Acceptance for deformation of dried sawnwood: A survey among practitioners in Norwegian sawmilling

Ylva Steiner[1] and Anders Q. Nyrud[2]

[1]Norsk Treteknisk Institutt (NTI), P.O. Box 113 Blindern, NO-0314 Oslo, NORWAY
ylva.steiner@treteknisk.no

[2]Norsk Treteknisk Institutt (NTI), P.O. Box 113 Blindern, NO-0314 Oslo, NORWAY
anders.q.nyrud@treteknisk.no

ABSTRACT

Drying personnel from Norwegian sawmills evaluated samples of dried sawnwood with varying degree of deformation. The respondents evaluated the material samples visually and stated whether the samples could be accepted for interior panels, exterior cladding and sawnwood for construction purposes. Acceptance was stated in a questionnaire. The study included ten different material samples with cup and five material samples with twist. Thirty one respondents completed the questionnaire, all respondents were practitioners working as drying personnel in Norwegian sawmills. According to the results, the respondents showed great uniformity with respect to the degree of deformation accepted. The results indicated that overall acceptance for deformation did comply with the new Norwegian Technical Standards for interior panels and exterior cladding products.

Key words: Sawnwood, timber, lumber, exterior cladding, interior panels, CE-marking, grading rules

INTRODUCTION

Grading of wood products is important in order to ensure consistent product quality. Consistent product quality is of substantial importance for consumers purchasing sawnwood, cf. Kliger *et al*. (1995); Perstorper *et al*. (1995); and Weinfurter and Hansen (1999). A new common European standard for solid softwood panels and cladding, CE EN 15146, was introduced in 2008, and recently two domestic technical specifications for interior panels and exterior cladding have been introduced in Norway. The introduction of new production standards does often pose problems for actors selling or purchasing sawnwood, because new production standards are not adopted simultaneously by all actors in the market.

THEORY AND METHODS

Grading rules and standards

In Norwegian sawmilling formal standards for appearance grading of sawnwood was first developed in the 1930's (Anonymous, 1981). Since the introduction, various product standards have been used in Norwegian sawmilling. *Grøna boken* (The Green Book: Grading of Sawnwood of Pine and Spruce) was the first Pan-Nordic product standard and was used in Finland, Norway and Sweden. In addition to The Green Book a set of grading rules developed in Eastern Norway, *ØS-reglene* (the ØS-Rules), was also used in Norwegian sawmilling (Anonymous, 1981). Both standards where officially replaced by the Nordic Timber-standard in 1994 (Anonymous, 1994), but are used by some sawmills and planer mills.

Appearance grading of sawnwood used for construction purposes is harmonised in the Scandinavian countries (Denmark, Finland, Norway and Sweden) and is carried out in accordance with NS-INSTA 142 (INSTA 142, 1997). Practically all Norwegian sawmills producing sawnwood for construction purposes, have adopted this standard.

Subsequent to the introduction of new European CE-standards, the domestic Norwegian standard for interior panels and exterior cladding, NS 3180, was replaced by new technical standards, SN TS 3183 and SN TS 3186. The new standards fulfil the requirements of the CE standard EN 15146 (SN TS 3183, 2008; SN TS 3186, 2008). Both technical standards have additional product requirements compared to CE EN 15146, for example for properties like cup and twist.

Deformations like cup and twist are influenced by raw material properties and the way drying operations are carried out at the sawmill. The grading rules for cup and twist has been similar in the appearance grading standards (Tab. 1 and Tab. 2 and Tab. 3). Naturally there are stronger requirements on cup for panel and cladding than for sawnwood used for construction purposes, since there are stronger aesthetical and technical requirements regarding cup. Twist, on the other hand, affects the technical performance for both sawnwood for construction purposes as well as wooden interior products, and that is reflected in the small differences in the rules for twist in the different standards.

In NS 3180 normative descriptions such as “insignificant of cup allowed” or “limited degree of twist allowed” were used to distinguish between quality grades (Tab. 1). Normative product requirements can be interpreted differently by the persons doing the grading and therefore result in differences within quality grades. Introduction of new and accurate production standards is therefore expected to result in improved quality consistency.

Table 1. Appearance grading rules for sawnwood used in Norwegian sawmilling, requirements for twist and cup.

