Two-Way Slab Load Shared to Supporting Beams

Load each beam takes from a two-way slab by the 45° tributary method (triangles and trapezoids), with equivalent uniform loads for bending and shear.

Method: Yield-line (45°) tributary division and equivalent uniform loads (Punmia, Reinforced Concrete Structures)

Input parameters

Unit system: SI

Parameter	Value	Unit
Slab load (dead + imposed)	10.000	kPa
Short span	4.0000	m
Long span	6.0000	m

Calculated results

Parameter	Value	Unit
Total load on each short-span beam	40.000	kN
Total load on each long-span beam	80.000	kN
Equivalent UDL for moment, short beam	13.333	kN/m
Equivalent UDL for moment, long beam	17.037	kN/m
Equivalent UDL for shear, short beam	10.000	kN/m
Equivalent UDL for shear, long beam	13.333	kN/m

Notes for this case

- 45° lines from each corner split the panel into two triangles (to the short-span beams) and two trapezoids (to the long-span beams). Equivalent UDLs give the same mid-span moment or end shear in a simply supported beam.

Formula and method

$$W_s = \frac{w l_x^2}{4}, \quad W_l = \frac{w l_x (2 l_y - l_x)}{4}$$

$$w_{e,s} = \frac{w l_x}{3}, \quad w_{e,l} = \frac{w l_x}{6}\left[3 - \left(\frac{l_x}{l_y}\right)^2\right] \quad \text{(moment)}$$

$$w_{v,s} = \frac{w l_x}{4}, \quad w_{v,l} = \frac{w l_x}{4}\left(2 - \frac{l_x}{l_y}\right) \quad \text{(shear)}$$

Variables

w	Slab load (dead + imposed)	Pa
l_x	Short span	m
l_y	Long span	m
W_s	Total load on each short-span beam	N
W_l	Total load on each long-span beam	N
$w_{e,s}$	Equivalent UDL for moment, short beam	N/m
$w_{e,l}$	Equivalent UDL for moment, long beam	N/m
$w_{v,s}$	Equivalent UDL for shear, short beam	N/m
$w_{v,l}$	Equivalent UDL for shear, long beam	N/m

Method and standards

Tributary areas.

Assumptions and limits

- Uniform load; 45° division of a two-way panel.
- For l_y > 2 l_x the slab is one-way: the page warns, and the 45° split then overstates the short-span beam load.

References

• Yield-line (45°) tributary division and equivalent uniform loads (Punmia, Reinforced Concrete Structures)

Report details

Report reference	FCC-5JN6-2W7J (the same inputs always give the same reference)
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Release checks	2 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/concrete/slab-load-to-beams

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.