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G20

Carpentry/Timber framing/First fixing

This guide provides an introduction to writing specifications for carpentry, timber framing and first fix joinery and should be read in conjunction with the guide Introduction to Writing Architectural Specifications. Together these guides provide an in depth reference for the development of specifications based on a simple framework that can be applied to projects of all sizes.

Contents

This guidance note covers the prescriptive specification of timber framing and first fix joinery items. Reference should be made to the following sections for the specification of repair works to existing joinery and the provision of other joinery items (i.e. barge boards, fascia, etc that do not form part of first fix works):

- C51 Repairing/Renovating/Conserving timber
- P20 Unframed isolated trims/skirting/sundry items

Design Considerations	2
• Solid Timber	2
• Engineer Timber Products	5
• Engineer Wood Panel Products	5
• Truss Rafters	6
• Metal Fixings	6
• Timber Certification	6
Specification Guidance	7
• Form of Specification	7
• Scope	7
• Products	8
• Accessories	8
• Workmanship	9
• Samples, Test, Certificates, etc	10
Standards & References	11

Design Considerations

Timber framing and first fix joinery items may be distinct elements of joinery or form part of the wider works, e.g. truss rafter roof construction.

The overall performance of individual joinery items and resultant systems must satisfy the specific requirements of the project. Project requirements include functional criteria as well budget; design life; time and environmental considerations. Once these requirements are established the key characteristics and associated levels of performance for the timber framing and first fix joinery items can be identified.

The selection of products and materials should be undertaken in consultation with suppliers and with reference to relevant British Standards, Statutory Regulations and current best practice.

Solid Timber

Strength

Only timber that is strength graded should be used for structural purposes. The strength of graded timber is indicated by its Strength Class, defined in N/mm². The Strength Class of timber is determined by the timber species concerned and the timber's Strength Grade.

The level of performance required will be governed by the loading (live and dead loads), span, spacing and size of timbers.

Durability

The durability of wood depends upon its ability to withstand various forms of biological attack, primarily fungal (causing dry and wet rot) and insect attack. As natural characteristics of wood vary from species to species so does durability. BS EN 350-2 identifies the durability of common soft and hardwood species to fungal and different forms of insect attack.

Durability against fungal attack is defined within BS EN 350-2 using a five class system:

- Class 1 Very durable
- Class 2 Durable
- Class 3 Moderately durable
- Class 4 Slightly durable
- Class 5 Not durable

These durability classes only relate to the fungal attack of Heartwoods, all Sapwoods are classified as 'not durable'.

Durability classes established in accordance with BS EN 350 provide an indication of performance when the wood is in contact with the ground (equal to conditions defined by Class 4 within BS 335-1). Where wood is not in contact with the ground its treatability (its water absorption characteristics) will also influence the service life of the wood, i.e. wood that is less absorbent for a given durability class will last longer than a wood that is more absorbent.

Where a wood does not provide the desired level of durability for its end use and location it may be treated with preservative.

Timber Finish

Timber is available in a range of different finishes. The appropriate finish will depend upon the intended use and location of the timber.

Building Grade Softwood

- **Rough Sawn Carcassing:** milled straight out of logs with a rough finish, either untreated or treated. Used where you can't see it, under floors, in the roof, etc and externally for fences, etc where the quality of finish is not of concern.
- **Eased Four Corners (rounded corners):** planed all round to give four rounded corners for easy handling, can be either untreated or treated.
- **CLS Studding (Canadian Lumber Standard):** also known as Studding Timber is planed all round to give four rounded corners for ease of handling and generally untreated. The quality of finish is not as high as PAR softwood but higher than that of sawn timber.

Joinery Quality Softwood

- **Sawn Square Edge Softwood:** used for internal joinery where it will not be visible, unless planed to a smooth finish.
- **Planed all Round (PAR) Square Edge Softwood:** planed on all four edges for a smooth and sharp cornered finish. Used primarily for internal joinery purposes, where it can be seen. May also be referred to as Planed Square Edge Softwood (PES).

Note with PAR timber the dimensions are given as the nominal sawn size before it's been planed, e.g. 102 mm x 51mm PAR will measure about 95 mm x 45mm.

Timber Quality

Quality relates to the degree of imperfections present within the timber. These characteristics are assessed as part of the visual strength grading process.

