Framing Systems

Framing systems are the basic structure used in the majority of new residential construction. Typically comprised of either wood or steel members, light frame construction provides a cost-effective, quickly assembled, and adaptable structure for building. Light frame construction can be used to build platforms, walls, ceilings, and roofs. The wood frame creates a skeleton for the house, which is stabilized using components such as sheeting and bracing.

Dimensional Lumber

Dimensional lumber is the most common material used for framing a building. Wood frame walls typically consists of 2x stud construction. As the most common mode of residential construction it is often the baseline against which alternative building techniques are measured, including in this document.

Advanced Framing

Advanced wood framing is a construction technique that uses a deeper stud (2x6 rather than 2x4) spaced 24" on center. Advantages in this system include direct load transfer, increased insulation depth, and reduced thermal bridging. The last two of these changes lead to greater energy savings. In some designs, the application of advanced framing techniques will decrease the overall amount of lumber need to frame a house.

Engineered Studs

Examples of engineered studs include laminated strand lumber, laminated veneer lumber, and parallel strand lumber. Most engineered studs are created from small, fast growing, easily replanted timber. To create an engineered stud, small pieces are bonded together with glues under compression and high heat. Studs are then milled into standard sizes and installed like dimensional lumber. Engineered lumber has a greater structural resistance than comparably sized dimensional lumber. The increased structural

(FIG.A) DIMENSIONAL LUMBER is the most typical material used in residential construction due to its ease of construction, familiarity, and relatively low cost.

(FIG.B) STEEL STUD FRAMING is a viable alternative to dimensional lumber framing and in large volumes can provide cost savings for the builder.

(FIG.C) TRUSSES offer a speedy alternative to traditional lumber joists in both floor and roof systems bridging larger spans and flexibility in the running of MEPs.

framing	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
conventional framing	+	+			+							+	+	+		
advanced wall framing						+			+							
engineered wood stud framing						+			+		+				−	
steel stud framing						+	+	+				−				
engineered wood floor trusses		+										−				
engineered steel floor trusses			+					+				+				
engineered wood roof trusses			+									+				
engineered steel roof trusses			+					+				+				

capability of engineered lumber is why it is often used when large beams or long spans are required.

Steel Studs

Another alternative to dimensional lumber framing is steel stud framing. While more typical in commercial construction, it is nonetheless a viable alternative in residential construction. When used in large volumes steel studs can provide cost savings for the builder. Although they require more precise methods of connection than wood framing, steel studs offer heightened structural capacity and other advantages.

Engineered Roof and Floor Trusses

Commonly used in residential development, engineered wood and steel roof and floor trusses can allow for greater spans than conventional lumber. Manufactured off site in a controlled environment, the precision and consistency of quality are viewed as major advantages. Additionally, open web trusses allow for utilities to run in either direction without cutting through lumber joists. Roof trusses can allow flexibility in form. Engineered wood floor trusses are typically constructed in an open-web design consisting of mostly 2x4 lumber connected at joints with metal plates.

Coastal builders must address the many challenges in making residential structures resilient in an environment with high winds and humidity. Ensuring that joints are properly sealed and connections strapped, regardless of the framing system used, is essential.

FURTHER INFORMATION

Energy Efficiency and Renewable Energy-Clearinghouse (EREC):
www.eren.doe.gov/buildings

Toolbase:
http://www.toolbase.org/PDF/DesignGuides/

OTHER TYPES OF FRAMING SYSTEMS

4 FRAMING SYSTEMS

subjects

Conventional Wood Framing

Overview: Dimensional lumber is by far the most popular wall framing material because it is readily available, easy to work with, and comparatively less expensive than other framing materials. Douglas fir and pine are some species frequently used to make framing lumber.

Materials such as steel and concrete are also used for framing. These materials can support more weight than wood framing, but are generally more costly and require special equipment and skilled professionals.[1]

INSTALLATION

Construction Process: Conventional wood framing is a process of construction where walls are framed on the slab or sub-floor, depending on the foundation and elevation of the house, and then tipped vertically into position.

Each exterior wall is laid out with a horizontal double top plate and bottom plate, and is most often framed with 2x4 studs spaced 16" on center. If openings for windows or doors are required, horizontal members are inserted at the proper width - a sill on the lower edge of the opening, and a deep load-bearing header on the upper edge of the opening.

Exterior walls are braced in position and then interior walls are framed and secured. At this point, walls should be strapped to the rim joist or foundation as well as at openings and at a regular interval along the wall in accordance with local code.

Finally, a roof will be framed in a similar manner using joists and ridge beams, or constructed using engineered trusses. This roof system will be strapped to the wall frame to complete the structural framework of the building.

Speed of Construction: Dimensional lumber framing is the most widely used method of wood residential construction and therefore provides a level of familiarity

(Fig. 1) A wall and doorway are shown framed in at a house on Mississippi's Gulf Coast

which allows for expedient construction. An experienced crew can frame a building in a matter of days.

Delivery Method: Dimensional lumber will typically be delivered to the site from the lumber distributor on a flat-bed truck in packages relating to the building sequence.

Required Equipment: Hammers or nail guns, nails, chop saw (or equivalent), any relevant hangers and/or straps.

Specialized Labor: Aside from basic carpentry knowledge, no specialized labor is needed for wood frame construction.

PERFORMANCE

Wind Load: Dimensional lumber, if properly spaced, sheathed and nailed, can be framed to withstand wind loads exceeding the 140 miles per hour required in hurricane-prone areas.

Water Resistance: Wood is prone to rot and mold and should be kept dry on site and inspected before walls are sealed, to ensure the elimination of any mold that may be present.

