The Truss-Framed System For Residential And Light Commercial Buildings

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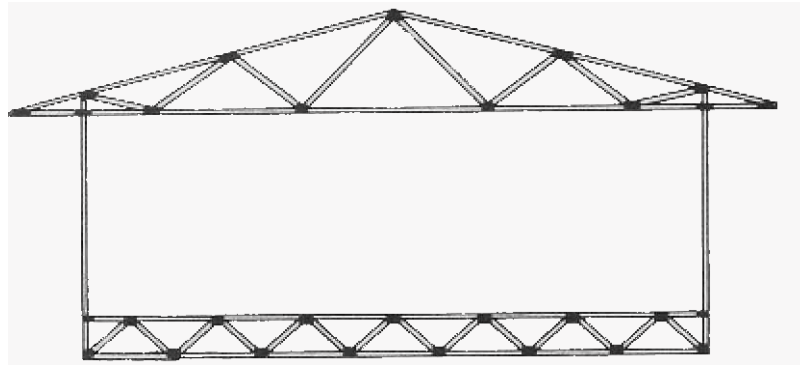


STRENGTH–The truss-framed system combined floor, walls, and roof into a unitized frame for structural continuity from the foundation up to the ridge.

The truss-framed system (TFS) is a new framing system conceived at the U. S. Forest Products Laboratory (FPL) as part of its mission to find efficient ways to utilize our Nation's timber resource. The system has been patented for public use and is available on a royalty-free basis to anyone interested in applying it.

The TFS concept shows great promise for both the builder and the home buyer. Since TFS has had only limited application in the U. S. to date, persons interested in the new technology will probably have difficulty finding someone to design and construct such a unit. However, to overcome this situation the U. S. Forest Service has developed plans for a nationwide information program to make more builders and truss fabricators aware of the attributes of TFS. Within the next 2 to 3 years it is estimated that TFS may be in actual use by one or more builders in at least 30 states.

Basically, TFS incorporates floor, walls, and roof into a unitized frame that provides structural continuity from the foundation up through the roof (Fig. 1). It overcomes conventional construction weakness in the connections between floor and wall, and wall and roof. TFS offers economical quality construction, design flexibility, fast erection, and added safety through improved structural integrity.

Applied Engineering

TFS extends the engineering principles that led to the success of prefabricated roof and floor trusses to the entire cross-section of the building. It advances "rule-of-thumb" building practices to a totally engineered system. Engineering design technology, already a part of the truss industry, can be applied to TFS.

Design requirements vary according to geographic location and building occupancy. Variables, such as imposed loads, frame spacing, clear span requirements, and material quality, can be quickly evaluated. Modifications in truss configuration, truss depth, etc., can be made to satisfy most of the preceding variables. Standardization of a few typical designs could eliminate the need for recurring engineering analyses.

Fabrication

Since truss frames would normally be fabricated in a plant under controlled conditions, materials can be efficiently utilized. For most applications, frames can be made with nominal 2 x 4's. Cutting schedules can be generated by computer to optimize usable material, and short pieces (normally culled) can be used for low stressed web members. Sawing operations are often automatically controlled to insure precision in fabrication. Finally, the proper grades of lumber are used according to strength requirements based upon applied engineering.

Site Erection

Speed of erection may be the greatest attraction of TFS. Since the floor, walls, and roof go up as a unit, the entire building can be erected almost as fast as setting conventional roof houses. The average house, 40 to 50 feet in length, requires only about 21 to 26 truss frames. One experienced TFS builder claims that he can erect the frames for a typical house in 1 hour and 30 minutes, and have it under lock and key that same day. Another builder is putting up four units per day with a single crew.

The truss frames for one or two buildings can be transported on a single truck. Depending upon site conditions, truss frames can be erected by hand or with various combinations of lifting equipment.

TFS offers a number of options in building construction. The component manufacturer can fabricate, erect, and finish the building. A general builder can purchase the frames, and do the erection and finishing work. Or the consumer can buy direct from the manufacturer and do the rest. There are six combinations of construction options within this process, and five have been used to date.

