

PUNCHING SHEAR

DESIGN OF FLAT SLAB PUNCHING SHEAR
DESIGN | C23

Summary

Design reinforced concrete flat slabs for punching shear at internal, edge, and corner columns by specifying the distance from the support to the slab edge; the module automatically determines the shear perimeters.

You can enter the amount of longitudinal reinforcement present at the critical perimeters, in the two main directions.

The design output gives the critical load case with corresponding amounts of punching shear reinforcement needed for each perimeter, as well as suggested reinforcement configurations and detailed calculations.

Critical load case: 2:DL+LL	Load Case 2:DL+LL			
Perimeter	1	2	3	4
Distance from Column face (mm)	580	870	1160	1450
Critical length (mm)	4869	5423	5878	6334
Allowable shear stress v_c (MPa)	0.47	0.47	0.47	0.47
Shear force capacity V_c (kN)	670	747	809	872
Effective shear force V_{eff} (kN)	690	900	900	900
Total required reinforcement A_{sv} (mm ²)	431	782	674	566
Suggested Reinforcement Configurations	9R8	16R8	14R8	12R8
	452 mm ²	804 mm ²	704 mm ²	603 mm ²
	6R10	10R10	9R10	8R10
	471 mm ²	785 mm ²	707 mm ²	628 mm ²
	4R12	7R12	6R12	6R12
	452 mm ²	792 mm ²	679 mm ²	679 mm ²
	3R16	4R16	4R16	3R16
	603 mm ²	804 mm ²	804 mm ²	603 mm ²
Shear reinforcement should be placed in a band $2.0 \cdot d$ wide inside each critical perimeter. Maximum spacing $0.75 \cdot d$ radially and $1.5 \cdot d$ parallel to perimeters.				
v at column face = 1.94 MPa < v_{cu} = 5.28 MPa				

DETAILED CALCULATIONS

Design code :Eurocode 2 - 2004

Punching shear capacity and reinforcement calculations:

Calculations for Critical Load Case 2:DL+LL:

Calculation of V_{eff} : Perimeter no.:1

$$\beta = 1.0 + 1.8 \cdot \sqrt{\left[\frac{m_x}{I_y} \right]^2 + \left[\frac{m_y}{I_x} \right]^2}$$

$$= 1.0 + 1.8 \times \sqrt{\left[\frac{28}{600} \right]^2 + \left[\frac{59}{1472.3} \right]^2}$$

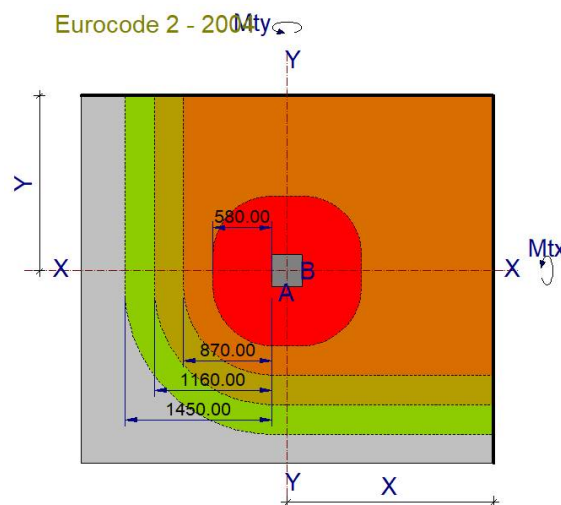
$$= 1.0000$$

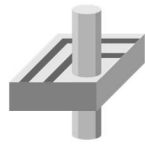
β is taken as at least 1.15 - value for internal column as per figure 6.21N.

$$V_{eff} = \beta \cdot V$$

$$= 1.15 \times 600$$

$$= 690.000 \text{ kN}$$





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What makes this module special?

- Various column positions allowed
- Detailed design calculations
- Suggested reinforcement configurations

Detailed Description

Punching Shear designs reinforced concrete flat slabs for punching shear (two-way shear action). You can design slabs at internal, edge, and corner columns by specifying the distance from the column to the slab edge; the module automatically determines the shear perimeters.

The module adjusts the effective shear force and shear capacity for the column moment and slab edge distance as dictated by the relevant design code. You can enter the amount of longitudinal reinforcement in the two main directions, crossing each perimeter. The module also gives the detailed calculations with relevant sections of the code.

Supported Codes

Design Codes

- ACI 318 - 1999
- ACI 318 - 2005
- ACI 318 - 2011
- ACI 318 - 2014
- ACI 318 - 2019
- AS 3600 - 2001
- AS 3600 - 2009
- AS3600 - 2018
- BS 8110 - 1985
- BS 8110 - 1997
- CP 65 - 1999
- CSA A23.3: 2019
- CSA A23.3-04 - 2010
- Eurocode 2 - 2004
- HK Concrete - 2004
- HK Concrete - 2013
- IS:456 - 2000
- NZ 3101 - 2006
- SABS 0100 - 2000
- SP 63.13330.2018

Detailing Codes

- BS 4466 - 1989
- BS 8666 - 2005
- SANS 282 - 2004
- SANS 282 - 2011