

Key terms	
Term	Definition
Structural analysis	A structural analysis predicts the response of a structure to the application of specified external loads.
Structural loads	Structural loads are forces on a structure that cause stresses, deformation, and displacement.
Dead loads	A dead load is the load that is permanently imposed on a structure, including the structure itself.
Live loads	Live loads are loads that are associated with the occupancy of a building, such as people, furniture and goods, or loads that are imposed on structures, such as traffic on a bridge.
Structural element	A structural element includes iron and steel beams, walls, timber, trusses and girders.

Categories of loads

Concentrated loads

A point load is a load where the weight is concentrated at a single point a set distance from the end of a beam.

Line loads

A line load exerts a load along a line created by a structure such as a partition wall.

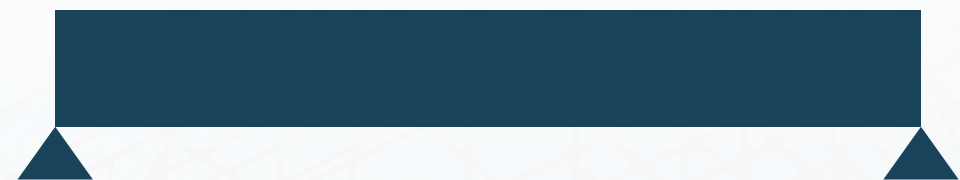
Distributed loads

A distributed load is exerted over an area such as the weight of a floor or roof.

Bending moments

A bending moment is a measure of the effect of an external force on a structural element such as a beam or cantilever.

Simply supported beams



A simple structure in which a beam is supported at each end.

Cantilever beams

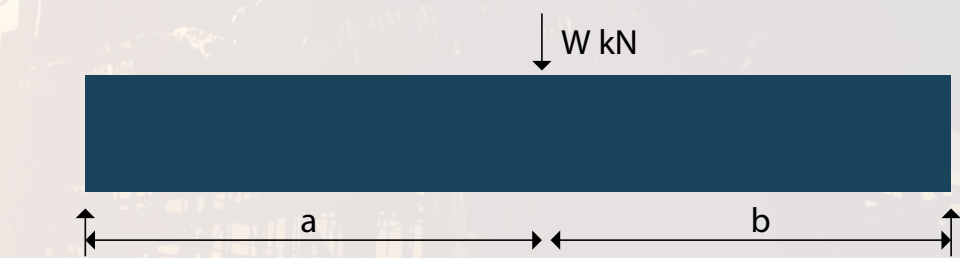


A beam supported at one end.

Formulae for calculating maximum bending moments

For simply supported beams:

- Point load in centre – $WL/4$ where W is the load in kN, and L is the span of the beam.
- Point load off centre – Wab/L where W is the load and L the span of the beam.



- Uniformly distributed load – $WL^2/8$ where W is the load and L is the span of the beam.

For cantilevered beams:

- Point load – WL where W is the load and L is the length of the cantilever.
- Distributed load – $WL^2/2$ where W is the load and L is the length of the cantilever.

The maximum bending moment occurs:

- at the mid-point of a simply supported beam when
 - a point load is applied at the centre of the beam
 - when a uniformly distributed load is applied, or
- at the support of a cantilevered beam when
 - a point load is applied anywhere on the cantilever
 - a uniformly distributed load is applied.

In general, a bending moment calculation involves the multiplication of a force by a distance. Forces are expressed in kilonewtons, and distance in metres. Therefore, the unit of a bending moment is kNm.

For information on the impact of temperature changes, building acoustics and lighting, see the knowledge organisers for 2.3.6, 2.3.7, and 2.3.8.