Building Construction

Structural Systems
1. Load-bearing wall construction
2. Skeleton framing
3. Combination of the two
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Factors governing type selection

• Economics – not necessarily the one that requires the least structural materials

• Architectural, mechanical, electrical, and other costs may be affected
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Load-bearing walls serve as:

• Facades
• Enclosures
• Separators
• Fire barriers
• Carry floor & roof loads to the foundation
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Load-bearing wood walls

• One to three story buildings (houses)
• 2” x 4” or 2” x 6” construction
• Studs on 16” to 24” centers
• Top & bottom plates
• Headers
• Max. wall ht. (unsupported) = 15’
Balloon Framing

Platform Framing
Post & Plank Framing
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Load-bearing masonry walls

- 10 stories or more
- Thickness of walls vary depending on height
- Trapezoidal cross section
- Lintels or arches at openings
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Load-bearing reinforced concrete walls

- Thinner than masonry
- Solid or cavity

Load-bearing walls are used for:

- Exterior
- Interior partitions
- Wind bracing
- Service core enclosure
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Load-bearing partitions:
- Short intervals
- Carry floor/ceiling loads

Load-bearing walls:
- Can serve as shear walls = resists wind & earthquake (seismic) loads
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Service core

- Enclosing stairs or elevators
- Service/mechanical rooms
- Duct/pipe chase
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*Skeleton framing*

- Columns carry loads to foundation
- Lateral forces resisted by columns and diagonal braces, or rigid frame
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Horizontal structural slab or deck

- Floor/ceiling/ducts
- Flat-plate construction
- Flat-slab reinforced concrete
- Slab-band construction
- Two way slabs
Beam-and-girder-construction

- Wood joist or rafters on 16” to 24” centers w/lumber or plywood decking
- Open web steel joist
- Light, rolled-steel beams
- Precast concrete planks
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*Heavier loads / longer spans*

- One-way ribbed concrete slabs
- Two-way waffle slab
- Prestressed concrete planks, tees, double tees, or girders
- Laminated wood girders
- Structural steel beams & girders
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Lateral-force bracing

- Low wood buildings
- Rigid frames
- Shear walls
- Braced frames
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Lateral-force bracing

- Tall buildings
  - Hollow tube cantilever
  - X – bracing
  - Knee bracing between columns & girders
  - Haunched-spandrels
  - Moment-resistant connections between columns & girder
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- Curtain Wall: non-load-bearing, exterior wall, supported on girts
- Spandrel Wall: curtain wall at the level of the outside floor beams in multi-story buildings
- Pilaster: bonded or keyed column of masonry, uniform thickness
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• Buttress: bonded masonry column
  – integral part of wall
  – provides lateral stability
  – decreases in thickness from top to bottom

• Curtain Walls: metal, plywood, stucco
  – stick systems
  – mullion-and-panel systems
  – panel systems

• Glazing: various window systems
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• Roof styles
  – steep sloped > 1½ “ in 12”
  – low-slope ≤ 1½ “ in 12”

• Sloped roof types
  – gable
  – hip
  – gambrel
  – shed
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- Sloped roof components
  - rafter/truss/purlins
  - sheathing
  - underlayment
  - fascia
  - soffet
  - drippedge
  eaves
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• Sloped roof components
  – ridge or hip
  – valley
  – rake gable end
  – saddle
  – dormer
  – flashing
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• Sloped roof materials
  – mineral fiber - cement shingles
  – asphalt (fiberglass)
  – wood shakes/shingles
  – slate shingles
  – clay (terra cotta)
  – concrete tile
  – metal roofing - corrugated or ribbed, aluminum, copper, or galvanized steel
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- Low-sloped roof materials
  - built-up bituminous, roll-roofing, single-ply membrane
  - components include:
    - substrate
    - underlayment
    - insulation
    - waterproof membrane
    - ballast
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- Bitumens include asphalt & coal tar
- Single-ply roofing
  - vulcanized elastomers (EPDM, neoprene)
  - non-vulcanized elastomers (CSPE, CPE, PIB)
  - thermoplastics
  - polymer-modified bitumens