

G-W Goodheart-Willcox Publisher

12th Edition

ARCHITECTURE

Residential Drafting and Design

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Presentations for PowerPoint

ARCHITECTURE

Residential Drafting and Design



The Goodheart-Willcox Co., Inc.
Tinley Park, Illinois

Chapter 20

Wall and Ceiling Construction

Objectives

- List the members of a typical frame wall.
- Explain methods of frame wall construction.
- Describe the applications, advantages, and disadvantages of steel framing in residential construction.
- Explain information shown on a ceiling joist span data chart.
- Describe types of masonry wall construction.

Objectives

- Identify the basic processes used to produce a quality, three-coat stucco finish.
- Describe the proper application of exterior insulation finish systems.
- Identify the uses of structural insulated panels in residential construction.
- Describe the types of insulated concrete forms used in concrete wall construction.

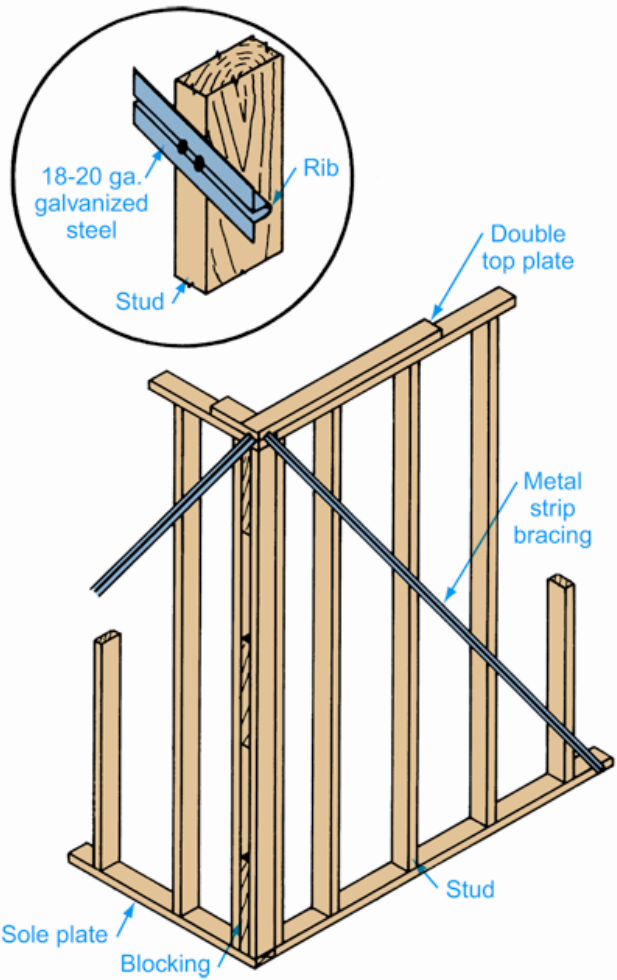
Residential Wall Construction

- Three types:
 - Frame
 - Masonry
 - Combination frame and masonry
- Wall panels may be constructed on site or prefabricated at another location

Frame Wall

- Typical framing members:
 - Sole plates
 - Top plates
 - Studs
 - Headers
 - Bracing

Typical Frame



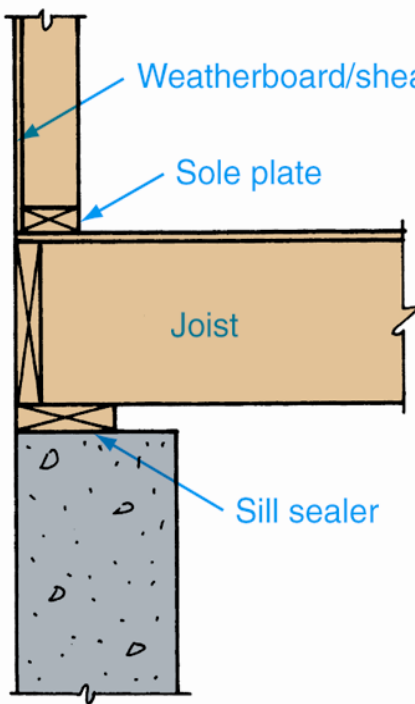
Framing Lumber

- Needs good stiffness, nail-holding properties
- Must be free from warp and easy to work
- Lumber grade commonly used is Number 2
- Moisture content should be 15% to 19%

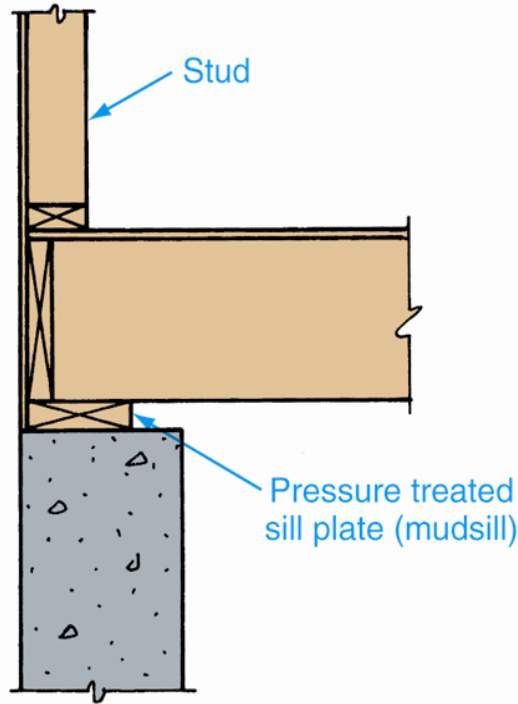
Frame Wall Construction

- Wall is usually constructed on subfloor, which provides large, flat work surface
- Entire wall panel may be built as unit or built in sections

