

Section C Sample Timber Specifications

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Introduction

This sample specification should be beneficial for everyday timber specification and general Bill of Quantities use. It indicates the essential timber specification elements but could be supplemented with additional clauses from the Building Specifications (Section D) where appropriate.

BS 5268 Part 2 was a permissible stress standard and was the main design standard used in Ireland (I.S. 444 was based on BS 5268-2) and the UK. However the equivalent European standard, Eurocode 5 (formally designated EN 1991-1-1 and EN 1995-1-2) is a limit state code and will increasingly come into use, replacing BS 5268. Italics are generally used in the following where a specific material or dimension is specified and which may be altered at the discretion of the specifier as long as it complies with good practice or the appropriate standards. Some British standards have been quoted even though they may have been withdrawn as some of these standards may still be in use particularly in the UK.

USE OF STANDARDS

In presenting broad-based specifications considerable reference has to be made to appropriate standards particularly the European Standards, known as Euro Norms (ENs) which have superseded many national standards. It is very important to check that quoted standards are current or if they have been revised; certain national standards may no longer apply and many European standards have already undergone revision.

In Ireland and the UK the national design standards have been withdrawn since 2010 (in Ireland, I.S. 444 and I.S. 193 and in the UK BS 5268 in its various parts) and are no longer supported by NSAI or BSI. A decision has to be made on which standard should be used for design and Technical Guidance Document A (Structure), [or Approved Document A in the UK] should be consulted.

It is important to note that, whereas both standards (Eurocode 5 and BS 5268) may be acceptable for design, they are not interchangeable as parameters within the standards differ. Where IS444 (or BS 5268) and Eurocode 5 are quoted they are mutually exclusive and either the Irish Standard/British Standard or Eurocode 5 may be used but not both. Generally the design and loading codes or standards (e.g. the wind codes) are separate and incompatible but with some exceptions. However, some European product standards are applicable to the Irish or British Standards (e.g. the plywood standard EN 636 and the standard on timber tolerances EN 336). The mixing of the new European standards with the old National standards (I.S. or BS) must be undertaken with care and generally the only mixing that should be undertaken is within the product standards.

All European Standards are quoted as EN followed by the appropriate number. These ENs when adopted by member states receive a further designation denoting their acceptance as a standard by a particular country. For example, when adopted by Ireland an EN will become I.S. EN; similarly an EN adopted by Britain becomes BS EN, thus the ENs also become National Standards. Because of the rate of promulgation of ENs, the process of adoption is on-going.

This Guide does not show the national prefix but I.S. ENs apply to Ireland and BS ENs apply to the UK (See section E4).

A number of standards allow a National choice in specifying certain values, these National values are contained in the different National Annexes (NAs) to the ENs; it should not be assumed that the Irish and British National Annexes are the same (although in many cases there are few differences).

The Irish National Annex should be used in Ireland and the British National Annex should be used in the U K.

In addition Non-Contradictory Complementary Information (NCCI) is allowed to be produced by a member state. NCCIs contain additional guidance on the Eurocodes but are voluntary and are not compulsory. In the UK PD 6399 contains supplementary information while in Ireland two documents have been produced to

replace I.S. 444 and I.S. 193. These have been provisionally designated Swift 6 and Swift 5 but may be produced as Irish Standards but even as Standards they will still be regarded as NCCI's.

Alternative standards to National Standards and Euro Norms are quoted in certain circumstances and it is important to ensure that these standards are current and appropriate to the work in hand.

The main examples shown in this document are based on Eurocode 5 but in some cases Irish and British Standards and in particular BS 5268 Part 2 have also been referenced; for example the nail and screw centres and edge distances come from Eurocode 5 as well as BS 5268 Part 2. In many cases Eurocode 5 (all of its parts) has very similar approaches to design as the different parts of BS 5268 (including designing for fire) and many of the example specification clauses here have an exact equivalent in the Eurocode.

C I Materials

1.1 TIMBER GENERALLY

All timber and timber based products including timber boards shall be properly certified and marked according to the relevant standards.

All timbers should be legally logged and forest managed under principles of sustainability in accordance with international guidelines. In Ireland and the UK the two main schemes certifying companies and allowing them to demonstrate appropriate chain of custody in relation to forest management are PEFC (Programme for Endorsement of Forest Certification) and FSC (Forest Stewardship Council). More information on these organisations can be obtained on their websites.

Timber shall be conditioned to a moisture content appropriate to its end use and free from defects or combination of defects, including decay, rendering it unsuitable for the purpose intended.

Structural timber shall be visually strength graded to comply with I.S. 127 (or for the UK BS 4978) or machine graded to comply with EN 14081.

Joinery timber shall comply with EN 942. (Note; this Standard is similar in many respects to BS 1186 Part 1. That Part 1 has been withdrawn but Parts 2 & 3 are still current.)

1.2 HARDWOOD

Hardwood joinery which is exposed to view in woodwork shall be totally free from the following defects: knots, sapwood, wane, warping, pith, brittle heart, decay, stain and beetle attack.

All hardwood shall be accurately cut and shall be in conformity with samples approved by the architect prior to commencement of work.

1.3 SOFTWOOD

Softwood joinery timber which will be exposed to view shall be European redwood, Class J10 of EN 942. The following defects shall not be permitted: pith shown on the surfaces; sloping grain exceeding one in eight; checks, splits and shakes in excess of those permitted by Class J10 of EN 942; knots, excepting isolated sound tight knots of less than 20 mm diameter; any evidence of beetle attack or decay.

Softwood not exposed to view will be accepted with minor defects with the exception of active beetle attack or decay.

1.4 MOISTURE CONTENT

The moisture content of woodwork after manufacture and/or kiln drying shall comply with EN 942. Structural timber shall comply with EN 1995-1-1 or BS 5268 Part 2 (for permissible stress designs) for the relevant service or use class.

Unless specified to the contrary, moisture content of timber at time of erection or assembly shall be within the following limits.

