Building Construction

Structural Systems

1. Load-bearing wall construction
2. Skeleton framing
3. Combination of the two

Building Construction

Factors governing type selection

- Economics – not necessarily the one that requires the least structural materials
- Architectural, mechanical, electrical, and other costs may be affected

Building Construction

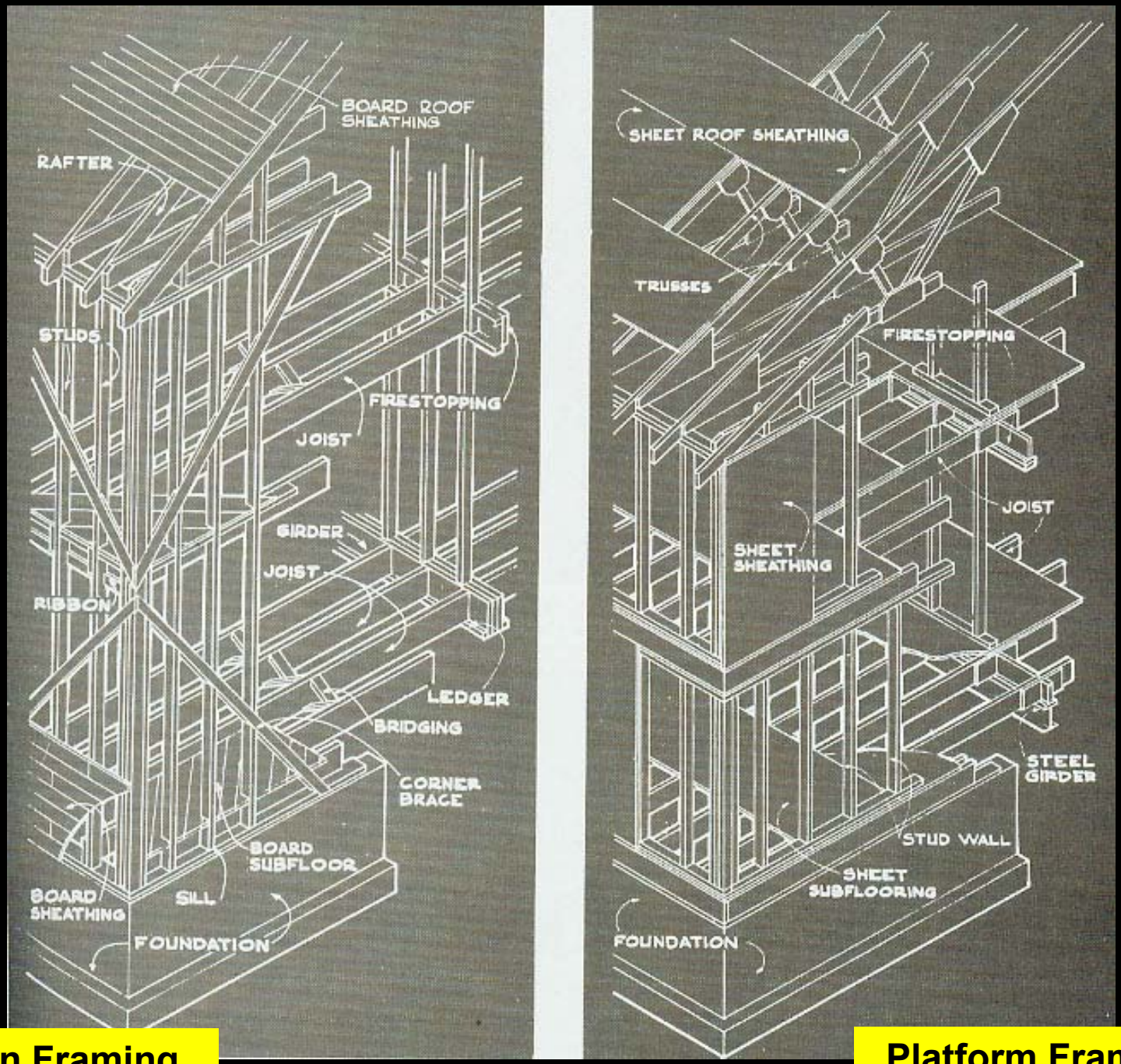
Load-bearing walls serve as:

- *Facades*
- *Enclosures*
- *Separators*
- *Fire barriers*
- *Carry floor & roof loads to the foundation*