The quality required and appropriate Strength Grade depends upon whether timber will be visible and the aesthetic quality desired.

Moisture Content

Variations in moisture content of timber cause the wood to expand and contract, mainly across the grain. As a result timber that has not been dried to the appropriate moisture content (i.e. reflecting the moisture content that it will achieve in its final environment) is at risk of shrinkage, warping and splitting.

The appropriate moisture content of the timber will depend on:

- Whether timber is to be located internally or externally.
- Where internal, if space will be heated or unheated.
- Where heated, the average temperature range.

Dimensional Movement

Dimensional movement refers to the changes in the dimensions of dried timber that occur when it is subjected to changes in its environment, i.e. temperature and humidity.

The acceptable level of movement will depend upon the quality of finish required and the range of temperatures and humidity anticipated within the timber's environmental.

BS EN 338: Strength Class

BS EN 338 sets out the method for assessing the Strength Class of timber based on an assessment of its strength, stiffness and density.

The strength class of timber is denoted by a number indicating the value of bend strength in N/mm² with a prefix to denote the type of timber:

- C – Softwood, e.g. C24.
- D – Hardwood, e.g. D30.

The specification of a higher strength class does not necessarily equate to a higher quality of finish. This is because classes allow defects that do not affect the strength performance of the timber members.

BS 4978 & BS 5756: Strength Grades

BS EN 1912 assigns Strength Classes based on the timber's Strength Grade (determined in accordance with BS 5756 and BS 4978) and its species.

For example, European Redwood or Whitewood and Canadian Douglas Fir of GS grade meet the requirements of strength class C16 while the same species graded to SS grade meet the requirements of strength class C24.

Timber may be strength graded visually or by machine, in accordance with BS EN 14081. For visual grading, compliance with this standard is achieved through adherence to BS 4978, BS 5756 and BS EN 338. For machine grading compliance is achieved by complying with BS EN 14081 Parts 1 to 4.

Visual Strength Grading of timber is based on the assessment of certain characteristics. The grade given depends on the limits of these characteristics, i.e. the size of knots.

At the time of assessment timber is designated either:

- Dry Graded: average moisture content \leq 20% (with no piece exceeding 24%) for timbers up to 100mm thick.
- Wet Graded: average moisture content \geq 20% or timbers over 100mm thick.

Only Dry Graded timbers can be used internally. Timber that does not meet the requirements for any of the grade categories is designated as being Ungraded and must not be used for structural purposes

Softwoods graded in accordance with BS 4978 are assigned into one of two categories:

- GS – General Structural Grade.
- SS – Special Structural Grade.

Hardwoods graded in accordance with BS 5756 are assigned into categories depending upon the size of timber and type of hardwood:

Structural Tropical Hardwood

- HS

Heavy Structural Temperate Hardwoods

(Timber with a cross sectional area equal to or greater than 20,000mm² and equal to or greater than 100mm in thickness.)

- THA – higher grade.
- THB – lower grade.

General Structural Temperate Hardwoods

(Timber with a cross sectional area less than 20,000mm² and less than 100mm in thickness.)

- TH1 – higher grade.
- TH2 – lower grade.

Where graded timber is re-sawn or re-surfaced, outside permitted limits described in BS 4978 and BS 5756 the timber will need to be re-graded.

Quality Classes

Ungraded timbers are classified by Quality Grade determined by visual assessment of different characteristics.

Softwoods are graded in accordance with BS EN 1611 using one of two procedures:

- G2: timber with knots on two faces only
- G4: timber with knots on two faces and edges

Within each procedure timbers are assessed based on the average size and distribution of knots together with twelve other characteristics. Timbers are assigned to Classes 0 to 4, with Class 4 having no limit placed on the presence of knots and other assessed characteristics.

Oak and Beech are graded in accordance with BS EN 975-1. Timbers are assessed based upon their product type and the different characteristics (from a list of 18) depending upon the product type.

Timbers are assigned Quality Grades 'A' and 1 to 4, with 'A' denoting exception quality and '4' low quality.

Quality Grades are prefixed to the denote product type. Suffixes are also used to indicate the presence or otherwise of exposed sapwood in Oak timber ('x' for on face/edge or 'xx' for all faces/edges) and read heart in Beech timber ('R').

