Restoration Toolbox

Initiated by Jugaadopolis

Introduction, Defects and Treatments

Material- Structural Timber- Roof

INTRODUCTION

Timber for Roof

Timber has been the traditional material for building roofs as far back as early Saxon times and beyond. It is still the roof material of choice for housebuilders and self-builders, whether they are building in traditional or contemporary styles or creating pitched or flat roofs.

A timber roof truss is a structural framework of timbers designed to bridge the space above a room and provide support for a roof. Trusses usually occur at regular intervals, linked by longitudinal timbers such as purlins. The space between each truss is known as a bay. Rafters have a tendency to flatten under gravity, thrusting outwards on the walls. For larger spans and thinner walls, this can topple the walls.

The popularity of timber as a roofing material is because it has been hitherto widely available, is generally light and easy to work with, has an excellent strength-to-weight ratio, can be an economic choice, usually has pleasing looks and can be an environmentally-friendly option when sustainably sourced. It is also bio-degradable. Also, loft space can be used for water tanks and storage. Timber was the most abundant and suitable material from which to build the roof structure.

Properties of Timber for Roofing

Lightweight -

The biggest property that makes wood a preferred material for roof trusses and other parts is its weight. Wood weighs less than steel, which is the other material that is ideal for trusses. The material is strong enough to accommodate the stress that it has to bear but not too heavy that it exerts undue pressure on the rest of the building.

Design Versatility -

Wood makes it easy for builders to create unique designs because it is wildly versatile. The material can be moulded into different shapes. If you are looking to construct an intricately designed building, then wood would make it less challenging than other materials.

Thermal Properties -

A timber roof won't allow heat to dissipate into the atmosphere, which makes the task of keeping a building warm less complicated. During construction, wood leave cavities that can be insulated thus, improving the energy efficiency of a building.

Cost-Effectiveness -

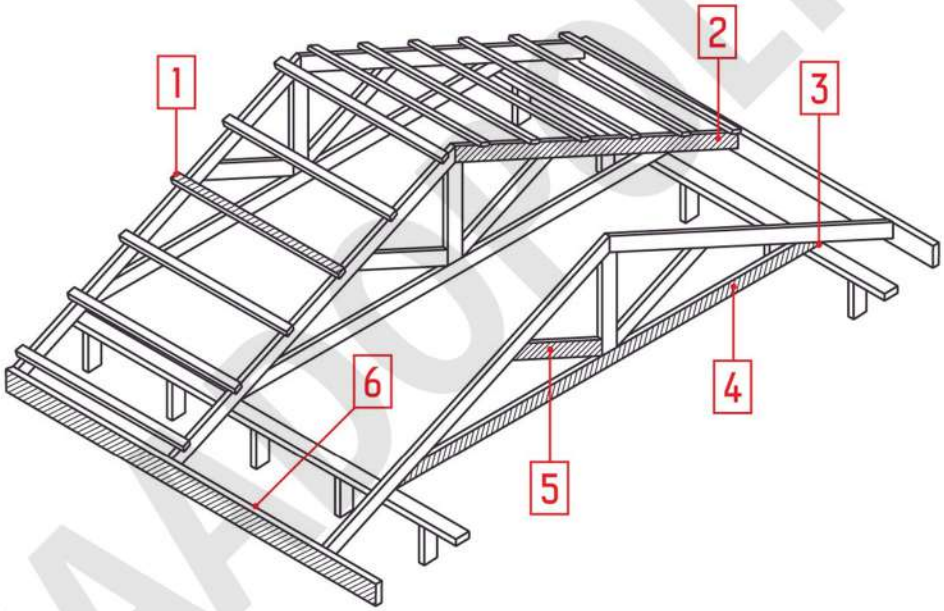
Cost is always a big determinant when putting up any building. A timber roof is one way to lower the costs of construction. Compared to steel, timber grows on trees as opposed to being engineered. Even when a roof is made of specially designed timber, it will still cost less than erecting a steel roof.

INTRODUCTION

Components of Timber Roofing

A truss is a structure comprising one or more triangular units. Each triangle is constructed with two top chords, a bottom chord and webs, all connected at the ends by joints. Roof battens are securely fixed to the truss top chords. Lightweight timber roof trusses are designed for the normal roof, ceiling and wind loads, and can be specifically engineered to accommodate heavy loads from solar units, air-conditioned units, hot water service, etc. Pre-fabricated, they allow quick and easy installations on-site, saving time and labour costs.