Fire Resistance: Wood is a combustible material and code mandates that fire blocking be installed if interior wall heights exceed 10 feet. Any vertical penetrations from electrical or plumbing lines must be fire-caulked.

Energy / Thermal: A typical wood wall that contains no insulation provides an R-value of around 3. Adding standard batt insulation to a 2x4 wall can bring its R-value up to 15.

Life Span: Despite many claims of conventional wood framing's shorter life spans, the life span of the building depends more heavily on the exterior cladding and construction of both interior and exterior walls, which protect the wood studs from moisture and exposure.

Common Failure: Failure in dimensional lumber framing arises mostly from problems of moisture exposure. Failure can also result from improperly connected joints or insufficient or incorrect fastening to adjoining members of the wall, roof, and floor systems.

DESIGN

Environmental Impact: After a long period of poor forestry practices, dimensional lumber production has moved toward more sustainable growing practices.

(Fig. 2) With an experienced crew, a house can be framed in a matter of days.

(Fig. 3) Basic carpentry knowledge is needed for wood frame construction.

(Fig. 4) It is important to ensure studs are properly strapped according to local building codes to prevent failure in a high wind event.

Lumber companies have begun branding many of their products to reflect the improved practices in the planting, harvesting, and nurturing of the trees associated with the milling process.

Versatility / Flexibility: Conventional wood framing techniques have been modified and adapted for centuries, and the flexibility and familiar nature of wood makes it versatile.

Market Exposure: As the prevalent material for residential construction, the market exposure of lumber framing is extremely high.

Code Approval: Conventional lumber frame construction complies with Residential Building Code.

Affordability: The affordability of dimensional lumber is one of the reasons it is the dominant framing material.

Coastal Considerations: The most critical factor in framing on the Gulf Coast is proper strapping and affixing of all fasteners. In a high wind situation, it is important to follow code requirements for additional sheathing, strapping, or framing.

GULF COAST AVAILABILITY / LOCAL MANUFACTURERS

Retailers in the Gulf Coast Area include: Nearly every building supply retailer carries dimensional lumber. These include major and local chains:

- Lowe's
- Home Depot
- 84 Lumber
- Home Town Lumber & Supply Incorporated
- Ocean Springs Lumber & Supply Co.
- McDonald W A & Sons
- Biloxi Lumber Co
- Bailey Lumber & Supply

(Fig. 5) Exterior walls are held plumb by bracing until interior walls are framed.

Advanced Wood Framing

Overview: Advanced wood framing is a technique that uses a deeper stud (2x6 rather than 2x4) spaced 24" on center in order to take advantage of direct load transfer, increase the insulation of walls to reduce energy loss, and decrease the overall amount of lumber used during framing.

INSTALLATION

Construction Process: Advanced wood framing is installed similarly to conventional wood framing but employs 2x6 studs at 24" on center, rather than 2x4 studs at 16" on center. One way in which it differs from conventional wood framing is the turning of a corner with a simpler two-stud construction. Additionally, there are techniques that must be implemented to adjust for the added depth of the wall and 24" spacing in relation to doors and windows.[2]

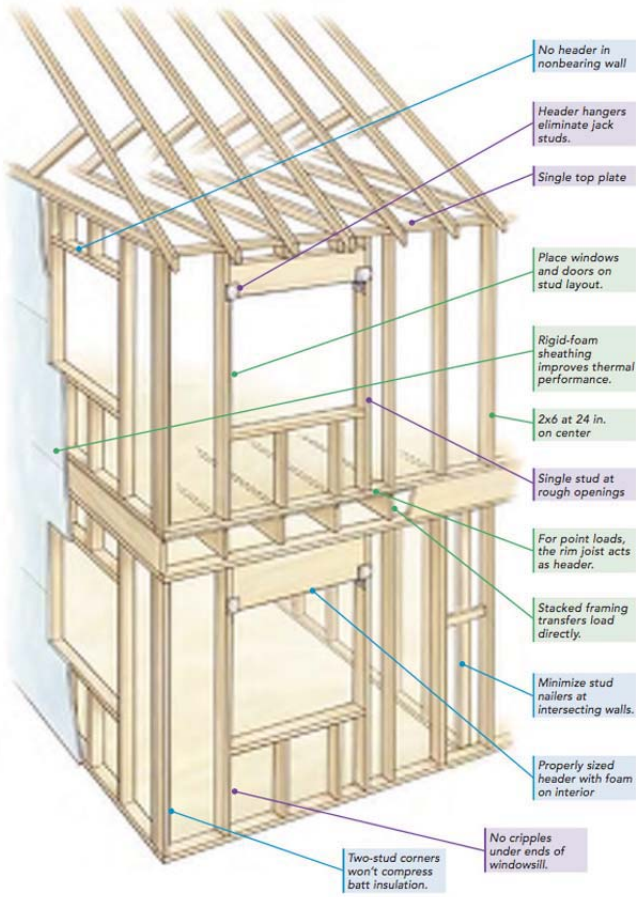
Beside the need to familiarize a crew with the code requirements, advanced wood framing is simpler than 16" spacing. It creates a house-wide 24" module that will align stud, joist, and rafter in a single line and ideally minimizes inaccuracies or missteps in the integrity of connections between the three.[3]

Speed of Construction: Advanced wood framing is not significantly faster than conventional lumber framing.

Delivery Method: Dimensional lumber is widely available and will typically be delivered to the site in packages as construction progresses.