Poplars are graded in accordance with BS EN 975-2 and are assessed based upon 11 different characteristics. Timbers are assigned to Classes 1 to 4, with Class 4 being of the lowest quality.

BS EN 1995: Moisture Content

BS EN 1995-1-1 (Eurocode 5) designates recommended moisture content levels of structural timber according to its Service Class.

- **Service Class 1**, average moisture content in most softwoods should be no greater than 12% at 20°C and Relative Humidity not exceeding 65% for more than 4 weeks per year.
- **Service Class 2**, average moisture content in most softwoods should be no greater than 12% at 20°C and Relative Humidity not exceeding 85% for more than 4 weeks per year.
- **Service Class 3**, where the average moisture content exceeds that for Service Class 2.

Service Classes for timber used in different locations are assigned within the National Annex to BS EN 1995-1-1:

Service Class 1

- Timber Frame Walls (internal and party walls).
- Intermediate Floors.
- Warm Roofs.

Service Class 2

- Timber Frame Walls (external walls).
- Ground Floors.
- Cold roofs.
- External uses where timber is protected from direct wetting.

Service Class 3

- External Uses fully exposed.

BS 8000-5: Moisture Content

BS 8000-5 provides recommended maximum moisture content levels for timber and joinery. Recommended levels are less onerous than BS EN 1995-1-1 and are applicable to non structural/ungraded timber only.

Timber

- 24% Sheltered, unheated locations.
- 21% Covered and generally heated locations.
- 19% Covered and continuously heated locations, structure timber within heated office space.

Joinery

- 16% +/- 2% External
- 13% - 17% Internal with intermediate heating
- 10% - 14% Internal with continuous heating, 12-19°C
- 8% - 12% Internal with continuous heating, 20-24°C
- 6% - 10% Close to heat source

Treatment of Timber

BS EN 335-1 defines five different service situations that wood and wood based products may be exposed to by reference to User Classes, these are:

Class 1 Interior covered (dry)

Class 2 Interior or exterior (occasionally wet)

Class 3.1 Exterior, above ground and protected (occasionally wet)

Class 3.2 Exterior, above ground and unprotected (frequently wet)

Class 4.2 Exterior, in ground contact and/or fresh water (predominantly or permanently wet)

Class 4.2 Exterior, in ground (severe) and/or fresh water (permanently wet)

Class 5 In salt water (permanently wet)

These User Classes establishes a means of reporting the suitability of wood products for different end use environments. It also provides a means for specifying the level of preservative treatment required.

Where a wood does not offer the desired level of durability for its end use and location it may be treated with preservative. The type of treatment, and how it's applied, will depend upon:

- Natural durability of the species of timber.
- Required level of durability after treatment.
- Treatability of the timber (its resistance to penetration by preservatives, also referred to as its permeability).
- The ease of any future maintenance, i.e. the re-application of preservatives.
- Location and use (some preservative treatments are not suitable for agricultural or internal uses).

The type of preservative used and the method of application will vary depending upon the type of wood, source and end use requirements.

The most effective means of applying preservative treatment is by industrial pre-treatment. Pre-treatment methods have the advantage that preservatives can be applied in a measured and controlled manner suitable for the species of wood, its end use and desired service life. Methods of pre-treatment are:

- Vacuum, high pressure treatments - Use Classes 1 to 4.
- Double vacuum, low pressure treatments - Use Classes 1, 2 and 3.1.

There are a large range of preservatives that can be used. To treat timber. These may be broadly defined as either being copper based or non metallic.

Copper based preservatives may corrode certain metal products (including fasteners, hardware and flashing). To prevent premature corrosion and failure it is important to follow the recommendations of the preservative manufacturer for all metal products.

Some non metallic treatments do not become fixed in the wood and can readily leach out overtime. The need to re-apply preservative at regular intervals should be taken into consideration.

Engineered Timber Products

Engineered timber products may be proprietary or purpose made. Principal characteristics comprise:

- Strength
- Durability/Preservative Treatment
- Configuration (depth, length and spacing)

The required performance and resultant configuration of engineered timber products will depend on loadings, span, available height and the need to accommodate services, penetrations (e.g. stairwells), and other features.