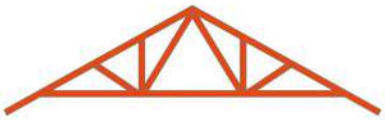
Roof Truss Components



1. Roof Battens
2. Top Chord
3. Pitching Point
4. Bottom Chord
5. Webs
6. Fascia

Types of Timber Roofing

KING POST TRUSS



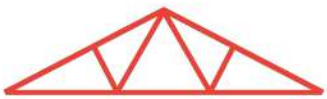
FAN TRUSS

PARALLEL CHORD ROOF TRUSS

QUEEN POST TRUSS

SCISSOR ROOF TRUSS

HOWE TRUSS



FINK TRUSS

DOUBLE FINK TRUSS

DOUBLE HOWE TRUSS

Restoration Toolbox

STRUCTURE OF TIMBER

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Various Maintenance Guidelines

MAINTENANCE GUIDELINES

General Maintenance and Guidelines

Problems with wooden structural members that support roofs are common and call for the experience of a structural engineer. Well, as your spirits are being lifted, the roof above you is typically being supported and held in place by massive wooden beams and rafters . They may be elaborate exposed trusses with carved tracery or simple frameworks hidden behind plaster ceilings. Employed since Roman times in buildings ranging from basilican churches to French Gothic cathedrals, the roof truss is a relative youngster compared to the arch, dome, and vault.

Regular Cleaning and washing helps.

Controlling the environment and surroundings, i.e., preventing decay and damage agents from becoming active, can help maintain wooden roof trusses that provide the structural framework between columns and/or bearing walls that support a building's roof. As a result, it comprises steps to regulate effects through environmental conditions as well as fire, water penetration, theft, and vandalism prevention. The effects of measurements performed on the urban environment should be considered in today's reality.

Repairs should only be made when absolutely necessary to prevent further degradation and preserve the surface decoration. Inspections are the foundation of prevention. In today's society, decisions about the preservation of timber structures should be made in light of their value to the environment, culture, and economic viability. According to Benny Kuriakose, carvings are extremely valuable and must be conserved at all costs, as stated in Intach's conservation brief. Once the decay is eliminated, the design of the timber part may be altered so that the ornamental element bears the weight.

Moisture deterioration from the failure of a roof covering is the single biggest cause of decay in wooden roof truss members. Leaking gutters, flashings, and mortar joints above beam ends raisethe moisture content of wood, inviting rot, fungal growth, and insect attack. Maintaining a watertight roof and the adequate ventilation of roof spaces to keep the moisture content of the wood low will inhibit fungal attack.

"Most failures occur at bolted connections that were either inadequately engineered at the time of construction or that have since failed due to deterioration," says J. Thomas Ryan, P.E., a consultant with Ryan-Biggs Associates, P.C. of Troy, NY. A less obvious fault may lie in deteriorated masonry walls which move and put unreasonable loads on the truss members.

The first sign of a structural failure may be severe bowing, or fresh cracks or splits. The inspection guide at right lists problems to watch for in annual inspections of wooden roof trusses.

A preliminary inspection will typically be followed by a proposal for a more detailed survey and analysis, if required.

Source: https://sacredplaces.org/uploads/files/647450436383893951-woodentrusses.pdf

MAINTENANCE GUIDELINES

In case of intensive treatments, some basic principles can be followed, such as -

1. Cleaning: Regular cleaning on the timber should be carried out to minimize the timber surface to grow mould, fungal, organic growths and airborne pollutants. The cleaning should be carried out using water and a mild detergent and soft brush, ensuring all the residual is washed away. If you choose to use high pressure waterblasters hold the nozzle at least 30cm away from the timber to avoid damage the surface of the timber, and not recommended to repeatedly concentrate the nozzle on one area for long period of time. Brush off leaves and debris from the timber using soft brush or scrub the timber with stiff broom and wash off the residual by rinsing water over the timber.

2. Drying Period: Leave the clean timber to dry and minimum require 3 to 7 days subjected to fine weather. The timber moisture content should be dry below 8% checked by using timber moisture meter to test the timber moisture content level.

