

Update of quality requirements of glued products from structural timber

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Abstract: Update of quality requirements of glued products from structural timber. Glued products from structural timber are significant members of timber structures. In present time, requirements of their quality, examination, production and labeling according to EN 14080:2013 are updated. The biggest changes were recorded with glued laminated timber (GLULAM). Paper describes quality parameters of structural timber of homogeneous and combined glued laminated timber and their requirements of characteristics properties in C and T classes. The strength C and T profiles of both strength classes are compared.

Keywords: glued product, strength classes, bending, tensile

INTRODUCTION

In recent days, structural timber is widely used for various glued products. Requirements for production and evaluation define STN EN 14080:2013. Figure 1 shows glued products made of structural timber, that is assembled by finger joints in length and width and glued by melamine adhesives or polyurethane based adhesives, respectively. Production technology allows to made load bearing flat products (such as frames, CLT panels, etc.) from basic glued components using large finger joints ($l_j \square 45$ mm).

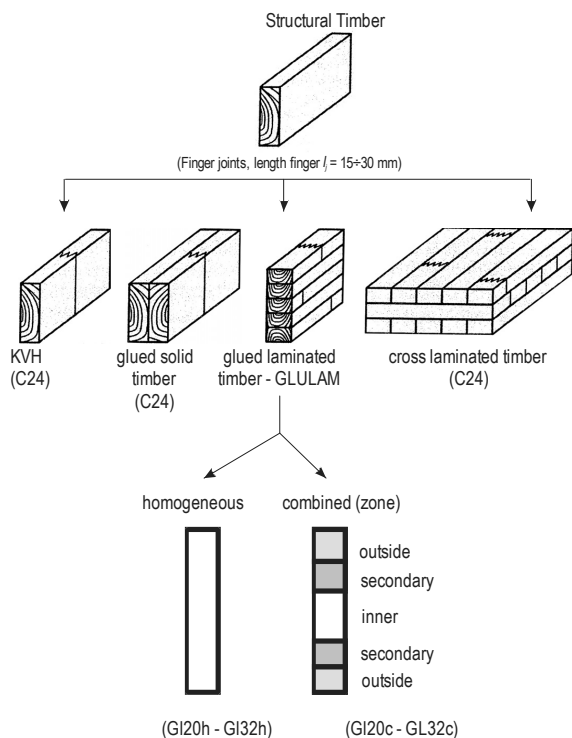


Fig. 1 Glued products and their strength classes according to EN 14 080:2013 - Strength classes

STRENGTH CLASSES - GLULAM

The current strength classification system for softwood in Europe is based on bending properties (C classes). For optimization of the efficient use of timber, especially for engineered timber products, an additional strength class system is based on tension properties (T classes) (*Bacher and Krzosek 2014*). For glued products is used EN 14 080:2013, which determines strength classes C and T (Table 1.).

Tab. 1 Comparison between C classes and T classes with equal tensile strength (EN 14 080)

Ekvivalentné triedy pevnosti T* ~ C a charakteristické hodnoty ihličnatého a topoľového dreva [MPa]												
Triedy „T“	T8	T10	T11	T12	T13	T14	T16	T18	T21	T24	T27	T30
$f_{t,0,k}$	8	10	11	12	13	14	16	18	21	24	27	30
Triedy „C“	C14	C16	C18	C20	C22	C24	C27	C30	C35	C40	C45	C50
$f_{m,k}$	14	16	18	20	22	24	27	30	35	40	45	50

* Class C according EN 338 satisfied at least requirements of class T values

Most significant assessment is the glued laminated timber – GLULAM. It distinguishes homogeneous and combined glulam with symmetrical and asymmetrical layout. The indication of strength classes of homogeneous GLULAM are from GL 20h until GL 32h. For combined glulam with symmetrical layout they are from GL 20c until GL 32c. These are set combination of T classes in the individual zones (fig.2 and fig.3).

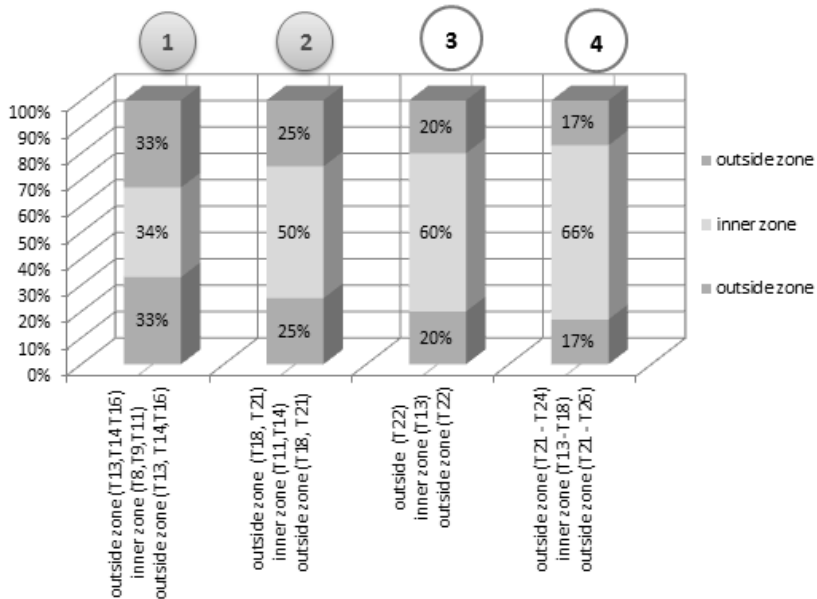


Fig. 2 Combined GLULAM – strength classes T in 3 zones (outside 2x, inner 1x)