Internal joinery/flooring	External joinery/cladding
With intermittent heating 15+/-2%	Normal structural timber 18+/-2%
With heating up to 20°C 12+/-2%	External cladding 18+/-2%
With heating over 20°C 10+/-2%	External joinery 16+/-3%

Note: Flooring for use with under-floor heating should have a moisture content of 7 +/-1% or as required by the specialist floor manufacturer and conditioning may be required prior to installation.

1.5 PLYWOOD

Plywood generally shall comply with EN 13986 and EN 636; BS 1088 parts 1 and 2 specifically cover marine plywood. Marine plywood is to be used where specified.

Notes:

All plywood shall be properly certified as required by EN 13986 and it should be CE marked.

If the plywood has an ETA (European Technical Approval) and/or is CE marked then there will be accompanying documentation giving additional information on the plywood (generally the marks on individual boards is limited). Accompanying information should be requested and the information on the boards and/or accompanying documents should be sought. The body responsible for monitoring the manufacture of the plywood will be a notified body but can be an approved body in the case of CE marking based on an ETA. The identification mark of the body should be on the boards or on the accompanying documentation. A company distributing any board material must be able to demonstrate the fitness of use of the board and must be able to supply the board information and supporting documentation.

As a further check confirmation of the plywood and associated information should be sought from the third party monitoring the manufacture of plywood (this is often the same party been responsible for confirmation of the physical properties and/or the production of an ETA) to confirm the certification and validity of the plywood.

1.6 ORIENTED STRAND BOARD (OSB)

OSB shall comply with EN 300.

Note: *There are a number of plants producing OSB in Europe and generally a specifier can have confidence in OSB certification.*

1.7 PARTICLE BOARD

Particle board (chipboard) shall comply with EN 312.

Note: *Particle board is similar to OSB in relation to production and confidence in certification.*

1.8 MEDIUM DENSITY FIBREBOARD (MDF)

MDF shall comply with EN 622.

Note: *MDF is similar to OSB in relation to production and confidence in certification.*

1.9 WOOD VENEERS

Wood veneers shall be prime quality, a sample of which shall be submitted and approved by the architect. The architect is to be informed when the whole of the stock is ready for his inspection and approval before work commences.

1.10 GLUES

Glues shall be of synthetic resin adhesive to EN 301. Type I/II as appropriate.

1.11 TIMBER SIZES

All joinery and furniture dimensions on architect's drawings are finished dimensions.

Structural timber shall be specified by the target size and tolerance class (to EN 336). Any timber that is regularised, planed or otherwise altered shall be designated with a new target size and tolerance class.

Note: *The grading standards give tolerances for re-worked timber where re-grading is necessary.*

C 2 Preservative treatment

2.1 GENERAL INFORMATION

As explained in the *Design Guidance* section A4, new European Standards have been introduced which have replaced the existing process-type specification with a results-type specification system. Specifiers should check with timber treatment plants and the relevant preservative company's technical departments whether existing British Standards or new European Standards methods of treatment are in use. Both systems depend on preservative penetration and retention in order to be effective. With either the EN or BS system the specifier must decide:

- The desired durability required and assess the likely Use/Hazard Class
- The relevant code of practice
- The type and method of preservative treatment

There are 4 main types of preservatives:

- Water-borne Micro-Emulsions to EN 599 e.g. Prevac or Vac-Vac
- Organic Solvents to EN599 e.g. Prevac or Vac-Vac
- Tar Oil Preservatives to BS 144 Creosote (but not recommended, only for specific exterior applications)
- Organic or inorganic waterborne to EN 599 e.g. Copper Triazole or ACQ

The three most widely used methods of preservation are

- immersion/ deluging
- organic solvent or water-based emulsion double vacuum treatment for timber not in ground contact and
- water-based pressure treatment for timber in ground contact.

Organic solvent preservation does not have a timber/metal reaction problem and it does not affect timber moisture content (i.e. there is no need for re-drying). It does not cause dimensional change to timber sections and has little effect on timber colour. It should be specified for close-fitting joinery such as doors and windows.

The specification clauses which follow give the European and British Standard approaches to joinery and timber preservation. Specify one system only. Generally do not mix the BS and EN systems together but some of the newer British Standards do refer to the EN Use/Hazard Class system.

Note: BS 8417 is a good standard that gives good overall advice and there is not yet a single EN that has the same information in one place. The term Use Class is replacing Hazard Class but the two terms are essentially synonymous and both terms have been used here.

2.2 ORGANIC PRESERVATIVE TREATMENT IN ACCORDANCE WITH EXISTING BRITISH STANDARDS FOR OUT OF GROUND CONTACT

2.2.1 Treatment methods and timber to be treated

Double Vacuum organic solvent wood preservative treatment shall comply with EN 599 i.e. fungicide plus insecticide and timber should be treated in accordance with BS 8417 Table 6.

2.2.2 Double vacuum schedules

The schedule shall be appropriate to the end use and shall comply with BS 8417

2.2.3 Treatment processing records (charge sheets)

Treatment certificates that make reference to the processing record shall be provided with all deliveries, copies of which shall be sent to the architect. A treatment docket is not acceptable unless specifically agreed beforehand with the architect. A full treatment processing record (charge sheet) with complete information is required to be provided to the satisfaction of the architect.

2.3 PRESERVATIVE TREATMENT IN ACCORDANCE WITH EXISTING BRITISH STANDARDS FOR OUT OF GROUND CONTACT BELOW DPC LEVEL AND HAZARDOUS END USES

2.3.1 Copper organic

Treatment with copper organic based wood preservatives should be in accordance with BS 8417. The determination of preservative retention (R) is specific to each preservative formulation and will vary according to the Hazard/Use class and wood preservative used.

