

The future of quality control for wood & wood products

The problems with standardisation?

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Round and sawn timber, general matters.

cost **E53**
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Wood is different!

The problem is, too many people forget that!

Anyone in the wood industry who does not understand and appreciate this is in the wrong business!

It is not sufficient to market wood in the same way as baked beans or underpants!

Wood or Timber

- Timber is as different from wood as concrete is different from cement

– *The two products – wood in the sense of clear, defect-free wood and timber, in the sense of commercial timber – have to be considered as two different materials and that must be respected when strength properties are developed for engineering purposes*

He also notes the truism that,

“The longer the human race has used a material the less it knows about it”

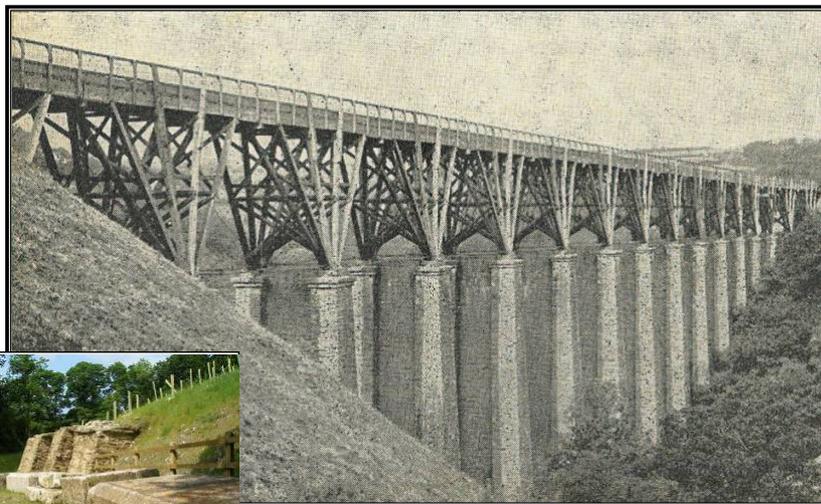
Borg Madsen – from:

‘Structural Behaviour of Timber’

Isambard Kingdom Brunel’s approach!

Walkham Viaduct – 1858

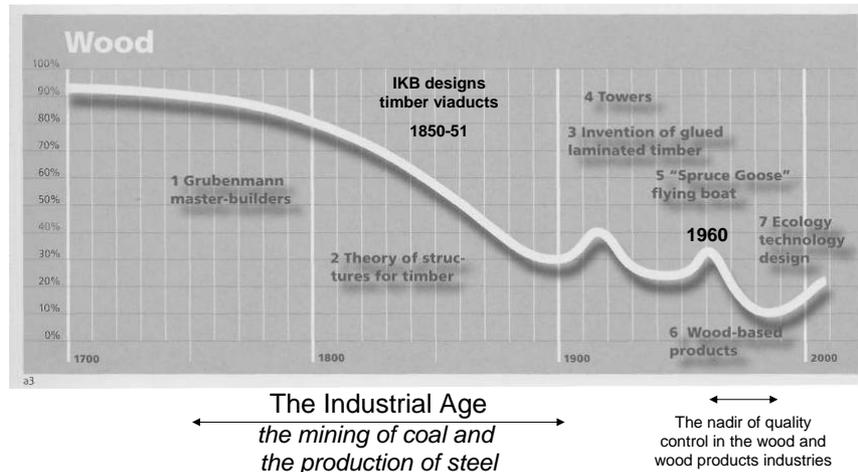
The zenith of on-site quality control!



Length - 367 yards Height - 132 feet

Especially when it forgets about it!

Decline in wood use over the centuries



Taken from 'Systems in Timber Engineering' by Josef Kolb

The third decline was inevitable.

Even more competition and look at the timing!

'Building' magazine in the UK published in 1952 what must have been one of the first media reports on the development of plastics for the construction industry. (Perfect timing for when the wood started to fail!)

- **Marketing strategies of all competing materials (including within the wood products sector!) has always been and continues to be for the sole purpose of taking market share from wood! And they do it by knocking wood, one way or another!**

- Save a tree, use PVC! (coined by the plastic window industry)
- Wood shrinks and splits (used by the concrete flooring sector)

Not if it is properly dried, prepared and installed it doesn't!

Bouncing back!

