Residential Wood Framing

Pete Fowler Construction Services, Inc.

Pete Fowler
CONSTRUCTION
Services, Inc.

927 Calle Negocio #G
San Clemente, CA 92673
T: 949-240-9971

9320 SW Barbur Blvd #170
Portland, OR 97219
T: 503-246-3744

75 Manhattan Dr #110
Boulder, CO 80303
T: 303-554-0381

Residential Wood Framing

Program Outline

1. Wood Framing & Building Design
2. Construction Drawings (Plans & Specifications)
3. Foundations
4. Structural Hardware
5. Layout
6. Framing Methods
7. Framing
8. Beams & Joists
9. Sheathing and Shear Walls
10. Stacking of Roof Framing and Trusses
11. Exterior Trim including Fascia
12. Specialty Framing
13. Common Defects

Residential Wood Framing

1. Wood Framing & Building Design

Buildings Are Exceedingly Complicated

Roof

- Must resist penetration by water, snow and ice, at the same time “breathe” to allow built- up moisture to escape from the inside.
- The surface is expected to absorb heat (in the winter) but reflect it (in the summer).
- Service personnel need to be able to walk or climb on the surface.

Havinland, D. (1994). The Architect’s Handbook of Professional Practice. The American Institute of Architects.

Residential Wood Framing

1. Wood Framing & Building Design

Buildings Are Costly

Buildings are large and voluminous in order to house the activities for which they are designed.

A large and complicated product is expensive. The more expensive a product, the more durable the owner expects it to be, adding to its cost.

Havinland, D. (1994). The Architect's Handbook of Professional Practice. The American Institute of Architects.

Residential Wood Framing

1. Wood Framing & Building Design

Buildings Are Constructed At Their Sites

Sites present various conditions:

- Topography
- Soils
- Utilities
- Neighbors
- Building Regulations

It is difficult to produce a product that must be adapted in so many ways.

Havinland, D. (1994). The Architect's Handbook of Professional Practice. The American Institute of Architects.

Residential Wood Framing

1. Wood Framing & Building Design

Buildings Are Produced By Project- Specific Teams

- "Team" of people
- Organizations
- Institutions
- Public agencies

Havinland, D. (1994). The Architect's Handbook of Professional Practice. The American Institute of Architects.

Residential Wood Framing

1. Wood Framing & Building Design

Buildings Are Unique

Building projects are individualized endeavors on a specific site, designed to a specific set of requirements, and involving a specific set of people, firms and public authorities.

The prototype is the final product.

Havinland, D. (1994). The Architect's Handbook of Professional Practice. The American Institute of Architects.

Residential Wood Framing

1. Wood Framing & Building Design

Building Is Inherently Difficult And Exciting

- Each participant brings a different set of goals, values and biases to the project.
- Technical requirements often conflict with one another.
- Scope, budget, and schedule trade-offs are necessary.

Havinland, D. (1994). The Architect's Handbook of Professional Practice. The American Institute of Architects.

Residential Wood Framing

1. Wood Framing & Building Design

Proper Design and Construction Can Last for Millennia

The Urnes Stave Church (c. 1150) in Norway

The Horyu-ji (c. 594) Temple in Nara, Japan

Residential Wood Framing

1. Wood Framing & Building Design

Loads on Buildings

When framing a building, a building's structure must be able to support two types of loads:

- Static Loads
- Dynamic Loads

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

Loads on Buildings

Static Loads are assumed to be constant in nature and are of two kinds:

Dead loads are relatively fixed and include the weight of the building structure itself as well as the weights of any permanent elements within the building, such as mechanical equipment.

Live loads are movable loads which may not be present all of the time. They include the weights of a building's occupants and furnishings, as well as snow loads on roofs.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

Loads on Buildings

Dynamic Loads can be applied to a structure suddenly and vary in magnitude and location:

Wind loads can produce pressure or suction on a building's walls and roof planes, depending on their geometry and orientation. The dynamic effects of wind on tall buildings are especially important.