2.4 PRESERVATIVE TREATMENT IN ACCORDANCE WITH EUROPEAN STANDARDS EN 335, EN 599.

GENERAL INFORMATION

Both the European and British Standards relate the risk of timber decay (whether through fungal or insect attack) to the situation where it is being used. Timber used below DPC level in has a higher risk than timber used internally within a building or for timber use above DPC level. EN 335 describes 5 Use/Hazard Classes ranging from Use/Hazard Class 1, where timber is essentially not at any risk of timber decay but may be subject to insect attack, to Use/Hazard Class 5 where timber is permanently exposed to salt water and at its greatest risk of decay. There are three parts of EN 335:

EN 335-1 Durability of wood and wood-based products. Definitions of use classes. General

EN 335-2 Durability of wood and wood-based products. Definition of use classes. Application to solid wood

EN 335-3 Hazard classes of wood and wood-based products against biological attack. Application to wood-based panels

Use Class is replacing Hazard Class as a term but they can be considered as synonymous.

The European standards require a demonstration of proof that the treatment used has produced the specified results. This can only be achieved through reference to chemical analytical methods. The preservative penetration and retention are intended to be the same as those achieved by the British Standard based processes. Preservatives such as inorganic concentrates and organic solvent types will continue to be used as they are today. However, water-based micro-emulsion preservatives have been developed (these are also referenced in BS 8417 rather than BS 5268-5) and are available to respond to the requirement for more environmentally compatible preservative treatments. These preservatives can fulfil the role of traditional ones in many circumstances.

Where sapwood is present, or heartwood which does not have adequate natural durability for its intended end use, preservative shall be applied according to its Use/Hazard Class, as defined in EN 335 Definition of Use/Hazard Classes. Other European Standards relevant to the determination of appropriate treatment are;

EN 350 Natural Durability Classes, EN 351 Penetration and Retention Classes and

EN 599 Performance Tests for Preservatives.

A certificate of preservative treatment shall be attached to each delivery of each Use/Hazard Class and copies sent to the architect - see 2.2.3. The moisture content of the timber to be delivered to site shall not exceed that specified.

2.4.1 USE/HAZARD CLASSES IN SERVICE – Examples

Use/Hazard Class 1:

Floor-boards, floor joists (excluding ground floor), timber above ground floor not built into external walls.

Use/Hazard Class 2:

Ground floor boards and joists, frame timbers in timber-frame houses, roof timbers, timbers built into external walls.

Use/Hazard Class 3:

External cladding, joinery, fascias, bargeboards, soffits and valley gutter timbers (coated).

Use/Hazard Class 4:

Sole plates below DPC, fence posts; playground equipment (if in ground contact).

Use/Hazard Class 5:

Marine, salt water contact.

Note: A more detailed table and additional information can be found in the Design Guidance section for designing for durability (A4). Use/Hazard classes and typical situations are also described in more detail in Table 1 of BS 8417.

2.5 RE-TREATMENT OF CUT SURFACES

All cutting, machining, profiling and notching must be completed prior to treatment. Any cutting of treated surfaces must have the architect's approval. Where the architect gives such approval, all exposed surfaces shall be retreated with a liberal brush or spray application of a suitable preservative.

Ripsawing, planing and heavy sanding will not be permitted unless the timber is returned for re-treatment after such work has been completed.

C 3 Fixings

Metal fasteners shall comply with the requirements of EN 14592 and metal connectors with EN 14545. All fasteners and connectors shall comply with the design requirements of EN 1995-1-1.

3.1 SCREWS AND NAILS

In general screws shall comply with BS 1210 and nails with I.S. 105 or BS 1202. In every case the size and material of screws and nails shall be as specified and comply with the relevant design standard (Eurocode 5 or BS 5268-2). Screws, nails or metal fastenings in hazardous locations or conditions must be non-ferrous, e.g. austenitic stainless steel, silicone bronze, no other screws or nails are permitted.

The fixing of external cladding, joinery or window beads shall be with stainless steel or silicon bronze screws, nails or fixing pins.

3.2 Bolts

Bolts shall comply with EN ISO 898-1; black hexagonal bolts shall comply with BS 4190 for designs to BS 5268.

All bolts, nuts and washers described on drawings as galvanised shall be hot-dipped galvanised, and those of stainless steel as austenitic stainless steel.

Bolt holes shall be drilled to diameters as close as possible to the nominal diameter of the bolt and in no case more than 1.0 mm larger than the bolt diameter or 2.0 mm for designs to BS 5268. A minimum of one complete thread shall protrude from the nut. Care shall be taken to avoid placing a bolt in any end split. The washer should be 3 times the bolt diameter and have a minimum thickness of 0.3 times the bolt diameter. Generally the smooth load bearing element of the shank shall be in full contact with the jointed members across the full width of the joint.

3.3 Connectors

All toothed-plate connectors are to comply with EN 912 and EN 14545 or BS 1579 for designs to BS 5268. All toothed-plate connectors together with bolts and washers are to be hot-dipped galvanised to EN 1461 or austenitic stainless steel or/and as specified. The connectors shall be fitted and embedded as described in the relevant design standard (Eurocode 5 or BS 5268-2). The washer size and thickness shall comply with Eurocode 5 and its referenced standards or BS 5268-2 and/or BS 1579.

3.4 Brackets, joist hangers, plates

Proprietary brackets, joist hangers, plates and the like shall be approved by the architect or the engineer before any assembly commences. All brackets, joist hangers plates, etc. shall be hot-dipped galvanised using double-dipped process to EN 1461 or stainless steel as described in drawings.

3.5 Tightening of bolts or connectors

Care must be taken to avoid the over-tightening of bolts in bolted or connector joints so that no crushing of the wood occurs under the washer.

3.6 Adhesives

Adhesive shall be Adhesive Type I to EN 301. PVA glues shall not be permitted. The mixing of the adhesive elements shall be carried out in clean containers; mix proportions, method of mixing, air temperature, method of application, rate of spreading, method of clamping including any pressure requirements, curing etc., shall be strictly in accordance with the adhesive manufacturer's instructions.

Adhesive spreading shall be carried out within the manufacturer's stated 'open storage' time and any adjustments in alignment or clamping after the two mating surfaces have been brought into contact, shall be carried out within the manufacturer's stated 'closed storage' time.