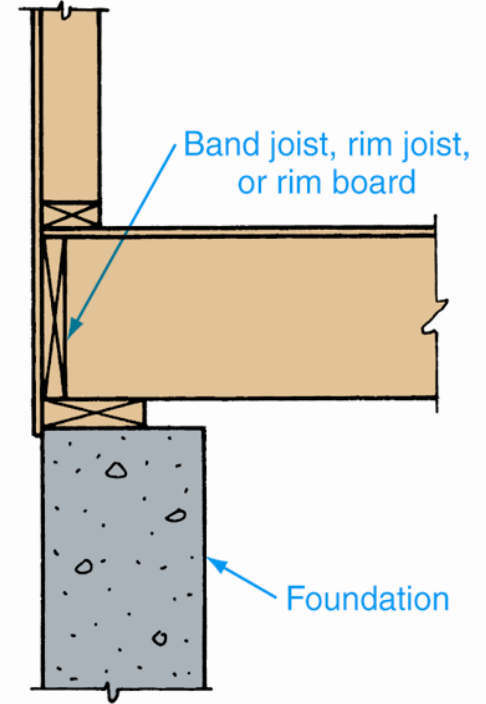
Exterior Wall Placement



Weatherboard Stops at Subfloor



Weatherboard Stops Flush with Foundation



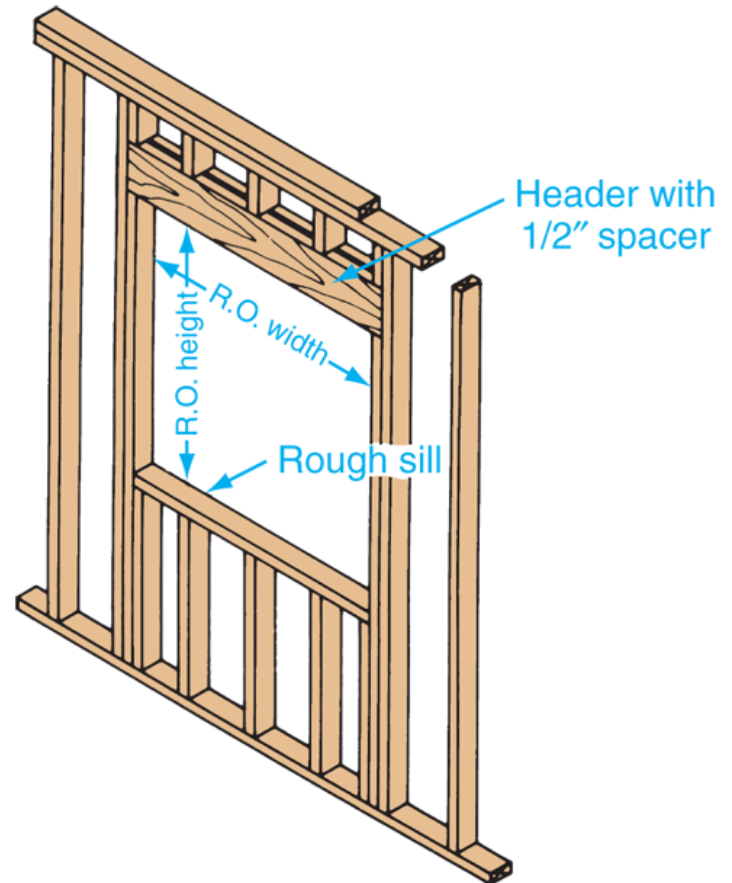
Weatherboard Extends Past Foundation

Plates

- Sole plate
 - Bottom horizontal member of wall on which studs rest
 - Wall studs are cut to length and nailed to sole plate
- Plate is nailed to top of studs
- Second plate is added after wall is in place

