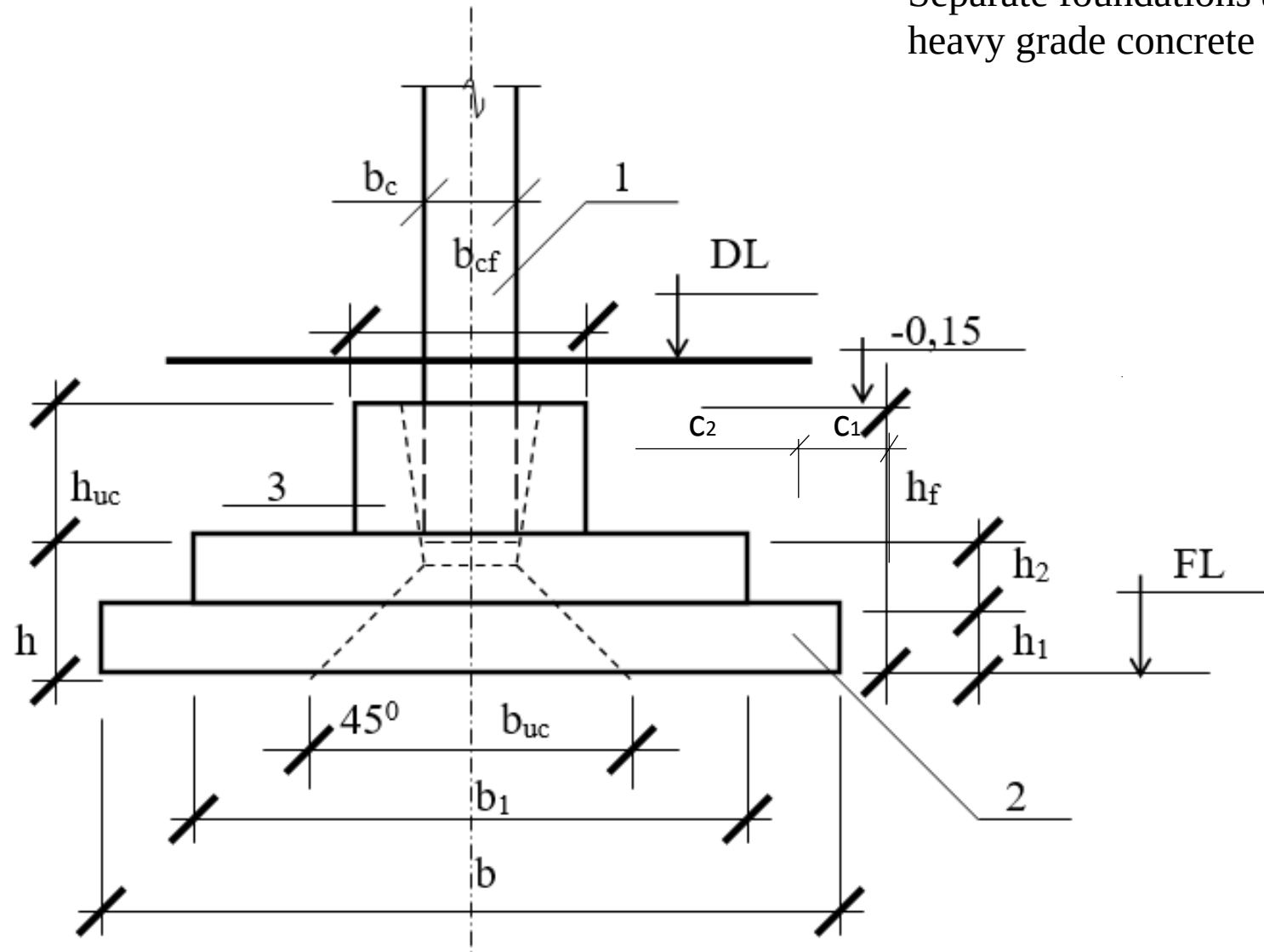


RULES FOR DESIGNING A CUP-TYPE FOUNDATION

Separate foundations are designed from heavy grade concrete C8/10 i C12/15



1. Separate foundations are designed from heavy concrete of class C8 / 10 and C12 / 15 in accordance with the requirements of DBN V.2.6-98: 2009

They consist of a slab part of a stepped shape, which transfers the load to the soil, and a column support, which is connected to the column

When connecting the foundation to the prefabricated column, a cup is arranged in the upper part of the column support, the dimensions of which are assigned depending on the cross section of the column. Its depth should be equal to or greater than the larger side of the column

