Wood-frame houses

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SUBJECT WOOD-FRAME HOUSES

Wood-frame construction is the most commonly used building system in Canada for single-family houses. It accounts for about 75 per cent of all such houses built annually. The remaining 25 per cent are built with masonry exterior walls and these are located chiefly in the Toronto area. The proportion of wood-frame houses being built in the United States is even greater.

Economy

There are a number of reasons for the popularity of wood-frame construction but the chief one is economy. It is one of the least expensive methods in use for building well insulated houses.

Speed

Speed of construction is another significant advantage. A crew of four carpenters can have the roof on a house in about 4 or 5 days after the foundation is in place. Where the main framing is prefabricated this time can be reduced still further. This enables the interior to be completed independent of weather conditions. A typical wood-frame house can be ready for occupancy in from 2 to 3 months after the excavation for the foundation is started.

Versatility

The wood-frame house can be prefabricated or can be built piece-by-piece on site. There is a wide range in the degree of prefabrication that may be used. On the one extreme the builder may prefabricate only the wall framing and roof framing. At the other extreme, the entire house may be built in a factory and then moved to the site in half sections. In between these extremes is a wide range in the degree of prefabrication employed. Even the traditional site builder of wood-frame construction has greatly reduced the on-site labour content by the increased use of sheet materials and prefabricated components such as trusses, kitchen cabinets, and prehung doors and windows.

Insulation

Wood-frame construction is very easy to insulate at economical costs. A typical wall can be insulated at a cost of about 9 cents per square foot (5 francs per square meter) to provide approximately 8 times the thermal insulation of solid brick wall 25 cm thick. In a cold climate this is a very important advantage.

Installation of Services

Plumbing pipes, heating ducts, and electrical wiring can be readily installed within the wall spaces so that they are completely hidden by the wall or ceiling finish.

Exterior Wall Finish

Another significant advantage with this system is that it is amenable to a wide variety of exterior finishes including wood, metal, brick, stone, and stucco. Brick and stone finishes are applied as a veneer about 9 cm thick and are tied to the frame with metal ties. The use of such veneers although still very common seems to be declining since the introduction of metal sidings with durable paint finishes, some of which are about one-half the cost of brick veneer.

Limitations

Like every other building material, wood has its limitations and these must also be recognized in the design of structures so that allowances can be made for them.

Combustibility

As wood is combustible, the walls and ceilings in a typical Canadian house are finished with gypsum wallboard or a lath and plaster which provide considerable protection to the wooden members. In addition, the wall spaces are blocked off at the floor and ceiling level as further protection against the spread of fire. Where additional protection is required, for example, between dwelling units in the same building, this can be built into the wall by using thicker wallboard or plaster or by using a special gypsum wallboard designed for this purpose. Alternatively the separating wall may be constructed of masonry.

Sound

Wood construction is generally quite light and does not provide sufficient sound resistance between dwelling units unless special measures are taken in the design of the wall or floor to increase the resistance to sound. This can be done in a variety of ways. This is explained in a technical paper entitled "Noise Control in Residential Buildings" issued by DBR/NRC Ottawa, February 1967 (NRC No. 9192).

Decay

Under adverse conditions wood is subject to decay. If wood is used where it is exposed to the weather, the design details should be such to allow the water to drain away and not collect in a manner to keep the wood permanently wet. Periodic wetting and drying should cause no harm, but if wood is maintained at a moisture content exceeding 30 per cent for extended periods, it will decay. Wood should not be allowed to come in contact with the ground, or be exposed to excessive ground moisture. If there is an enclosed space beneath a building, a vapour barrier should be installed over the ground and the space

vented to the outside air to prevent the accumulation of ground moisture within the space. In the winter time, moisture can migrate from the living areas into the wall and roof spaces and condense. For this reason a vapour barrier must be installed on the warm side of the wall and ceiling insulation to prevent such moisture problems. In addition, the attic space above the ceiling insulation is usually vented to the outside to dissipate any moisture that may get by the vapour barrier.

All of these details are described in the book of Residential Standards, Supplement No. 5 to the National Building Code. Generally speaking, however, wood decay is not a serious problem.

Another limitation is change in dimension with change in moisture content. The greatest change in dimension occurs across the grain of the wood and there is relatively little dimensional change in the direction of the grain. Problems related to shrinkage are usually associated with the interior finish in the form of cracks in the interior finish or the raising of nail heads in the wall and floor surfaces. The wetter the framing material, the greater the likelihood of problems. Even where the framing lumber is not dry, however, techniques of applying the interior finish materials have been developed which can greatly reduce these problems.