TIMBER DEVELOPMENT UK

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In-Situ Timber Maintenance

Maintaining timber structures properly will prevent future costly repair, by addressing early signs of fungal attack, insect infestation, building movement, overloading, water damage, fissures, fire, and accidental damage.

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In-Situ Timber Maintenance

"In-situ" means in position, which for timber construction means on site. Maintenance of timber in-situ requires surveying and remediation without damaging the timber itself, to maintain its structural integrity.

Survey of In-Situ Timber

A survey by an experienced building surveyor or structural engineer to inspect the building to identify potential failure points is essential to produce a maintenance plan. In new buildings, the architect or engineer can provide the necessary information to create a maintenance plan prior to construction.

The survey informs priorities for maintenance activities and their frequency. A good maintenance plan should reduce the need for expensive and disruptive repairs. Part of maintenance is assessing the condition of the parts of the building – including timber - and inputting this into the maintenance plan to inform future activity. This makes the plan responsive.

An effective survey adopts a multidisciplinary approach to analysing the structure, while avoiding invasive techniques that could damage the building.

The survey should include assessments of:

- **Timber moisture content (mc)**

Timber can often appear sound on its exterior while being damaged at its core. Therefore, tests using dedicated tools should be conducted. Elevated levels of moisture indicate a risk for fungal attack and infestation, indicating the need for maintenance activities to ventilate the structure.

- **Age and form of the structure**

Throughout history, different timbers and construction methods have been used. Experience learned from structures of similar eras and construction type can be extrapolated to the building being surveyed.

The building methods used in the structure can inform its age and maintenance requirements:

- **Craft-based technology** was used until the end of the 17th century: timber construction of Oak with a wide variety of traditional joints, often pegged with hardwood. Much of the framing used external hardwood.
- **Softwood structures** built from the mid-17th century to the early 19th century often used imported Baltic softwood as Oak became scarce. Timber framing was often internal and protected from weather. King and queen post trusses were used - with some ironwork but with carpentry joints. Floor joists became deeper and narrower.
- **Early engineered forms** from around 1900 to the 1920s used modern timbers, and mechanically laminated trusses became available. Metal connectors were introduced, while variations on king post trusses and girders, and machine-sawn timber with vertical sections were used.
- **Modern timber construction**, from the 1920s onwards, conforms to design codes and uses some standardised designs. Metal connectors, glulam, structural plywood, and graded timber add more certainty to outcomes.

- **Condition of materials**

In addition to assessing condition – including visual strength grading of timbers – the survey should record the arrangement of the wall frames, floor, roof beams, trusses, rafters, joists, columns, posts and bracing to identify any defects or deterioration, or areas where this may be a risk. Other materials in contact with the timber should also be assessed.

- **In-situ grading of timber**

This must be performed by a qualified grader, to **BS 4978 Visual strength grading of softwood**, **BS 5756 Visual grading of temperate hardwood**, or **BS EN 16737 Visual strength grading of tropical hardwood**. Strength must be assessed to **BS EN 1912 Structural timber. Strength classes. Assignment of visual grades and species**.

Assessment of In-Situ Timber

The survey should provide data on any parts of the building requiring maintenance, to inform a structural engineering assessment as follows:

- **Strength**

Is maintenance needed to ensure frame members and joints remain stable while supporting the current load, or the loads imposed by a proposed change of use? **Eurocode 5** informs this assessment. Tests should be non-destructive.

- **Stability**

A full engineering analysis should assess what is required to maintain structural stability.

Where a more thorough assessment cannot be performed, the 100-year rule assumes that if the building has stood for 100 years or more, is in good condition, and its use and form are unlikely to change, then the building is sound, and the existing maintenance regime is sufficient. This assumes that in 100 years of life the building has already prevailed over the types of once-in-a-century wind, snow and rain events that are likely to endanger it.

- **Serviceability**

Is the timber in the building likely to deflect (twist, warp, sag or otherwise change shape) in a way that threatens the structure's suitability for its current or intended purpose? Timber in many old buildings shows signs of deflection which can be part of its visual character. The assessment, therefore, needs to balance the aesthetic desirability of the creep against structural compromise.

- **Durability**

Can the building withstand the physical demands placed upon it?

- **Appearance**

Where appearance is important to the building's intended use, what maintenance is required to keep up the appearance? It should be noted that many maintenance actions, such as painting external timber, serve both an aesthetic and preservative function.

- **Accidental damage**

Is there a risk of accidental damage to the building? The assessment may suggest the use of elements such as corner protectors to safeguard the structure.

Maintenance of In-Situ Timber

Maintenance methods should be selected based on the requirements of the building:

- Keeping timber dry is the most fundamental maintenance consideration. Maintaining an mc below 20% in softwoods is key to preventing fungal growth or infestation, movement, deformation, and fissures. General maintenance and ensuring good ventilation should be sufficient in a building that meets modern building regulations.

  Keeping timber dry requires clearing drains, roof gutters, valleys, and downpipes, as well as ensuring the roofing surface is in good order and clear of any debris that may damage the integrity of the surface or cause water to pool.

- Flashing and waterproofing around windows, doors, and surface-penetrating fittings is important to maintaining a dry structure. Ventilators should be kept clear and unobstructed and any changes to the building should be carefully considered with respect to ventilation.

- Surface treatments including paint, traditional oil finishes and polishes, and modern technical products such as epoxy coatings, penetrating silicone finishes and acrylics protect timber by sealing the surface against moisture. Some paints have fire-retardant qualities.

- Chemical treatments penetrate timber to kill microbes and protect against infestation, as well as inhibiting fire. Some penetrating treatments act as a repair medium by killing fungus and stabilising weakened timber fibres. These can be applied in-situ.

- Physical barriers may be employed, including corner protectors, waterproof and fireproof covers, or measures to channel water away from the structure.

Seven Stages of In-Situ Timber Survey, Assessment, and Intervention

1. Perform a structural survey to identify the most at-risk areas which may need follow-up by specialist investigations. The aim of the survey is to understand as much as possible about the timber elements using non-destructive inspection methods. These include observation of the timbers in-situ, and accounting for the age and form of the structure.

2. Assess survey results to develop a complete understanding of the building's timber and the maintenance required. This should include an architect, surveyor, and/or structural engineer. Ensure remediation of the original cause of the failure has been undertaken before assessing repairs.

3. Define and agree the aims and scope of maintenance or repairs. Fragile or high-risk areas should receive more detailed and more frequent attention. It is prudent to examine the different maintenance and repair options and develop some principles within the plan.

4. Select maintenance and repair methods. Define the aim and scope of maintenance or repair along with any heritage considerations to identify the preferred activities, limits, and constraints of the work.

5. Have specific maintenance or repair details approved by a qualified person. This includes specifications of the maintenance, specifications for materials and products, and method statements for the work.

6. Select contractors and agree procedures for contract supervision. Depending on the age and fragility of the building, specialist contractors or heritage artisans may be required to perform timber maintenance and repair tasks. Working at height or underwater should also be considered where appropriate.

7. Implement the work and perform inspection and handover arrangements.