

STA advice notes

Introduction to the construction of commercial timber frame buildings



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Scope of this document

The purpose of this document is to provide potential end users of timber frame with a review of the suitability of timber frame structures for buildings.

Introduction

The majority of timber frame structures being built today are typically what is referred to as platform timber frame. This construction technique has been used commercially since the 1960s with significant growth periods for schools and housing in the late 1970s and early 80s and with commercial structures in multi storey flats and hotels in the late 1990s through to today.

Platform timber frame is a style of building using pre-formed structural panels and floors with each level of floor being the platform to build the next level of walls and so on.

The pre-formed panels manufactured in factories deliver opportunities for audited quality systems to be put in place which improves product performance and addresses some of the Governments requirements for improvements of design to as built performance targets.

The use of timber as the construction material addresses sustainability demands of the Government energy targets both in raw material supply and in the performance of retaining heat in the building during the use of the building.

The use of timber frame is particularly suited to repeat room buildings as the pre-formed panels and floors allow, as in any factory made product, repetition reducing the cost base of the product. However, timber frame panel sizes can be changed and made bespoke for many shapes and sizes which is attractive to architects who look to create interesting building forms and address planning requirements for sites.



Which industry clients use timber frame?

Sector	Approximate % volume of market	Reason for choosing timber frame
Housing - self build market	50%	Cost certainty Fabric performance Quality and sustainability targets Simplifies contracting and build process for cash flow and management
Private developers	15% over the UK but in Scotland this is in excess of 50%	Reduced site waste Delivered quality targets Predictable costs and build programmes.
Hotels	New build hotels and extensions from 2 to 6 storey account for 30% with some clients such as Premier Inn and Travel Lodge up to 90% use	Less weather dependent and increased site productivity Predictable room sizes for forward purchase of bulk fixed furniture such as bathrooms
For multi storey flatted developments	Up to 6 storeys the use of timber frame is 3 storeys - 20%, 4 storey 20%, 5 storey 30% and 6 storey 20% of the market	Sustainability and fabric performance targets meet BREEAM and Code for Sustainable Homes
Schools	New build schools and extensions account for 25% of projects	Sustainability and fabric performance targets meet BREEAM Predictable room sizes for forward purchase of bulk fixed furniture such as bathrooms/ laboratory equipment
For social housing landlords	50%	Off-site manufacturing labour health care and training targets met Predictable costs and build programmes
Hospital wards, local doctors surgery	10%	Less weather dependent and increased site productivity
Nursing homes	30%	Design iteration with governors and trust / users at an early stage through 3D models. Logistics for confined infill site benefits and reduced local neighbourhood construction interference (noise reduction, duration, waste, reduced opportunity for vandalism)
Other markets such as offices, shop kiosks, fast food outlets, ticket booths, show suites for developments.	Not known / recorded	Volumetric options typically with predictable costs and build programmes Less weather dependent and increased site productivity Logistics for confined infill site benefits and reduced local neighbourhood construction interference (noise reduction, duration, waste, reduced opportunity for vandalism)

Detail consideration

Design life

Research into the performance of timber frame construction has predominantly been carried out by the Building Research Establishment (BRE) who have provided an independent view of the construction method. The BRE undertook extensive research into the durability of timber frame (BRE - Timber- framed housing - a technical appraisal - Freeman et al - 1983). This report concluded that properly constructed timber frame buildings did not have durability issues but that the construction method required controlled design and build processes and that, as for all materials, good workmanship was pivotal in ensuring that the method delivered predicted performance. It is, in part, for this reason that the STA insists that its members implement Quality Assurance systems.