Structural Safety In Natural Disasters

It would not be practical or even possible to design houses for the most severe catastrophe, such as a direct hit by a strong tornado. But the probability of survival from most storm phenomena can be enhanced by incorporating disaster-resistant construction features.

Two considerations that led to the TFS concept were field observations following natural disasters, and full-scale testing at FPL. In most cases, failures occurred in the roof-to-wall or wall-to-floor joints before the structural

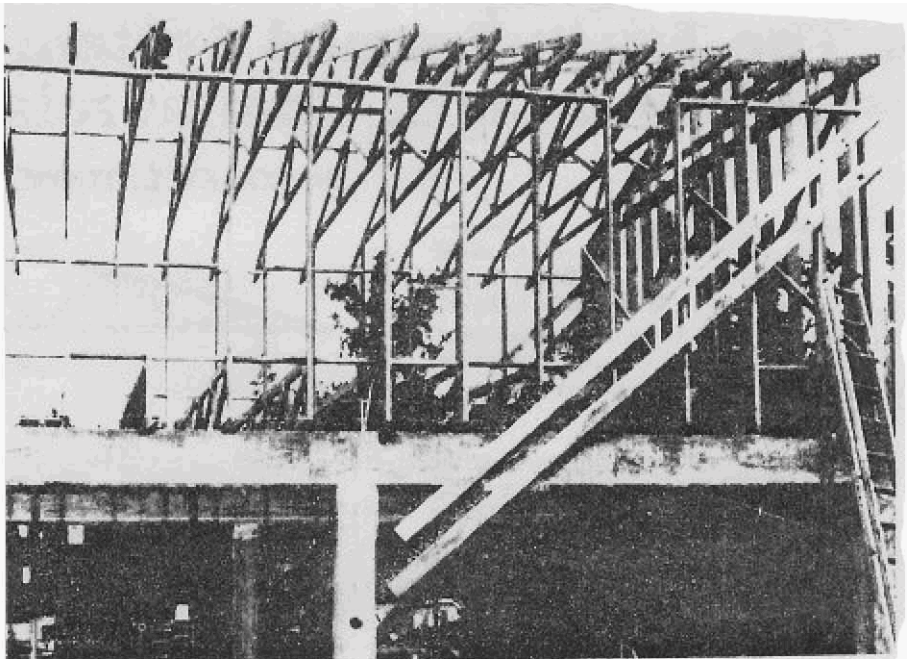
elements were stressed to failure. Investigations by the Commonwealth Scientific and Industrial Research Organization in Australia following cyclones Athea and Tracy indicated that most failures were due to construction errors (e.g., improper or inadequate nailing). TFS provides the structural continuity found deficient in conventional construction and the fabrication process reduces the opportunity for construction errors.

Florida Keys Truss, Inc., recently built a TFS house near Marathon, Fla. on an elevated concreate beam and pedestal foundation (Fig. 2). The house was built 10 feet above ground level for protection from storm surge during hurricanes. They also incorporated hurricane-resistant details to provide positive anchorage of frames to the foundation. Despite the elevated working conditions, training for this 1,500-square-foot house was completed in under 3 hours.

Summary

A new building concept has been introduced that shows promise as a viable alternative to present systems. TFS is a combination of factory and site construction. Truss frames can be fabricated in a plant under controlled conditions, then erected on site. The site builder gains protection from the weather in a short time, and can complete construction in a normal manner.

To date, approximately 90 TFS houses have been built, including 20 in Columbia, South America. Those using TFS are finding ways to modify and improve the basic concept to suit their particular needs. Some are planning large developments using TFS where the potential advantages could be throughly tested.



FAST–Florida Keys Truss, Inc., recently erected a 1500 square foot house in two hours and 50 minutes. It was built on an elevated concrete beam and pedestal foundation for protection from storm surge during hurricanes (Photo–Florida Keys Truss, Inc.)

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