Building Construction

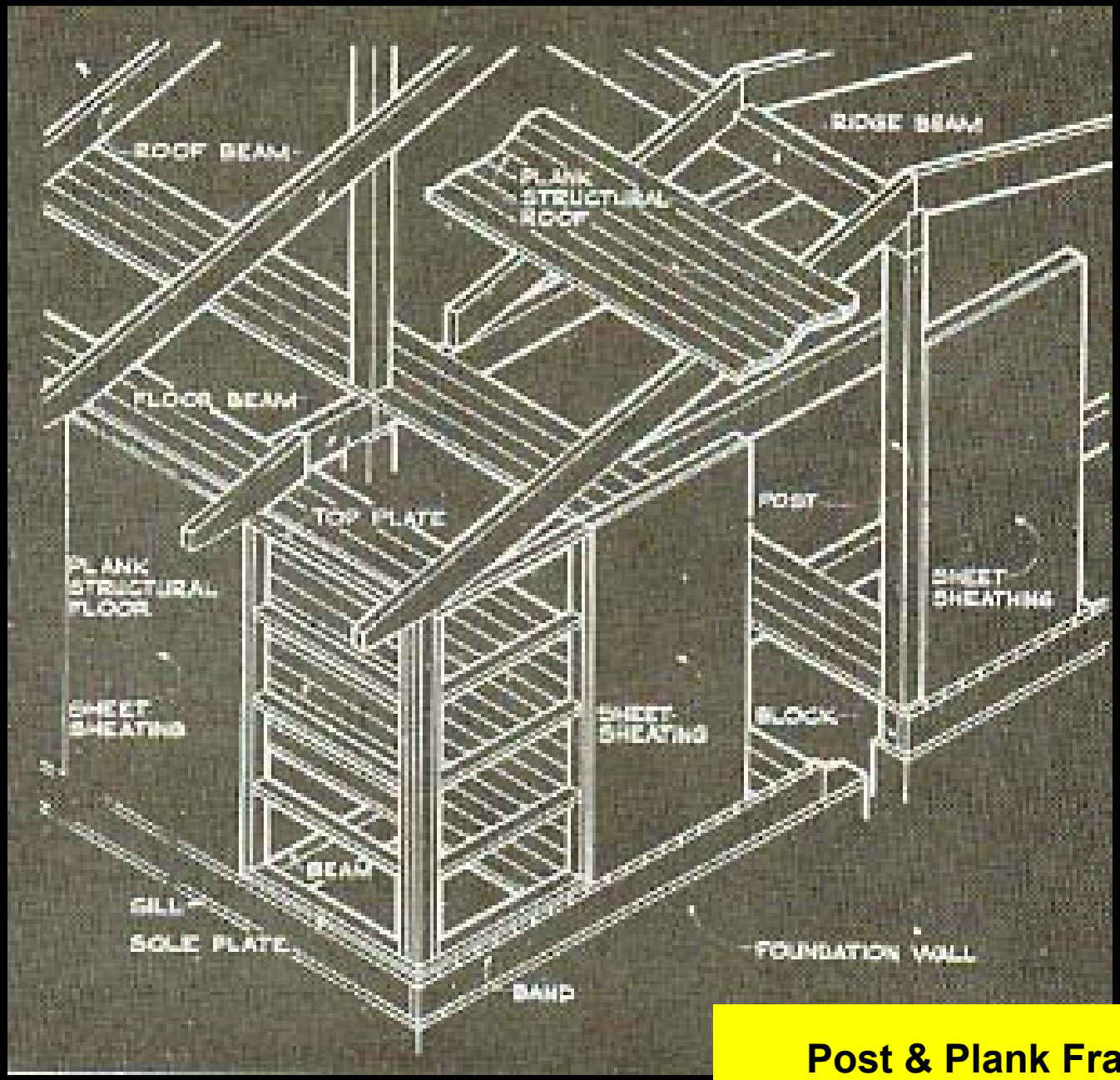
Load-bearing wood walls

- *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

Building Construction

Load-bearing masonry walls

- *10 stories or more*
- *Thickness of walls vary depending on height*
- *Trapezoidal cross section*
- *Lintels or arches at openings*

Building Construction

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

Building Construction

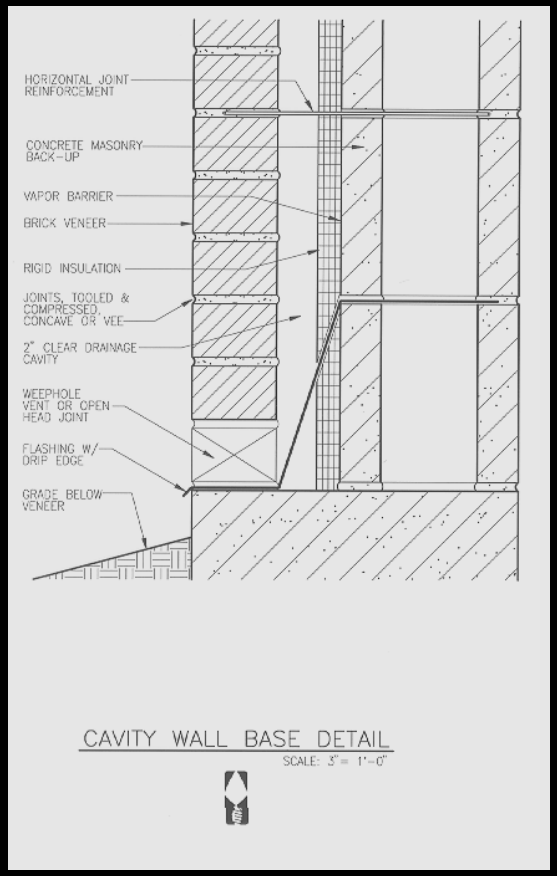
Load-bearing partitions:

- Short intervals
- Carry floor/ceiling loads

Load-bearing walls:

