

ADVANCED CONSTRUCTION TECHNIQUES USING ENGINEERED TIMBER

Poorva Swarnkar¹, Bhumish Singh Thakur², Milind Kumar³, Piyush Nirmalkar⁴

Under graduate^{1,2,3,4}

Miss MITALI SHRIVASTAVA

Assistant Professor (Civil Engineering)

Dept. Civil Engineering, Shri Shankaracharya Technical Campus, Bhilai, C.G., India

ABSTRACT: One of the most valuable and significant building materials is timber. Because there are many various types of timber, choosing the best one for your project requires careful consideration. Plywood and raw wood are two more common forms of using timber. Items like plywood planks and plywood blocks. To provide the strength, toughness, and longevity, heavy pattern doors and windows are made of solid wood/timber.

It is crucial to choose the proper kind of wood for the job because low-quality wood used in building might need to be replaced. One should take into account the quality of the wood while choosing it because it needs to be free of termites, fungi, and other types of degradation. **Keywords:** IGBTs, MCS 51 series 89c52 microcontroller, and 16X2 dot matrix LCD display are some of the terms used in this paper.

With an amazing 202,027 square feet of internal space, the University of Arkansas debuted the largest mass-timbered structure in the country in 2009.

Builders, however, are enthusiastic about more than just the additional structural strength that wood offers:

- When compared to steel and concrete buildings, mass timber construction is also more quicker, cutting down on build times by about 25%.
- Compared to steel and concrete, wood is far more aesthetically pleasant, improving the appearance of buildings.

KEYWORD:-

Timber

I. INTRODUCTION

A species of wood known as the Timber has been transformed into beams and planks. In the US and Canada, it is also referred to as "lumber." Timber or lumber is essentially the firewood or wood from growing trees. Timber or lumber can refer to any wood that can produce a minimum dimensional size. It is a step in the process of making wood. For structural purposes, timbers are utilised. Timbers are woods that have been prepared for

use in construction. Standard sizes of finished wood are provided to industry. Building homes and producing furniture both need wood.

1. Timber grows quickly, with softwood varieties being able to replenish more quickly than hardwood varieties
2. Compared to other materials like steel, which must be produced using furnaces that operate at high temperatures, timber does not require a significant amount of energy to be produced into a usable form.

3. Timber continues to store the extra carbon that is removed from the atmosphere for the entirety of its existence.

4 Timber is a natural product that is safe to handle, non-toxic, and does not release dangerous gases when it is cut or machined.

WOOD FOR MAKING A BUILDING'S STRUCTURAL FRAMES

Typically, a system of panelized structural walls and floors made of small-section wood studs and covered in board products is referred to as a "timber frame." The timber frame carries vertical and horizontal loads to the foundations. Neither timber post and beam structures nor timber constructed structural frames are typically used to describe it.

If the structural shell must be built rapidly, if the ground is very unfavourable, or if the design does not call for very long structural spans, timber frames may be the best option. Benefits and drawbacks of timber frame houses for further information.

There are several methods for creating timber frame structures:

1. Platform frames, in which each story is built by floor-to-ceiling timber panels and a floor deck that subsequently serves as the platform for the construction of the following level, are a popular method for building timber frames.
2. The use of insulation between load-bearing timber studs using the engineered stud method.
3. The twin stud method uses two parallel timber frame stud walls (sometimes with only one supporting the load).an insulated chamber separates them from the vertical load.
4. An insulating core is encased between two structural facings to make structural insulated panels (SIPs). The common vendors in the UK typically utilise the same structural facing oriented strand board (OSB). See Structural for more details. Cross-laminated timber (CLT) building

systems. See Cross-laminated timber for more information.

II. TYPES OF TIMBER

1. Bamboo Timber

A natural organic tree that is utilised to build houses is the bamboo tree. It is one of a kind on earth and unusual. Many nations have bamboo trees, particularly in tropical and subtropical areas.

South Asia is where you may find the majority of bamboo trees that produce timbers. The hue of bamboo can range from light yellow to nearly gold. It is one of the industrial materials and the most promising one for construction.



Fig 2.1 Bamboo Timber

2. TEAK Timber

Teakwood is the ideal type of wood to utilise while building structures. Although it is vulnerable to attacks from white ants and other insects, teakwood is a naturally resilient material with good worth. However, teakwood is favoured by builders because to its natural appearance, toughness, and long-lasting qualities.



Fig 2.2 Teak Timber

3.Cedar Timber

One of the high-quality wood varieties is cedar. It is made from a variety of trees whose wood is referred to as cedar. Cedar is the only saviour and ideal material for this, as it is when the strength and aesthetics of the



exposed wood beams are crucial criteria.

