

Fast structures based on steel and other are an essential adaptation of steel
 All these structures to determine loads used for roof, joints and cables
 to easily installed and are quickly assembled on site with simple tools.

1.02 - 1.06 Sustainability "a form of development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
 - Almost half the total GHG emissions caused by buildings

1.01 - 1.06 Sustainability

Horizontal 31.4%
 Residential 23.2%
 Commercial 18.5%
 Transportation: 27.8%

Building sector's energy consumption attributable to heating, cooling, and lighting of buildings.

2.01-2.30 The Building

• Kern area - central area of any horizontal section of a column or wall within which the resultant of all compressive loads must pass if only compressive stresses are to be present in the section. Compressive loads beyond this area will cause tensile stresses to develop in this section.

External forces create internal stresses within structural elements.

BUILDING SYSTEMS

Structural System
 Design and analysis to support and transfer applied loads and loads applied to the ground.

Roof System
 The construction of the roof structure above the structure.

Column-beam and post-tension
 walls support floor and roof slabs.

The construction of the vertical exterior of a building above the foundation.

Foundation System (Foot)
 and column walls, exterior walls, double walls.

Roofing System
 design area, water table, security.

Internal System
 double panel doors, windows.

Other Systems
 Stairs, lifts, building, air-conditioning, fire alarm, fire extinguishers, water, gas, electricity, heating, ventilation, air conditioning, etc.

LOADS ON BUILDINGS

Static and dynamic loads.

Under a static load a structure responds slowly and deformation reaches a peak when the static force is maximum.

- Dead loads are static loads acting vertically downward on a structure, comprising the self-weight of the structure.

- Live loads are moving loads, collected snow or water or moving equipment.

- Occupancy loads result from the weight of people, furniture, stored material, and other similar items in a building.

- Rain loads result from clapping due to roof form or deformation.

- Ground pressure is the horizontal force a soil mass exerts on a vertical retaining structure.

Water

2.04 BUILDING SYSTEMS

Building Systems in construction should take into account:

- Performance Requirements
 - Structural Safety
 - Stability (Fire)
 - Assemblies (Robustness)
 - Heat & Air Flow
 - Moisture & condensation of water vapor
 - Building Movement (Change in temperature)
 - Noise reduction, sound insulation
 - Material resistance
 - Safety
- Aesthetic Qualities
 - Integration with community
 - Qualities (Color, color, texture)
- Regulatory Constraints
 - Zoning + codes
- Economic Considerations
 - Material, transportation, equipment & labor costs
 - Life-cycle costs (maintenance, operation, useful lifetime, demolition, replacement costs, interest on invested money)
- Environmental Impact

2.18 PLATE STRUCTURES

Tilted plate structures - slabs are joined rigidly + being steep angles base against building.

• Beam in longitudinal direction

• Slab direction and tilted acts as support.

• Transverse slabs act as continuous beam

• Vertical diaphragms stiffen tilted plates. Enables long distance span.

• Frame structure has a truss structure, which rigid floor slabs transmit loads being supported and in structural members.

• Spine supports help is needed to avoid it acts as a truss structure.

right plates are usually connected to a central spine. This provides a truss structure in the horizontal direction.

effective length factor (k)

The effective length factor (k) is a coefficient for modifying the actual length of a column according to its end conditions in order to determine its effective length. For example, fixing both ends of a long column reduces its effective length by half and increases its load-carrying capacity by a factor of 4.

1. Both ends fixed; k=0.5

2. One end pinned; one end fixed; k=0.7

3. Both ends pinned; k=1.0

4. One end free; one end fixed; k=2.0

2.15 Beam Spans
 Cantilever supported at only one fixed end.

enclosure envelope - closely related to site and energy.

HVAC (Heating, Ventilation, air conditioning)

ventilation, attached to duct

Ceiling

Loads - dead load - static load - dynamic / kinetic load.

occupancy loads - people and furniture.

• Some buildings have load bearing walls.

• Decking - use same material you used for structure.

moment force causes an object to rotate. (2.11)

welding pocket for moment connections.

- cross-bearing

curved metal sheets

compression

tension

2.16 TRUSSES

truss structural form triangle. Linear members subject only to axial tension or compression.

• Top and bottom chords are the principal members of a truss extending forward to end and connected by web members.

• Web - integral system.

• Panel = spaces within web.

Roof truss - load here. Only axial tension. Prevent secondary stresses, central axis + load should pass through common point.

2.14 BEAMS

Beams are rigid structural members designed to carry transverse loads across space to supporting elements. The nonconcurrent pattern of forces subjects a beam to bending + deflection, which must be resisted by the internal strength of the material.

Deflection = perpendicular distance a spanning member deviates from a true course under transverse loading, increasing with load and span, and decreasing with increase in the moment of inertia of the section or the modulus of elasticity of the material.

Bending moment is an external moment, causes rotation/bending. Equal to algebraic sum of moments about central axis of section considered equal and opposite to a resisting moment is an internal moment.