Annals of Warsaw University of Life Sciences – SGGW
Forestry and Wood Technology No 72, 2010: 225-228
(Ann. WULS-SGGW, For and Wood Technol. 72, 2010)

Logs and sawn Timber Quality for building constructions

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Abstract *Logs and sawn Timber Quality for structural timber.* Timber used for building constructions is generally made of softwood logs of III.A and III.B qualitative grade (class). The most important grading features when screening the logs are: reaction wood, sap stain and rot (decay). The qualitative grade S0, SI or SII is carried out by both visual and machine grading methods. Dominant grading parameters are knots. The machine grading methods based on various principles (bending, acoustic, radiation...) offer more reliable results.
In the log processing for timber, the timber quality was evaluated by visual method according with STN 49 1531. The choice of timber in relation to log quality was taken into account. The results showed a higher representation of the highest quality grade S0 for III.A (58%), for III.B only 25%. Therefore, the requirement of the purpose-oriented assessment of timber quality directly at log processing is justified and economical.

*Keywords***:** log, sawn timber, quality, knot, grading, visual method, structural timber

INTRODUCTION

For timber building constructions, we use the softwood timber made of logs of quality grade III.A, III.B and III.C. The log quality is determined by visual method according with the standard STN 48 0055, on the basis of the presence of wood defects, such as knots (the most important), rot (decay), sap stain and reaction wood.

The requirements for quality of timber assigned for building constructions are specified in the EN and Slovak Technical Standards (STN). The quality of wood is defined by the parameters such as strength (stiffness), elasticity and density. The visual and machine grading methods working on various principles (bending, vibration, ultrasonic and radiation) are used to determine these parameters.

The principle of purpose-oriented log processing and sorting the wood into construction timber is not utilized in practise in the conditions of Slovakia. This article (contribution) analyses the grading process of logs and timber in compliance with Slovak Technical Standards (STN).

Visual grading method was applied for the quality assessment of both logs and timber for construction purposes, on the levels:

- ***log*** **-** quality of log - III.A, III.B, and III.C,
- ***timber*** **-** quality of timber - S0, SI and SII.

TIMBER QUALITY - *visual method*

In Slovakia, the quality of timber for building constructions is assessed by visual method in accordance with STN 49 1531. It assigns the permitted range of wood defects such as knots, cracks (splits). For construction timber, it assigns the following classes of quality:

S0 – high strength timber,
SI – normal strength timber,
SII – low strength timber.

The most important indicator of timber quality is its strength. Using the visual grading method, it is not possible to determine precisely the strength of timber, but on the basis of wood defects presence, we can predict the weakest (the most critical) portion of timber. Knots are the most important grading parameter allowing to determine the quality class (grade).

2 methods are used for knots assessment:

- method of proportional knot dimensions (ratio of the sum of knot sizes across the surface and the edge to double width of the sawn timber),
- method of knot area ratio – KAR method: cross – sectional proportion of the knots (ratio of cross - sectional surfaces of all knots to cross – section of the total board surface).

MATERIAL AND METHODS

The spruce wood (*Picea abies*) was used for the experiments. Trial material was obtained from logs. The quality of logs was determined by visual method in compliance with STN 48 0055 in saw mill factory. The choice of logs was purpose-oriented: 6 pieces of logs of III.A qualitative class and 7 pieces of logs of III.B qualitative class. The quality class III.C was not present. Firstly, using the frame saw, one middle prism was obtained from each log. Secondly, 4 planks of 50x190x5000 *mm* were obtained by following sawing of prism - 2 side and 2 middle planks. Planks from each log were marked as follows: ***side:*** planks 1 and 4, ***middle:*** planks 2 and 3 (Figure 1). The location of plank in prism was not taken into account during the experiments.

Measuring was made on 52 pieces of planks, therefrom:

- 24 pcs. of qualitative class III.A,
- 28 pcs. of qualitative class III.B.

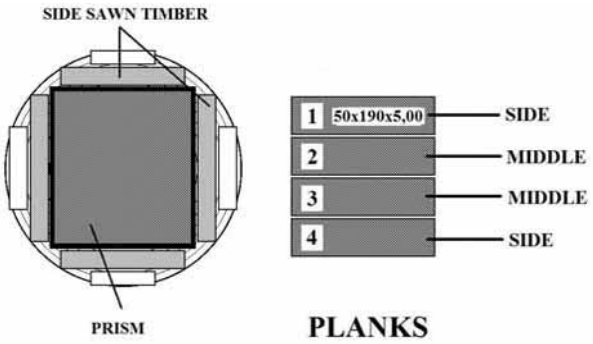

Fig.1 Transverse section across log – parts of cutting (prism, side sawn timber) and marking of planks in prism.

Then, the thickness and the wide of planks were corrected into dimensions of 40x180x5000 *mm*. The quality of planks was evaluated by visual method in compliance with STN 49 1531. The presence of pith was determined and the presence of knots was evaluated on all four sides of plank (timber) by first (1.) method of their assesment *(method of proportional knot dimensions)*. Wood defects that significantly influenced the qualitative class of timber ***S0***, ***SI*** or ***SII***, they were grafically noted into the registration sheet.

