# Isolated Footing Depth for One-Way and Punching Shear

Net soil pressure, effective depth for one-way and two-way (punching) shear, and bending moment at the column face of a square isolated footing.

**Method:** Shear and flexure of square spread footings

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Factored column load | 1,200.0 | kN |
| Footing width (square) | 2.4000 | m |
| Column width (square) | 400.00 | mm |
| Allowable one-way shear stress | 0.75000 | MPa |
| Allowable punching shear stress | 1.4000 | MPa |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Net factored soil pressure | 208.33 | kPa |
| Depth for one-way shear | 217.39 | mm |
| Depth for punching shear | 286.57 | mm |
| Effective depth needed | 286.57 | mm |
| Moment at column face (whole width) | 250.00 | kN·m |

### Notes for this case

• One-way shear at d from the face: q(B − c − 2d)/2 = v_c1·d. Punching at d/2: q(B² − (c + d)²) = v_c2·4(c + d)d. Moment at the face q·B·x²/2 with x = (B − c)/2. Take allowable stresses from your code; overall depth adds cover and half a bar.

## Formula and method

$$q_u = \frac{P_u}{B^2}, \quad d_1 = \frac{q_u (B - c)/2}{v_{c1} + q_u}, \quad q_u \left[B^2 - (c + d)^2\right] = 4 v_{c2} (c + d) d$$

### Variables

| | | |
|---|---|---|
| $P_u$ | Factored column load | N |
| $B$ | Footing width (square) | m |
| $c$ | Column width (square) | m |
| $v_{c1}$ | Allowable one-way shear stress | Pa |
| $v_{c2}$ | Allowable punching shear stress | Pa |
| $q_u$ | Net factored soil pressure | Pa |
| $d_1$ | Depth for one-way shear | m |
| $d_2$ | Depth for punching shear | m |
| $d$ | Effective depth needed | m |
| $M_u$ | Moment at column face (whole width) | N·m |

### Method and standards

Footing shear.

### Assumptions and limits

- Concentric load; square footing and column; rigid footing.

### References
Shear and flexure of square spread footings

## Report details

| | |
|---|---|
| Report reference | FCC-NAK5-HXPE (the same inputs always give the same reference) |
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| Release checks | 3 reference cases of this calculator, computed independently, are checked on every release |

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

### This calculator online
https://calc.firecad.com/civil/foundations/footing-shear-depth

Open this case on calc.firecad.com →
Reopens the calculator with the inputs of this report.