At the time of adhesive application the moisture content shall comply with the manufacturer's requirements.

The surfaces of the timber to be fixed with adhesive shall be machined and the application of adhesive carried out within 48 hours of machining. Care shall be taken that the adhesive to be used is compatible with any treatment applied to the timber (e.g. a preservative or fire retardant).

Where any adhesive joints occur on exposed areas of timber, the exposed areas shall be removed by light planing or sanding after the adhesive has set such that all adhesive which has been 'squeezed out' of the joint is removed to the satisfaction of the architect.

C 4 Fire-retardant treatment requirements

4.1 FIRE-RETARDANT TREATMENT

4.1.1 Internal walls and ceilings

Where specified internal timber wall cladding and timber ceilings (excluding proprietary fire-rated panel systems) shall be treated with a suitable fire retardant. The fire retardant shall be as specified by the architect, and unless agreed otherwise the treatment shall be pressure applied in accordance with the manufacturer's instructions.

The flame retardant used (and its method of application) shall have an ETA (European Technical Assessment with appropriate supporting documentation) and/or be certified by a suitable body such as the Agrément Board.

Note: CE marked timber treated with a fire retardant requires a higher level of attestation than untreated timber.

4.1.2 Preparation for treatment

1. Timber and plywood should preferably be new, clean and unpainted. All inner and outer bark must be removed from solid timber prior to treatment.
2. The moisture content must not exceed 22% or lower if specified by the treatment manufacturer or required by their end use.
3. As far as possible all ripping, planing, profiling and extensive machining should be completed before treatment. Slight dimensional changes may occur during treatment and the treatment plant should be consulted beforehand.
4. To obtain a rapid treatment service it is advisable to contact the treatment plant to establish the best method of parcelling timber to suit the plant dimensions and handling equipment.

4.1.3 Quality control

Full details of every phase of fire-retardant treatment are to be recorded for each charge treated. (**Note:** This will help to ensure that the treatment conforms to specification and that the correct treatment has been followed).

The specifier may, on demand, obtain a copy of this Charge Sheet record or he may ask for a Certificate of Treatment.

Note: See also section 4.7.

4.2 GLUING

When fire-retardant treated material is to be glued, the glue manufacturer should be consulted for appropriate recommendations.

The method of gluing should be in accordance with the glue manufacturer's recommendations.

Note: Phenol formaldehyde, melamine formaldehyde or resorcinol types may be recommended depending on the end use of the product.

4.3 SAWN ENDS

Surfaces exposed by cross-cutting, drilling, notching etc. must be liberally brushed with a fire-retardant concentrate. Rip sawn pieces must be returned for re-impregnation.

Note: It is important that solid timber is cut to size as far as is practical prior to treatment and that rip-sawing on site is avoided. Cross-cutting plywood in any direction is permissible, but edges should be brushed with a fire-retardant concentrate.

4.4 HANDLING AND USE ON SITE

When storing treated wood, the material should be kept off the ground and covered to shield it from the weather or direct wetting.

Fire-retardant treated wood should be installed so that it will not be exposed to the weather or direct wetting.

When painting or staining, the paint or stain manufacturer's recommendations should be followed. As with untreated wood, the surface should be clean and dry. Light sanding may be necessary.

Appropriate precaution should be taken when using and handling the product. Dust masks and eye protection devices are recommended to avoid possible irritation from dust or chips and gloves will help avoid splinters; hands should be washed after doing construction work.

The nature of the chemicals used in the fire-retardant treatment process should be ascertained and the treated wood products should be handled with whatever precautions are recommended by the manufacturer. The user should be aware of proper handling and personal hygiene practices.

4.5 DECORATING

It must be ascertained whether the fire retardant treatment affects the appearance of the timber to determine if it may be used unpainted or if it requires a protective coating. If it is to be painted by conventional methods, the manufacturer's recommendations should be followed.

It should be established that any finishes applied do not affect the spread of flame control achieved by the fire-retardant treatment. Highly flammable finishes such as nitrocellulose-based lacquers must not be used.

4.6 FIRE DOORSETS AND SCREENS

Fire door sets and screens shall be classified in accordance with EN 13501-2 and shall comply with the relevant fire tests including EN 1634 Part 1, 2 and 3 (or BS 476

Parts 20 and 22 and BS 8214 for designs to BS 5268-2).

Manufacture of fire-doors and screens shall be carried out by an approved joinery manufacturer who can produce an appropriate Certificate of Fire Resistance to the satisfaction of the architect.

4.7 TIMBER VENEER WALL PANELS**4.7.1 General**

Wall panels to be flush veneered laminated panels, manufactured and supplied by (state brand name), or equal and approved by the architect.

Wall panels shall meet Class C – s3,d2 or Class B –s3,d2 to the European class system (or if BS 476 is appropriate, Class1 rating or Class 0 as defined by the Technical Guidance Documents or for the UK the Approved Documents to the Building Regulations), at the locations shown on the architect's drawings.(Note; the areas could also be specified as below).

Panels to the circulation, foyer and concourse areas shall have a Class B-s3, d2 rating (or if appropriate Class 0).

Panels to the interiors of other rooms shall have a Class C-s3, d2 rating (or if appropriate a Class 1 surface spread of flame rating).

An appropriate ETA (with supporting documentation) and/or an Agrément Certificate of compliance shall be provided by the manufacturer.

Notes:

Class C-s3,d2 is approximately equivalent to Class 1 and Class B-s3,d2 to Class 0. The European class system is described under the term 'Reaction to fire' and is similar to BS 476 term 'Surface spread of flame'.

Appropriate locations and classification system to be substituted as required. Larger rooms will also require Class B-s3.d2 or Class 0 surface spread of flame rating.

The drawings submitted for a Fire Certificate should include the ratings for different areas and the final work should comply with the issued Fire Certificate.

4.7.2 Panel size

(*State brand name*), 18mm thick veneer panels, or equal and approved by the architect, with dimensions as shown on the architect's interior wall elevations, shall be used throughout.