Required Equipment: Hammers or nail guns, nails, chop saw (or equivalent), any relevant hangers and/or straps

Specialized Labor: Other than familiarizing a crew with the construction techniques, no specialized labor is necessary for advanced wood framing



(Fig. 6) Using advanced framing techniques increases the interval between studs from 16" to 24" O.C.

PERFORMANCE

Wind Load: Despite wider spacing, advanced wood framing's increased stud size results in similar wind performance as standard lumber framing.

Water Resistance: Wood is prone to rot and mold and should be kept dry on site and inspected before walls are sealed, to ensure the elimination of any mold that may be present.

Fire Resistance: Wood is a combustible material and code mandates that fire blocking be installed if interior wall heights exceed 10 (ten) feet. Any vertical penetrations such as electrical wiring or plumbing requires fire caulking.

Energy / Thermal: A typical wood wall that contains no insulation provides an R-value of around 3. Adding standard batt insulation to a 2x6 wall can result in a wall with an R-value of up to R-22.

Life Span: Despite many claims of conventional wood framing's shorter life spans, the life span of the building depends more on the exterior cladding and the construction of both interior and exterior walls to protect the wood studs from moisture and exposure.

Common Failure: Failure in advanced wood framing, as in dimensional lumber framing, arises mostly from the problems of moisture exposure. Failure can also result from improperly connected joints or insufficient or incorrect fastening to adjoining members of the wall, roof, and floor system.

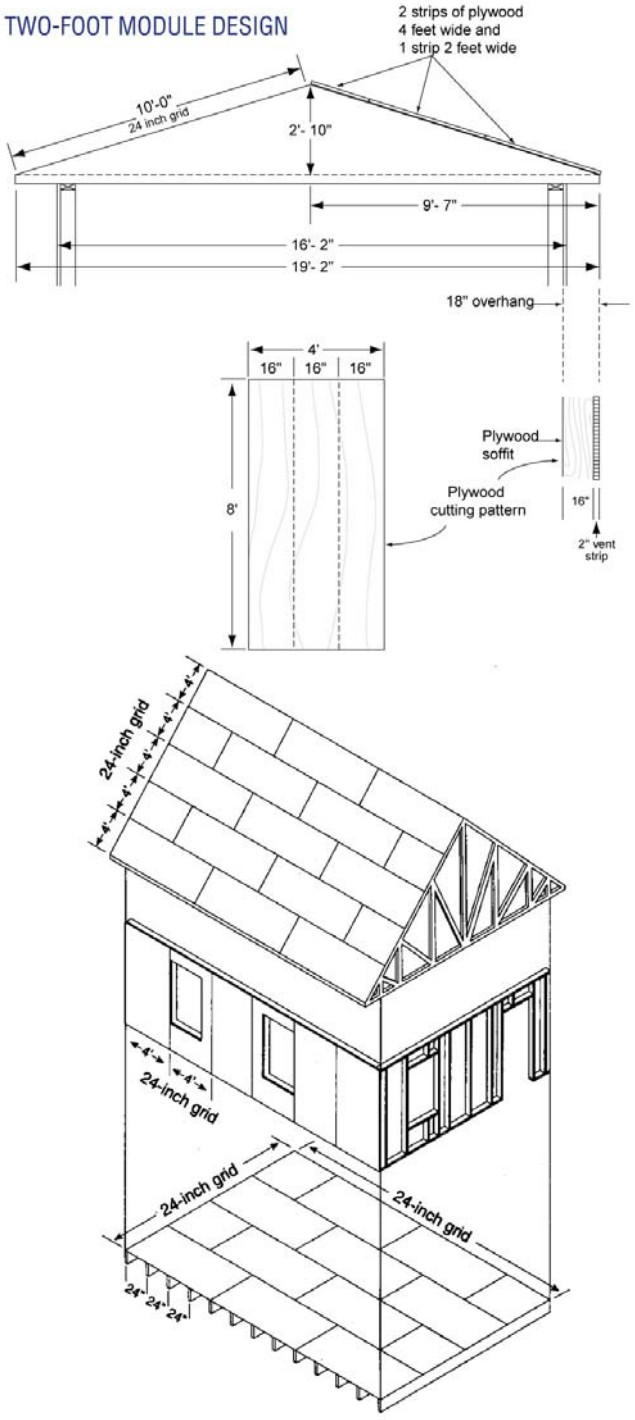
DESIGN

Environmental Impact: One of the main advantages of advanced wood framing is the increase in whole wall R-value. This is achieved with the greater wall depth and additional insulation, as well as reduced thermal bridging, all of which lead to energy savings for the home owner.

Versatility / Flexibility: As a lumber-based system, an advanced wood framing system is very flexible. However, the 24" spacing has more code restrictions, such as lateral bracing and strapping requirements. In addition, more planning is required in determining the framing layout in the field.[4]

Market Exposure: Advanced wood framing techniques are still not widely used. This system's popularity is likely to grow as the benefits of and differences from conventional wood framing are more widely understood.

Code Approval: Advanced wood framing is allowed by



(Fig. 7) The two-foot module allows the entire structural system to align. The consistent dimensions minimize waste.

residential building codes but may need to be introduced to, discussed with, and demonstrated to code officials to gain their confidence in this alternative system.

Affordability: Although the cost of a 2x6 is greater than a typical 2x4 used in conventional framing, the reduced material usage and energy savings may offset this drawback.