RESULTS AND THEIR ANALYSIS

Results of visual grading of planks into the class S0, SI or SII are summarised in Table 1.

Table 1. Visual classes of planks S0, SI and SII from logs of quality III.A and III.B

logs		*planks - visual classes*			
number	**pcs.**	**pcs.**	**S0**	**SI**	**SII**
III.A	6	24	4	14	6
III.B	7	28	1	7	20

Results of visual grading of logs and planks are shown in fig. 2. From the log quality III.A, there was following representation of the qualitative classes of planks: S0 -17%, ***SI-58%*** and SII-25%. For log quality III.B the percentage of qualitative classes of planks was: S0-3,6%, SI-25% and ***SII*-71%.**

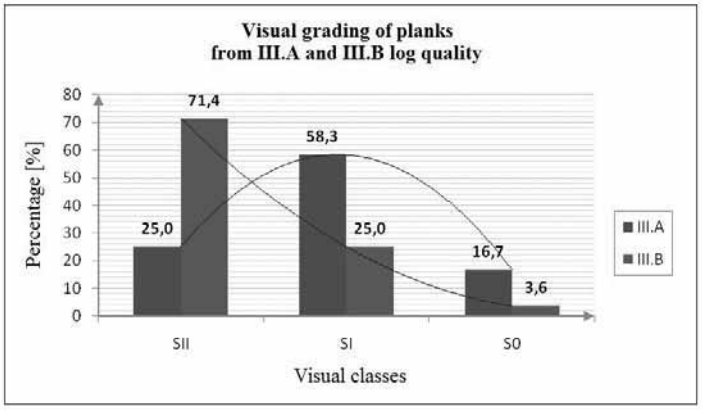

Figure 2 Visual grading of logs (III.A and III.B) and planks SII, SI and S0

When comparing the qualitative classes of logs – planks it is possible to state the following findings:

- from logs of III.A quality, the plank quality SI has the highest representation – 58% and the lowest representation of plank qualitative class goes for S0 – 17%. Therefore, the quality of certain logs was not sufficiently objectively determined,

- log quality III.B – qualitative classes S0, SI, SII have increasing tendency (4 – 25 – 71 %) and therefore we can conclude the proper qualitatif classification of logs,
- from each of logs III.A1, III.A5 and III.A6, 4 planks were obtained (12 pcs.). Therefrom 2 planks from each set (in general middle position) were classified into the lowest qualitative class SII. This can be explained by higher representation of planks of qualitative class SII (25%) than the representation of qualitative class S0 for logs III.A.

***Logs*:** 50% of III.A quality was not properly classified. This error could be caused by internal cracks or rot that is not possible to detect from transverse section of log. The evaluation of

plank classification by visual grading method from III.B log quality revealed that the qualitative classes of logs were determined objectively.

The results showed (refered to) the deficiency of objectivity and accuracy of qualitative assesment of III.A logs (rot, cracks). However the qualitative class of logs III.B was determined in compliance with the standard, the planks of SII qualitative class were represented by the highest percentage – 71%. It shows the fact, that the suitability of using the logs III.B for obtaining the timber for loadbearing constructions is overvalued.

CONCLUSION

The reliability of wooden construction members is conditioned also by the qualitative choice of timber. The effective assesment is a result of purpose – oriented classification of wooden raw material in processing chain from logs to sawn timber for building constructions. The visual grading method is used for qualitative assesment of logs and timber. The logs of quality class III.A offer the guarantee that the wood for loadbearing construction members meet the proper quality. It can be proved by the highest representation of timber with normal (standard) strength SI – 58%. The qualitative class of logs III.B was determined in compliance with the standard, but the planks of the lowest qualitative class SII were represented by the highest percentage – 71%. The results show the fact of overvaluation of the suitability of using the logs III.B for construction timber for loadbearing constructions.

This study was supported by project under the contract No.VEGA 1/0549/08 „Quality of wood for building structures and its experimental analysis and verification *in situ*".

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Streszczenie*:* *Jakość drewna okrągłego i materiałów tartych w zastosowaniach konstrukcyjnych.* Tarcica w zastosowaniach konstrukcyjnych pochodzi zazwyczaj z kłód iglastych w klasach III.A oraz III.B. Najważniejszymi czynnikami przy sortowaniu kłód są: drewno reakcyjne, przeżywiczenia oraz zgnilizna. Klasy jakościowe S0, SI oraz SII są nadawane przy sortowaniu wizualnym oraz maszynowm. Najważniejszym czynnikiem w procesie sortowania wizualnego są sęki. Sortowanie maszynowe bazując na wielu zasadach (zginanie, promieniowanie, inspekcja akustyczna) oferuje bardziej wiarygodne wyniiki. W trakcie sortowania tarcicy stosowano metodę wizualną zgodnie z normą STN 49 1531. Badano zależności między jakością kłód a tarcicy. Wykazano większą zawartość klasy S0 w III.A (58%), dla III.B tylko 25%. Konieczność sortowania przeznaczeniowego już przy obróbce kłód jest uzasadniona oraz ekonomiczna.

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