3. Sanding & Stripping: Maintenance work and expense caused by using wrong application on your property, or leaving the maintenance period for too long. In general, timber maintenance is advised to do in every 6-12 months, if longer than the advised period, timber sanding and stripping is strongly recommended. A simple sanding helps timber to opens up the pores and allowing more stain to penetrate deeper into timber cell, this will providing an even, consistent and long-lasting finish.
Use 60 – 80 grit sand paper to remove the existing coating with a hand tool or machine sanding method, once the existing coating is completely removed, clean up the sanding dust from the timber surface, and then the timber is ready for coating application.
If the existing timber coating is using paint such like marine paint or wood paint, it must use paint stripper to strip off the existing paint before sanding. Use 60 – 80 grit sand paper to sand the timber let the timber pore open up, allowing coating to penetrate into timber cell.

4. Exterior Oil/Water-based Coating: There are 2 reasons that exterior oil is superior to other painted-on varnish or water-based products, (1) you don't need to sand back, or strip, but over 12 months period, sanding is recommended, (2) ease of maintenance again, simple cleaning and re-oiling the timber
surface, it cost effective and quicker.
When come to painted-on varnish or water-based coating product, you need to do sanding and stripping in every maintenance work. The reapplication of the coating is minimum 2 coats if the timber surface is fully bare. Otherwise one coat is recommended during maintenance period.
Before starting coating application, be aware of the following:
- Do not apply in direct sunlight
- Do not apply in wet weather
- Do not apply when the timber is still wet and moisture content is above 8%
- Do not apply when the temperatures are above 25 degree

Using the correct coating brush and pad, these two applicators are most effective for applying to timber as it provides you more consistent and even coating finishes.

5. Look after your project and property: Regular brushing and occasional washing away of leaves, soil or debris will keep the surface clean and defend against algae growth.
Any areas which are seen to be discolored, scratched or failing should attend quickly to avoid any further decay, discoloration, attack by insects. In most cases a cleaning and recoat the timber is all that's needed to restore the timber beauty of the existing finish.

Source: https://sacredplaces.org/uploads/files/647450436383893951-woodentrusses.pdf

MAINTENANCE GUIDELINES

Daily Maintenance and Guidelines

Although everyday maintenance for wood roof trusses is not required, but certain basic guidelines can be followed, such as:

- Use a duster or a dry cloth to dust your wood timber.
- Please use a brush to reach the deepest places of your wooden truss member.
- You can maintain your structure as well as truss clean while also sprucing it up in this manner.

- You should not use a damp cloth or a cleaning chemical on the truss systems.
- Do not use acids, strong soaps or abrasives on trusses.
- Water-based polish CANNOT be applied over solvent-based polish.
- For lighter cleanings on a sealed floor, just a quick mopping with plain water will do the job.

Daily Maintenance Benefits:

1. Easy Identification of defects

2. Cost effective

3. Early remedies prevent further damage

4. Readily available materials

MAINTENANCE GUIDELINES

Annual Maintenance and Guidelines

Pre Monsoon Work (March to June)	→	**Activity-** Inspect and Maintain only
Monsoon Work (July to Sept)	→	**Activity-** Planning
Winter Work (Oct to Feb)	→	**Activity-** Inspect, Repair and Maintain
Summer	→	**Activity-** Evaluate

The key to the durability of timber has already been identified as "keeping it dry". Most of the maintenance requirements outlined lead to the exclusion of moisture from the timber. Others are concerned with the integrity of barriers that control infestation by termites. The most important factor after timber installation is to maintaining the long term beauty and aesthetics of your exterior timber project is to do proper maintenance.

Timber appearance will degrade over time, maintenance requirement will vary, depending on the timber species, application, location, exposure and coating selected.

The most common problems are discoloration, loose boards, insect, decay, shrinking, cracking, mould and protruding nail. Timber maintenance should be carried out annually to ensure the timber appearance looking good as new.

Source: https://www.woodsolutions.com.au/timber-maintenance

Restoration Toolbox

STRUCTURE OF TIMBER

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Various Defects and Treatmeant Methods

STRUCTURAL TIMBER-ROOF

Minor Repair Methods

DEFECT- DISCOLORATION

1.IDENTIFICATION

The surface of timber truss might be discoloured due to exposure to chemicals, paints, etc. .

2.DEFECT

Cause-
Due to pollution, lack of maintenance & chemical factors.

3.TOOLS NEEDED

1 Cloth
2 Hydrogen peroxide
3 Bowl
4 Gloves and goggles
5 Mask
6 Measuring flask

TREATMENT INSTRUCTIONS

Step 1
Soak a cloth in 3% hydrogen peroxide. Take a clean rag and soak it with the peroxide.