Types of engineered timber products include:

- Laminated Timber.
- Open Web Joists.
- I-Joists, also know as I-Beams.
- Structural Composite Lumber:
 - i. Laminated strand lumber (LSL).
 - ii. Parallel strand lumber (PSL).
 - iii. Orientated strand lumber (OSL).

Engineered Wood Panel Products

Engineered wood panel products may be used for structural and non structural purposes, e.g. to provide additional stability, and resistance against racking.

Types of engineered timber products include:

- Plywood.
- Orientated strand board (OSB).
- Structural Insulated Panels (SIP) .

Required characteristics of Structural Insulated Panels and other composite panel systems include:

- Strength.
- Durability/Treatment.
- Maximum and minimum sizes.
- Thermal performance.
- Provision of additional features, e.g. openings, chases.

The level of performance needed and associated configuration of engineered timber panels will depend on loadings, span, available height and the need to accommodate services, penetrations (e.g. stairwells), and other features.

Trussed Rafters

A wide range of different trussed rafters are available. Generally trusses are purpose made to provide the exact characteristics and levels of performance required for each individual project. Principal characteristics include:

- Strength.
- Durability/Preservative Treatment.
- Configuration.

Trussed rafters must be designed in accordance with BS EN 1995-1-1 (Eurocode 5), and to the requirements of the current Building Regulations.

The required performance and resultant configuration of trusses will be determined by:

- Loadings (roof, ceiling and attic loadings).
- Span.
- Pitch.
- Configuration, i.e. monopitch, hips, gable ends, 'L' returns, doglegs, etc.
- Features, i.e. overhangs, dormer windows, stairwells, etc.

While trussed rafters form the principal structural elements additional timber members will also be required as part of the roof construction and should be specified separately. Examples include:

- Bracing.
- Hip Boards, Jack Rafters, Ridge Boards, etc.
- Gable Ladders.

Metal Fixings

The type of fixings used within timber frame construction will vary depending upon the required characteristics and level of performance.

BS EN 1995-1-1 provides guidance on the suitability of different materials for fasteners for different environments (service classes) together with minimum spacings and maximum size of bolt holes.

Note copper based preservatives may corrode certain metal products (including fasteners, hardware and flashing). To prevent premature corrosion and failure it is important to follow the recommendations of the manufacturer for all metal products. In general metal fasteners should be non-corrosive or protected from corrosion.

Where trusses are assembled with punched metal plate fasteners they must be manufactured in accordance with the requirements of BS EN 14250:2010.

Timber Certification

The UK Government's timber procurement policy requires that all timber and wood-derived products must be independently verifiable and either from a:

- Legal and Sustainable source; or
- FLEGT-licensed or equivalent source;

The policy is mandatory for all Central Government Departments, Executive Agencies and Non Departmental Public Bodies. Local Authorities, and other public bodies.

The policy provides a recognised benchmark and its adoption within the private sector is encouraged by the Government and may be considered as general good practice when specifying timber based products.

Compliance with the UK Government timber procurement policy is achieved by ensuring that Contracts contain a suitably worded condition. Usually this will take the form of an appropriately worded clause within the Specification or Contract Preliminaries.

In order to assist compliance with the policy the government has identified two types of evidence can be used to demonstrate the legality and sustainability of timber and timber products:

- Category A : Certification of materials under one of the approved schemes
- Category B: All other forms of evidence, for example audit statements, government documentation or supplier declarations.

The use of certified materials provides the most common and simplest form of ensuring compliance. Four certification schemes have been confirmed by The UK Government's Central Point of Expertise on Timber (CPET) as demonstrating that timber and wood products come from legal and sustainable sources. These are:

- FSC (COC): Forest Stewardship Council Chain of Custody
- PEFC: Programme for the Endorsement of Forest Certification Schemes
- CSA: Canadian Standards Association
- SFI: North American Sustainable Forest Initiative

The PEFC is an "umbrella scheme" which endorses national schemes, including the Canadian scheme (CSA) and the North American (SFI) schemes. It is the UK Government's policy to treat all four schemes as equivalent when purchasing timber and wood products.

Specification Guidance

Form of Specification

Timber framing and first fix joinery may be specified on a performance basis or a prescriptively depending upon the scope of the project.