Headers

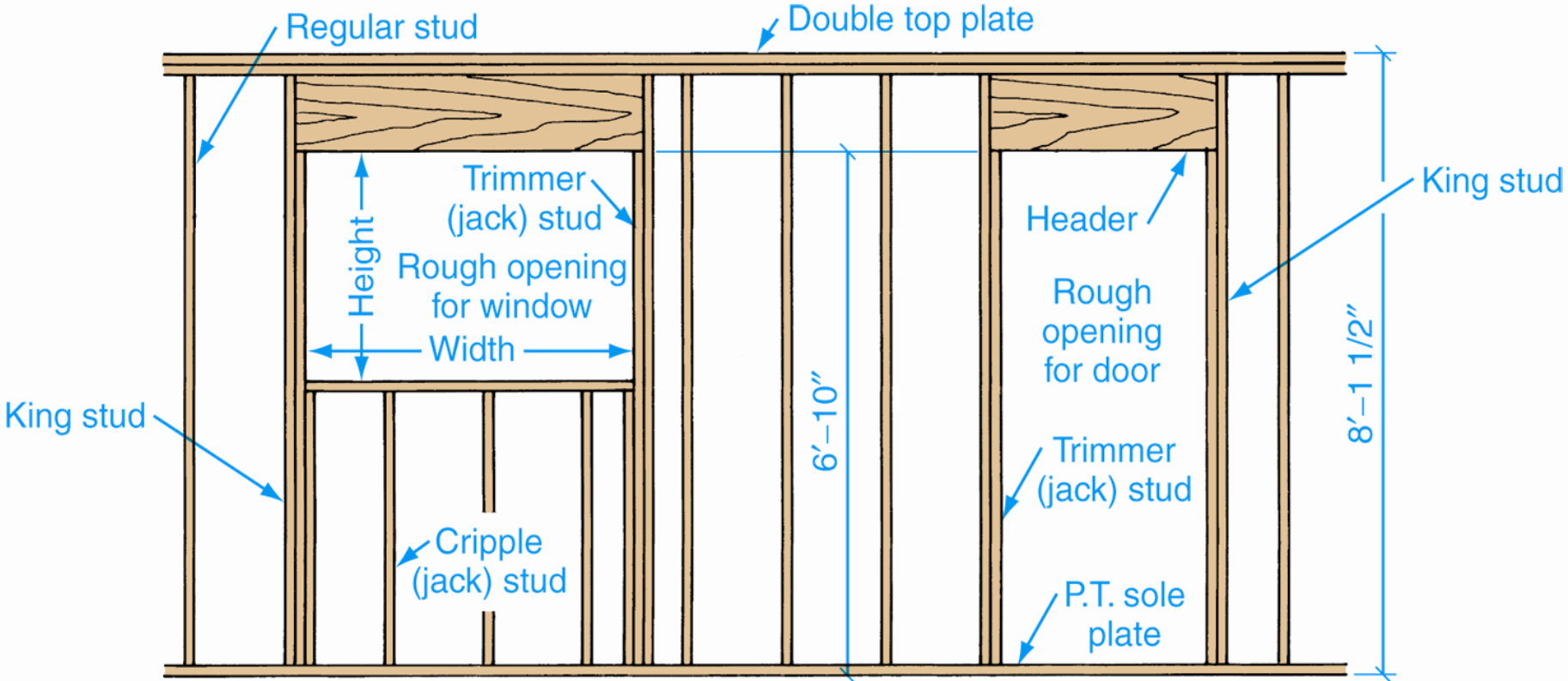
- Also known as lintels
- Sustain weight above openings for doors and windows
- Two basic approaches
 - Solid blocking
 - Header-and-stud framing



Solid Blocking

- Header size is increased to fill space from top of rough opening to top plate
- Trimmers (jack studs) are positioned inside opening
- Trimmers are nailed to king studs on either side of opening