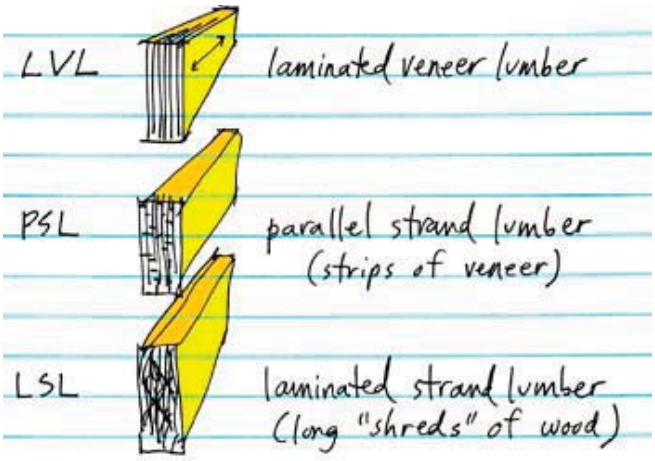
Coastal Considerations: A critical consideration for building on the coast is ensuring proper construction to withstand wind loads. In addition, local builders may face inspectors unfamiliar with this system.

GULF COAST AVAILABILITY / LOCAL MANUFACTURERS:

Retailers in the Gulf Coast Area include: Nearly every building supply retailer along the Gulf Coast carries dimensional lumber. These include:

- Lowe's
- Home Depot
- 84 Lumber
- Home Town Lumber & Supply Incorporated
- Ocean Springs Lumber & Supply Co.
- McDonald W A & Sons
- Biloxi Lumber Co
- Bailey Lumber & Supply

(Fig. 8) 2x6 studs on 24 inch centers, stack framed, single top plates, two stud corners, no jacks, no cripples. Almost 40 percent of the framing elements typical in traditional wood frame construction have been removed.



(Fig. 9) Engineered wood studs come in three main varieties that are delineated by the material and composition technique in the bonding process during manufacturing.

Engineered Wood Stud Framing

Overview: Engineered studs consist of Laminated Strand Lumber (LSL), Laminated Veneer Lumber (LVL), and Parallel Strand Lumber (PSL). They are made of small dimension, fast growth timber that can be easily replanted. The manufacturing process bonds wood components with glues and compression under high heat, and then mills them into standard dimensional lumber sizes. Because they are factory manufactured, their dimensions are more precise and consistent than standard dimensional lumber. Engineered studs are installed identically to standard dimensional lumber. [5]

INSTALLATION

Construction Process: Methods of construction are identical to standard dimensional lumber construction.

Speed of Construction: Although there may be a minimal amount of time saved due to the more regular nature of engineered studs, it is not significant in comparison to lumber framing.

Delivery Method: Methods of construction are similar to standard dimensional lumber construction.

Required Equipment: Hammers or nail guns, nails, chop saw (or equivalent), any relevant hangers and/or straps.

Specialized Labor: Methods of construction are identical to standard dimensional lumber construction.

PERFORMANCE

Wind Load: Engineered Lumber has the same structural resistance as comparably sized dimensional lumber

(Fig. 10) An LSL used as a header along with typical wood frame construction.

(Fig. 11) Finger jointed i-beam engineered studs arriving on-site in a lumber package delivery.

but can be designed to carry increased loads and spans if desired. This is often employed in beams or long span situations.

Water Resistance: Similar to dimensional lumber, engineered wood is prone to rot and mold. Additional water damage can occur when the glue is exposed to water if the lumber is not properly sealed. Engineered lumber should be kept dry on site and inspected before walls are sealed to ensure the elimination of any mold that may be present.

Fire Resistance: Engineered wood is a combustible material and code mandates that fire blocking be installed if interior wall heights exceed 10 feet. Any vertical penetration such as electrical wiring or plumbing requires fire caulk.

Energy / Thermal: Engineered wood provides no additional thermal advantages. With standard batt insulation builders can attain an R-value of 15.

Life Span: Due to its more precise construction, engineered lumber can reduce inconsistencies in the wall system. As a result, this system has been reported to reduce the possibility of mold growth inside the wall cavity.

Common Failure: Failure in engineered wood framing arises from the same problems as conventional framing: water and moisture exposure, improperly connected joints, and insufficient or incorrect fastening to adjoining members of the wall, roof, and floor systems.

DESIGN

Environmental Impact: Because engineered wood is manufactured using small dimension, fast growing trees such as aspen and poplar, it reduces depletion of old-growth forests.[6]

Versatility / Flexibility: Because components are formed to specification, engineered lumber is an extremely versatile building material.

Market Exposure: Although widely available, engineered lumber is typically viewed as a specialty product due to the cost differential between engineered studs and dimensional lumber.

Code Approval: Engineered lumber complies with typical residential building codes. A submittal consisting of load tables and specifications for installation and an evaluation report for building officials should accompany the construction drawings submitted for permitting.

Affordability: For wall framing applications engineered studs cost between 3 to 4 times more than dimensional lumber.

Coastal Considerations: Builders should follow code prescription for any additional sheathing, strapping, or framing needed to increase structural stability in preparation for high wind events.

GULF COAST AVAILABILITY / LOCAL MANUFACTURERS

- Gulf Coast Components LLC
- Phillips Frame & Truss Inc.

Gulf Coast availability of engineered studs is limited but many stores are able to place orders to out of state manufacturers. The following are some manufacturers in the region:

- Louisiana Pacific, Nashville, TN: http://www.lpcorp.com/
- Boise Cascade, Memphis, TN/Milton, FL: http://www.bc.com/
- Georgia-Pacific, Atlanta, GA: http://www.gp.com/build

(Fig. 12) A close-up of an engineered wood stud.