Step 2
Press the cloth onto the stain. Take the rag and rub it a bit over the stain to wet the wood. Then lay it down directly over the stain and press it a bit so the peroxide soaks into the wood.

Step 3
Leave the cloth over the stain overnight. This isn't a quick treatment. The peroxide needs a few hours to lift and soak up the stain. Let it sit over night for the best results.

Step 4
Remove the rag and wipe up any remaining peroxide. After a few hours pass, you can pick up the rag. Wipe it around to pick up any excess peroxide.

Step 5
Wipe the wood before applying peroxide again. It's normal if the stain isn't completely gone, and you might need 1 or 2 more peroxide applications. Before using additional treatments, take a wet cloth and wipe the wood to remove any dried peroxide.

STRUCTURAL TIMBER-ROOF

Minor Cleaning Methods

DEFECT- SOOT DEPOSITS

1.IDENTIFICATION

The surface of the timber truss is covered in a black-ish soot like layer.

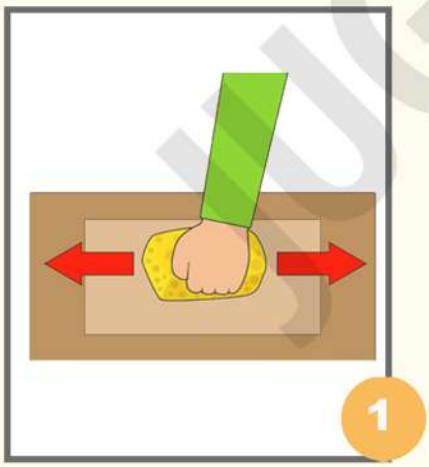
2.DEFECT

Cause-
Due to presence of dirt, lack of maintenance, occurrence of fire.

3.TOOLS NEEDED

1 Bowl
2 Knife
3 Cloth
4 Softer cloth/tissue paper

TREATMENT INSTRUCTIONS



Step 1

Wipe the sponge across the soot in straight lines until the surface of the sponge turns black.

Step 2

Turn it over and use another side until all sides are black, then carefully shave off the surface of the sponge using a knife to expose a new, clean layer to clean with.

Step 3

This will ensure that you don't scrub the soot back into the timber.

STRUCTURAL TIMBER-ROOF

Minor Repair Methods

DEFECT- DRY ROT ON SURFACE

1.IDENTIFICATION

A decay of seasoned timber caused by fungi that consume the cellulose of wood.

2.DEFECT

Cause-
Due to a type of fungus (Serpula lacrymans),water leakage.

3.TOOLS NEEDED

1 Spray 2 Boric acid
3 Brush 4 Wood scrapper
5 Epoxy 6 Sandpaper

TREATMENT INSTRUCTIONS

Step 1

Sprinkle boric acid across wood that shows signs of dry rot. Dry rot typically looks like puffy, white mold growing out of timber or other wooden surfaces.

Step 2

If the dry rot extends deeper than 1⁄4 inch, boric acid won't have much of an effect. You'll need to scrape away the rotted wood, which will take the rot-causing fungus with it.

Step 3

Fill the gouged-out section of timber with a wood epoxy bonding agent.

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Step 4

Sand the epoxy so it's flush with the rest of the wood. This will smooth it out further and make it look more finished.

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STRUCTURAL TIMBER-ROOF

Minor Repair Methods

DEFECT- MOULD DEPOSITS

1.IDENTIFICATION

The surface of timber truss might have spots with/without fungal growths.

2.DEFECT

Cause-
Due to high moisture content, condensation on truss

3.TOOLS NEEDED

1 Sponge 2 Pressure spray
3 Soap 4 Gloves and goggles
5 Mask 6 Brush
7 Bleach

TREATMENT INSTRUCTIONS

1

Step 1
Mix together a household detergent, like dish soap, bleach, and water. Use a quarter cup (59 ml) of detergent, 2½ cups (591 ml) of bleach, and 5 cups (1.2 L) of water.

2

Step 2
Apply the bleach solution to the truss. Dip a stiff bristle brush or a scrub sponge into your bleach solution. Use moderate pressure and move your cleaning tool in circles as you clean. Allow the truss to air dry.

3

Step 3
Clean sanded areas with the bleach solution after sanding and air dry the truss.Even lightly sanding finished wood will cause damage to the finish and require refinishing once the mold is removed.Sand off solution resistant mold.