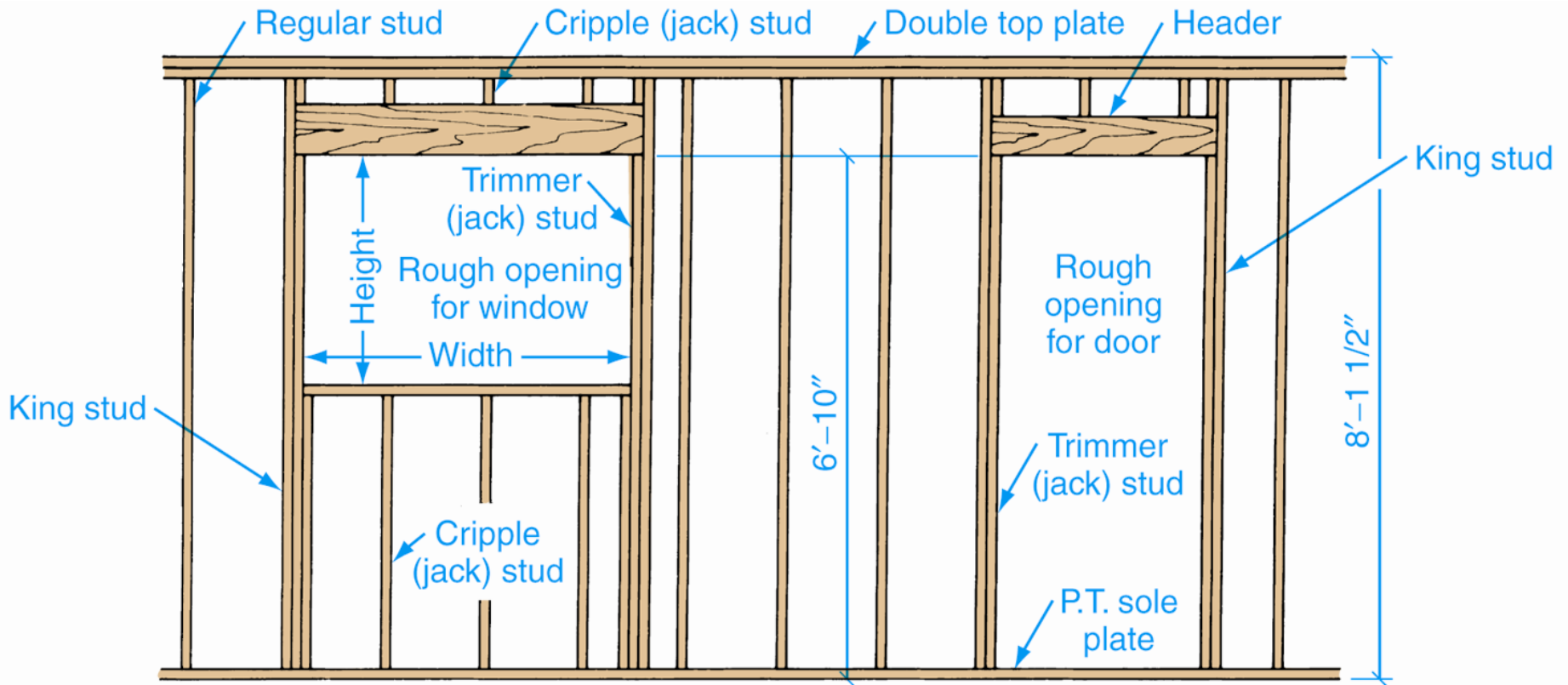
Solid Blocking



Header-and-Stud Framing

- Cripple studs and trimmers are nailed to sole and top plates
- Length of header = width of rough opening plus thickness of two trimmers

Header-and-Stud Framing



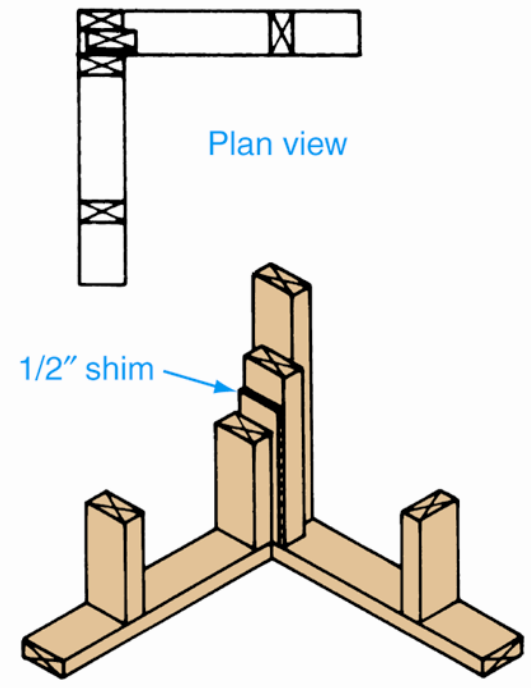
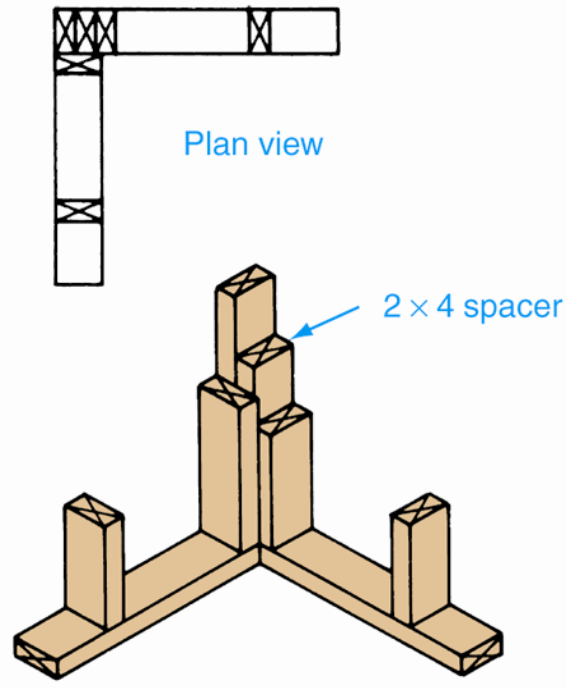
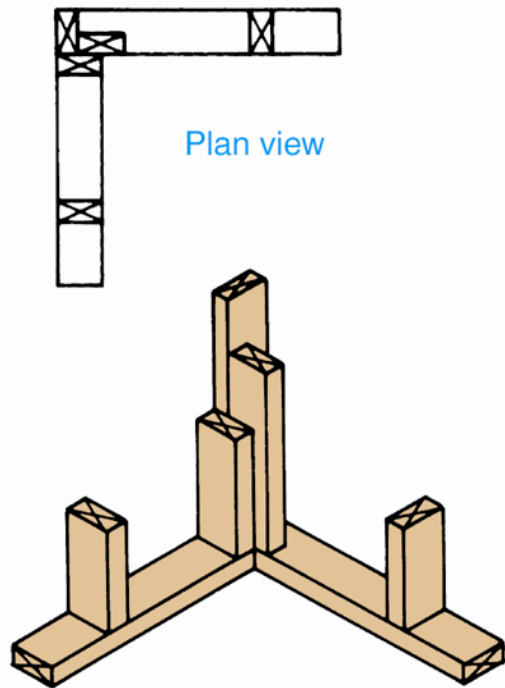
Rough Openings in Frame Walls

- Rough openings for windows and doors are dimensioned to center of opening in frame wall
 - Specific dimensions are provided by schedule
- Rough opening height of most doors is 6'-10"

Exterior Corners and Bracing

- Corner must provide:
 - Nailing edge for interior wall material
 - Adequate support for the structure
- Corner bracing is required by most codes
- Two methods:
 - Diagonal corner braces
 - Sheet of plywood nailed to studs at each corner

