STA | STRUCTURAL TIMBER ASSOCIATION

# STRUCTURAL TIMBER

## Design and construction guidance

# Contents

# Disclaimer

**It is important that you read and understand this statement before making use of this document.**

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**The STA acknowledges the RIBA Plan of Work 2020 as the source for the majority of the information within this document.**

*Please note that the references/actionsusedineachoftheRIBAstagesareonlythoseparticulartostructural timber and may differ from other building systems.*

# 1. Background and introduction

## 1.1 Leading the way to net zero

Structural timber has been identified by the Government as a significant contributor to addressing climate change. There have been many publications on the topic but none more significant than the Net Zero Strategy 'Build Back Greener October 2022', which led to the setting up of the cross-government department working group Timber in Construction [TiC1].

TiC stated objectives:

- Foster collaboration between sectors to develop policy options to safely increase the use of timber in construction.
- Produce a policy roadmap for timber in construction with a clear implementation plan.

This will include:

- Encouraging research into barriers to the uptake of timber, specifically looking at timber strength grades and the fire resistance of engineered timber structures. This will inform key safety recommendations to increase timber in construction in England.
- Collaboration between industry and Government to increase the supply and demand of timber in construction in England. This will inform recommendations to strengthen the domestic timber market.
- Boosting market confidence for lenders, insurers, and warranty providers for timber in construction, outlin g key regulatory recommendations.
- Utilising and encouraging research into timber's role in the reduction of embodied carbon in the built environment. This will inform key recommendations about best practices within low-carbon construction.

The Structural Timber Association has, for many years, represented the structural timber industry in driving forward construction best practice.

With over 120 manufacturing members supplying timber frames, structural insulated panels and mass timber systems such as CLT and Glulam and more than 780 members supplying products and services to the industry, the STA recognises the importance of having highly trained and skilled supply chains, supported by the most detailed technical support.

Mandated processes such as the STA Assure quality assurance programme and Installer Training Scheme (ITS) are two examples of how the association helps members provide market-leading quality and service.

We are also investing in timber frame fire testing, which has been central to ensuring systems are proven safe. This guide has been produced to help constructors who are less familiar with structural timber systems extract the most from their project.

1 Further information on Timber in Construction can be found **HERE**

Broken down into eight stages (0-7) following the much-used RIBA Plan of Work, this guide will provide signposts for more technical detail in addition to highlighting essential care points.

Much like all panelised building systems, considerations are required that may be different to a more traditional on-site assembly of components.

## 1.2 Who should use this guidance?

All participants in the supply chain of structural timber systems, from designer/architects, specifiers and engineers, through to developers and housebuilders, who may be less familiar with the use of timber panelised building systems.

Key stakeholders such as warranty providers, insurers and lenders less familiar with timber building systems, will also benefit from this guidance, in so far as they will be able to better manage their risk profile.

## 2. RIBA Plan of Work

# 2.1 The different stages in brief

The RIBA Plan of Work organises the process of briefing, designing, delivering, maintaining, operating and using a building into eight stages. It is a framework for all disciplines on construction projects and should be used solely as guidance for the preparation of detailed professional services and building contracts.

The stages of the plan are defined by RIBA as outlined below:

