

Reference	NR/L3/CIV/140/160GN
Issue	2
Publication date	5 th December 2009
Compliance date	6 th March 2010

MODEL CLAUSES FOR CIVIL ENGINEERING WORKS

Contents	Page
160.1 Scope of Model Clauses	2
160.2 Application of standards	3
160.3 Softwood and hardwoods	4
160.4 Timber species	5
160.5 Glue laminated timber (glulam)	5
160.6 Wood based panel materials	6
160.7 Other wood based materials	7
160.8 Timber for marine and freshwater use	7
160.9 Timber sizes	8
160.10 Moisture content	8
160.11 Metal fastenings and fittings	9
160.12 Corrosion protection of metal fixings	10
160.13 Hazard class	11
160.14 Durability	12
160.15 Storage of materials	12
160.16 Inspection	12
160.17 Resin repairs	13
160.18 Preservative treatment	13
160.19 Types of preservative	14
160.20 Fabrication after treatment	15
160.21 Fire retardant treatment	15
References	
British Standards	16
Network Rail standards	16
Model Clauses	17
Other publications	17

Reference	NR/L3/CIV/140/160GN
Issue	2
Publication date	5 th December 2009
Compliance date	6 th March 2010

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GUIDANCE NOTE FOR THE USE OF STRUCTURAL TIMBER

Scope of Model Clauses **160.1** For a Contract Specification that includes requirements for structural timber, **Section 160** of the Model Clauses should be used in combination with the other relevant Sections as follows:

Section 161: Design requirements for structural timber should be used for a Specification in which there is an element of design for timber structures.

Section 162: Workmanship for structural timber should be used for a Specification which requires the supply, fabrication, construction or repair of structural timber.

Section 163: Maintenance and repair of structural timber should be used for a Specification for maintaining or repairing structural timber and should be used in conjunction with **Section 23:** Structural repair survey.

Section 164: Timber preservation and fire protection should always be included in the Specification where wood preservatives or fire retardant treatments are required.

Requirements for timber piles are specified in **Section 74:** Timber piles.

Sections 160 to 164 of the Model Clauses state the requirements for the structural use of timber and wood based products for Permanent Works, and have been written for the following range of structures:

- (1) underline bridge structures,
 - piers/trestles (a rare occurrence for new structures but might be constructed in a refurbishment project)
 - waybeams (also see NR/PS/TRK/029: Wood sleepers, bearers and longitudinal timbers, and RT/CE/S/038: Longitudinal timbers - Design, installation and maintenance)
 - cross beams (possibly in combination with steel framing)
 - bracing/strutting (possibly in combination with steel framing)
 - walkways (timber decking)
- (2) footbridges,
 - handrails/balustrades
 - treads/risers
 - roof protecting structure (if timber)
 - deck boards / joists
 - superstructure (if timber)
- (3) sea defence and coastal protection works, such as groynes

Reference	NR/L3/CIV/140/160GN
Issue	2
Publication date	5 th December 2009
Compliance date	6 th March 2010

(4) station structures

- *roof structures, purlins, rafters, trussed rafters, principal beams and trusses*
- *full frame structures, portals*
- *structural bracing/diaphragm systems*
- *permanent or temporary platforms (such as plywood decks on framing)*

(5) track crossings including cattle grids and externally fixed timber (such as walkway edging), and other timber exposed to the elements.

Contract Specifications that cover the use of timber in Temporary Works, such as excavations and formwork, are not covered by these Sections of the Model Clauses.

**Application
of standards**

160.2 *The rules for the design of structural timber are detailed in BS 5268-2, and in BS EN 1995-1-1 (Eurocode 5) and its UK National Annex.*

BS 5268-2 is based on the permissible stress design method and provides permissible stresses for most softwood and hardwood designs. However, that standard, together with British Standards design codes for other materials, will be withdrawn by March 2010 when the period of co-existence with Eurocodes ends.

BS EN 1995-1-1 is based on limit state design principles and provides no design strength values. Limit state design is based on the design strength of materials which are derived from the characteristic material strengths given in supporting standards, for example BS EN 338 and BS EN 1912 for structural timber. This design approach is common to all the structural Eurocodes thereby making it much easier for engineers to design a structure that incorporates a range of materials.

At present there is no specific British Standard for structural timber used in bridges. Current advice to designers of timber bridges is to apply applicable aspects of BS 5400-2, BS 5268-2, or BS EN 1995-2 and its UK National Annex.

BS 8000-5 provides information and recommendations for site construction and workmanship. However, some sections of BS 8000-5 should be used with care as there are some conflicts when the structure has been designed to BS 5268 - in which section 6.1 in Part 2 provides guidance on workmanship for solid timber and types of structural assemblies. BS 5669-5 covers the storage and handling of particle board.

Reference	NR/L3/CIV/140/160GN
Issue	2
Publication date	5 th December 2009
Compliance date	6 th March 2010

Historically, British Standards have been performance driven and the BS design codes include aspects of workmanship. Harmonised European standards (the EuroNorms) tend to be process driven and focus on manufacturing quality and consistency. These standards detail the required material qualities for the specified end use for a range of different service classes and tend not to include guidance on storage or workmanship. Guidance on storage and workmanship can be obtained from the relevant BS design codes. Guidance on storage is also given in TRADA Wood Information Sheet No 4-12.