The main dimensions of foundations are assigned in multiples of 100 mm. The upper edge of the foundation should be 150 mm below the planned ground mark

The dimensions of the column support are determined constructively depending on its connection with the column and the slab part of the foundation

Dimensions of the column support, mm

Cross section of the column	Dimensions in the plan	The dimensions of the cup	
		depth	in the plan
400 x 400	900 x 900	800	550 x 550
500 x 500	1200 x 1200	800	650 x 650
400 x 600		900	550 x 750
500 x 600		800	650 x 750
400 x 800		900	550 x 950
500 x 800	1200 x 1500	900	650 x 950

The height of the slab part of the foundation and the height of the steps are set in multiples of 150 mm. The plate can have up to three steps (h1, h2 and h3), the dimensions of which, depending on its height, are indicated in the table

Height of steps of the slab part of the foundation, mm

The height of the slab part h	h ₁	h ₂	h ₃
300	300	-	-
450	450	-	-
600	300	300	-
750	300	450	-
900	300	300	300
1050	300	300	450
1200	300	450	450
1500	450	450	600

Overhangs of ledges (steps) are assigned constructively. $c \cong (1.5 \dots 3)h_i$
The area of the lower part of the step should be equal to the area of the sole of the foundation, selected according to the strength conditions of the base soil.

We determine the number of steps according to the height of the hpl, provided that the steps are taken in multiples of 150 mm, that is, 300, 450, 600 mm.

The minimum thickness of the walls of the unreinforced glass on the top should be taken at least 0.75 of the height of the upper ledge (column support) of the foundation or 0.75 of the depth of the glass dp and not less than 200 mm.

In foundations with a reinforced cup part, the thickness of the cup walls should be at least the values indicated in the table.

The thickness of the walls of the cup

Direction of effort	The thickness of the walls of the cup t, mm		
	columns of rectangular section with eccentricity of longitudinal force		two-branched columns
	$e_0 \leq 2l_c$	$e_0 > 2l_c$	
In the plane of the bending moment	0,2 l_c , but no less 150	0,3 l_c but no less 150	0,2 l_d , but no less 150
From the plane of the bending moment	150	150	150

The thickness of the bottom of the cup should be at least 200 mm.

The depth of the cup d_p is taken to be 50 mm greater than the depth of the column closure d_s , which is determined from the following conditions:

for two-branch columns: If $l_c \geq 1,2 \text{ m}$ $d_c = 0,5 + 0,33 l_c$, but no more than 1.2 m,

where l_s is the width of the two-branched column along the outer edges;

with $l_c < 1.2$ $d_c = l_c$, but not less than 0.8m

Example

Geological structure and hydrogeological conditions of the construction site

№ layer	Soil	Well number and the depth of the sole of each soil layer from the surface of the earth, m				
		1	2	3	4	5
1.	plant layer	0,3	0,3	0,3	0,3	
2.	Subsidence soil	4,8	4,6	4,9	4,8	
3.	Sand medium-sized	3,4	3,6	3,5	3,3	
4.	sandy loam	3,5	3,6	3,7	3,6	
5.	Clay gray	8,7	8,9	8,8	8,7	
	The depth of underground water	8,2	8,0	8,3	8,1	
	Well mark, m					

Variant	Cross section of the column, mm	Combination			
		I		II	
		N,MN	M, MNm	N,MN	M,MNm
	600x400	2,1	0,26	1,2	0,41

b = 2,6 m, l = 3,6 m.

Characteristics of soil properties

Name	Legend	Units of measurement	Layer number				
			1	2	3	4	5
Density	ρ_{II}	t/m ³	1,39	1,72	2,01	1,98	2,06
Solid Particle density	ρ_s	t/m ³		2,73	2,68	2,69	2,70
Water content	W			0,15	0,24	0,26	0,22
Liquid limit	W _L			0,35		0,28	0,40
Plastic limit	W _p			0,19		0,22	0,20
Angle of internal friction	φ_{II}	degree		21	33	20	15
Specific cohesion	C _{II}	kPa		25	1	12	80
Modulus of Deformation	E	MPa		20	30	15	50
Relative subsidence under pressure p, MПа	ϵ_{SL}	p=0,1		0,04			
		p=0,2		0,073			
		p=0,3		0,082			
Angle of internal friction water-saturated soil	$\varphi_{II,sat}$	degree		19			
Specific cohesion water-saturated soil	C _{II,sat}	kPa		5			
Modulus of Deformation water-saturated soil	E _{sat}	MPa		6			