| | |
|---|---|
| **STAGE 0** | Determining the best means of achieving the client's requirements. An open mind is required because a building might not be the most appropriate solution. |
| **STAGE 1** | Working with the client, developing the detail of the brief and making sure that everything needed for the design process is in place before Stage 2. This includes ensuring that the brief can be accommodated on the site. |
| **STAGE 2** | Is concerned with getting the design concept right and making sure that the look and feel of the building proceed in line with the client's vision, brief and budget. The key challenge of this stage is to make sure that the tasks that are undertaken are geared to meeting the stage objectives.<br><br>Going into too much detail too early can pivot the design team's effort away from setting the best strategy for the project; but if there is too little detail, Stage 3 becomes inefficient. |
| **STAGE 3** | The purpose is to spatially coordinate the design before the focus turns to preparing the detailed information required to manufacture and construct the building. The information at the end of this stage needs to be coordinated sufficiently to avoid all but the most minor of iterations at Stage 4 - and make sure that the planning application is based on the best possible information. |
| **STAGE 4** | Developing the information required to efficiently manufacture and construct the building. This requires information from the design team and the specialist subcontractors employed by the contractor, regardless of which procurement route is used. |
| **STAGE 5** | When the building is manufactured and constructed. |
| **STAGE 6** | The building is in use and the emphasis of the project team will have switched to closing out any defects and completing the tasks required to conclude the project. |
| **STAGE 7** | The period when the building is in use, lasting until the building reaches the end of its life. |

# 2.2 Stage boundaries

Stages 0-4will generallybe undertaken oneafter the other.

Stages 4 and 5 will overlap in the project programme for most projects.

Stage 5 commences when the contractor takes possession of the site and finishes at practical completion.
Stage 6 starts with the handover of the building to the client immediately after practical completion and finishes at the end of the defects liability period.

Stage 7 starts concurrently with Stage 6 and lasts for the life of the building.

**Each stage consists of:**

- Stage outcomes
- Core task
- Core statutory processes
- Procurement route
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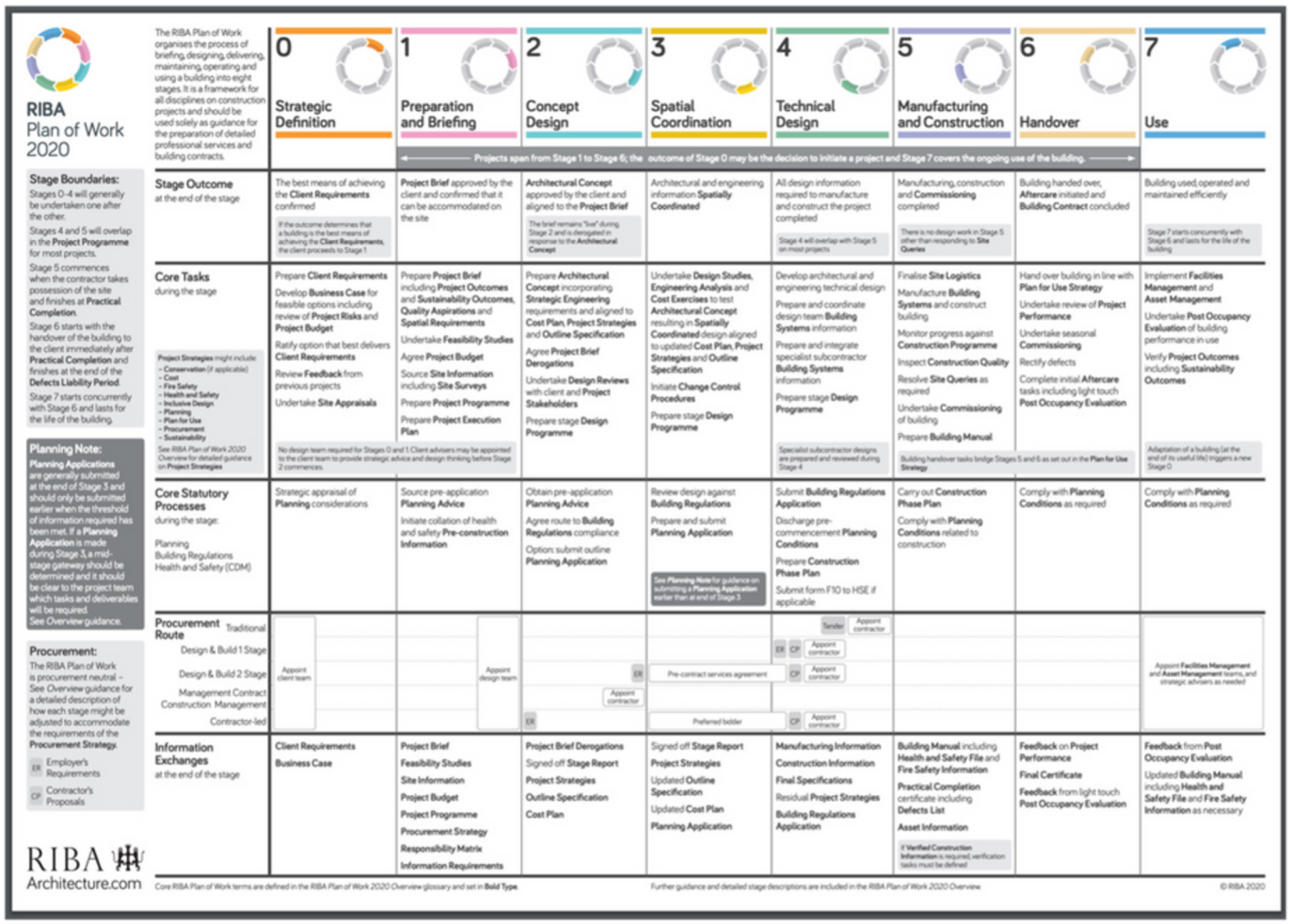
Details of the RIBA Plan of Work 2020 can be found by using the link **HERE**.