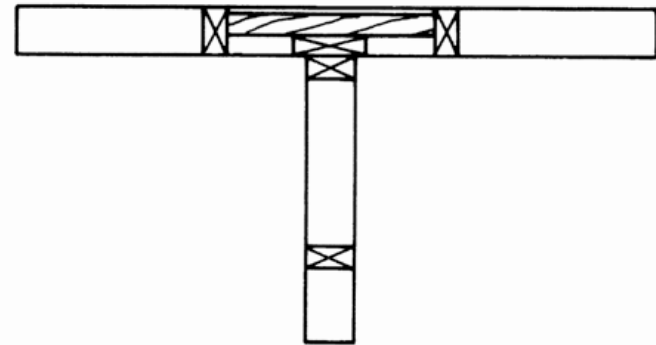
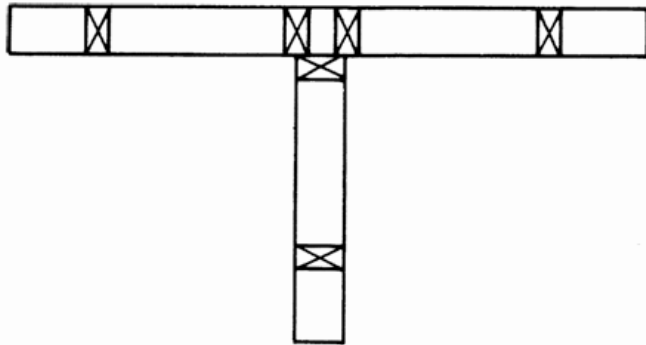
Exterior Corners and Bracing



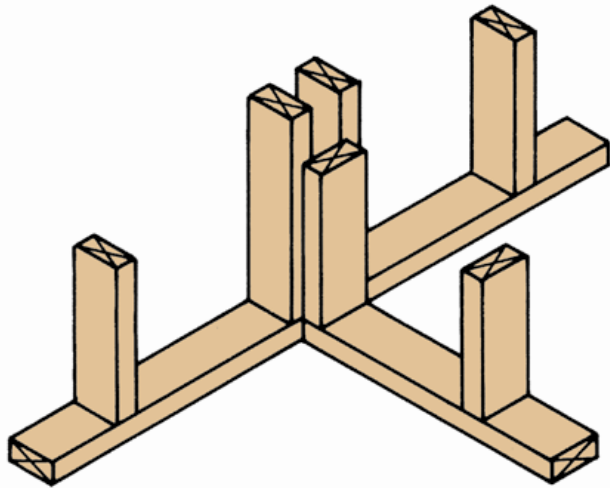
Interior Framed Walls

- Constructed in same way as exterior walls
 - Sole plates, studs, and double top plates
 - Interior walls are securely fastened to walls they intersect
 - Nailing edge must be provided for drywall, paneling, or plaster base

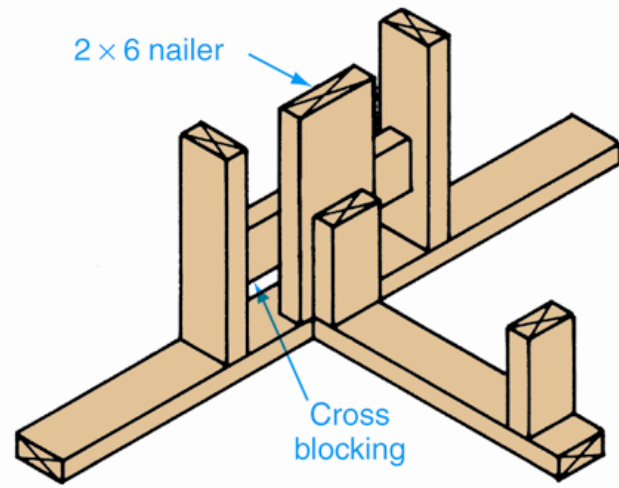
Interior Framed Walls



Plan Views



Intersecting at Stud



Intersecting between Studs

Steel Framing

- Steel framing is gaining in popularity
 - Quality wood is scarce and expensive
 - Steel framing has performed well in commercial construction
 - Steel framing is made from recyclable material
 - Price of steel has been relatively stable

Steel Framing Components

- Structural C (C-section), unpunched or prepunched
- Dimensions similar to dimensional lumber
- Thickness ranges from 12 to 25 gauge
- Track or channel members are used for rim joists, top and bottom plates, and blocking
- Hot-rolled channel is used for furring
- All members are fastened with screws

Steel Wall and Roof Systems

- Construction elements of a framed house include floors, walls, and roofs
- Two types of steel studs are used for walls
 - Structural C for load-bearing walls
 - Drywall studs for nonbearing partitions

Ceiling Construction

- Ceiling joists may be put in place after exterior and interior walls are finished
- Joists positioned in same direction as rafters
- Ceiling construction differs from floor construction in two main ways
 - Header is not required around perimeter
 - Smaller size lumber is used

General Framing Considerations

- Access hole needed in ceiling to access attic
- Framing around ceiling openings, floor is same
- Double headers are used for large holes
- Special framing required heating ducts openings, wall backing for fixtures, extra support for bathtub
- Bay window framing presents other problems