- Can serve as shear walls = resists wind & earthquake (seismic) loads

Building Construction



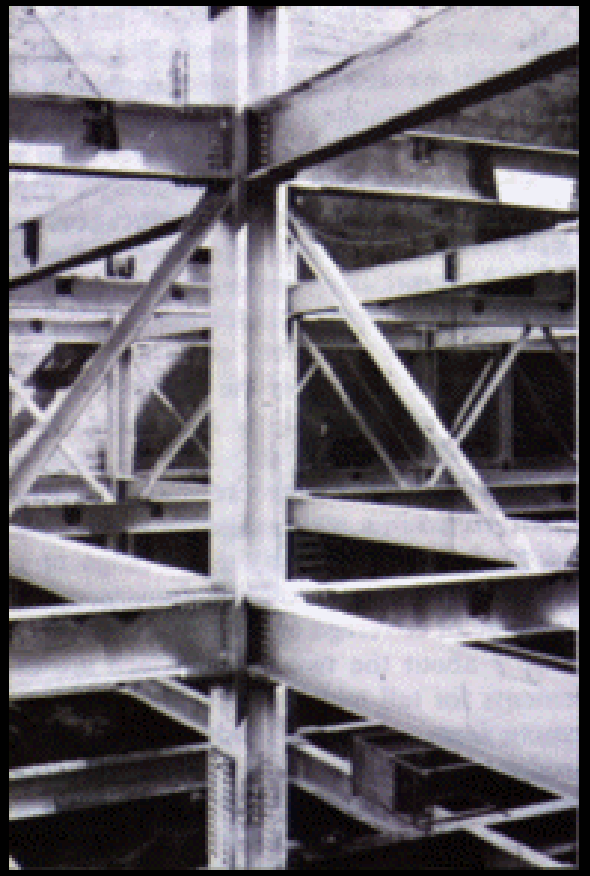
Service core

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

Building Construction

Skeleton framing

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



Building Construction

Horizontal structural slab or deck

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

Building Construction

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

Building Construction

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

Building Construction

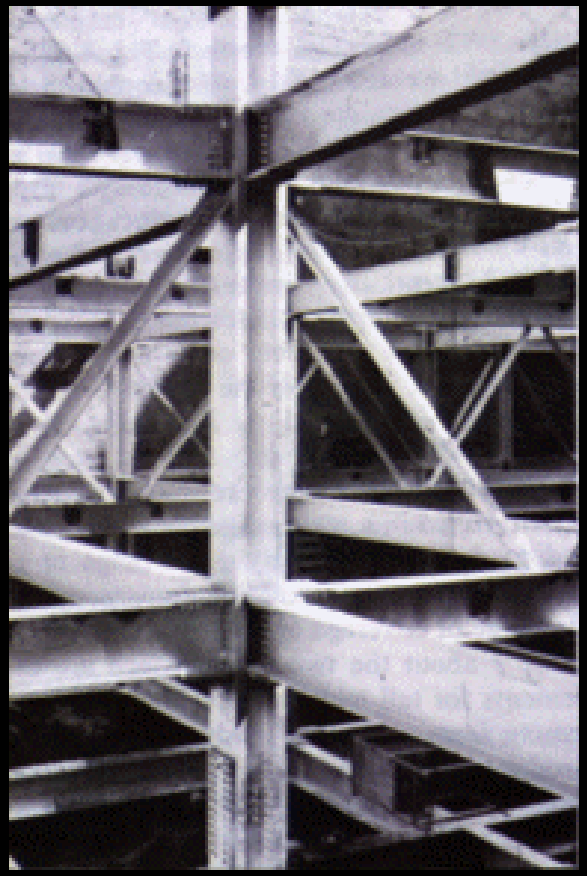
Lateral-force bracing

- Low wood buildings
- Rigid frames
- Shear walls
- Braced frames

Building Construction

Lateral-force bracing

- Tall buildings
  - Hollow tube cantilever
  - X – bracing
  - Knee bracing between columns & girders
  - Haunched-spandrels
  - Moment-resistant connections between columns & girder



Building Construction

- 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

Building Construction

- 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

Building Construction

- Roof styles
  - steep sloped > 1½ “ in 12”
  - low-slope ≤ 1½ “ in 12”
- Sloped roof types
  - gable
  - hip
  - gambrel
  - shed

Building Construction

- Sloped roof components
  - rafter/truss/purlins
  - sheathing
  - underlayment
  - fascia
  - soffet
  - dripedge

eaves

Building Construction

- Sloped roof components
  - ridge or hip
  - valley
  - rake gable end
  - saddle
  - dormer
  - flashing

Building Construction

- 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

Building Construction

- Low-sloped roof materials
  - built-up bituminous, roll-roofing, single-ply membrane
  - components include:
    - substrate
    - underlayment
    - insulation
    - waterproof membrane
    - ballast

Building Construction

- Bitumens include asphalt & coal tar
- Single-ply roofing
  - vulcanized elastomers (EPDM, neoprene)
  - non-vulcanized elastomers (CSPE, CPE, PIB)
  - thermoplastics
  - polymer-modified bitumens