Steel Stud Framing

Overview: Steel framing, while more typical in commercial construction than residential, is a viable alternative to conventional wood stud framing. In large volumes, steel framing can provide cost savings for the builder. Although it does require different installation equipment and training in layout and construction, steel framing provides more structural capacity than wood framing.[7]

INSTALLATION

Construction Process: Although it requires a different set of tools than wood stud framing, ease of construction is comparable to standard wood framing techniques. Due to the sharp edges of site-cut steel members, safety is a consideration. Installers should wear eye and hand protection at all times while framing.[8]

Speed of Construction: Speed is comparable to standard wood framing once a crew is properly trained.

Delivery Method: Steel studs arrive on site in packages along with ceiling and floor tracks.

Required Equipment: Screwdriver, c-clamp locking pliers, sheet-metal locking/duckbill pliers, tape measure, straight-cut metal snips, miter saw with metal cutting blade, screws (self-tapping preferred), level (with magnetic strip is convenient), work gloves, eye protection[9]

Specialized Labor: Individuals that do wood framing can be trained to do steel stud framing.

PERFORMANCE

Wind Load: Steel studs can be designed to withstand required lateral forces seismic loads derived from local conditions and requirements.

(Fig. 13) Steel stud walls are constructed with upper and lower guide tracks that are attached to the ceiling and floor.

(Fig. 14) After setting the guide tracks the studs are attached to create the walls.

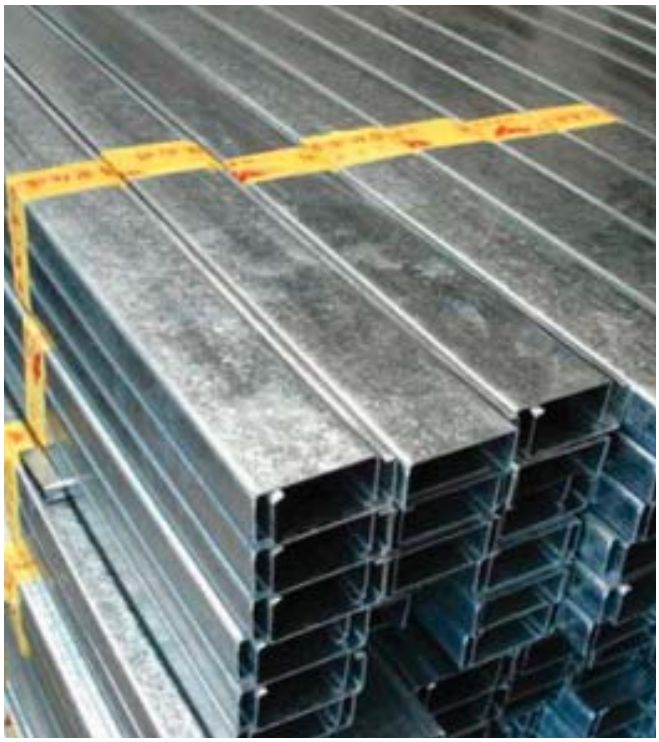
Water Resistance: Steel studs are typically coated with a water resistant material or galvanized in order to prevent rust and resist water damage.

Fire Resistance: Steel studs are fire resistant and non-combustible.

Energy / Thermal: The thermal properties of a steel wall are nearly identical to conventional wood framed walls. However, in northern states, different insulation practices may be required.

Life Span: Metal studs resist rot, insects, and mold, providing the possibility of a longer life span.

Common Failure: Failure can arise from improper connections to both roof and floor systems, especially in hybrid wood and steel systems.



(Fig. 15) Steel studs arrive on site in bundles similar to their wood counterparts.

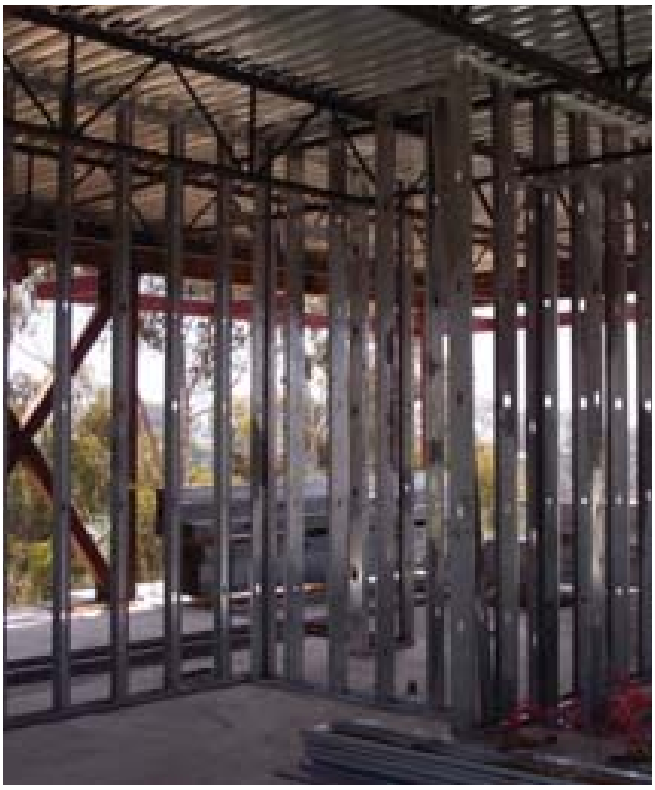
DESIGN

Environmental Impact: Steel studs are highly recyclable. Steel studs can be purchased at with varying amounts of recycled content. Some manufactures offer products with as high as 90% recycled content. A study cited by Whole Earth states that steel studs contain about 20% more embodied energy than dimensional wood lumber. [10]

Versatility / Flexibility: Steel-framed interior walls are typically not load bearing. If interior walls are to be load bearing, some planning is necessary, as larger or heavier gauge components are required. In general, steel framed walls are less flexible than their wood counterparts, as the 2-step process of laying track and infilling with studs makes sections more difficult to relocate on site than conventional wood framed walls. In addition, because wood blocking is needed where cabinets or other components are to be attached to the completed wall, preliminary planning is required to determine where these elements will go before walls are closed in.[11]

Market Exposure: Steel studs are sold in a variety of sizes comparable to dimensional lumber. Most home and lumber stores carry only the most typical 3 5/8" wide 25-gauge steel studs in 8-, 9-, 10-, and 12-foot lengths. These are used for framing non-load-bearing interior walls. Components in different widths and heavier gauges (for non-load-bearing and load-bearing exterior walls) can be special ordered through many larger retailers[12].

