

# Basic principles of steel structures

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**Beam (梁)** A member which supports transverse loads or moments only.

**Beam-column (梁柱单元)** A member which supports transverse loads or moments which cause bending and axial loads which cause compression.

**Biaxial bending (双向弯矩)** The general state of a member which is subjected to bending actions in both principal planes together with axial compression and torsion actions.

**Brittle fracture (脆断)** A mode of failure under a tension action in which fracture occurs without yielding.

**Buckling (屈曲)** A mode of failure in which there is a sudden deformation in a direction or plane normal to that of the loads or moments acting.

**Column (柱)** A member which supports axial compression loads.

**Compact section (紧凑截面)** A section capable of reaching the full plastic moment.

**Connection (连接)** The means by which members are connected together and through which forces and moments are transmitted .

**Dead load (恒载)** The weight of all permanent construction.

**Deformation capacity (变形能力)** A measure of the ability of a structure to deform as a plastic collapse mechanism develops without otherwise failing.

**Design resistance (设计抗力)** The capacity of the structure or element to resist the design load.

**Design load (设计荷载)** A combination of factored nominal loads which the structure is required to resist.

**Distortion (扭曲)** A mode of deformation in which the cross-section of a member changes shape.

**Effective length (计算长度)** The length of an equivalent simply supported member which has the same elastic buckling load as the actual member.

**Effective width (有效宽度)** The portion of the width of a flat plate which has a non-uniform stress distribution (caused by local buckling or shear lag ) which may be considered as fully effective when the non-uniformity of the stress distribution is ignored.

**Factor of safety (安全系数)** The factor by which the strength is divided to obtain the working load capacity and the maximum permissible stress.

**Fastener (紧固件)** A bolt, pin, rivet ,or weld used in a connection.

**Fatigue (疲劳)** A mode of failure in which a member fractures after many applications of load .

**First-order analysis (一阶分析)** An analysis in which equilibrium is formulated for the undeformed position of the structure ,so that the moments caused by products of the loads and deflections are ignored.

**Flexural-torsional buckling (弯扭屈曲)** A mode of buckling in which a member deflects and twists.

**Friction-grip joint (摩擦型节点)** A joint in which forces are transferred by friction forces generated between plates by clamping them together with tensioned high tensile bolts.

**Gusset (连接板)** A short plate element used in a connection.

**Imposed load (活荷载)** The load assumed to act as a result of the use of the structure, but excluding wind load.

**Inelastic behaviour (非弹性性能)** Deformations accompanied by yielding.

**In-plane behaviour (平面内性能)** The behaviour of a member which deforms only in the plane of the applied loads.

**Joint (节点)** A connection.

**Lateral buckling (侧向屈曲)** Flexural-torsional buckling of a beam.

**Limit states design (极限状态设计)** A method of design in which the performance of the structure is assessed by comparison with a number of limiting conditions of usefulness. The most common conditions are the strength limit state and the serviceability limit state.

**Load factor (荷载系数)** A factor used to multiply a nominal load to obtain part of the design load.

**Local buckling (局部屈曲)** A mode of buckling which occurs locally (rather than generally) in a thin plate element of a member.

**Mechanism (机构)** A structure system with a sufficient number of frictionless and plastic hinges to allow it to deform indefinitely under constant load.

**Member (构件)** A one-dimensional structural element which supports transverse or longitudinal loads or moments.

**Nominal load (名义荷载)** The load magnitude determined from a loading code or specification.

**Plastic analysis (塑性分析)** A method of analysis in which the ultimate strength of a structure is computed by considering the conditions for which there are sufficient plastic hinges to transform the structure into a mechanism.

**Plastic hinge (塑性铰)** A fully yielded cross-section of a member which allows the member portions on either side to rotate under constant moment (the plastic moment).