The design of complex timber structures, such as trussed roofs, may be undertaken by the supplier, post tender requiring a performance based specification. For simple timber structures and isolated structural timbers the design of elements will typically be undertaken pre-contract and specified on a prescriptive basis. The specification for timber framing and first fix joinery may also be undertaken by a Structural Engineer.

The scope of any separate engineering specifications, their incorporation into the Contract and coordination with the architectural specification must be clearly defined. Likewise the form of specification together with the Contractor's design responsibilities, if any, must be clearly set out.

This guide covers the prescriptive specification of timber framing and first fix joinery.

Scope

The Scope provides a brief description of the works specified within the particular section and details any contractual matters that are relevant to them. Care should be taken to avoid repeating particulars already included within the Contract Preliminaries.

Scope of Specification

To help the reader quickly understand which elements of the works are covered in this Works Section it is useful to provide a brief description of items, e.g. *Trussed rafter construction to main roof*.

Form of Specification

State whether the specification is performance based or prescriptive together with any contractual requirements or information that relate to the Works Section. Do not include any requirements or information already set out within the Contract Preliminaries.

Where the specification is prescriptive in nature requirements placed on the Contractor may include:

- The selection, supply and incorporation into the works of all listed accessories and sundry items in conjunction with Manufacturer's recommendations.
- The selection, supply and use of all minor items required for the installation of specified materials.

It is normal for the terms of a contract or the Contract Preliminaries to state that the Contractor can offer equivalent and, or, substitute products. Where this is not applicable to all Works Sections an appropriate statement must be provided.

Execution of the Works

Any general requirements or information specifically relating to the execution of masonry works which are not contained within the Contract Preliminaries should be listed. These might comprise:

Reference Documents

A list of all instructions, guidance and standards concerning handling, storage, installation and maintenance of materials that the Contractor is to comply with while executing the works must be given. This may include:

- Installation instructions and recommendations provided by the manufacturer(s) of engineered timber products, SIPs and trussed rafters.
- British Standards, e.g. *BS 8000-5:1990 Code of practice for carpentry, joinery and general fixings*.
- Workmanship clauses provided within the Specification.

In some circumstances conflicts might exist between the requirements set out within the documents listed. A statement should be included that sets out which documents take precedence or confirms whether compliance with the most or least onerous condition is required.

Dimensions

Construction tolerances and the imperfect nature of existing works mean that dimensions provided within the Contract Documents might not reflect final built dimensions. It is therefore advisable to require that the Contractor confirms actual site dimensions before ordering and cutting timbers.

Product

Within prescriptive specifications the Contractor needs sufficient information to:

- Gain a clear and full understanding of the required works.
- Price the works.
- Order all materials, products and systems required in the execution of the works.

The level and type of product information provided will vary depending on the scope of the project, the form of contract and the nature of the works.

The different types of timber framing and first fix joinery items that might be specified within this Works Section can be grouped by product and function, *e.g. Ungraded Softwood*.

Solid Timber

- Location/Purpose: State use of timber product, *e.g. floor joists*.
- Species: Give common name and source of timber, *e.g. Canadian Redwood*. Where timbers have similar names the botanical name can also be provided for clarity.
- Strength Grade: graded timber only *e.g. THB to BS5756*.
- Strength Class: graded timber only *e.g. C24 to BS EN 338*.
- Quality Class: Ungraded timber only, stipulate class of timber required referencing British Standard, *e.g. Class 2 to EN BS 1611*.
- Moisture Content: Expressed as a percentage.
- Surface Finish: Finish of timber, *e.g. rough sawn*.
- Preservative Treatment: The scope of information provided in the specification of preservative treatment may include either of the following criteria:
 - i. Design Life.
 - ii. Treatment Reference.
 - iii. Required Durability Classification (BS EN 335-1) of timber post treatment.
- Size: Finished or nominal size in millimetres.

Engineered Wood Products and Trusses

- Manufacturer: Name of manufacturer, website and telephone number.
- Reference: Product/system reference name and, or, code.

Accessories/Related Components

Where related components need to be specified it is recommended these items are specified as an additional item within the relevant product clause where provided by the same manufacturer.