Seismic forces result from sudden movements in the earth's crust. They are multidirectional in nature and propagate in the form of waves. These cause the earth's surface and any buildings resting on it to vibrate because of the tendency of a building's mass to remain at rest.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

Loads on Buildings

- While a building's dead loads are relatively fixed in character, static live, dynamic wind and seismic loads can vary in magnitude, duration, and point of application. A building's structure must be designed for these possibilities.
- Building codes typically provide equivalent distributed or concentrated loads for design purposes. These are based on the net effect of the maximum expected combination of forces.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

Structural Forces

- In the structure analysis of buildings, we are concerned with the magnitude, direction, and point of application of forces, and their resolution to produce a state of equilibrium.
- As each structural element is loaded, its supporting elements must react with equal but opposite forces.
- Forces can be assumed to be applied in a uniformly distributed manner, as in the case of a live load on a floor or a wind load on a wall. A force can also be a concentrated load, as when a beam bears on a post or a column bears on its footing.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

Basic Structural Elements: Column & Beam

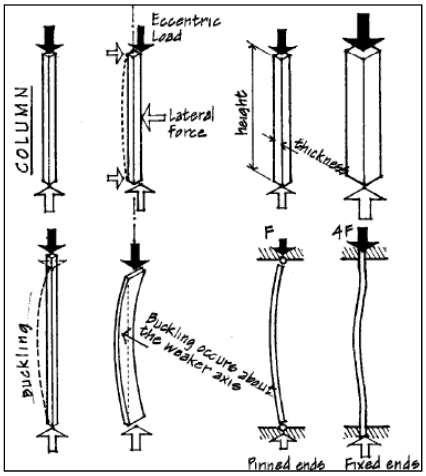
- Structural elements can be classified according to their geometry, rigidity, and how they respond to the forces applied to them.
- The two basic types of rigid, linear structural elements are the column and beam.
  - A column transmits compressive forces vertically along its shaft.
  - A beam transfers its load laterally along its length to its supports.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

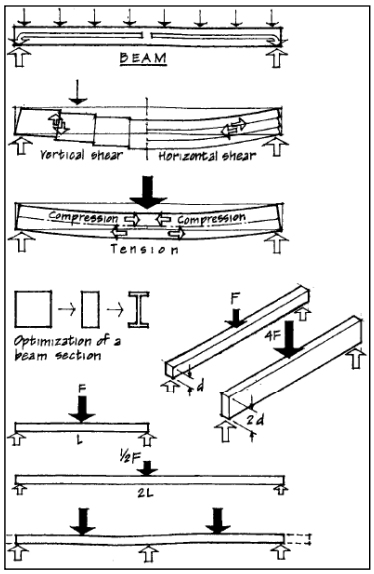
Basic Structural Elements: Column & Beam



Residential Wood Framing

1. Wood Framing & Building Design

Basic Structural Elements: Column & Beam



Residential Wood Framing

1. Wood Framing & Building Design

Basic Structural Elements: Load- Bearing Wall

When a beam is supported by two columns, the assembly defines an invisible plane and qualifies the space around it.

The typical column-and-beam assembly is not capable of resisting lateral forces unless it is braced. If the joints between the columns and beam are made rigid, then the assembly is called frame.

A rigid frame has a greater measure of lateral stability in the direction of its plane, and now acts as a load- bearing wall.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

Basic Structural Elements: Slabs

- A planar structural element, such as a reinforced concrete slab, can span horizontally and transfer its loads to its supports by bending.
- A one-way slab acts as a wide, flat beam spanning between two supports.
- A two-way slab, supported along four sides, is more versatile since it provides more paths along which stresses may travel to the supporting elements.
- Typical residential slabs on grade are four sided slabs.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

