# Base Pressure under an Eccentrically Loaded Footing

Maximum and minimum soil pressure under a rectangular footing with a vertical load and moments about one or both axes, with the no-tension check and the peak pressure when part of the base lifts.

**Method:** Linear soil pressure q = P/A (1 ± 6e_L/L ± 6e_B/B)

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Vertical load (including footing and soil) | 900.00 | kN |
| Moment about the axis parallel to B (acts along L) | 90.000 | kN·m |
| Moment about the axis parallel to L (acts along B) | 45.000 | kN·m |
| Footing length | 2.5000 | m |
| Footing width | 2.0000 | m |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Eccentricity along L | 0.10000 | m |
| Eccentricity along B | 0.050000 | m |
| Maximum pressure | 250.20 | kPa |
| Minimum pressure | 109.80 | kPa |
| Average pressure P/(BL) | 180.00 | kPa |

## Formula and method

$$q = \frac{P}{BL}\left(1 \pm \frac{6e_L}{L} \pm \frac{6e_B}{B}\right), \quad e = \frac{M}{P}$$

$$q_{max} = \frac{4P}{3B(L-2e)}, \quad q_{min} = 0$$

### Variables

| | | |
|---|---|---|
| $P$ | Vertical load (including footing and soil) | N |
| $M_x$ | Moment about the axis parallel to B (acts along L) | N·m |
| $M_y$ | Moment about the axis parallel to L (acts along B) | N·m |
| $L$ | Footing length | m |
| $B$ | Footing width | m |
| $e_L$ | Eccentricity along L | m |
| $e_B$ | Eccentricity along B | m |
| $q_{max}$ | Maximum pressure | Pa |
| $q_{min}$ | Minimum pressure | Pa |
| $q_{avg}$ | Average pressure P/(BL) | Pa |

### Method and standards

Linear pressure distribution.

### Assumptions and limits

- Rigid footing, linear pressure.

### References

- Linear soil pressure q = P/A (1 ± 6e_L/L ± 6e_B/B)

## Report details

| | |
|---|---|
| Report reference | FCC-C5S1-7KP8 (the same inputs always give the same reference) |
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| Calculator | Base Pressure under an Eccentrically Loaded Footing |
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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/eccentric-footing-pressure

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.