**Post-buckling strength (后屈曲强度)** A reserve of strength after buckling which is possessed by some thin plate elements.

**Purlin (檩条)** A horizontal member between main beams which supports roof sheeting.

**Residual stresses (残余应力)** The stresses in an unloaded member caused by uneven cooling after rolling, flame cutting, or welding.

**Second-order analysis (二阶分析)** An analysis in which equilibrium is formulated for the deformed position of the structure, so that the moments caused by products of the loads and deflections are included.

**Service loads (使用荷载)** The design loads appropriate for the serviceability limit state.

**Shear centre (剪力中心)** The point in the cross-section of a beam through which the resultant transverse force must act if the beam is not to twist.

**Shear lag (剪力滞后)** A phenomenon which occurs in thin wide flanges of beams in which shear straining causes the distribution of bending normal stresses to become sensibly non-uniform.

**Slender section (薄柔截面)** A section which does not have sufficient resistance to local buckling to allow it to reach the yield stress.

**Squash load (压溃荷载)** The value of the compressive axial load which will cause yielding throughout a short member.

**Strain-hardening (应变硬化)** A stress-strain state which occurs at stresses which are greater than the yield stress.

**Strength limit state (承载力极限状态)** The state of collapse or loss of structural integrity.

**Tangent modulus (切线模量)** The slope of the inelastic stress-strain curve which is used to predict buckling of inelastic members under increasing load.

**Tensile strength (抗拉强度)** The maximum nominal stress which can be reached in tension.

**Tension member (受拉构件)** A member which supports axial tension loads.

**Warping (翘曲)** A mode of deformation in which plane cross-sections do not remain plane.

**Working load design (使用荷载设计)** A method of design in which the stresses caused by the service loads compared with maximum permissible stresses.

**Yield strength (屈服强度)** The average stress during yielding when significant straining takes place. Usually, the minimum yield strength in tension specified for the particular steel.

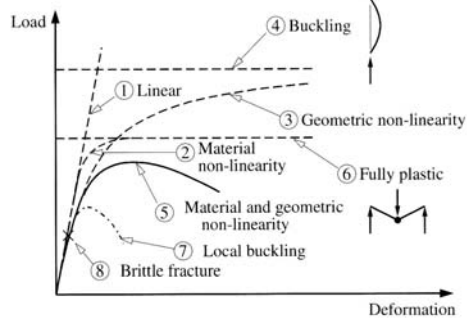


Fig. 1.12 Member behaviour

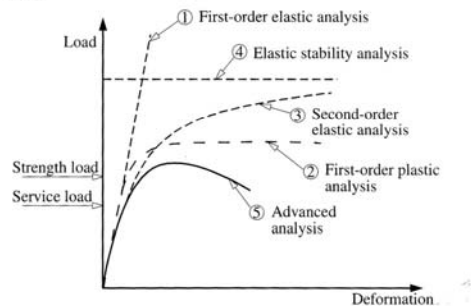


Fig. 1.15 Predictions of structural analyses

## Glossary summary

- Beam
- Beam-column
- Biaxial bending
- Bifurcation
- Brittle fracture
- Buckling
- Build-up member
- Characteristic strength
- Cladding
- Cold-formed member
- Column
- Composite beam
- Compact section
- Connection
- Design documents
- Design strength
- Drift
- Drift index
- Effective length
- Fastener
- Fatigue
- First-order elastic analysis
- Flexible connection
- Floor system
- Instability
- Joint
- Lateral buckling
- Limit state
- Plastic analysis
- Plastic hinge
- Plastic modulus
- Plastic moment
- Plastic zone
- Plate girder
- Post-buckling strength
- Residual stress
- Rigid frame
- Rotation capacity
- Second-order elastic analysis
- Serviceability limit state
- Shape factor
- Slenderness ratio
- Slip-critical joint
- Stiffener
- Stiffness
- Strain hardening
- Strength limit state
- Stress concentration
- Structural system
- Stub column
- Tangent modulus
- Tensile strength
- Toe of fillet
- Ultimate limit state
- Upper bound load
- Web buckling
- Yield strength