- At long last the benefits of wood are becoming widely recognised but it is not enough to hope to succeed based on the green building agenda alone!
- The loss of higher education in wood was at long last recognised and acted upon!
- With this we must strive to increase product knowledge amongst specifiers and users to ensure that wood and wood products deliver optimum serviceability performance!
- Appropriate quality control will ensure they have a head start!

But we are still in need of an understanding of 'the common good'!

- *(Named product) offers all of the advantages of regular wood siding but contrary to regular wood, it resists termite damage and will not rot, crack or split.*

The creators of such product marketing are quite unconcerned as to the possibility of the negative impact such words might have on the acceptance of ALL wood throughout the entire construction industry!

So, where do we go from here?

European Standardisation

- Addressing the requirements of the European Commission for the EU 'single market' for construction products
- In support of the 'Construction Products Directive'
- Endeavouring to ensure the optimum performance of wood and wood products used in construction

Still a little bit divided in more ways than one!

- CEN/TC112 - Wood-based panels
- CEN/TC124 - Timber Structures
- CEN/TC175 - Round and sawn timber

to name but three!

To structural timber committees non-structural timber is to all intents and purposes irrelevant!

Unfortunately as we have just seen it was premature failure of non-structural components that has influenced the attitude, to all wood in construction, of several generations!

It's all wood, so where is the problem?!

Moisture content

- Possibly the single most influential property of wood on its long-term serviceability and performance.
- Much, perhaps most, premature failure of wood in construction can be attributed to moisture content.
- For glued structural components the requirements for moisture content are simplicity itself when compared with those for joinery components!
- Wood is different and in terms of moisture content, very different indeed!
- Kiln drying is a good average process at best!

CEN/TC175 Documents

Moisture content requirements

To develop a degree of consistency!

The highlighted values are in the format as presented in the documents; the italic values are the equivalent moisture contents in the alternate format

Table 1 - Sawn and planed timber - components or end products		Moisture content range	
1	Timber in joinery (prEN 942)		
	- internal use, heated buildings >21°C	8±2%	6-10%
	- internal use, heated buildings 12-21°C	11±2%	9-13%
	- internal use, unheated buildings	14±2%	12-16%
	- external use	16±4%	12-19%
2	Wood flooring elements (EN 13228)		
	- individual elements	9±2%	7-11%
	- individual chestnut elements	10±3%	7-13%
3	Timber planks and semi-finished profiles (prEN 13307)		
	- internal use (e.g. doors, stairs)	9±3%	6-12%
	- external use (e.g. doors, windows)	12±3%	9-15%
	- weather exposure (e.g. fences, stairs)	15±3%	12-18%
4	Hardwood floor boards (EN 13629)		
	- individual element	9±3%	6-12%
5	Stair components (prEN 13912) (Withdrawn?)		
	- internal use, heated space	9±2%	7-11%
	- internal use, un-heated space	12±2%	10-14%
	- external use	15±2%	13-17%
6	Softwood floor boards (EN 13990)		
	- for internal use, heated buildings	9±2%	7-11%
	- for other uses	17±2%	15-19%
7	External windows, door leaves and door frames (prEN 14220)		≤16%
8	Internal windows, door leaves and door frames (prEN 14221)		
	- heated buildings		≤13%
	- unheated buildings		≤16%
9	Drying quality (EN 14298)		
	- 7-9%		-1/+1%
	- 10-12%		-1,5/+1,5%
	- 13-15%		-2,0/+1,5%
	- 16-18%		-2,5/+2,0%
10	Machined softwood profiles with tongue and groove (EN 14519)		
	- internal use	12±2%	10-14%
	- external use	17±2%	15-19%
11	Machined hardwood profiles (EN 14951)		
	- individual panelling element	10±3%	7-13%
	- individual cladding element	15±3%	12-18%
11	Machined softwood profiles without tongue and groove (prEN 15146)		
	- internal use	12±2%	10-14%
	- external use	17±2%	15-19%

Summary of Table 1 Moisture Content

from Table 1		1	2	3	4	5	6*	7	8	9*	10	11*
Heating 'condition'	Fig. 1 [†]	%										
Internal heated > 21°C	9-11%	8±2	9±2	9±3	9±3	9±2	9±2		≤13		10±3	
Internal heated 12 - 21°C	12%	11±2				12±2				12±2		12±2
Internal unheated	14%	14±2							≤16			
External	16-18%	16±4		12±3		15±2	17±2	≤16		17±2	15±3	17±2
External weather exposed	16-18%			15±3								

*6, 9 and 11 are softwood specific documents † Refer also to the moisture content values below

A clearly apparent degree of consistency in relation to heating conditions but nothing relating to variability of geographical location.