Despite increased availability and exposure of metal studs, wood remains the prevalent residential framing material in the United States. The American Iron and Steel Institute estimates that annually just two percent of new homes, or 27,000, are steel framed.[13]



(Fig. 16) A steel-framed wall system tied into steel floor trusses and steel pan flooring.

Code Approval: Steel stud construction complies with Residential Building Codes.

Affordability: Though the initial cost of the studs and tracks may be comparable to wood stud framing, there are additional costs to consider such as additional electrical costs to comply with code and the use of thicker drywall.

Coastal Considerations: One main issue can be the corrosion of the studs from contact with improper tools, which can cause chips or breaks in the protective coating. This can be avoided by using the proper installation tools and procedures.

(Fig. 17) Steel studs come in a variety of sizes, most of which are comparable to wood studs.

GULF COAST AVAILABILITY / LOCAL MANUFACTURERS

- PowerBilt Steel Buildings, Inc.
- Universal Steel Corp.

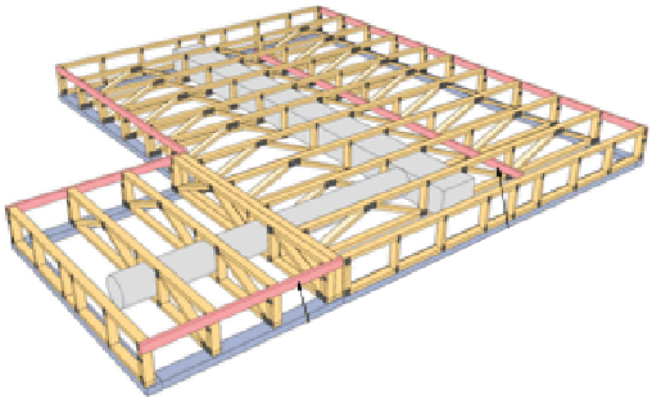
Gulf Coast availability of steel studs is limited but many stores are able to place orders to out of state manufacturers. The following are some manufacturers in the region:

- Allsteel & Gypsum Products Inc., Ft. Lauderdale, FL http://www.allsteelproducts.com/
- Craco Manufacturing, Inc. York, SC. http://www.cracometals.com
- Steel Construction Systems. Orlando, FL. http://www.steelconsystems.com
- Southeastern Stud & Components, Inc., Montgomery, AL.
- The Formetal Co., Inc., Forest Park, GA
- The Steel Network. Durham, NC. http://steelnetwork.com

Engineered Floor Trusses

Overview: Commonly used in residential construction, engineered wood floor trusses allow for much greater spans than conventional lumber. Manufactured off site in a controlled environment, their precision and consistent quality are major advantages. Additionally, open web trusses allow for utilities to run in either direction without the need for on-site cutting. Engineered wood floor trusses are typically constructed in an open-web design consisting of mostly 2x4 lumber connected at joints with metal plates.[14]

As a non-combustible alternative to the wood floor truss, engineered steel floor trusses are already being used in many commercial and multi-unit residential applications. They have yet to significantly infiltrate the single-family home market.



(Fig. 18) Floor trusses allow for utilities to run perpendicular within the confines of the structure.

INSTALLATION

Construction Process: Because they are built to specification, engineered floor trusses are delivered as an entire floor package. Trusses can save time and are relatively easy to install. Installation details provided by the manufacturers should be followed closely and will be familiar to a skilled construction crew. Steel trusses should be assembled by a crew with a knowledge of steel frame assemblies.

Speed of Construction: The main advantage of using a truss system is speed. With pre-cut and engineered steel trusses, the on-site labor for a house can be reduced greatly with a skilled construction crew.

Delivery Method: Floor trusses are ordered and delivered by a manufacturer to the site as a complete package, typically on a flatbed semi-trailer.

Required Equipment: Standard framing tools are the only tools necessary; larger trusses become unwieldy and

(Fig. 19) Trusses are assembled in a manufacturing plant.

may require a crane. This may be the case when using steel trusses or large wood trusses.

Specialized Labor: Although no specialized labor is required, construction crews should have a general understanding of the connections specific to the wood or steel truss packages.

PERFORMANCE

Wind Load: Engineered trusses are designed and manufactured to withstand wind loads based on geographical wind data and other factors such as specialized truss usage.

Water Resistance: As with all wood systems, engineered wood floor trusses are prone to rot and mold and should be kept dry on site. Steel trusses are typically coated with a water resistant material or are galvanized in order to prevent rust and maintain their water resistance.

Fire Resistance: Wood trusses have the same susceptibility to fire as other dimensional lumber. Steel roof trusses are fire resistant and non-combustible.

Energy / Thermal: The depth of engineered floor trusses, commonly 12, 14, 16, 18 or 24", provides adequate space for insulation to exceed residential building code requirements.