STRUCTURAL TIMBER-ROOF

Minor Repair Methods

DEFECT - TINY HOLES ON SURFACE

1.IDENTIFICATION

Wood showing tiny holes on the surface.

2.DEFECT

Cause-
A type of fungus (Serpula lacrymans),water leakage

3.TOOLS NEEDED

1 Mask
2 Boron powder
3 Brush
4 Safety gear
5 Spray
6 Measuring flask

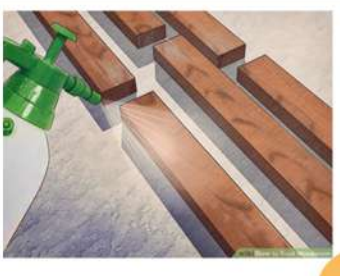
TREATMENT INSTRUCTIONS

Step 1
Determine the extent of the damage. Try to dry out the wood.

Step 2
Purchase boron powder to make a treatment solution

Step 3
Take precautions before using the treatment.

Step 4
Prepare the treatment solution. Respect the ratio of water to solution; the exact ratio will be indicated on the packaging.



Step 5
Apply an even coat of the treatment solution to the wood surface. Allow the coat to dry before attempting to move the wood; leave the item at least an hour before repeating.

STRUCTURAL TIMBER-ROOF

Minor Cleaning Methods

DEFECT- DUST SETTLEMENT

1.IDENTIFICATION

The timber surface looks dusty due to less frequent maintenance, polluted surroundings.

2.DEFECT

Cause-
Due to pollution, lack of maintenance, external factors (construction work, presence of factories, etc.)

3.TOOLS NEEDED

1 Brush
2 Bowl
3 Pressure spray
4 Ammonia
5 Cloth

TREATMENT INSTRUCTIONS

Step 1
This process is straightforward, but speed is of the essence. A dilute mixture of ammonia and Water (about 1:8) is prepared in a small bowl.

Step 2
This is brushed over the wood with a stiff bristle scrubbing-brush, which will loosen the remaining traces of coloring. It is then sprayed off by pressure spray and if the color persists. The process should be repeated. once the piece is dry.

STRUCTURAL TIMBER-ROOF

Minor Repair Methods

DEFECT- WOOD BORER INFESTATION

1.IDENTIFICATION

The timber truss (all/part) have tiny holes. Borer insects might be visible.

2.DEFECT

Cause-
Due to high moisture content, already present borer eggs in holes.

3.TOOLS NEEDED

1 Plastic brush with plastic bristles
2 Required solvent
3 Cloth

TREATMENT INSTRUCTIONS

Step 1
Rub any solvent on an ornamented surface. In densely ornamented surfaces, do it with a brush that has plastic bristles.

Step 2
Prefer to rub solvent in one direction only

Step 3
Apply the solvent and rub in different small sections.

GLOSSARY

Beam : A main horizontal member in a building's frame

Braces : Smaller timbers placed diagonally between posts and girts or plates to make a structure more rigid

Collar Tie : A timber placed horizontally and between rafters that control spreading or sagging of the rafters, usually placed parallel to the girts which connect rafter pairs at a given height

Common Rafters : Closely and regularly spaced inclined timbers that support the roof covering, independent of the bent system

Found Curve : Naturally occurring crooked timbers usually with two sides sawn and two sides with the bark removed, used as knee braces, posts and beams

Hammer Beam : A horizontal timber projecting from the top of the wall or rafter that supports a roof truss. The design creates a large roof span with relatively short timbers

Intermediate Wallplate : Major horizontal timber that connects posts

Joist : Smaller horizontal timbers parallel to each other to complete the floor frame

King Post : A central, vertical post extending from the bent plate or girt to the junction of the rafters at roof peak

Knee Brace : A short diagonal timber placed between the horizontal and vertical members of the frame to make them rigid

Plate : The major horizontal timber which runs from one end of the frame to the other and supports the base of the rafters

Post : Upright or vertical timbers erected within the frame that provide structural support of the members above

Principal Rafters : A pair of inclined timbers that are framed into a bent and used with either purlins or secondary rafters or alone

Purlin : A horizontal member of the roof frame which runs between rafters

Queen Posts : A pair of vertical posts of a roof truss standing on the bent or girt and supporting the rafters or collar tie

Rafter : Sloping main timber of the roof frame

Secondary Rafters : Smaller sized timber rafters placed between principal rafters

Strut : A short timber placed in a structure either diagonally or vertically, designed to act in compression along the direction of its lengths