4.7.3 Panel core

Panel core shall be (*state brand name*), or equal and approved, solid timber core of narrow laminate spruce strips faced on both sides with high-density chipboard.

4.7.4 Lippings

Lippings to edges shall be a minimum 10mm thickness in matching timber species supplied to all edges before veneering. All lippings to be square and true.

4.7.5 Veneers

Veneers shall be from selected prime quality logs. Cherry and beech quarter-sawn veneer shall be laid "bookmatched" vertically.

4.7.6 Finish

Veneer panels shall be fully finished before delivery to site with a specifically formulated pre-catalysed lacquer applied in two/three coats to give a semi-matt finish to the satisfaction of the architect.

4.7.7 Fixing method

Panels shall be fixed in full accordance with the manufacturer's instructions and the architect's detailed drawings.

Notes:

The 'surface spread of flame' term has been replaced by 'reaction to fire' in the new European testing and classification system.

Timber treated to improve its reaction to fire classification has a higher level of attestation (level 1) and therefore site applied treatments are unlikely to be CE marked (a mark does not have to be on the product). At present there appears to be no treatment plants in Ireland and most timber is treated in the UK.

C 5 Workmanship

5.1 STORAGE

Timber on the site shall be stored under cover, clear of the ground and protected from dampness. Timber shall be stored on level bearers located at centres sufficiently close to prevent distortion. Timber that is not stored in this manner shall be rejected.

5.2 GENERAL

Wall plates, ceiling joists, etc., shall be in one length where possible. All joints shall be made directly over supports. Structural timber shall be as specified by the design engineer; generally members shall be in one length and joints shall comply with the requirements of the design engineer.

All joinery is to be finished with a smooth wrought face.

Surfaces to be painted with a matt paint, shall have a finish such that any imperfections will not be apparent. Surfaces for gloss or matt transparent finish shall be such that when so finished no imperfections shall be apparent.

Joinery intended to be painted is to be fixed by stainless steel nails. Nail heads are to be punched below the surface and are to be filled with leadless paste filler. Joinery intended for transparent finishes is to be secretly fixed. Heads of screws are to be countersunk and pelleted in the same wood and with matching colour and grain. In general all fixings are to be stainless steel or silicon bronze unless otherwise stated.

Unless timber is impregnated with preservative, the backs of frames etc., to be fixed to walls and all other bedding surfaces are to be painted with two coats of preservative before priming. All work to be painted is to be treated with knotting as necessary and given one brush coat of primer to all faces. Surfaces to be joined are not to be primed. The number of coats and methods of application of all finishes are to be as specified.

5.3 DEFECTIVE WORK

Should any shrinkage or distortion occur or any other defects appear in the joinery work before the end of the Defects Liability Period, such defective work is to be taken down and renewed to the architect's satisfaction, and any work disturbed in consequence must be made good at the contractor's expense.

5.4 PLUGGING

The term 'plugging' shall mean the provision and fixing of hardwood or approved proprietary plugs and includes any necessary wedging and drilling of wood, concrete or brickwork.

Where plugging and screwing of door or window frames is measured this shall be deemed to include plugs and screws of adequate size and strength to suit the frame size including proprietary frame fixings as manufactured by (state brand name), or equal and approved.

5.5 WORKMANSHIP AND MANUFACTURE

The joinery shall be constructed as indicated on the architect's details and the manufacturer is to be responsible for the sound construction of the components using recognised forms of joints in appropriate positions.

Workmanship in general shall be in accordance with BS 1186, Part 2, and in particular with Clauses 2.1; 2.2.1; 2.3.4; 2.4.2; 2.5 and 5.

Joiners' full-scale setting out drawings and construction details must be seen and approved by the architect before work begins. Facilities are to be given for the architect to inspect all work in progress in the manufacturing shops and on the site.

5.6 HANDLING, STORAGE AND PROTECTION

The completed doors, windows and panels shall at all times be protected from the weather and stored under cover and clear of the ground. Transportation shall be in covered trucks. Every possible care and precaution must be taken to avoid damage to framing, all surfaces and arrises during handling and storage.

Any preservative treatment shall be applied and allowed to dry fully before installation and painting to ensure all surfaces are treated.

Doors, windows and panels shall be protected against moisture penetration and coated with paint or other surface coatings as soon as possible after installation. Protection against damage must be maintained until handover.

C 6 Definitions

6.1 FINISHED SIZES

The term 'f' qualifying an expression of size means that the work shall be finished to the size given. The term 'f sizes' means that all dimensions contained in an expression so qualified are finished dimensions. The tolerances on the timber size should be specified with the finished size.

Note: All joinery dimensions on architect's drawings are usually finished dimensions.

6.2 EXACT SIZES

The term 'exact' qualifying an expression of size means that no deviation from the size given is permitted. The term 'exact sizes' means that all dimensions contained in an expression so qualified are exact.

6.3 HARDWOOD OR THE LIKE

The term 'hardwood or the like', which is used as a statement of background to which ironmongery is to be fixed, is deemed to include plywood and other manufactured materials except where these materials are faced with metal, laminated plastics or the like.

6.4 FIRE DOORS AND SCREENS

Notwithstanding the information provided on drawings or in the Bill of Quantities, where doors or screens are described as fire resistant, the contractor shall provide everything necessary (including intumescent fire and smoke seals, bedding ironmongery in intumescent paste - which are not measured), in order to achieve the fire rating specified and shall be required to produce an Approval Certificate (a fire certificate from a recognised fire testing house for the fire doors and screens) The contractor will be deemed to have taken this into account in pricing his tender.

C 7 Specification for structural timber

7.1 MATERIALS

Materials shall comply with the requirements of Eurocode 5 or BS 5268 for permissible stress designs. Note. The specifier should delete the standard that is not appropriate.