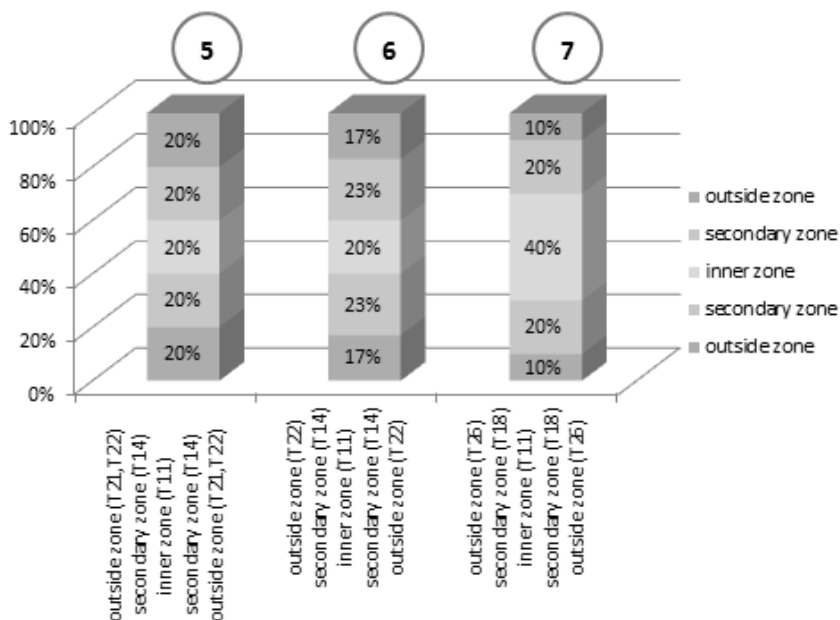


Fig. 3 Combined GLULAM – strength classes T in 5 zones (outside 2×, secondary 2×, inner 1×)

Tab. 2 Strength classes and characteristic values – comparison between selected countries (EN 338: 2010, EN 1912:2012)

Standards		Strength class– characteristic values (poplar wood and softwood)									
		C 14	C 16	C 18	C 22	C 24	C 27	C 30	C 35	C 40	C 50
EN 338	Strength classes	C 14	C 16	C 18	C 22	C 24	C 27	C 30	C 35	C 40	C 50
	$f_{m,k}$ [MPa]	14	16	18	22	24	27	30	35	40	50
	$E_{0,mean}$ [MPa]	7000	8000	9000	10000	11000	11000	12000	13000	14000	16000
	ρ_{mean} [kg·m ⁻³]	350	370	380	410	420	450	460	480	500	550
STN 49 1531 (Slovakia)		-	SII	-	-	SI	-	S0	-	-	-
ČSN 73 2824/Z1 (Czech Republic)		-	-	S7	-	S10	-	S13	-	-	-
PN – 82/D 94021 (Poland)		-	-	KG	-	KS	-	KW	-	-	-
DIN 4074 (Republic of Germany)		-	-	S7	-	S10	-	S13	-	-	-
ÖN DIN 4074-1 + A1 (Austria)		-	-	S7K	-	S10K	-	S13K	-	-	-

CONCLUSIONS

New T classes will be included in the next revision of EN 338. Most significant assessment is at glued laminated timber – GLULAM. Multitude of strength classes T ~ C manufacturer complicated reliable selection of timber quality. In practice used 3 strength classes. Table 2 states C classes of the selected countries.

Industry uses production strength classes C18 (T11), C24 (T14) a C30 (T18). Incorporation of visual grades and wood species in specific country is given according to EN 1912. Other strength classes of higher characteristic values are not used in grading or technological processing.

Figure 2 specifies 4 models of combined GLULAM and its strength grades within 3 zones (outside 2× and inner 1×). Representation of technological classes in particular zones are as follow: T11 – 8%, T14 – 12,5% and T18 -12,5%, which is too low. It is suspected that the most eligible models are model no. 1 and 2 (given in red). For combined GLULAM with 5 zones (outside 2×, secondary 2×, inner 1×), 3 models are given (Figure 3). The highest portion of classes belongs to secondary and inner zone. However, for the strength of the highest values is required the outside zone, which is not practical. Utilization of models 5, 6 and 7 is not anticipated.

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Streszczenie: *Aktualizacja wymagań jakościowych produktów klejonych z drewna konstrukcyjnego.* Klejone produkty z drewna konstrukcyjnego są istotnymi elementami konstrukcji drewnianych. Obecnie są aktualizowane wymagania dotyczące ich jakości, produkcji i oznakowań zgodnych z normą EN 14080: 2013. Największe zmiany odnotowano dla drewna klejonego warstwowo. Artykuł opisuje parametry jakościowe drewna konstrukcyjnego litego i drewna klejonego warstwowo oraz ich wymagań wytrzymałościowych w klasach jakościowych C i T.

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