Fig 2.3 Cedar Timber

4 .Cherry Timber

Cherry wood is well recognised for being a form of wood from tree plantations. There are various types of cherry wood, but the only one with any commercial worth and a significant supply of native cherries is black cherry wood.

Eastern United Nations is where it is primarily found. Cherry wood's predominant quality is that its grains are often straight. One of the sources of hardwood is there. In general, cherry wood has a medium density and is moderately durable.

Veneers, handles, cabinets, and tiny pieces of furniture are among its primary applicationscherry Wood



Fig 2.2 Teak Timber

5.Mahogany Timber

As wood types, it is of great grade. Almost every continent makes use of it commercially. Mahogany is mostly utilised in the construction of furniture and cabinets.

It is used to create plywood and several types of trim. The grain is tough. Among the hardwoods that are frequently used, it is one of the softer woods.

Mahogany has a fair amount of natural sheen. Age causes its hue to deepen, and its medium, consistent texture.



Fig 2.2 Mahogany Timber

III. TEST ON TIMBER

Various Quality tests are carried out to determine the quality and sustainability of the Timbers. Several test protocols are listed in this article.

- Test for moisture content
- Test of tensile strength
- Test of compressive strength
- Test for shear strength
- Test of bending

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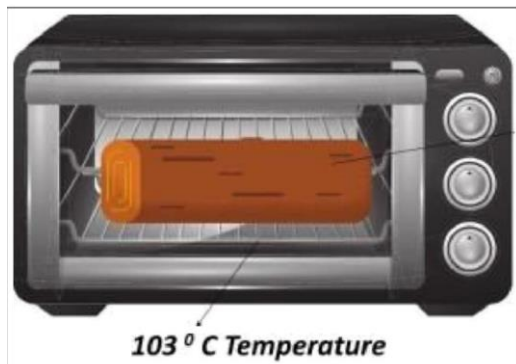


Fig 3.1 MOISTURE CONTENT TEST OF TIMBER

testing for wood's moisture content Relevant IS codes are J977 and IS 1 2380 (Part VI).

Test procedure

- Begin by taking a specimen that is 5 cm x 5 cm x 24 r in size.
- Next, weigh the specimen using a weighing machine. Add a W1 to it.
- After that, dry the wood in an oven set to 103 degrees Celsius.
- When the specimen dries out later, remove it.
- Weigh the dried specimen once more and record the result as W2.
- Lastly, determine the moisture content percentage by

percent of moisture content = $\frac{\text{Weight of moisture in sample}}{\text{Dry weight of sample}} = \frac{W1 - W2}{W2}$

• TENSILE STRENGTH TEST OF TIMBER

The tensile strength test determines a material's durability and resistance to breaking. We can also figure out how much weight the timber can support.

IS codes that apply:

J977 IS 1 2380 (Part VI)

Test procedure

- To start, measure a specimen that is 5 cm x 5 cm and 20 cm long.
- After that, set the specimen on the instrument's base plate.
- Apply load on the grains after that, either parallel or perpendicular.
- Note the weight at which the wood fractures.
- Lastly, figure out the wood's tensile strength.

Maximum applied force divided by cross-sectional area gives tensile strength.

test on wood

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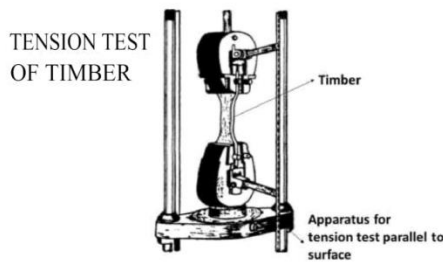


Fig 3.2 TENSILE STRENGTH TEST ON TIMBER

• COMPRESSIVE STRENGTH TEST

The compressive strength test determines the timber's crushing strength. The load that the wood can sustain over time is also determined by this test.

IS codes that apply:

J977 IS 1 2380 (Part VI)

test methodology

- Begin by obtaining a specimen that measures 5 cm by 5 cm by 20 cm.

The specimen should next be placed into the compressive testing apparatus.

- After that, put pressure on the grain-parallel direction.
- There shouldn't be any flaws in the specimen. Increase the load gradually.
- After that, record the load at which the wood breaks.
- Lastly, determine the compressive strength from the below formula.