Life Span: Like any other wood system, wood floor trusses' durability depends greatly on the care used in construction to protect the trusses from moisture and exposure. In exposed and treated floor trusses, it is important to use properly treated nails and to protect the components from insects and small animals, which may be accomplished with screening. As is the case with steel studs, steel floor trusses resist rot, insects, and mold, which increases their life span.

Common Failure: Wood trusses typically fail due to moisture exposure, as well as in high wind events due to improperly connected joints or insufficient or incorrect fastening to adjoining members of the wall system. Failure can also occur in hybrid systems that are insufficient or improperly constructed.

DESIGN

Environmental Impact: All engineered floor trusses reduce on-site waste because they are manufactured. Steel trusses can be made of recycled material.

(Fig. 20) A truss used to create a platform-framed second floor. Gaps in the truss allow room for plumbing, electrical, and HVAC to run freely.

Versatility / Flexibility: Engineered wood floor trusses allow for long spans. The open web design allows for flexibility in placing mechanical, electrical, and plumbing systems. Additionally, a new industry development, trimmable wood floor trusses, allows the members to be shortened by creating either an I-joist on either end, or an end built of dimensional lumber and created separate from the existing truss plate.[15]

Market Exposure: The engineered open-web truss is the most common floor truss. Trusses are widely used in repeatable floor plans and houses built by developers and housing manufacturers, but are less common in individually contracted homes.

Code Approval: Engineered floor trusses comply with typical residential building codes. A submittal consisting of load tables and specifications for installation and an evaluation report for building officials should accompany the construction drawings submitted for permitting.

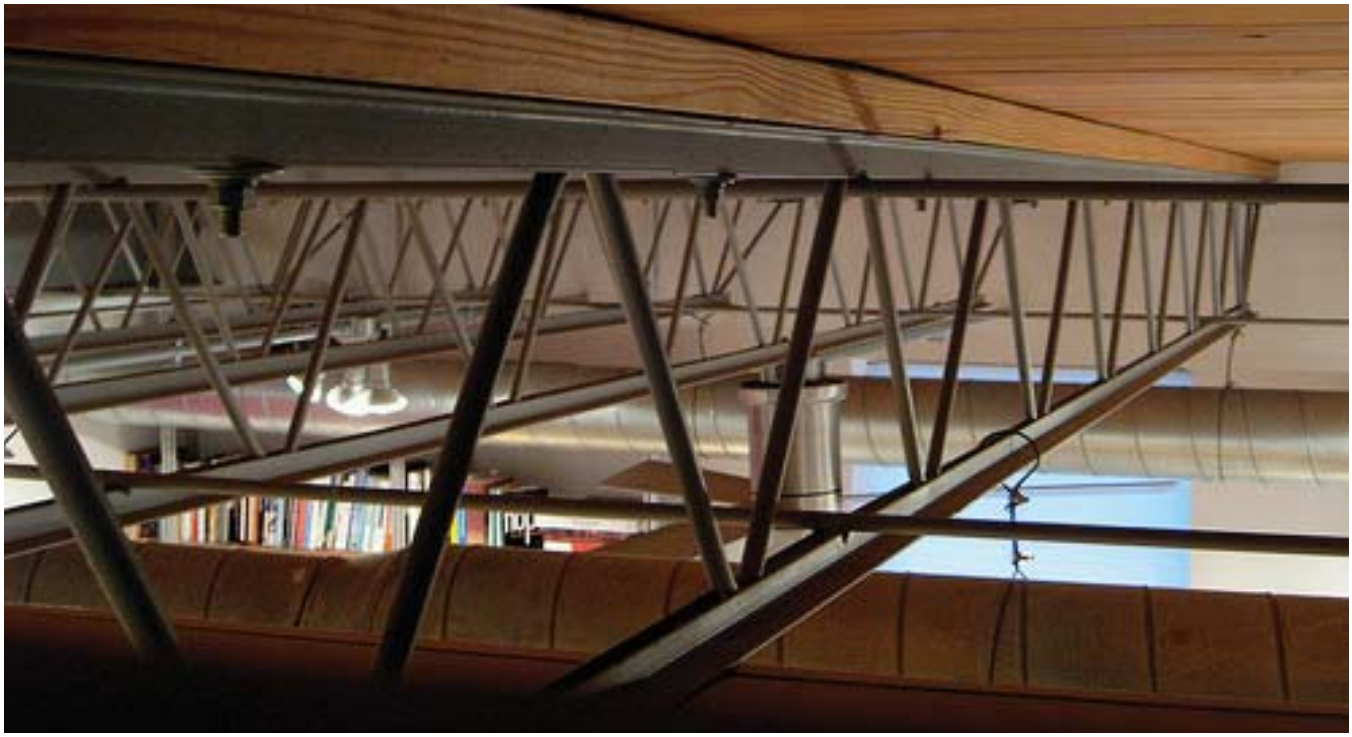
Affordability: Although trusses are more costly than conventionally framed roofs, they require less carpentry skill and save on overall cost of labor due to their relative speed of construction.

Coastal Considerations: Moisture is the biggest concern. Trusses should be properly covered to prevent mold growth and stored flat to prevent warping.

Like steel studs, steel trusses can corrode from contact with improper tools, which can cause chips or breaks in the protective coating. This can be avoided by using the proper installation tools and procedures.