7.2 SOFTWOOD SPECIES AND GRADE

Structural timber shall be strength graded to comply with EN 14081 (Note. Generally in Ireland visually graded timber will be to I.S. 127 and in the UK to BS 4978; imported timber can be graded to National Standard of the country of production subject to the requirements of EN 14081 and the contents of EN 1912. Machine grading in both Ireland and the UK is usually to EN 14081-4).

Where a particular timber species is specified then this shall be confirmed by an independent specialist.

7.3 HARDWOOD SPECIES AND GRADE

Structural hardwoods shall be strength graded to EN 14081-4 or BS 5756. Where a particular hardwood is specified then the species of the supplied material shall be confirmed by an independent specialist.

7.4 SIZES AND SURFACE FINISH

Target sizes may be considered as the finished size subject to permitted tolerances to EN 336 or to those specifically specified by the architect or engineer. Tolerance Class 1 is usually applied to sawn timber while Tolerance Class 2 is usually applied to processed timbers such as those used for roof trusses or timber frame construction.

Glulam sizes shall comply with EN 390.

7.5 MOISTURE CONTENT

Moisture content shall be specified in accordance with the Service Class outlined in Eurocode 5 (or BS 5268 Part 2) or as required by the end use. Maximum moisture content in general shall be as required by the end use and Eurocode 5 (or BS 5268 Part 2), but note that in general structural timbers shall be kiln-dried to a maximum of 20%.

7.6 STORAGE

Materials shall be stored on level bearers, under cover, out of ground contact, protected from the weather and shall be kept free from damp.

7.7 PRESERVATIVE

Where necessary, timber shall be pressure impregnated with an approved preservative as specified by the architect. All ends cut on site shall be treated before fixing with an appropriate preservative or preservative concentrate. See also Section C2.

7.8 GLULAM (GLUED LAMINATED TIMBER)

Glued laminated timber at the time of assembly shall comply with EN 386 and EN 390.

All timbers used for lamination shall be of the one species, shall be in the longest possible lengths with finger joints where ends of lengths meet and shall be planed to equal finished sizes before gluing. Glue shall be spread evenly and the timber sections immediately placed in position and clamped tightly together until the glue has fully set. On completion of all gluing, the laminated member shall be planed all over to the exact sections and contours shown on the detailed drawings. Only adhesives of the Phenol/Resorcinol type shall be used. Adhesives are to be applied in accordance with manufacturer's instructions. The moisture content of the timber shall conform with the adhesive manufacturer's recommendations.

Note: Subject to design and ascetic requirements different strength classes and species can be used but most 'off the shelf' Glulam is of a single species and strength class.

C 8 Finishing

8.1 FINISHING METHODS

Two pack polyurethane matt finish shall be applied to timber floors and stairs. Both manufacturer and supplier are to be approved by the architect prior to application.

8.2 STAIN FINISH

(*State brand name*), or equal and approved microporous wood stain in the selected colour shall be applied in strict accordance with manufacturer's instructions/recommendations. A minimum of three coats is required.

Note: *An aluminium primer is to be applied to all end grain of external timber to architect's satisfaction, ensuring that no primer appears on exposed faces. Particular attention should be given to the recommended time scale and sequence of painting especially with regard to window installation and glazing rebates.*

C 9 Cladding

9.1 VERTICAL TG AND V TYPE

External cladding shall be tongued, grooved and v-jointed vertical Douglas fir pressure impregnated to a minimum of Use/Hazard Class 3.2 in accordance with EN 335, EN 350 and EN 351. Following preservative treatment the timber shall be re-dried to a moisture content of 16±3%.

Cladding boards shall be 100x25mm (see B12.2.4, 18mm minimum thickness for cedar) finished dimensions, with a stress-relieving back groove, all as shown in the detail cladding board profile drawing. Boards shall be fixed through the v-joint with silicon bronze or austenitic stainless steel ring shank nails, to 50x36mm horizontal battens and vertical counter battens at a maximum of 450mm centres treated to hazard class 2 (minimum). All end grain to be sealed with aluminium primer. Counter battens shall be used with vertical cladding.

9.2 VENTILATION

Provide a 25mm minimum continuous clear cavity behind the cladding boards. Stainless steel insect mesh shall be fitted to all ventilation openings to the wall cladding.

9.3 BREATHER MEMBRANE

The breather membrane shall comply with BS 4016 and/or shall be of a type specified by the architect. The breather membrane shall be fixed with stainless steel staples at 300mm centres (or as specified by the manufacturer) with minimum overlaps of 150mm at junctions in the horizontal direction and 100mm in the vertical direction. The breather membrane shall also be turned-in at window openings so as to properly lap with the internal vapour control layer, and run below DPC at ground level. See Section B for details of breather membrane/DPC interfaces.

9.4 FILLERS

No wood fillers shall be used externally. Internally no wood fillers may be used where a translucent wood finish is used. Fillers may only be used in other situations with the architect's permission.

C 10 Flooring

10.1 ACOUSTIC PERFORMANCE

The Building Regulations (through the Technical Guidance Documents) require certain sound insulation standards for floors especially in relation to compartment floors in multi-use or multi-occupancy end use. For example at present in Ireland the maximum individual transmission values are 65dB for impact sound and a minimum of 48dB for airborne sound (TGD E 1997 - there are also requirements for mean values depending on the number of rooms tested, the UK has similar requirements in their Approved Documents, and Robust Details Limited provides construction details and a means of certification scheme for acoustic performance). To achieve these requirements both the structural subfloor and the decorative floor finish must be acoustically evaluated to ensure an effective performance. An underlay with a specific acoustic performance is normally required.

10.2 SUB-FLOORS

Sub-floors shall have not more than a 3mm gap under a 3m straight edge. Where gaps exceed this requirement a self-levelling screed, with low moisture content, shall be used for a concrete sub-floor. For a timber sub-floor additional levelling pieces and an 18mm OSB3 base shall be required where the sub-floor shall be allowed to dry fully before laying timber structure deviates by more than 3mm over 3m to achieve a level floor.

Concrete floor bases, their preparation and moisture content shall conform with BS 8201 and shall have a suitable damp-proof membrane underneath.

