$



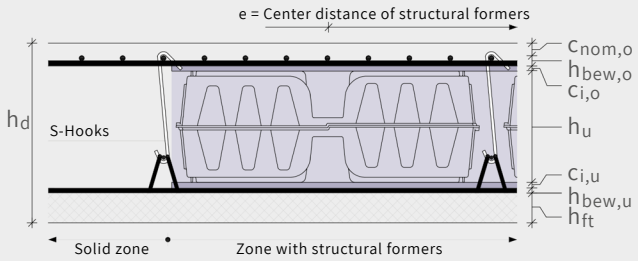
When casting the concrete in two layers, the transmission of the horizontal shear forces in the joint between the concreting layers with reduced bonding area $A_{i,red}$ must be verified and, if necessary, a joint reinforcement arranged. The reinforcement shall be anchored on both sides of the contact surface.



Method 2
Semi-prefabricated elements

$c_{ft,min} \leq (h_{bew,u} + c_{i,u})$

$h_u \leq h_d - (c_{nom,o} + h_{bew,o} + c_{i,o} + h_{ft} + h_{bew,u} + c_{i,u})$



Design and detailing

A Cobiax voided slab with CLS structural formers can be designed and planned by any structural engineer in compliance with the local building code and standards and supplementary certificates and test reports.

1. Slab cross-section and design parameters

After estimating the slab thickness h_d, a suitable Cobiax CLS structural 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 structural 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.

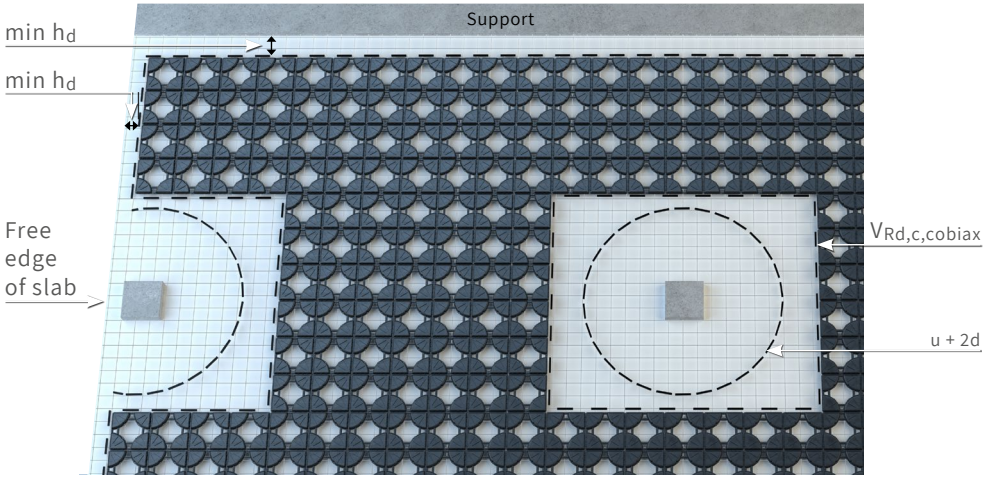
2. First run of structural calculation

The calculation of a Cobiax voided slab is to be done in similar manner as that of a reinforced 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 structural 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 reinforcement by at least the dimension $2d$. Otherwise the solid zone must be enlarged accordingly. Along linear supports and 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 structural formers and a second, final run of structural calculation has to be done.



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

4. Detailed design check

Casting the concrete in two layers (to prevent uplift of the structural 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 $A_{i,red}$ due to the structural formers (see software tool Quick & Light).

Execution on site

The contractor installs the Cobiax structural formers immediately next to each other according to the Cobiax layout drawing between the top and bottom reinforcement layers. In-situ solution as well as semi prefabricated or prefabricated solutions are possible.

With the in-situ solution (Method 1) the structural formers are usually secured against uplift by casting the concrete in two separate layers. After the first concrete layer (approx. 8 cm to 12 cm thick only in the area of the structural formers) has hardened, the CLS modules are finally fixed and ready for the second layer of concrete. This can be done within a few hours, depending on the temperature, weather conditions and concrete properties. With the semi prefabricated solution with Cobiax modules installed on site (Method 2) uplift is prevented by tying the upper reinforcement to the lattice girders of the semi-prefabricated elements.

Cobiax can be combined for example with post tensioning or concrete core activation.

Application data

			CLS-P-100	CLS-P-120	CLS-P-140	CLS-P-160	CLS-P-180	CLS-P-200	CLS-P-220	CLS-P-240	CLS-P-260	CLS-P-280	CLS-P-300	CLS-P-320	CLS-P-340	CLS-P-360	CLS-P-380	CLS-P-400	CLS-P-460	CLS-P-520	CLS-P-580
General																					
min. slab thickness	$h_{d,min}$	cm	20	22	24	26	28	32	34	36	38	40	44	46	48	50	52	56	62	70	76
max. slab thickness	$h_{d,max}$	cm	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	74	80	86
Support height	h_u	cm	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	46	52	58
Shear factor	f_V	-	0.45					0.40					0.35								
Stiffness factor	f_{EI}	-	0.96	0.95	0.93	0.91	0.90	0.90	0.89	0.87	0.86	0.85	0.86	0.85	0.84	0.83	0.83	0.84	0.82	0.82	0.81
Void height		cm	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	44	50	56
min. slab thickness to void top/bottom		cm	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	10	10
Void volume		dm³/St	16.4	20.5	24.5	28.1	31.7	35.2	38.8	42.0	45.5	49.1	50.5	54.0	59.4	59.0	62.5	67.9	76.4	84.9	93.4
Reduced bonding area		-	$A_{i,red} = 0{,}24\ A_i$																		
External dimension		cm	60/60																		
min. center distance of structural formers	e	cm	60																		
Structural formers per m²		St/m²	2.78																		
Area per structural former		m²/St	0.36																		
Concrete strength and consistency class		-	C20/25 up to C45/55, F3 up to F4																		
Maximum aggregate		mm	16																		
CO_2-Emission reduction		t/m²	0.010	0.012	0.014	0.016	0.018	0.021	0.023	0.024	0.027	0.029	0.029	0.032	0.035	0.034	0.036	0.040	0.045	0.050	0.054
In-situ solution and prefabricated concrete solution																					
Volume displacement	h_{cx}	m³/m²	0.0456	0.0568	0.0681	0.0780	0.0879	0.0979	0.1078	0.1165	0.1265	0.1364	0.1401	0.1501	0.1650	0.1638	0.1737	0.1886	0.2122	0.2358	0.2594
Weight reduction (25 kN/m³)		kN/m²	1.14	1.42	1.70	1.95	2.20	2.45	2.69	2.91	3.16	3.41	3.50	3.75	4.13	4.09	4.34	4.72	5.31	5.90	6.49
Semi prefabricated concrete solution																					
Volume displacement (-10%) 1)	$h_{cx,ft}$	m³/m²	0.0410	0.0511	0.0613	0.0702	0.0792	0.0881	0.0970	0.1049	0.1138	0.1228	0.1261	0.1351	0.1485	0.1474	0.1563	0.1698	0.1910	0.2123	0.2335
Weight reduction (25 kN/m³)		kN/m²	1.03	1.28	1.53	1.76	1.98	2.20	2.43	2.62	2.85	3.07	3.15	3.38	3.71	3.68	3.91	4.24	4.78	5.31	5.84
min. distance between surface of semi prefabricated element and lower edge of structural former module [2]	$c_{ft,min}$	cm	2																		

1) Increased center distance of void formers caused by additional lattice girders 2) e.g. additional spacers