These can be specified in two ways:

- *Fixings: reference G20.4160 Plate Connectors*
- *Fixings: Plate Connectors, Reference XXXX*

The last option is suitable where only a reference is required and, or, the final selection of the product to be used can be undertaken by the unit manufacturer. The first option is suitable where additional information, *e.g. dimensions*, also need to be provided

Additional Information

Additional descriptive or performance related information can be provided where it is felt that this will aid the Contractor in understanding the scope of works, how they are to be achieved and the required level of workmanship. Examples may include:

- Location: Where a number of elements are specified it may be advantageous to indicate their location.
- Method of Fixing: *e.g. SS Bolts*.
- Finish: Include the specification reference for any finishes that are to be applied to timber, *e.g. paint to external facia*.

Where additional information is provided it should be grouped together with the relevant item or clause.

Accessories

Where related components are specified in detail all necessary information needed to order the correct materials or products must be given.

Check with the manufacturer of the principal materials, products and system to ensure that the selected components are compatible with other systems. Information to be provided includes:

- Manufacturer: Name of manufacturer, website and telephone number.
- Reference: Product/system reference name and, or, code.
- Finish: *e.g. stainless steel*.

Workmanship

Additional requirements relating to the installation of specified materials and products can be provided within Workmanship Clauses. Requirements generally relate to:

- Scope of works, e.g. frequency of movement joints.
- Additional design information, e.g. setting out information, joint widths, etc.
- Quality control, e.g. permissible tolerances, discarding non-compliant materials.
- Method of working, e.g. sequencing or works.

In the majority of instances guidance provided by BS 8000-5 will be sufficient to enable the Contractor to undertake the work to a high standard. Additional requirements may be provided that expand upon, alter, confirm or emphasise requirements already outlined within the reference documents (i.e. where work needs to be undertaken to an historic building in a particular manner).

Where workmanship clauses stipulate the method of working to be employed by the Contractor, check that any instructions given will not reduce the performance of the material in question.

Storage of Timber

Where timber is stored on site it must be placed so that its moisture content remains within the required range and does not become overstressed, distorted or disfigured.

Instruct the Contractor to store timber in accordance with the guidance contained within BS 8000-5. In the case of engineered products or trusses state that these must be stored in accordance with the manufacturer's recommendations. Specific recommendations may be emphasised including the need to:

- Cover timber to protect it from sun and rain, providing adequate ventilation around all items.
- Segregate timbers and wood products that are of different grades, preservative and moisture content and place spacers to protect projecting elements.
- Provide temporary stays to keep trusses, etc, vertical.
- Where items are stored horizontally, provide adequate support along the full length of items to prevent sagging, with bearers vertically aligned and at close centres.
- Place items on bearers of sufficient height so that they are clear of the ground and the free movement of air around them is achieved.

Handling of Engineered Products/Trusses

To ensure engineered products and trusses do not become overstressed, distorted or disfigured they must be transported, stored, lifted, incorporated into the works in accordance with manufacturer's recommendations.

Instruct the Contractor to comply with the handling recommendations provided by the product/truss manufacturer and require that all timbers that become warped, split, shrunk or weakened are to be discarded and not incorporated into the works.

Cutting of Timbers

BS 8000-5 sets out the permissible location and size of notches and penetrations generally and in relation to knots and, or, other defects in a manner that ensures the strength of the timber is not impacted up.

BS 4978 and BS 5756 set out the limits by which graded timber can be re-sawn or re-surfaced (i.e. planed) before it must be re-graded in to order to comply with the relevant standard.

Confirm that the Contractor must comply with the relevant British Standards and associated restrictions on re-sawing, re-surfacing, placement and size of notches and penetrations.

Any additional restrictions on the cutting of timber members may also be included within this clause, such as restrictions on the use of certain types of timber joint that might impact on the timber's strength, e.g. scarf joints and finger joints and splice plates.

Fixing Timber

The method of fixing timber should be specified. Additional information relating to the method of fixing can be set out within an appropriate workmanship clause. Requirements that might be stated include but are not limited too:

- Setting out of fixings.
 - i. spacing of fixings.
 - ii. size of bolt holes.
 - iii. accurate positioning.
 - iv. minimum distance of fixing from end of timber.
- Achievement of correct bearings.
- Items to be fixed so that they are.
 - i. are plumb and level.
 - ii. of the correct alignment.
- Provision of temporary bracing.