Standard	Grade		Twist [mm/25 mm width]	Cup [mm/25 mm width]
The Green Book	I II III IV V VI		Shall be taken into consideration if affecting the sawn goods quality	
ØS-Rules	NA		3	No specific requirements
Nordic Timber	A1 and A2	thickness ≤44mm	1,5	0,5
		thickness >44mm	1	0,5
	A3, A4 and B	thickness ≤44mm	2,5	0,5
		thickness >44mm	1,5	0,5
	C	thickness ≤44mm	5	1
		thickness >44mm	2,5	1

Table 2. Appearance grading rules for sawnwood used in construction, requirements for twist and cup.

Standard	Grade	Twist [mm/25 mm width]	Cup [mm/25 mm width]
INSTA 142	NA	1	No specific requirements

Table 3. Appearance grading rules for interior panels and exterior cladding used in Norwegian sawmilling, requirements for twist and cup.

Standard	Grade	Twist [mm/25 mm width]	Cup [mm/25 mm width]
NS 3180	1 front	Insignificant twist allowed	Insignificant cup allowed
	2 front	Limited twist allowed	Limited cup allowed

	1 and 2 back	No specific requirements	No specific requirements
SN TS 3186	1	1	0,25
	2	Boards can be easily fitted together	0,5
SN TS 3183	1	1	0,25
	2	1	0,25
	3	Boards can be easily fitted together	0,5

Survey design

Personnel from Norwegian sawmills evaluated a set of material samples visually and identified the samples that were not acceptable for interior panels, exterior cladding or for construction purposes. Acceptance was stated in a questionnaire where each material sample was identified by a unique three-digit number. The respondents evaluated fifteen material samples each: ten material samples with varying degree of cup, five cladding and five paneling samples, and five material samples with varying degree of twist. Deformation for the cladding samples with cup measured 0,8 mm (0,5 %), 0,7 mm (0,5 %), 1,7 mm (1,1 %), 3,1 mm (2,1 %) and 3,7 mm (2,5 %). Deformation for the interior panel samples with cup measured 0 mm (0 %), 0,8 mm (0,7 %), 1,3 mm (1,1 %), 2,4 mm (2,0 %) and 2,5 mm (2,1 %). Deformation for the samples with twist measured 1 mm, 3 mm, 5 mm, 10 mm and 33 mm.

RESULTS

Descriptive statistics about the respondents is provided in Tab. 4. Most respondents have long experience from the sawmilling industry. It is also worth noting that most mills are integrated sawmills and planer mills.

Table 4. Descriptive statistics.

Age	**< 30 yrs**	**30-44 yrs**	**45-59 yrs**	**≥ 60 yrs**
No of respondents	1	10	18	2
Experience	**< 5 yrs**	**5-14 yrs**	**15-29 yrs**	**≥ 30 yrs**
No of respondents	2	9	14	6

Responsibilities	**Production**	**Sales**	**Administration**	**Others**
No of respondents	24	6	13	5

Type of mill	**Saw and planer mill**	**Sawmill**	**Planer mill**	**NA**
No of respondents	25	4	1	1

Species processed	**Pine**	**Spruce**	**Pine and spruce**	**NA**
No of respondents	1	18	11	1

Cup: Interior Panels

Fig. 1 presents the results with regards to acceptance for cup for interior panels. According to the new technical standards, two samples were well within the requirements for interior panel (sample 1 and 2) and one sample (3) corresponded exactly to the requirement stated in the grading rule. Two samples could not be allowed (4 and 5). As is evident from the Fig. 1, the respondents are somewhat conservative with respect to the acceptance for deformations.

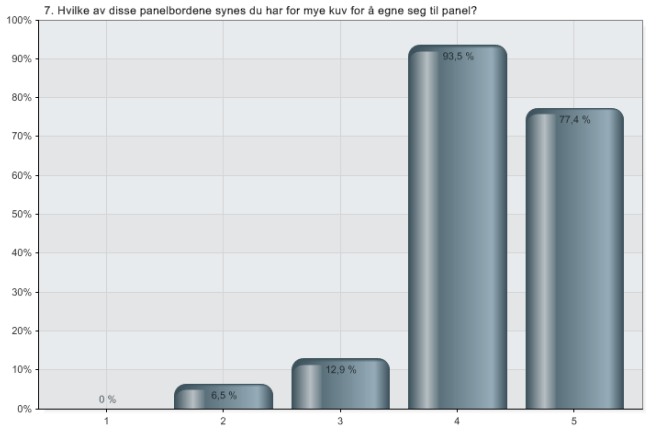

Figure 1. Tolerance for cup for interior panels.