Green Architecture

Sustainable Masonry

- Masonry life cycle is long and most masonry is recyclable
- Poor workmanship and inferior materials can reduce sustainability of masonry
- International Masonry Institute provides resources and certification program

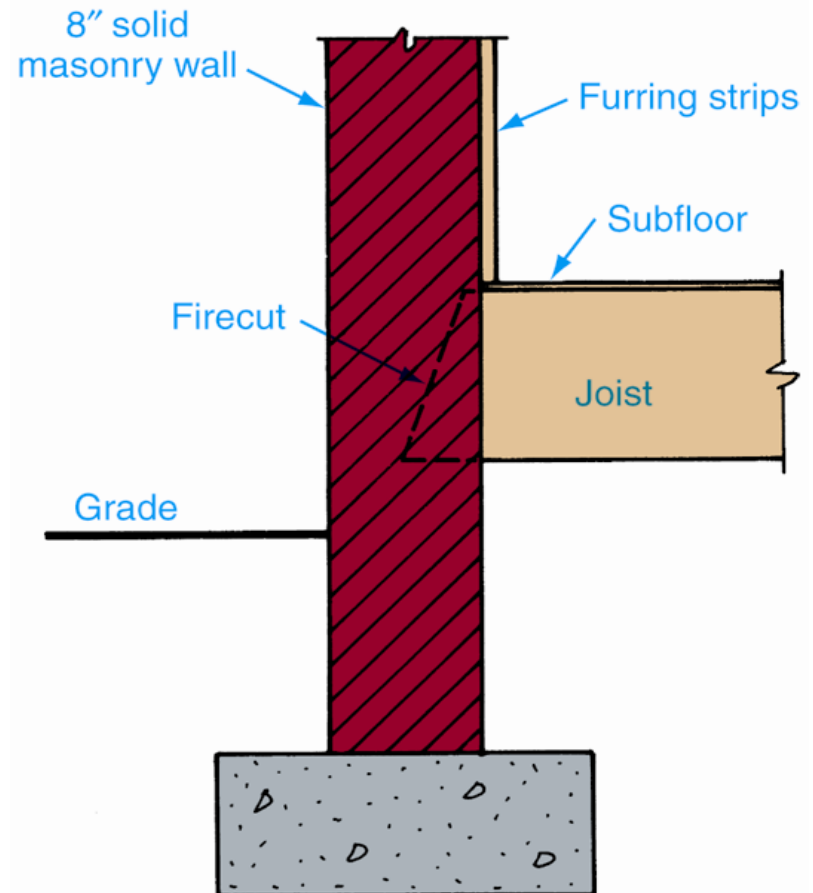
Masonry Wall Construction

- Solid wall or cavity wall (concrete block wall)
- Brick, concrete block, stone, clay tile, terra cotta, or combination
- Residential construction walls usually 8" thick
- Walls needing more than one masonry thickness have all thicknesses bonded together



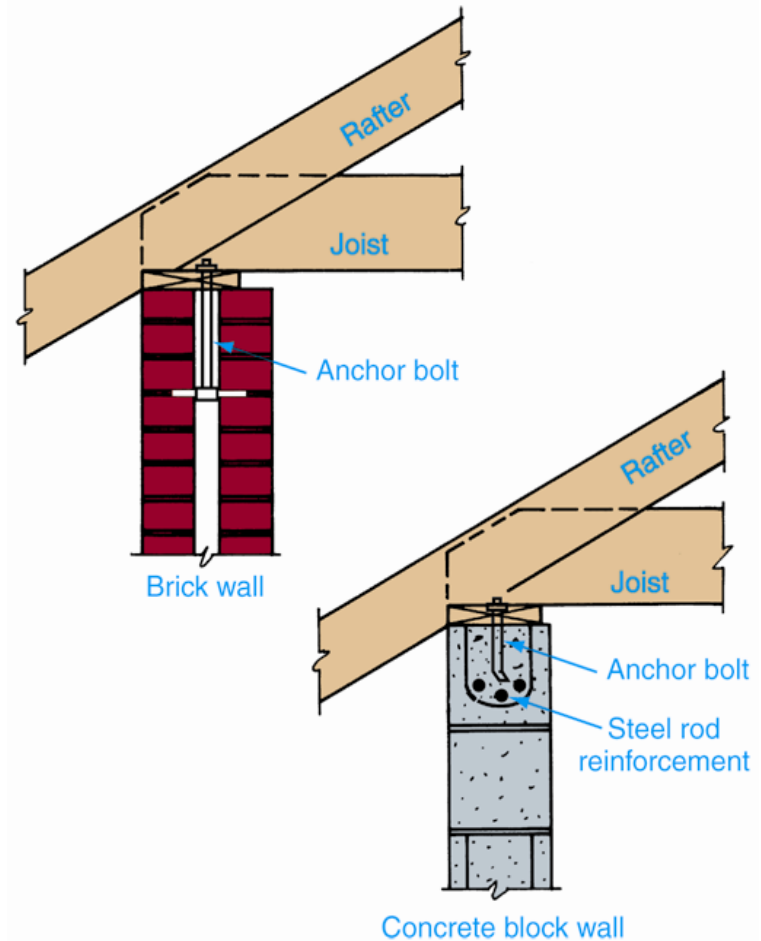
Masonry Wall Construction

- Solid masonry walls require furring strips if drywall or paneling is used
- Firecut is used when floor joists are placed directly into solid masonry walls



