Steel Framing

■ Advantages ■ Disadvantages

Steel framing is becoming more common in residential construction. The use of steel for framing residential construction has both advantages and disadvantages. Carefully consider both when deciding on your home's construction.

Construction Considerations. Steel offers dimensional stability. There is no shrinkage, and steel members have exact dimensions. Steel will not rot and is immune to insects.

There are three residential steel framing methods: stick-built construction, panelized systems and pre-engineered systems.

Stick-built. Layout and assembly of steel framing is the same as for lumber, except components are screwed together rather than nailed. Replacing wood framing with steel, stud for stud, requires skilled labor to field engineer the material. Raw materials may cost less than wood, but labor may be higher.

Panelized systems pre-fabricate walls, floors and roof components. This is efficient when there is a repetition of panel types and dimensions. Exterior sheathing or complete exterior finish is applied to the panel prior to erection. Panels can be made in the shop or field. A panelized system can be framed in about one fourth of the time required to stick build.

Pre-engineered systems take advantage of the structural properties of steel. They use steel efficiently and allow design flexibility unavailable with other systems. Pre-engineered systems require framing crew training by the supplier of the system. Most of the fabrication labor is done by the supplier. The materials in a pre-engineered system may cost 10-15% more than conventional 2x6 wood framing in the Southeast.

Resource Efficiency. Iron ore, limestone, and coal are all used in making steel. These materials are non-renewable substances mined from the earth. Steel is one of the most energy-intensive industrial materials, generating pollution and waste from all stages of the process, including coking coal, purifying iron, and galvanizing. On the other hand, steel is recyclable. It takes approximately one-fourth of an acre of mature trees to produce the wood framing for a typical house. The same house can be steel framed from the recycled steel in three or four junked cars. While overall the steel industry has a recycling rate of 66%, the average recycled content in steel framing is only 24%.

Thermal Efficiency. One of the biggest disadvantages of steel is its thermoconductivity. Steel is over 400 times more conductive of heat than wood. A steel framed wall will have an overall R-value of only 46-70% of a similarly wood-framed wall with the same amount of cavity insulation. Increasing insulation from 3½" to 5½" in steel framing does not proportionally increase the R-value. To increase R-value, it is more effective to go from 16" o.c. to 24" o.c.; in other words, reduce the number of places available for thermal bridging.

Thermal bridging occurs when steel spans from the outside to the inside of the building envelope. It can cause high heating and cooling bills; the need for larger HVAC equipment; and moisture condensation on the warm side of the wall which can lead to mold.

A thermal break of insulating sheathing should be used when framing with steel. If the insulating sheathing is fastened directly to the studs with metal connectors, a thermal bridge will occur at the fasteners. Install plywood or OSB sheathing or wood strapping on the studs and fasten the insulation to the panels or strapping to prevent thermal bridging.

Indoor Air Quality. Steel is inert, and releases no terpenes like wood or toxins like treated lumber. It is unattractive to insects and does not have to be treated for termites.

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