10.3 WOODBLOCK

The floor shall be tongued and grooved oak blocks measuring 225x56x19mm or similar and fixed with approved adhesive in accordance with the manufacturer's instructions. The laid floor shall be lightly sanded and finished with two-pack polyurethane all in accordance with the manufacturer's instructions. The moisture content shall be between 8 and 12% in conventionally heated buildings. For areas with underfloor heating the moisture content shall be between 6 and 8%. Wood shall be sourced from sustainable and managed forests.

10.3/10.4

Woodblock and strip flooring come in several species and the examples quoted in these clauses are oak and maple. Other species may be specified but it is important to specify precisely the species and grade required.

10.4 HARDWOOD STRIP FLOORING ON BATTENS

The floor shall be solid, prime grade, hard maple, tongued and grooved and end matched boards. The boards shall be 20mm thick by 57mm wide or similar and approved by the architect. The boards shall be laid across level battens or joists at maximum centres of 400mm. The boards shall be secret nailed to every batten at an angle of 45° through the top of the tongue using lost head nails, 2.8x63mm or machine nails 2.9x63mm, with ring shanked or serrated edges.

10.5 HARDWOOD STRIP FLOORING ON CLIP SYSTEM

The floor system shall be an approved system installed according to the manufacturer's specification laid on an underlay and moisture barrier which shall be taped and lapped by 200mm at all joints and turned up at perimeter walls. The clip system shall be as recommended by the flooring manufacturer. The clip size shall suit the proposed heating system and expected relative humidity of the space in which it shall be installed, all in accordance with the manufacturer's instructions.

10.6 HARDWOOD STRIP FLOORING FOR SPECIALIST SPORTS USE

The specialist sports floor shall meet BS 7044 or DIN 18032 Part 11 requirements and be approved by the architect.

Supporting battens and specialist pads shall be provided where floor-boards are cut at walls, goal post supports, etc.

The boards shall be secret nailed at an angle of 45° through the top of the tongue using 2.9x63mm special machine nails. Where the floor is wider than 12m the board laying shall start in the centre of the floor with the tongue of the boards pointing towards the side walls. A loose tongue shall be glued to both centre boards along their full length. Allowance for natural movement and ventilation of the floor shall be in strict accordance with the specialist manufacturer's instructions. A certificate of compliance with BS 7044 or DIN 18032 Part 11 shall be provided by the specialist flooring contractor.

10.7 APPROVED FLOOR SAMPLE

A control sample floor area, which may become part of the finished floor, shall be provided for the architect's approval prior to the commencement of the entire floor area.

10.8 EXPANSION ALLOWANCES

Expansion gaps shall be provided at wall junctions, floor junctions and pipe locations. A 15mm minimum expansion gap shall be provided at these locations or 1.5mm for every metre of floor width, whichever is the greater. In addition, expansion between boards shall be a minimum of a 2mm gap every five boards, or 0.4mm between every board. In intermittently heated spaces with 60 - 90% RH a 2mm gap every two boards shall be required. Boards shall not be too tightly cramped together when fixing with mechanical nailing systems. (In spaces which are heated constantly 24 hours per day, such as hospitals, allowances should be made for shrinkage and the appropriate clearances calculated).

Note: *The expansion gaps are dependent on species, moisture content of timber as supplied and on the expected in-service moisture content, and the figures quoted above are for guidance only. There may be a need for the specifier to supply the flooring contractor with exact details for expansion requirements.*

10.9 CONSTRUCTION EXPANSION GAP

Where a construction expansion gap occurs in a concrete sub-floor, the overlaid timber floor shall be provided with an expansion joint to coincide with the concrete construction/expansion gap and this joint shall extend the full thickness of the timber floor and its support system. A compliant joint material shall be used to the satisfaction of the architect.

10.10 FLOOR FINISH

A factory applied two-pack polyurethane matt finish or a specialist light oil finish shall be applied in accordance with the manufacturer's instructions to the satisfaction and approval of the architect.

Note: See also C8 and 10.3.

10.11 PROTECTION ON FLOORING

All efforts shall be made to protect laid floors from damage, dirt, moisture and thermal shock. The heating system shall be commissioned prior to the floor being laid and kept running thereafter. No trades shall work above the floor while flooring work is in progress. The laid floor shall be protected by hardboard laid loose, but taped at all junctions, until the issue of the Practical Completion Certificate by the architect.

10.12 COMPLIANCE

Aspects of flooring shall comply with the following codes and standards, as relevant: Eurocode 5 or BS 1297; BS 8201; BS 5268 Part 2.

10.13 MAINTENANCE

The specialist timber flooring contractor shall hand over the technical data sheets relating to cleaning and maintenance of the floor at Practical Completion stage to the architect.

C II Joinery elements

11.1 WINDOWS

Timber main frames and casements shall be of Douglas fir complying with Class J10 of EN942, all in accordance with architect's drawings and details. Timber glazing beads shall be of Douglas fir complying with Class J2 of EN 942 and be fixed with stainless steel pins. Lamination of sections is permitted. Finger jointing of individual laminae is permitted, but not of whole sections or on exposed surfaces intended for a natural or satin finish. Plugs and fillers are not permitted. There shall be no signs of insect attack. Moisture content of timber at time of installation shall be 16±3%. Resin adhesives shall comply with grade D4 of EN 204. Workmanship shall be in accordance with BS 1186: Part 2. Safety devices shall be in accordance with BS 5588: Part 1. Preservative treatment shall be to the requirements for Use/Hazard Class 3 in accordance with BS 8417 (table 6 for organic solvents and table 9 for water based treatments). Note: Use/Hazard class for joinery falls into Use Class 3.2 in EN 335-2.

11.1.1 Glazing and full beading

Double-glazed units as noted on architect's drawings shall be hermetically sealed employing the 'Double Seal System' and in accordance with BS 5713 – Specification for hermetically sealed flat double glazing units.