Softwoods and hardwoods

160.3 *A range of common commercially available softwoods and tropical hardwoods is covered in BS 5268-2 and BS EN 1912. Structural timber can be selected by strength class (C16, D40 etc.) or by specific species and strength grade. It is common practice to select a strength grade according to the visual grades; GS and SS for softwood, and HS for tropical hardwood. Alternatively, timber may be machine graded into a strength class (C16, D40 etc.), but the availability of machine grading can be limited to a selection of common species.*

Detailed information on the strength properties of some hardwood species that are not adequately covered in BS 5268 or BS EN 1995-1-1 or their supporting standards has been published in, for instance, Hardwoods in Construction (TRADA). Advice should be sought on interpreting this information in the context of current design codes. Species of timber not included in BS 5268-2 or BS EN 1995-1-1 or their supporting standards should only be used where their design strength and durability values are certified by a body accredited by the United Kingdom Accreditation Service (UKAS) or equivalent.

At present, a limited number of temperate hardwoods can be specified using BS 5268-2 or BS EN 1995-1-1. Detailed information on the strength properties of some of these that are not adequately covered in BS 5268 or BS EN 1995-1-1 has been published in, for instance, Hardwoods in Construction (TRADA) but advice should be sought on interpreting this information in the context of current design codes. Species of timber not included in BS 5268-2 or BS EN 1995-1-1 or their supporting standards should only be used where their design strength and durability values are certified by a body accredited by the United Kingdom Accreditation Service (UKAS) or equivalent.

The issue regarding the sound environmental credentials of timber used in construction is becoming ever more important, particularly when specifying tropical hardwoods. From 1st April 2009, central government departments, their executive agencies and non-departmental public bodies are required to procure either legal and sustainable timber or FLEGT - licensed timber (Forest Law Enforcement, Governance and Trade).

Reference	NR/L3/CIV/140/160GN
Issue	2
Publication date	5 th December 2009
Compliance date	6 th March 2010

Timber shall be sourced in accordance with Current UK Government timber procurement policy. Guidance on this can be obtained from the DEFRA funded Central Point of Expertise on Timber (CPET). The Central Point of Expertise on Timber (CPET) is funded by DEFRA to provide free advice and guidance to all public sector buyers and their suppliers to aid compliance with the policy. The contact details of the CPET are: 01865 243776 CPET@proforest.net

Timber species

160.4 *The list of timber species detailed in BS 5268-2, BS EN 13556 and BS EN 1912 is not exhaustive, and some confusion might occur, particularly with tropical hardwoods where local names are often used. The specifier should take this into account when considering the use of other species or when specifying a particular species.*

The choice of species may also be influenced by the inherent durability and/or behaviour characteristics of the timber which are independent of the strength values.

Independent expert advice may be sought from:

*TRADA Technology Limited
Chiltern House
Stocking Lane
Hughenden Valley
High Wycombe Tel: 01494 569631
Bucks HP14 4ND Fax: 01494 565487*

*Building Research Establishment
Garston
Watford
Herts. Tel: 01923 664000
WD2 7JR Fax: 01923 664010*

Glue laminated timber (Glulam)

160.5 *Glulam shall be supplied by manufacturers whose quality system for product conformity has been approved by an inspection body accredited by the United Kingdom Accreditation Service (UKAS), or equivalent, in accordance with the procedures detailed in BS EN 386 and BS EN 14080. The latter standard specifies the requirements for glulam (produced from either untreated timber or timber treated against biological attack) for use in load bearing structures and it also specifies the requirements for large finger joints in glulam.*

*BS EN 386 specifies requirements for the components of glulam members and for producing structural glulam members. BS 5268-2 and BS EN 386 specify requirements for general applications in service class 1 or 2. BS EN 1995-1-1 refers the specifier to BS EN 14080 for product conformity and to BS EN 1194 for strength and stiffness values. Relevant expert advice may be sought from TRADA and/or BRE - see **160.4**.*

*The strength requirements for glulam should be specified in **Appendix 160/1**.*

Reference	NR/L3/CIV/140/160GN
Issue	2
Publication date	5 th December 2009
Compliance date	6 th March 2010

Adhesive Type I to BS EN 301 is the only adhesive that can be used for all Service Classes, but adhesive type II is satisfactory for timber in Service Classes 1 or 2.

Glulam members shall have adequate durability provided either through selection of naturally durable species and/or by applying preservative treatment.

The moisture content requirements for manufacture have been tightened from those given in BS EN 386 because matching the conditions between manufacture and end use is crucial for maintaining the long term performance of glulam members. Where appearance is important, requirements should be noted on the Contract Drawings.

*The manufacturer should be informed where glulam is to be used externally. The specifier should check with the manufacturer and seek specialist advice regarding the suitability and compatibility of the timber species, adhesive type, the need for preservative treatment and the type of preservative. The particular requirements for glulam for external use should be specified in **Appendix 160/2**. Glulam is unlikely to be suitable for heavy duty longitudinal beams, but mechanical laminated hardwood might be appropriate. Guidance can be obtained from TRADA - see **160.4**.*

Wood based panel materials

160.6 *The specifier should note that British Standards, such as BS 5268 and BS 5669, pertaining to the specification of wood based panels for structural use, have been or are about to be withdrawn. Guidance on the specification of wood based panels for structural use is provided in BS EN 13986.*

*As noted in **160.2**, whilst British Standards either have been or are in the processes of being withdrawn they are useful sources of technical on the quality of workmanship and storage - and such issues are not addressed in BS EN 13986.*

The performance of wood based products is sensitive to the service class and end use environment conditions and, therefore, the limitation of the application of such products should always be checked.

With reference to plywood, the terms “exterior grade”, “exterior quality”, “Class 3”, or “weather and boil proof (WBP) grade” relate to the durability of the adhesive and not that of the timber component of the plywood. Care should be taken when specifying plywood for use in service class 3 conditions. Note also that the term “marine plywood” does not necessarily indicate that it is suitable for marine use.