## 3. RIBA stages in relation to structural timber

# 3.1 RIBA Stage 0 - Strategic definition

### The best means of achieving the client requirements confirmed

Typically,Stage 0 would address the fundamental requirements of the project. However, addressing issues such as ESG with the client at this early stage could lead to the desire to use structural timber.

The Government's initiative, Timber in Construction encourages asset owners to use more timber in response to the climate change agenda. Specifically, the Government's Net Zero 2050 commitments, which may impact a client's preference for timber construction.

Early decisions on the use of structural timber will assist in the smooth development of any scheme. As we will see later in this guidance, some limitations in design should be considered early in the project to ensure risks such as fire resilience and moisture ingress can be mitigated.

**STA recommended care points**

- Finalise decision on type of structural timber systems to be used - see information below.
- Identify procurement route. Select a supplier early to begin collaboration. The STA website 'find a member' database will ensure that the chosen supplier is compliant with all STA quality protocols. View list of STA members **HERE**.
- Consider reviewing 'Design life of timber frame buildings' from the STA technical library HERE.
- Examine the need for temporary fire protection and action in accordance with the STA's 16 Steps.

# Structural timber construction methods

STA members utilise the latest structural timber technologies offering a range of structural timber systems:

### Open panel timber frame

The open panel system provides the structural frame, to which site installed insulation, services and plasterboard elements are added.

The building's wall and floor plans are divided into panels which can be assembled on site to provide a weathertight working environment once windows are installed.

Panels can also be supplied with factory installed insulation.

### Closed panel timber frame

The structural frame is the same as 'open panel' construction, but includes factory-fitted insulation and inner sheathing boards to close off the panel. Advanced closed panels include pre-fitted windows, service battens, services and plasterboard.

The advantages of closed panels include more value added in the factory, quicker assembly and less waste on site.

## Structural Insulated Panels (SIP)

A SIP is a structural panel comprising boards that encase a rigid insulating foam sandwich core. The boards are usually made from OSB (orientated strand board).

The insulation (typically polyurethane) is injected and set to auto-bond the boards to the insulation, or is adhesively bonded expanded polystyrene.

## Cross Laminated Timber (CLT)

Part of the solid wood panel family of products, CLT consists of perpendicular alternating laminations of softwood, creating a solid panel.

CLT is a build method in its own right and is used for walls, floors and roofs. The advantages of CLT include a reduced structural depth, when compared to joisted floor beams, with quick and easy fitting on site. CLT also improves site safety with less time working at height over open cassettes.