Proposed 'Introduction' for moisture content for all TC175 Product Standards.

The serviceability and long-term performance of wood products is influenced in nearly all cases by the moisture content of the wood used in the manufacture of those products. This standard sets out the requirements for moisture content suited to different environments and tolerance limits appropriate for those moisture contents.

The variability inherent in all timber and the ease or difficulty of drying different species with available kiln technology makes drying to constant moisture contents effectively impossible. A range of target moisture contents, and an allowable range of average moisture content around each target moisture content, for 'standard drying' is set out in EN 14298.

This does not, however, guarantee that all pieces within the same batch/consignment will be within the target moisture content tolerance limits. For this reason EN 14298 also specifies the number of pieces in a single batch or lot which shall have individual moisture content between the stipulated upper and lower limits.

In some cases it may be appropriate to specify target moisture content with tighter tolerances than those available with 'standard drying'. EN 14298 sets out what should be stipulated for 'Drying for specific end-use and certain species' and provides guidance on what tolerances should be expected with this enhanced drying. EN 14298 also sets out requirements for what should be expected as maximum amounts of non-compliant pieces within a batch of kiln dried timber.'

EN 14298 – Drying quality

Clause 5.3 of EN 14298 to be revised in recognition of variability prevalent in the process and the material:

Revised wording

5.3 'Drying for specific end-use and certain species'

EN 942 as an example

- product standards, unlike the target moisture content approach of EN 14298, should include moisture contents as the expected range (e.g. 8% to 11%) likely to be encountered and best suited to individual Member States' climatic conditions and so potentially quite variable in countries such as Italy for example. This detail could also highlight seasonal variability in addition to longer term EMC.
- EN 942 – suggested amendment to Annex B, Table B.1; table heading to be:
 - *'Equilibrium moisture content of solid timber by category – regional and seasonal moisture content range related to in-service climates'*
 - column 3 headed *'Expected moisture content range in %'*

The knowledge does exist!

- Whilst just-in-time delivery may be perfect for the automotive industry ...



... it is not the best option for manufacturers of joinery -
unless, of course, the wood has been appropriately dried
and supplied by ***specialist timber merchants!***

No just-in-time delivery here!



CE marking of strength graded timber

Or

*does graded structural timber really need factory
production control?*

- At least ten years in the making but still some countries were not ready! Was it too costly for small producers?
- EN 14081-1 date of applicability 01/09/2006 followed by an unprecedented three extensions of the co-existence period now ending 01/09/2012.
- CE marking has already been adopted for machine grading at least by a number of producers within the EU but ...
- ... the majority within the timber trade and structural products sectors are still wholly uninformed about this! What is an 'ACD'?
- How can they be properly informed or producers gear up for implementation with such wildly unpredictable dates!!

The marking of strength graded timber

- The simple process of individual piece marking claimed by a number of countries to be too difficult to implement!
- The Commission lobbied to overturn the committee decision to not permit batch marking (this to avoid piece marking or to avoid grading?!)
- A seriously retrograde step in Member States where strength grading and individual piece marking is considered essential.
- Fortunately batch marking not allowed for machine graded timber!

Eurocode 5 – premature and imperfect?

- Eurocodes implemented throughout the EU March 2010
Just one simple point of many much more complex -
- EC 5 Clause 2.4.2 (1) - *'Geometrical data for cross-sections and systems may be taken as nominal values from product standards hEN or drawings for the execution'*.
- EN 336 Clause 3.1 Target size – *'size specified (at the reference moisture content) and to which the deviations, which would ideally be zero, are to be related'*.
- EN 336 is not included in EC5 normative references or bibliography!
- Target Size (effectively 'actual' size) was adopted to overcome the problems associated with the term 'nominal' and structural timber design!

And finally, talking of targets, what do we do to overcome this?

If a picture paint a thousand words ...



...we must tell the whole story, somehow!