The units shall be full bedded with an approved mastic compound. The compound manufacturer's instructions must be followed. With timber frames, faces in contact with the compound must be completely sealed with an appropriate sealer to prevent oil absorption from the compound. Some preservation treatments used for timber frames can adversely affect compounds. However, two coats of recommended sealer on the relevant frame surfaces are a suitable precaution with most treatments. Nevertheless, exceptions exist, e.g. wax or silicone-based water repellents and water-based acrylic primers. The space between the edge of the unit and the rebate must be completely filled with compound before fitting the beads. The beads must be well bedded with compound to both frame and unit. Exposed edges of compound both inside and outside must be chamfered, so as to shed water. After bedding the glazing with mastic until it is exposed for chamfering allow for a second external face sealing with approved mastic using a narrow finishing nozzle to ensure a complete waterproof window. No linseed oil putty may be used. The unit must be secured in the frame by sprigs or spring clips.

Edge clearance, which must not be less than 3mm, must be maintained by distance pieces of non-absorbent non-compressible material. They should be placed opposite each other on each side of the unit, not more than 300mm apart, opposite the securing points of the beads but not immediately above setting or location blocks. They should be approximately 40mm long, 3mm thick and a breadth of 3mm less than the rebate depth.

Distance pieces are not necessary with mastic strip designated as load bearing by the manufacturer.

11.1.2 Approved mastic

The following, approved mastic may be used: (*state brand name*) with primer as required, or equal and approved by the architect.

11.1.3 Setting blocks

Setting blocks shall be of a minimum length 30mm/sq. m of glass in plasticised P.V.C. (to BS 2571 softness No. 35-45) or of neoprene to Shore hardness No. 80-90.

11.1.4 Location blocks (to casements or the like)

Location blocks shall be of a minimum length 25mm in plasticised P.V.C. (to BS 2571 - softness No. 35-45) or neoprene to Shore hardness No. 80-90.

11.1.5 Distance pieces

Distance pieces shall be of a minimum length 25mm in plasticised P.V.C. (to BS 2571 - softness No. 35-45) or neoprene to Shore hardness No. 80-90.

11.2 DOORS, DOORSETS AND FIRE-RESISTANT SCREENS

(See also 4.6)

11.2.1 External doors

External doors shall be of *European or American white oak* with TG&V panels fixed to framing with stainless steel or silicon bronze nails. Stiles and rails shall be jointed with stub tenons or non-corrosive mechanical devices. The framework shall be square when assembled in a true plane, and the parts shall match each other in thickness. Minimum door thickness shall be 50mm, and all in accordance with architect's detailed drawings. Preservative treatment shall be provided to minimum Use/Hazard Class 3.2. The door locking mechanism shall be of the "three point type" to eliminate warp and provide additional security. Moisture content shall be 16±3%. A full size prototype to be made up by the joinery works for approval by the architect prior to fabrication of all the doors. Glazed external doors shall have a minimum timber thickness of 55mm.

11.2.2 Interior doors

Interior panel doors shall be made of *Scots pine* to Class J10 of EN942. Glazing beads, where required, shall match and shall be supplied loose. Door frames and linings to match and suit finish and thickness of door. Minimum thickness 45mm. Moisture content 12±2% at time of manufacture and site installation. Workmanship shall be in accordance with BS 1186 Part 2.

11.2.3 Flush solid door

Solid core doors shall consist of a suitable 100% core of solid timber covered on both sides with facings of minimum 6mm plywood or other architect-approved material; with or without apertures for glazing or ventilation louvres. Quarter-sawn *American white oak* veneer to be used throughout or as detailed on architect's drawings.

Note: For Fire-rated doors and fire-resistant screens see section 4.6.

11.2.4 Fire resistant glass

Supply and fit (*state brand name*) or equal and approved by the architect multi-laminated glass assembled with clear intumescent interlayers in accordance with the manufacturer's written instruction to meet the integrity and insulation criteria, according to EN 1363-1/2 and EN01364-1 or BS 476: Part 22 and the safety requirements of BS 6206 (*delete those not applicable*). Note the fire-resistant glass cannot be cut on site and the edge protection tape must not be removed or damaged.

In addition the following glazing instructions must be adhered to.

- Do not allow any contact of the glazing's edges with water.
- Do not install fire-resistant glass in locations where the glass temperature might exceed 40°C.
- Always refer to the fire test reports.
- Avoid all glass to metal contact.
- Do not exercise any restraint on the glazing.
- Do not damage the glazing's edges or the protection tape.
- Keep the rebates dry and free from aggressive products (acids, organic solvents, etc.).
- Use hardwood setting blocks or equivalent (Shore hardness A75).
- Provide an edge clearance of 4-5mm.
- Provide front and back clearances of 4-5mm, using closed cells foam tape.
- Provide a rebate depth of minimum 20mm.
- Apply a neutral silicone sealant immediately after sealing.
- All installation to be in accordance with the manufacturer's/supplier's instructions.

11.3 STAIRCASES

11.3.1 Softwood staircases

Strings shall be *Scots pine* to Class J30 of EN 942 where not exposed. Handrails, balustrades, newels, treads and risers shall be Class J30 of EN 942 where painted or Class J10 when exposed and decorated with a clear polyurethane finish.

Sizes and tolerances shall comply with BS 585: Part 1 for domestic use only. Workmanship shall be in accordance with BS 1186: Part 2. Adhesive shall be one-part polyvinyl acetate complying with EN 204. The moisture content at the time of manufacture and installation shall be $12\pm 2\%$ and all in accordance with the architect's detailed drawings.

11.3.2 Hardwood staircases

The hardwood staircases shall be constructed from prime quality American white oak with approved joints and adhesives all in accordance with architect's detailed drawings, including slip resistant inserts to tread nosing and two-pack matt polyurethane finish. Moisture content at the time of manufacture and installation shall be $12\pm 2\%$.

11.3.3 Building regulations

Landings, balusters, handrails, and step rise and going shall comply with the current Technical Guidance Document (Note: Approved Documents in the UK) to the Building Regulations for their respective end use and as specified by the architect.