## Glulam (Engineered Wood)

Glued laminated timber is a way to create large structural timber members that cannot normally and efficiently be sourced direct from the tree. Glulam is often integrated into the structural design of a timber frame, enabling large openings and spaces to be formed to meet architectural requirements. It can effectively be used in nearly any location where a steel or concrete product can be used.

**NOTE:** *Similar products are Laminated Veneer Lumber (LVL), Duo Lam, Tri Lam and Laminated Strand Lumber (LSL) except these do not come precurved.*

## Volumetric

A volumetric frame consists of large portions of a structure completed in a factory environment and delivered to site whole.

These can be entire rooms, including the fixtures and fittings which are 'plugged' together on site. These properties make them ideal for a quick erect of repetitive design layout.

## 3.2 RIBA Stages 1, 2 and 3 - Preparation and briefing, concept design, spatial coordination

**Stage1 - Projectbrief**
Approved by the client and confirmed that the proposed building can be accommodated on the site - noting that timber frame solutions can provide logistical advantages.

**Stage 2 - Architectural concept**
Approvedbytheclientandalignedtothe project brief - concept staging including the thermal and sustainability benefits that may be addressed by structural timber frame solutions.

**Stage 3 - Architectural and engineering information**
Spatial coordination–a submission stage fort he project at which sub-contractors are typically engaged following the earlier less formal input.

By collaborating early with the timber system supplier, they will provide guidance through the concept and design process to ensure that the project is deliverable in premanufactured panels.

The STA Assured structural timber systems supplier will be familiar with all the care points below and will have either contracted engineers or in-house engineers who will confirm the structural integrity of the proposed structure.

**NOTE ON SCALE OF PROJECTS**

The complexityof the process differsfor different scales of projects. For single houses the process is likely to progress to Stage 3 and engagement of the structural timber solution provider within the combined Stage 2 and 3.

Larger projects are likely to have a Stage 3 report from which the structural timber supplier is engaged to respond.

### STA recommended care points

- Recognition of the limitations when complying with Building Regulations and Statutory Guidance such as 18m upper floor height limit for combustible structures and 11m upper floor height for generic compliance or insulation restrictions.
- Reference 'STA Fire Research Volume 1 Pattern Book' for guidance on fire-tested timber frame elements. Download from the STA technical library HERE.
- Familiarisation with the installation requirements for fire stopping and cavity barriers utilising data in the 'STA Fire Research Volume 2 Cavity Barrier Installation'. Download from the STA technical library HERE.
- Ensure the chosen supplier's STA Assure status. This can be identified on the STA website. View list of STA members HERE.
- Understanding of the contractual differences between structural timber system supplier and other typologies2. See 'STA Technical Note 31 - Vocabulary of rolls in a structural timber project'. Download from the STA technical library HERE.

Appoint an engineer and confirm their competency levels in the use of structural timber and ensure STA Assure quality management is in place.
Reference documents provided by STA will provide guidance. The following recommended documents are all available on the STA website HERE.

- STA Technical Note 11 - Design load clarification
- Advice Note 2 - Design life of timber frame
- Advice Note 4 - Foundation tolerances
- Technical Note - 19 STA Assure structural timber engineering design and quality procedures.

Understand the logistical requirements of the supplier regarding site management; panelised components have specific handling and storage on-site requirements.

Establish obligations under Construction Design and Management (CDM) Regulations L153 HSG 168 and Coniac's Fire Risk Management Plan. See 'STA Advice Note 9', Part 1 and Part 2.
Familiarisation with the 'STA 16 steps to fire safety under construction'. Download from the STA technical library HERE.

Technical Note 5 - 16 Steps summary and cross reference document:

- This document provides summary guidance for the preparation of a design phase, pre-construction and construction phase fire risk assessment for new build projects by STA members and others in the construction industry.

- The document also assumes the reader is familiar with the legal requirements and understanding of fire risk assessments, along with all other aspects of safety risk. See HSE website **HERE**.