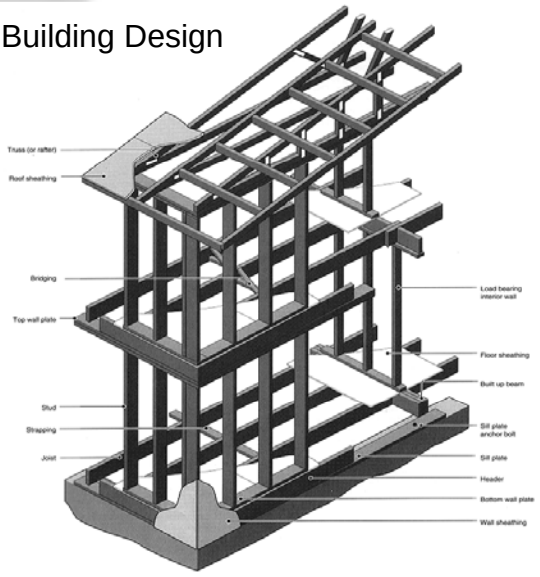
Basic Structural Units

- With the primary structural elements of column, beam slab and load-bearing wall, it is possible to form a basic structural unit capable of defining and enclosing a volume of space for habitation. This structural unit, whether used alone or in a repetitive manner, is the basic building block for a building's structural system.
- In wood framing, the post, beams, headers, shear walls and studs create an economical and 3 dimensional skeletal framework with a potential for openness.
- Horizontal "slabs" are created by concrete slabs on grade and plywood sheathing at the floors and roof. The plywood sheathing supported by a integrated system of columns, posts wall framing and shear wall define the horizontal layers of space.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

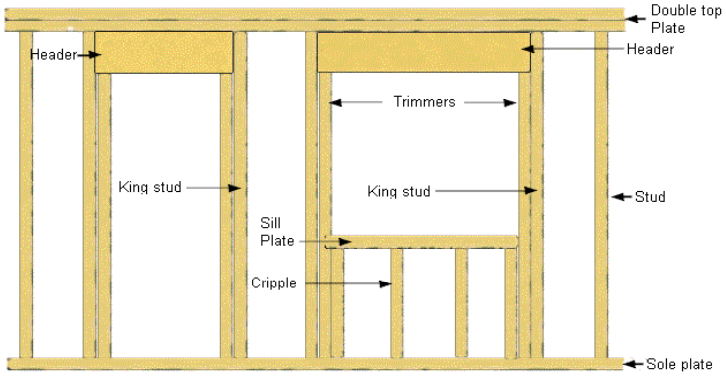
1. Wood Framing & Building Design



Residential Wood Framing

1. Wood Framing & Building Design

Basic Components of a Framed Wall



Components of a framed wall
Showing rough door and window openings

Residential Wood Framing

1. Wood Framing & Building Design

Lateral Stability

A building's structural element must be:

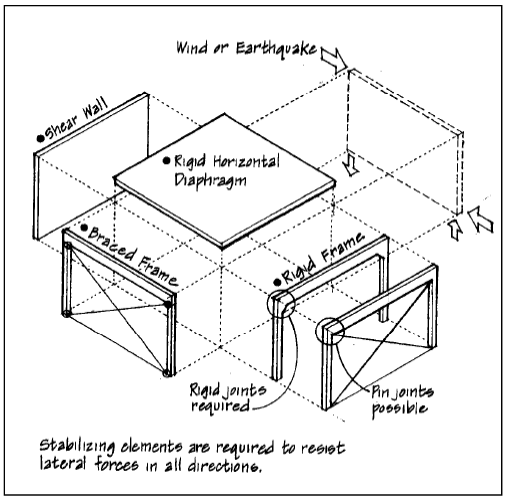
- Diagonal Bracing (timber or steel) Bracing a frame with diagonal members.
- Rigid Frame (steel or reinforced concrete) Developing a frame with rigid joints capable of resisting changes in angular relationships.
- Shear Wall (wood, concrete, or masonry) Using a rigid planar element capable of resisting shape changes.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

Lateral Stability



Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

1. Wood Framing & Building Design

Lateral Stability

Lateral stabilizing may be placed within a building or along its perimeters, and combined in various ways.

In all cases, however, a number of stabilizing elements must be used to resist lateral forces in all directions.

Ching, F., Adams, F. (1991). Building Construction Illustrated Second Edition. Van Nostrand Reinhold.

Residential Wood Framing

2. Construction Drawings

Where do I find framing stuff and how can I visualize the finished building before picking up a hammer?

General Notes

- Division 1- General notes may refer to structural engineers report that contains calculations for the building
- Division 16- Rough carpentry typically delineates the grade and species of lumber (studs, posts, beam, sheathing) to be used in building

Site Plan

Typically shows the set back surrounding the concrete pad, the site plan will show where the building is located on the site

Residential Wood Framing

2. Construction Drawings

Where do I find framing stuff and how can I visualize the finished building before picking up a hammer?

Foundation Pages

- Typically shows the overall dimensions of the individual building plan
- Indicated the location of hold-downs, PA straps
- Usually contains a written description of the composition of the concrete

Residential Wood Framing

2. Construction Drawings

Where do I find framing stuff and how can I visualize the finished building before picking up a hammer?