Attaching Top Plates

- Top plate for roof must be anchored securely to solid masonry wall
- Anchor bolts are used to secure the plate



Stonework

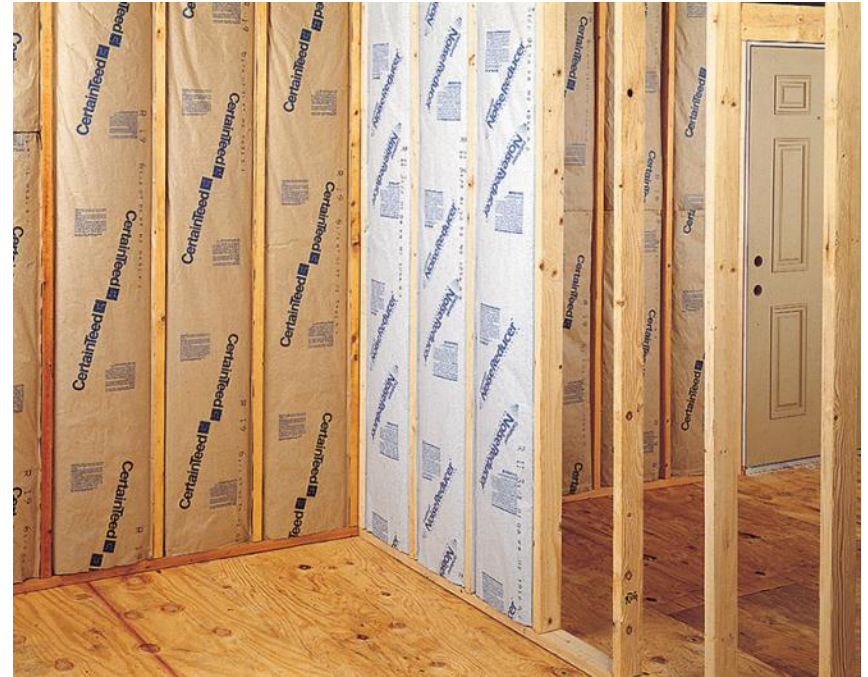
- Provides a decorative look
- Ashlar stonework uses dressed, cut, or squared stones
- Rubble stonework is made from undressed stones of irregular shapes
 - Coursed rubble and uncoursed cobweb (polygonal rubble)

Masonry Veneer

- Brick or stone veneer provides the same visual effect as solid brick or stone walls
- Veneer is a facing material and does not support the weight of the building
- Veneer wall is better insulated and less expensive than solid masonry wall

Masonry Veneer Walls

- Brick veneer wall is typically insulated on frame wall side
- Veneer is usually 4" or 6" thick and placed 1" away from frame wall to provide dead airspace for insulation



Brick Names and Sizes

- Face brick
 - Very uniform in shape
 - Sharp corners and lines
- Common brick
 - Generally used as a backing material
 - Rustic appearance when used as facing material

Brick Names and Sizes		
Name	Nominal Size	Actual Size
Roman	2 × 4 × 12	1-5/8 × 3-5/8 × 11-5/8"
Modular	2-2/3 × 4 × 8	2-1/4 × 3-5/8 × 7-5/8"
SCR Brick	2-2/3 × 6 × 12	2-1/8 × 5-1/2 × 11-1/2"
Standard	Nonmodular	2-1/4 × 3-5/8 × 8"
Norman	2-2/3 × 4 × 12	2-1/4 × 3-5/8 × 11-5/8"
Firebrick*	2-2/3 × 4 × 9	2-1/2 × 3-5/8 × 9"

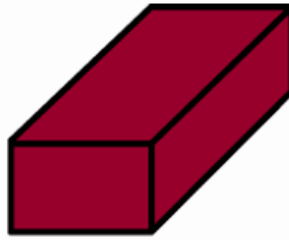
*Firebrick is not used for exterior wall construction, but is included because it is used in fireplaces.

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Brick Positions



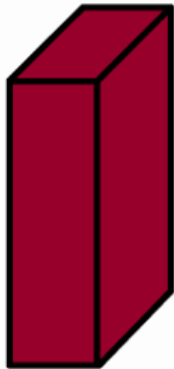
Stretcher



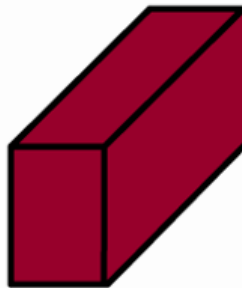
Header



Rowlock stretcher



Soldier



Rowlock



Sailor

Mortar Joints

- Types of mortar joints used in residential construction



Concave
Severe
Weathering



V
Severe
Weathering



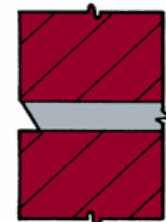
Grapevine
Severe
Weathering



Weathered
Moderate
Weathering



Beaded
Moderate
Weathering



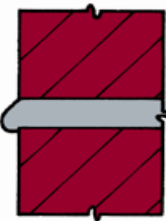
Struck
Negligible
Weathering



Flush
Negligible
Weathering



Raked
Negligible
Weathering



Extruded
Negligible
Weathering

Stucco

- Exterior applications of wall coating
- Traditional three-coat stucco consists of Portland cement, lime, sand, and water
- Produces a protective shell
- May be repaired, if necessary
- Problems generally result from poor workmanship or improper installation