The structural timber frame products as with other construction materials comply with:

Sector	Approximate % volume of market	Reason for choosing timber frame
Design life to BS 7543: 1992	Components and assemblies	Main structural elements: design life 60 years Floor finishes: design life < 60 years External cladding: maintainable / design life 60 years with maintenance
Design life to BS EN 1990: 2002		Design working life = 50 years The Eurocode also directs that the structure shall be designed such that deterioration over its design working life does not impair the performance of the structure below that intended, having due regard to its environment and the anticipated level of maintenance
Design life to BS ISO 15686-1: 2000	Components and assemblies within a building	Design life Inaccessible or structural components: 60 years Expensive or difficult to replace components: 60 years Major replaceable components: 40 years Building services: 25 years Easy to replace components: 3-6 years

NOTE: Timber frame design life is no less than other competitive materials or forms of construction

Quality of panels

Factory-built frames which are assembled on site in large sections, thereby minimising the amount of connections which need to be made on site. When a timber frame is obtained from a STA member company products will have an audited STA Quality Approval processes. CE marking for Timber frame panels is not yet available due to the EN code not being available, however, Factory Production Controls will allow a smooth transition for CE mark panels when the code is introduced.

Designing for performance

Companies that are considering the use of timber frame construction methods for building structures would be advised to ensure that they engage competent designers and Quality Assured timber frame manufacturing companies. Timber frame designers should be familiar with 'Timber frame construction- 5th Edition' published by TRADA.

Design guides and links to further information and best practice for timber frame construction is available from the following sources:

www.structuraltimber.co.uk

www.trada.com

www.bre.co.uk

Quality of workmanship on site and site inspection

The objective of site inspections is to check that the Contractor is properly executing the works and meeting the construction and quality specified. Monitoring the quality of workmanship on site is an essential part of the construction process as deficiencies in the completed building can negate many aspects of the design process. Routine site inspections should be carried out by the employer's agent, supervising officer or appointed consultants on a regular basis. A Clerk of Works should conduct more frequent inspections or be resident on site, depending on the size of the scheme.

Thermal performance



The ease of incorporating insulation into the timber frame superstructure means that the requirements of the building regulations can easily be met and much higher levels can be achieved.

Fire performance

Fire is an emotive subject and is one of the first issues raised when timber frame construction is discussed. However, timber frame buildings must meet the same fire regulations as all other types of construction and therefore pose no greater risk to their inhabitants.

Timber stud partitions and timber joist floors have been used for many years as fire separating elements and their performance has been proven time and time again in test and real fire situations. In the unlikely event of a fire starting within the construction, firestops and cavity barriers prevent fire spread through concealed areas. Full scale fire tests undertaken on a six storey 'Timber Frame 2000' demonstration building showed compartmentation and building integrity maintained throughout the test. TRADA and BRE fire safety research concluded that "Timber frame performs as well as other construction in fire and life safety is at no greater risk"

Acoustic performance

Timber frame structures rely to a large degree upon structural separation to achieve sound reduction, rather than simply incorporating more mass into a structure. Tests on timber frame party walls comprising two separate stud walls showed that sound insulation performance was well above the levels required in current Building Regulations. Sound resistance requirements in timber party floors are currently met by separating the floor deck from the walking surface by floating layers, incorporating insulation and having sufficient mass in the deck and ceiling. Higher levels of sound insulation can be achieved by de-coupling the ceiling from the joists by the use of resilient bars to support the ceiling or by installing separate ceiling joists.

CDM risk assessment

Under CDM Regulations, the timber frame company will consider all parts of the construction such that the construction of the timber frame structure will not pose a specific risk of injury on the condition that the installation is undertaken by competent individuals.

This statement is limited to the design of the structure and does not cover any obligations under Health & Safety Regulations that are the responsibility of the Site Health & Safety Manager and the Main Contractor.

All works on site are to be in compliance with the UK Timber Frame Association 'Sitesafe' initiative and STA document 16 Steps to Fire Safety. In addition compliance with HSG 168 with approved products accepted by HSE for risk mitigation for fire during construction.

The Timber Frame Company will provide CDM Design Safety Assessments following completion of the engineering design phase to highlight any additional risks which have been identified during the design stage.

Contractor requirements

The Contractor will forward all Risk Assessments and Method Statements for review before the commencement of construction. All installations will be completed in accordance with the Site Health & Safety Regulations and the manufacturers recommended methods of construction.





References

TRADA - Timber frame construction. 5th edition

NHBC Standards - January 2013

UK Timber Frame Association - guidance notes

BRE multi storey timber frame - a designers guide.

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