Treatment of Cut Surfaces

Where pre-treated timber is used it is important to ensure that any surface exposed by drilling or cutting is coated with a cut end preservative. Failure to coat will affect the value of the preservative.

Where preservative treatment is not specified, instruct the Contractor to check that preservative treatments used are suitable for the pre-treated timber.

Packing

The performance of fire or acoustic rated construction may be impacted upon by the presence of voids between timbers and substrates, e.g. around framework. Where packing is required, instruct the Contractor to pack voids between trims and substrate ensuring:

- Packing materials fill voids and gaps providing the necessary level of performance.
- Packing materials are inert, non compressible and non degradable.

Samples, Tests, Certificates, etc

The following guidance should be read in conjunction with the guidance provided for Samples, Tests, Certificates, etc within Specright's Introduction to writing Architectural Specifications.

Electrical Moisture Test

The requirement for testing will depend upon the nature and sequencing of the works together with methods of working employed by the Contractor.

The electrical resistance method is suitable for measuring timber with a moisture content of 7% - 30%, although over 20% measurements are generally considered to be unreliable. The method of testing varies depending upon the model of meter used. It is therefore important that the instructions provided by the meter manufacturer are followed to ensure that:

- Adjustment is made to take account of the wood species and wood temperature.
- Electrodes are sufficiently long enough to penetrate into the timber by the recommended depth.

- Calibrate measurements according to type/size of tip used to take readings.
- Adjustment is made for the effect that preservatives may have on readings.
- Because measurements may vary depending on the local properties of the timber, measurements are taken at multiple points to establish the average and maximum moisture content

Set out the requirements for testing, including:

- Timing of Tests: *e.g. at time of delivery, or, immediately before installation.*
- Test Frequency: *e.g. each batch.*
- Test Method: *Electrical resistance method to BS EN 13183 -2 or in strict accordance with meter manufacturer's instructions.*
- Test Results: *State item/batch tested, date and moisture content.*
- Reporting: *e.g. Retain on site for inspection, or, submit to Employers Agent.*

Note that although BS EN 13183-2 may be referenced the current version of the Standard is limited in scope and instructions provided by the meter manufacturer are likely to be more thorough.

Additionally where testing is to be carried out to high quality timber trims it is recommended that the Contractor is advised that probes must be inserted into those timber faces that will be concealed in the final works.

Timber Certification

Where all timber and wood-derived products must be provided from independently verifiable legal and sustainable, or equivalent, sources this requirement together with the permitted method for demonstrating compliance must be given. Requirements should include:

- Scope: range of materials/products to be from a certified sustainable source, *e.g. each batch of timber and wood derived products utilised during the course of the works.*
- Acceptable forms of evidence: i.e. list of approved certification schemes.
- Reporting: *e.g. Retain on site for inspection, or, submit to Employers Agent.*

Standards & References

Timber

BS 8000-5:1990	Workmanship on building sites. Code of practice for carpentry, joinery and general fixings
BS 4978+A1	Visual strength grading of softwood. Specification
BS 5756+A1	Visual strength grading of hardwood. Specification
BS EN 338	Structural timber. Strength classes
BS EN 14081-1+A1	Timber structures. Strength graded structural timber with rectangular cross section. General requirements.
BS EN 1912	Structural Timber. Strength classes. Assignment of visual grades and species
BS EN 1611-1	Sawn timber. Appearance grading of softwoods. European spruces, firs, pines and Douglas fir
BS EN 975-1	Sawn timber. Appearance grading of hardwoods. Oak and beech
BS EN 975-2	Sawn timber. Appearance grading of hardwoods. Poplars

Timber Structures

BS EN 1995-1-1+A1	Eurocode 5. Design of timber structures. General. Common rules and rules for buildings
BS EN 14250	Timber structures. Product requirements for prefabricated structural members assembled with punched metal plate fasteners
BS EN 14592+A1.	Timber structures. Dowel type fasteners. Requirements

Durability

BS EN 350-2	Durability of wood and wood-based products, natural durability of solid wood
BS EN 355-1	Durability of wood and wood-based products, definitions of use classes

Electrical Moisture Test

BS EN 13183-2	Moisture content of a piece of sawn timber. Estimation by electrical resistance method
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