Preparing for Stucco

- Rigid structure is essential
- Cracks in masonry walls will “telescope”
- Thin spots in stucco will crack
- Movement in plywood that is not properly spaced and nailed will cause stucco to crack
- Mixing engineered lumber and standard lumber may result in cracking stucco shell

Moisture Barrier and Flashing

- Keep moisture from going behind stucco shell
- Prevent moisture from space behind stucco
- Special attention given to joints, openings, and penetrations in the wall
- Flashing is Kraft paper around wall openings and wall penetrations
- Caulk used to repair holes or tears in flashing

Lath (Reinforcement)

- Lath attaches stucco shell to structure
- Available as self-furring wire lath or rib lath
- Moisture-proof membrane is usually attached to the lath at factory
- Furring nails or staples attach lath to sheathing
- Lath orientation is important

Scratch or Foundation Coat

- First stucco layer, generally 3/8" thick
- Embeds reinforcement in stucco
- When scratch coat has begun to set, surface should be roughened



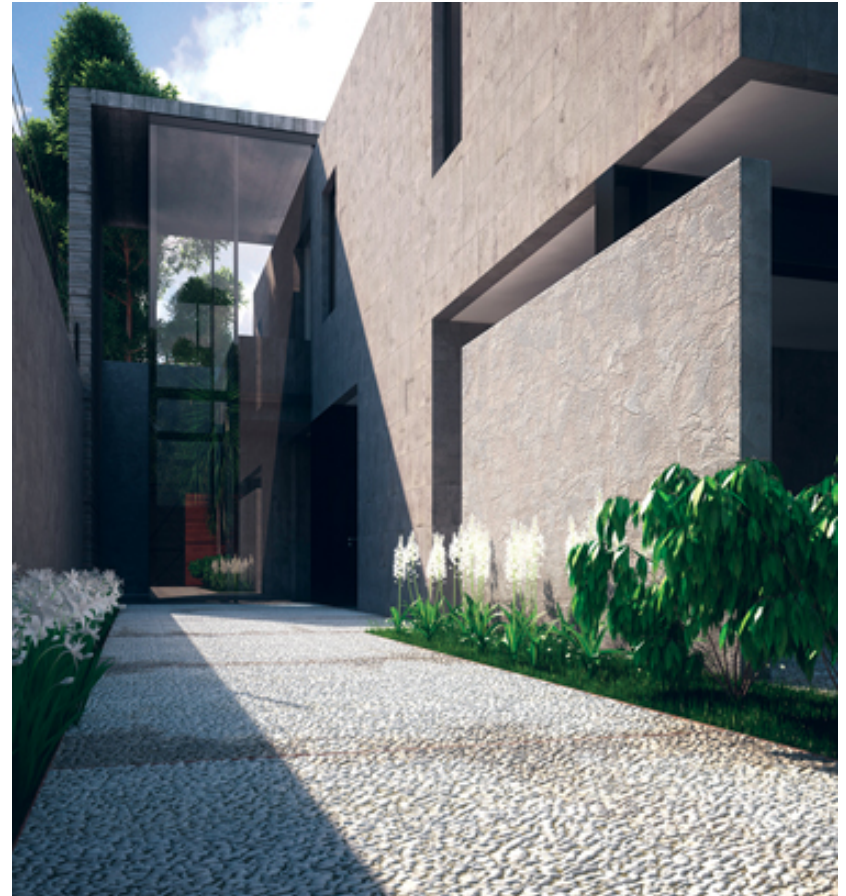
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Brown Coat

- Second stucco layer
- Covers any visible lath, adds strength, trues the surface, and prepares for final finish
- Leveled with straight edge to thickness of 3/8"

Finish Coat

- Provides texture or design to surface
- About 1/8" thick, applied by hand or machine
- Color may be added to this finish or stucco can be painted later
 - Stucco should cure for 28 days before painting



Finish Coat



Exterior Insulation Finish Systems (EIFS)

- Also known as synthetic stucco
- Provides thermal insulation and durable external finish
- Exterior coating is polymer-based material
- Requirements are specified in International Residential Code

EIFS Advantages/Disadvantages

- Advantages
 - Time reduction
 - Improved thermal performance
- Disadvantage
 - Cracking, sealant failure, and water damage if work is not performed correctly

Structural Insulated Panels

- Combine two outer skins and insulating foam core into single unit for framing
- Replace three stages of framing, sheathing, and insulation
- Special tools are required to erect panels



Concrete Wall Systems

- Insulated concrete forms (ICFs)
 - Forms made of foam insulation remain in place after concrete is placed and become part of wall
- Common types
 - Planks
 - Blocks
 - Panels

Plank Forms

- 2" × 8" sections of rigid polystyrene foam insulation
- Planks are separated with plastic ties so space between panels can be filled with concrete
- Special form ties and corner ties are needed

Block Forms

- Interlocking blocks of plastic foam insulation that are stackable
 - Hollow cores are filled with concrete



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Employability

Creativity and Brainstorming

- Thinking “outside the box” is an important skill
- Brainstorming aids creativity
- Practice helps you become a more creative thinker