Cup: Exterior Cladding

Fig. 2 presents the results with regards to tolerance of cup used for exterior cladding. According to the new technical standards, two samples were well within the requirements for interior panel (sample 1 and 2) and one sample (3) corresponded exactly to the requirement stated in the grading rule. Two samples could not be allowed (4 and 5). As is

evident from the Fig. 2, the respondents are somewhat conservative with respect to the acceptance for deformations.

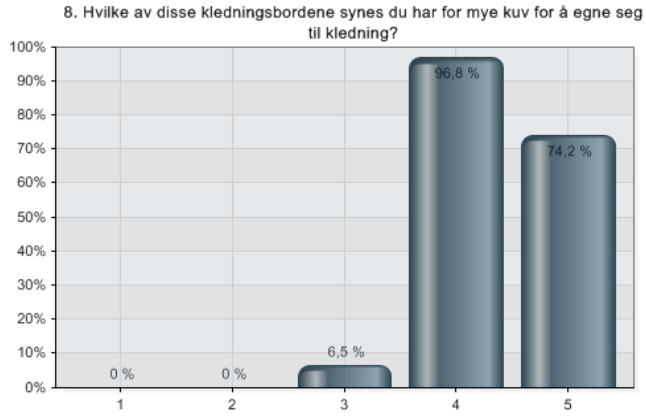

Figure 2. Tolerance for exterior cladding.

Twist: Exterior Cladding and Sawnwood for Construction

Fig. 3 presents the results with regards to tolerance of twist for raw material used for exterior cladding or sawnwood for construction purposes. According to INSTA 142, two samples were well within the requirements for sawnwood for construction purposes (sample 1 and 3) and one sample (2) corresponded exactly to the requirement stated in the grading rule. Two samples could not be allowed (4 and 5). As is evident from the Fig. 3, the respondents are somewhat conservative with respect to the acceptance for deformations. There are no requirements for raw material used for exterior cladding and all samples were in principle allowed for this use. Still, most respondents are fairly conservative when evaluating the samples used for this purpose, but they tolerate more twist in raw material for exterior cladding than for sawnwood used in construction.

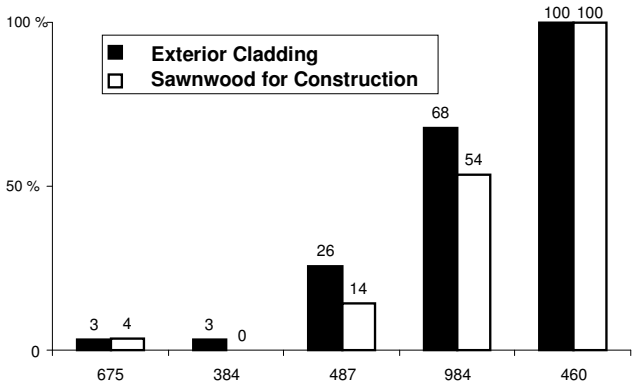

Figure 3. Tolerance for twist when used as raw material for exterior cladding or for construction.

DISCUSSION

- Several appearance grading rules are used in Norwegian sawmilling, some of these date back to the 1980s
- Respondents were able to distinguish minor quality changes (cup and twist)
- The new grading rules correspond well with previous experience and should therefore be easy to implement in Norwegian sawmilling
- Size of pieces can affect the appearance of deformation
- The evaluation was not carried out in an industry setting and the respondents were allowed more time to evaluate the samples than what is feasible in real life

LITERATURE CITED

Anonymous. 1981. Grading rules for sawn timber: as practiced by Østlandets Skurlastmåling [in Norwegian]. Norwegian Institute of Wood Technology, Oslo.

Anonymous. 1994. Nordic Timber. Grading rules for pine (Pinus silvestris) and spruce (Picea abies) sawn timber: Commercial grading based on evaluation of the four sides of sawn timber. Treindustriens tekniske forening, Oslo. 64 pp.

INSTA 142. 1997. Nordic visual strength grading rules for timber.

Kliger, I.R., M. Perstorper, G. Johansson, and P.J. Pellicane. 1995. Quality of timber products from Norway spruce. Wood Science and Technology 29:397-410.

Perstorper, M., P.J. Pellicane, I.R. Kliger and G. Johansson. 1995. Quality of timber products from Norway spruce. Wood Science and Technology 29:339-352.

SN TS 3183. 2008. Technical specification of interior panels from softwood [in Norwegian].

SN TS 3186. 2008. Technical specification of exterior cladding from softwood [in Norwegian].

Weinfurter, S. and E. Hansen. 1999. Softwood lumber quality requirements: examining the supplier/buyer perception gap. Wood and Fiber Science 31(1):83-94.