The duties of a Principal Designer and Principal Contractor are to ensure the employment of an STA member who will undertake the necessary steps to safely complete a project; the STA member will follow STA Site Safe policy procedures.

2 Often the contract in the supply of a system is simpler than one where several other subcontractors are involved in the assembly of the structure

## 3.3 RIBA Stage 4 - Technical design

### All design information required to manufacture and construct the project completed

As the project proceeds through the stages of the RIBA Plan of Work, compliance with various standards - and in particular safety during construction - will be required.

### STA recommended care points

- Consider theuse of STA Assured suppliers for assured competency.
- Agree the scope of the package to be supplied and identify clear areas of responsibilities in accordance with the Building Safety Act, if applied. The 'STA Guide to the Building Safety Act' is available HERE.
- Agree with the supplier exactly what is included in the structural timber system and what is not. NB. numerous additional components can be included in the package if required.
- Ensure installation of the structural timber elements is undertaken by carpenters who are certified under the STA Installer Training Scheme (ITS).
- Agree the supplier works under the CDM Regulations and can evidence this. See STA Advice Note 19.1 - CDM regulations for STA members. Download from the STA technical library HERE.
- Confirm the chosen structural timber system supplier works to the STA 16 Steps the fire risk mitigation during construction, ensuring the supplier has all the required details to comply with this and can provide evidence to support this. See STA documents:
    - STA 16 steps to fire safety
    - STA Advice Note 15, Parts 1, 2 and 3 - fire safety on site explained.
- Identify whether the system proposed has elements that are fire-safe proven, through fire testing, or UKAS accredited assessment through the field of application.
- Identify the system proposed follows the STA guidance in moisture ingress management. Download from the STA technical library HERE.
- Agree with the supplier the logistical requirements - for example access for large components and safe/dry site storage on hard standing, plus crane location points.
- Understand the speed of construction and planned project programme to ensure gains are maximised.
- Sign off scaffold requirements based on NASC guidance. Details can be found HERE.

Changes to the project design at this stage will incur redesign costs and could potentially increase risk to the project if any potential changes are not carefully considered.

**NOTE:** *Regulatory Reform Order 2005 on fire safety will be amended soon to cover the need to appoint a competent person.*

## 3.4 RIBA Stages 5, 6 and 7 - Manufacturing and construction, handover, building use

### Stage 5
Manufacturing, construction, and commissioning completed.

### Stage 6
Building handed over, aftercare initiated, and Building Contract concluded.

### Stage 7
Building used, operated and maintained efficiently
The structural timber system will be signed off and agreed at Stage 5. Whilst it is still possible to alter the final façade, for example, it needs to be undertaken with care to ensure the changes are within the scope of the engineered performance and regulatory requirements.

The installation of the completed structural timber kit of parts is critical to a successful project. Only by using an STA manufacturing member can competency be assured, as they will only be using installers who have completed and passed the STA Installer Training Scheme (ITS).

For more information on training please go to the STA Skills Hub **HERE**.
Many STA members now provide photographic evidence of the installation as part of the sign-off procedure. Establish with the supplier if this is available for the project.

### Hand over
Confirmation should be sought from the structural timber system supplier that care points will be provided by follow-on trades.

**NOTE:** *Any change control process must review the impact on process safety risks.*

## Prepare information to end-user, for example

- Where required, a fire engineer report should be included.
- Establish the maintenance requirements for the building, paying particular attention to the mitigation of any risk associated with prolonged moisture ingress. Details of the STA Moisture Management Strategy found HERE.
- Confirm with the client requirements to ensure the "Golden Thread", relating to the storage of project information, are met.
- Donot undertake any work on the building that requires the structure to be penetrated without consulting an engineer.
- Useful reference point for the end-user of the finished building is the STA's 'Living in a timber frame home', which can be downloaded HERE.
- Health and safety information within the building's operational manual.

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