Compressive strength = Load at which the specimen breaks/ Total area of the specimen

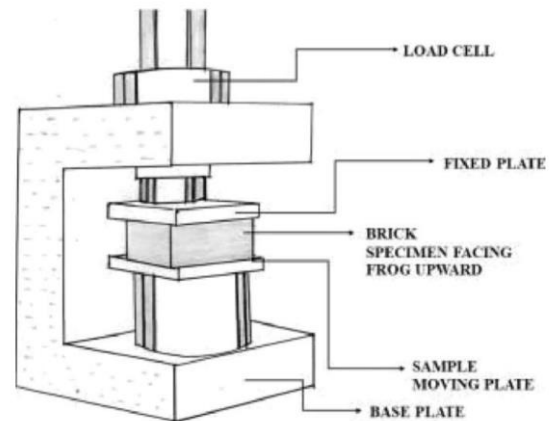


Fig 3.3 COMPRESSIVE STRENGTH TEST ON TIMBER

• SHEAR STRENGTH TEST

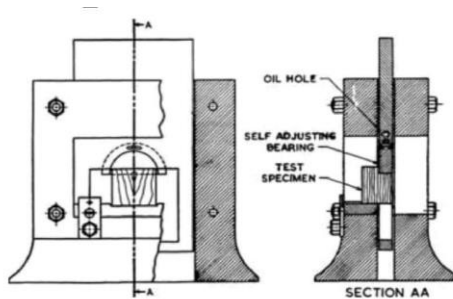
The shear strength is crucial when timber is used as slabs. Applying the load parallel to the grains is recommended.

IS codes that apply:

J977 IS 1 2380 (Part VI)

test methodology

- The specimen for shear strength measures 5 m by 5 m by 6.25 cm.
- Next, trim the specimen's corner.
- As a result, the 5 m x 5 m surface fails.
- But this failure happens radially or tangentially.



Testing arrangement for Shear parallel to grain

Fig 3.4 SHEAR STRENGTH TEST ON TIMBER

• BENDING STRENGTH TEST

When using timber as a beam, the Bending Strength Test is required. We can determine the modulus of rupture and modulus of elasticity with this test.

IS codes that apply:

J977 IS 1 2380 (Part VI)

test methodology

- To do this, use a specimen that measures 5 m by 5 m by 7.5 m.
- There shouldn't be any flaws or degradation in the specimen.
- After that, drop a hammer of a particular weight from a particular height.

As a result, the impact bending occurs.

- Lastly utilising the load and deflection, calculate bending strength

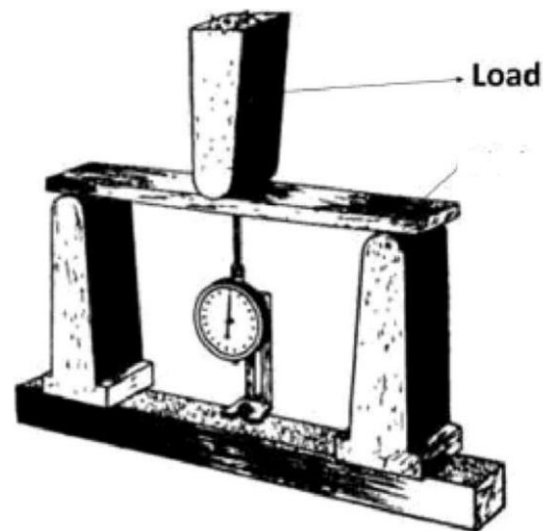


Fig 3.5 BENDING STRENGTH TEST ON TIMBER

IV. RESULTS:

Timber will normally be far less expensive than steel-framed buildings, but more expensive than brick, even if costs will vary based on the magnitude of a project and where it is sourced. Despite this, wood structures are more long-lasting and require less upkeep, which results in long-term cost savings.

Since wall, ceiling and roof panels are prefabricated, the rain- and windproof building structure can be erected from the top edge of the basement ceiling in no time at all. The final finishing tasks can then be completed without regard to the weather in a dry area.

The short time needed to fund both the new building and rented housing is the economic gain for the private home builder.

Value preservation

For a number of years, insurance companies and banks have valued wood frame building on par with other types of construction. The evident quality standard is the

cause of this. This guaranteed quality serves as another strong justification for public funding sources that offer subsidies. Quality assessments establish the worth of verified performance when it comes to reselling the property.

As long as routine maintenance is ensured, a building constructed with a wood frame today has a projected usable life of 80 to 100 years. Thus, there is hardly any distinction from traditional solid construction techniques.

V. CONCLUSION:

In this subject, we learned about the different types of lumber and how they may be used as a primary building material. Utilizing timber has a number of benefits, including being a sustainable resource and a versatile natural building material. It is easily accessible and may be purchased from a variety of building supply companies in Australia. Timber is non-toxic because it comes from a natural source. It is secure to handle, and it won't harm the environment as it ages. It maximises the Green Star Energy rating and carbon credits and is safe to reuse or recycle. Nowadays, most wood is certified or responsibly obtained to ensure a long life cycle. Because of its low density,

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