GULF COAST AVAILABILITY / LOCAL MANUFACTURERS

- Gulf Coast Components
- Gulf Coast Truss
- Phillips Building Supply
- Phillips Frame & Truss Inc
- Pine Belt Truss Company

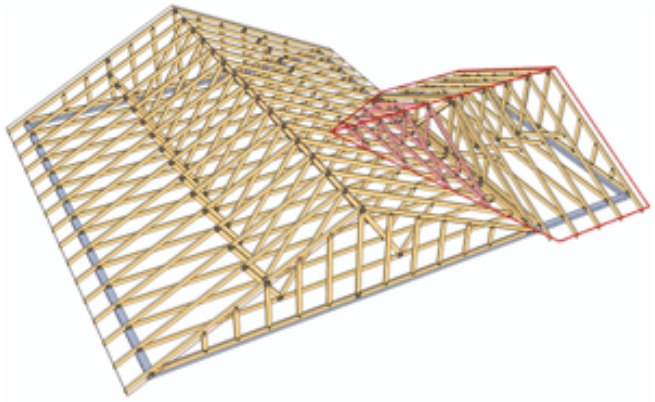


(Fig. 21) An engineered steel truss in a hybrid application.

Engineered Roof Trusses

Overview: Nearly all residential roofs are framed using one of two methods: standard dimensional lumber stick framing, or truss framing. Stick-framed roofs utilize individual rafters that span from the tops of exterior walls to the ridge. Truss-framed roofs are built from triangular-shaped, pre-made truss units. A truss is one continuous rafter/ceiling joist unit. Truss construction is as strong as stick framing, but is lighter weight and uses smaller components.[16]

Like wall studs and floor joists, rafters and trusses are spaced 16" or 24" on center. Most roofs utilize 24" spacings for strength and rigidity, while limiting the amount of material needed.



(Fig. 22) Trusses are cost effective. They save labor with fast installation, and can reduce job-site errors, cleanup, and waste. The open web design allows easy installation of plumbing, electrical, and HVAC.

INSTALLATION

Construction Process: Trusses offer a precisely manufactured, lightweight alternative to stick-framed roofs for simplified construction. Trusses are connected to the wall system, and blocking of a similar material is used to tie individual trusses together.

Speed: An advantage of truss construction is speed. Engineered trusses require less on-site labor than stick-framed roofs because the trusses are pre-assembled, easy to maneuver into place, and typically comprise both roof and ceiling construction.

Delivery Method: Roof trusses are ordered and delivered by a manufacturer to the site as a package, typically on a flatbed semi-trailer.

Required Equipment: Similar to floor trusses, standard framing tools are the only tools necessary; larger trusses may require a crane. This may be the case when using steel trusses or large wood trusses.

Specialized Labor: Although no specialized labor is

(Fig. 23) Blocking is nailed in place to tie the trusses together.

required, construction crews should have a general understanding of the connections specific to the wood or steel truss packages.

PERFORMANCE

Wind Load: Engineered roof trusses are designed and manufactured to withstand wind loads based on geographical wind data and other factors such as specialized truss usage.

Water Resistance: As with all wood systems, engineered wood roof trusses are prone to rot and mold and should be kept dry on site to avoid any mold growth. Steel trusses are typically coated with a water resistant material or are galvanized in order to prevent rust and maintain water resistance.

Fire Resistance: Wood trusses have the same susceptibility to fire as other dimensional lumber. Steel roof trusses are fire resistant and non-combustible.

Energy / Thermal: The depth of engineered floor trusses, commonly 12, 14, 16, 18 or 24", allows for insulation to exceed residential building code requirements.

Life Span: Like any other wood system, wood floor trusses' durability depends greatly on the care used in construction to protect the trusses from moisture and exposure. In exposed and treated floor trusses, it is important to use properly treated nails and to protect the components from insects and small animals, which may be accomplished with screening. As is the case with steel studs, steel floor trusses resist rot, insects, and mold, which increases their life span.

Common Failure: Failure may arise from improper connections to wall systems during high wind events when sudden uplift occurs.

DESIGN

Environmental Impact: Engineered roof trusses can reduce on-site waste because of their precise manufacturing. Steel trusses can be comprised of recycled material.

Versatility / Flexibility: Engineered roof trusses allow for longer spans. The open web design also allows for flexibility in placing mechanical, electrical, and plumbing systems.

Market Exposure: Trusses are widely used in repeatable floor plans and houses built by developers and housing manufacturers, but are less common in individually contracted homes.

(Fig. 24) Lightweight steel trusses allow for design flexibility and are resistant to corrosion.

(Fig. 25) Roof trusses are typically constructed with 2x4 or 2x6 lumber.

(Fig. 26) Wood roof trusses sit on an exterior bearing wall.

Code Approval: Engineered floor trusses comply with typical residential building codes. A submittal consisting of load tables and specifications for installation and an evaluation report for building officials should accompany the construction drawings submitted for permitting.

Affordability: Although trusses are more costly than conventionally framed roofs, they require less carpentry skill and save on overall cost of labor due to their relative speed of construction.

Coastal Considerations: Moisture is the biggest concern. Trusses should be properly covered to prevent mold growth and stored flat to prevent warping.

Like steel studs, steel trusses can corrode from contact with improper tools, which can cause chips or breaks in the protective coating. This can be avoided by using the proper installation tools and procedures.

GULF COAST AVAILABILITY / LOCAL MANUFACTURERS

- Gatorback Truss Manufacturing
- Gulf Coast Components
- Gulf Coast Truss
- Modern Homes & Equipment Co. Inc.
- Phillips Building Supply
- Phillips Frame & Truss Inc.
- Pine Belt Truss Company

(Fig. 27) Roof trusses can be configured in many different ways to account for ventilation, storage, or mechanical systems.

(Fig. 28) Similar to other dimensional building systems, trusses are delivered from the builder in packages according to specification.