Floor Framing Plan

- The written portions will typically contain:
  - Framing notes
  - Sill plate nailing
  - Lateral shear notes
  - Balloon framing notes
- The graphic portions depicts the placement and size of framing components- headers beam, shear walls (plywood, gypsum wall board, and stucco). The framing plan will make reference to structural details.

Residential Wood Framing

2. Construction Drawings

Where do I find framing stuff and how can I visualize the finished building before picking up a hammer?

Structural Details

Typically the detailed enlarged representation of shear transfer assemblies:

- Cross section of concrete
- Anchor bolt details
- Strapping details
- Hold down anchors

Residential Wood Framing

3. Foundations

The foundation system for a building – its substructure- is the critical link in the transmission of building loads to the ground.

Bearing directly on the soil, the foundation system must distribute vertical loads so that settlement of a building is either negligible or uniform under all parts of a building.

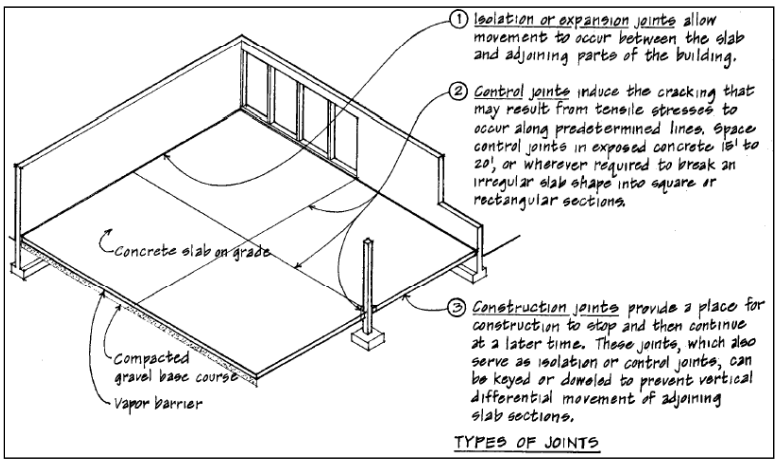
It must also anchor the building's superstructure against uplifting and racking due to wind or earthquake forces.

The most critical factor in determining the foundation system of a building is the type and bearing capacity of the soil to which the building loads are distributed.

Residential Wood Framing

3. Foundations

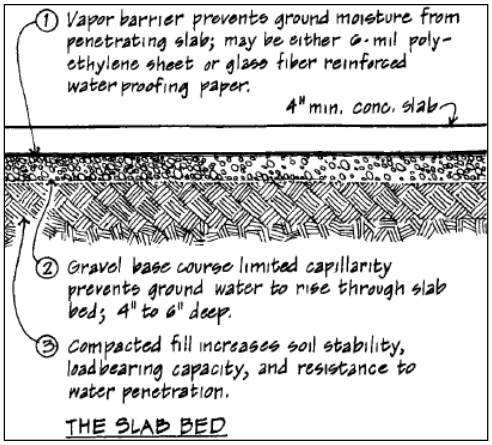
Concrete Ground Slabs



Residential Wood Framing

3. Foundations

Concrete Ground Slabs / Slab on Grade



Residential Wood Framing

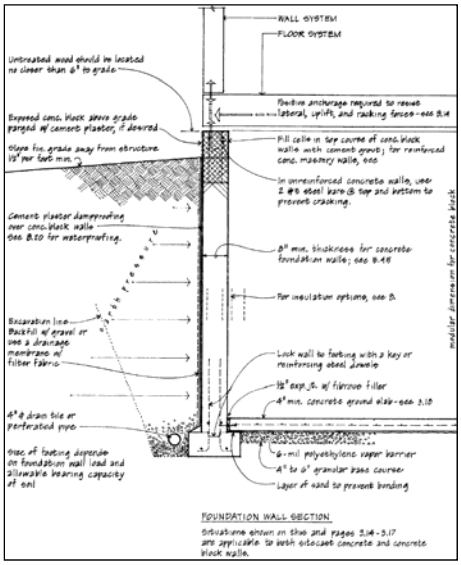
3. Foundations

Slab on Grade

Residential Wood Framing

3. Foundations

Foundation Wall Section
(stem wall)



Residential Wood Framing

3. Foundations

Stem Wall