Log grade revision: structural log grades

Craig Treloar, Tenon Industries

Most structural logs are currently sold solely on the basis of size (sed and length) and external log quality (branch size and straightness). Only in a minority of cases are structural logs (or stands) segregated using a sonic tool to estimate stiffness or by using wood density as a surrogate for stiffness. However this situation needs to change.

The sawmilling industry within NZ is currently undergoing a major change with the introduction of the NZ 3603 and 3622 Standards' specifications for framing lumber. These new standards will change the way sawmillers who produce framing will purchase logs and it is prudent that the issues be discussed and addressed within the framework of a national log grades review.

To explain: basically, the lumber produced from logs must meet the stiffness and strength criteria set out in the document NZ 3603, the audit process being set out within the draft document NZ 3622. The standard describes framing grades in three main categories, MSG (machine stress graded), VSG (visually stress graded) and VF (visually graded framing). Table 1 simply expresses a breakdown of the draft standard by grade.

To produce grades such as MSG8 and VSG8, which appears to be where most sawmillers in the market are aiming, logs need to be graded by "internal" quality as well as the traditional external characteristics. These proposed "internal" quality characteristics should follow the standard assessment factors researchers are currently promoting.

Breast height outerwood basic density (BHOBD)

We have used a single measurement taken as a bulk oven dry density which is a measure of 30 increment cores sampled at breast height, from a stand of trees that have a unique age, planting stock and silvicultural regime (Units=kg/m^3). An advantage is that results can be readily adjusted for age to determine optimum felling age or to amend for time since sampling. Density sampling can be carried out as a separate assessment or simply included in standard inventory.

Standing tree velocity (STV)

A single number representing an average sonic 'time-of-flight' measurement (in kilometres per second) of 50 trees sampled at breast height from a stand of trees that have a unique age, planting stock and silvicultural regime. An advantage is that individual tree values are recorded and therefore a measure of variability within a stand is obtained.

Log Velocity (LV)

A measurement of acoustic resonance stated as a velocity (kilometres per second) taken as an average of 30 or more logs from one harvest area. This is a more accurate measure than the above stand estimates as it incorporates other factors such as branching characteristics and internal damage. Logs can be measured on truck or on the skids at time of log making. Results can be used to match mill production requirements. For example ratings between 2.5 and 3.4 km/s may suit production of MSG 8 material.

BHOBD/STV measures can be used in assessing the value of standing trees for the purpose of stumpage sales or optimising harvest scheduling. These define structural and non-structural pre-harvest characteristics. LV is used to define structural or non-structural logs post harvest, generally on delivery or at time of log making. All measures describe log suitability for purpose and therefore value. Whatever measurement system is used, the challenge is to determine the appropriate cut-offs to differentiate different structural log grades and also to differentiate structural logs from non-structural logs.

If no measurements are available then the logs are downgraded to non-structural log grades such as utility or industrial grades. The classifications above should apply to all length categories within the current grades. Table 2 illustrates the type of criteria that need to be incorporated in the new set of log grades in order for them to allow for "structural" logs. To produce MSG/VSG 10 lumber, producers will need (given the example specifications) logs supplied with LV >3.4km/s or alternatively, a source of logs with BHOBD >470kg/m^3 or a comparative STV >2.9km/s. To produce MSG/VSG 8 lumber, producers will need logs supplied with LV >2.5km/s or alternatively, a source of logs with BHOBD >400kg/m^3 or a comparative STV >2.3km/s.

Note that these figures are examples only and will need to be set as an independent industry standard. The grades used imply S for structural and the number is a broad indicator for the suitability of the log to produce MSG grades.

Table 2: Example log grade specifications for structural logs proposed for new national log grades.

Grade	S8	S10
Branch size(maximum) (cm)	6	6
Lengths (m)	4.9-6.1	4.9-6.1
BHOBD (minimum) (kg/m^3)	400	470
STV (minimum) (km/s)	>2.3	>2.9
Log Velocity(minimum) (km/s)	>2.5	>3.4

Table 1: Framing lumber grades in each of three NZ3603/3622 categories. Columns represent broad equivalence of grades in each category

Grading category	Testing					
Machine Stress Grades	All pieces tested			MSG6	MSG8	MSG10	MSG12
Certified Visual Framing	1 in 1000 pieces tested				VSG8	VSG10	
Uncertified Visual Framing	No testing	No 2 Frame (no design values)	No 1 Frame (MoE = 6)	G8	G10	

Pruned log descriptors

Jim Park*

Introduction

A prime motivation in creating Pruned Log Index (PLI) in the mid 1980s and subsequently developing practical stand sampling systems based around PLI was to provide methods for determining pruned log quality based on measurable log parameters only. The index needed to remain independent of, but directly relate to, clearwood recoveries by any sawmill. Those objectives have been achieved and after proof in numerous sawing trials PLI has been accepted nationwide as the appropriate measure of *basic pruned sawlog quality*.

However the underlying motive of installing PLI, augmented by other essential quality measures such as resin pocket incidence, as the prime determinant of quality in log price negotiations has been largely frustrated. Return To Log (RTL) type studies completely controlled and conducted by the sawmill (i.e. the customers for logs) remain the norm. While such RTL studies may constitute an essential element in sawmill's purchasing decisions and general mill efficiencies, they will always be biased, to at least some degree, in the sawmill's favour and cannot provide a neutral definition of pruned log quality.

It is readily conceded that pruned quality does not equal pruned price. There are a number of issues influencing pruned log prices with quality being just one of the components and, unfortunately for the better grower, not always the most dominant one. Regardless, quality inevitably has an impact on price and a purpose here is to further promote independent measures as the fairest and most appropriate determinants of pruned log quality.

Pruned stand sampling remains the most reliable and unbiased method of determining pruned quality. Interface sampling systems are based around PLI but also include gathering data and producing results on the incidence of random defects (principally resin pockets), intra-ring checking index (IRC), other properties such as percentage heartwood and percentage corewood if requested, and Clear Veneer Potential (CVP) for pruned logs as peelers.

A sensible first step in any examination of a pruned resource is the prediction of PLI. When stand records are good and silviculture has been well applied and consistent, PLI can be accurately predicted. However, even in the best situations some element of doubt remains. Additionally resin levels, IRC and CVP have all proved impossible to reliably predict. Consequently, although predicted PLIs have, and will doubtless continue to be, presented as the prime quality measures in some price negotiations, the unknowns and levels of risk are both increased to the point where sawmills are virtually forced to insist on adjustments based on their own RTLs.

The purpose in preparing this note is to present a proposed system of pruned log descriptors to improve pruned log trading practices. Hopefully it will provoke thought and generate some discussion.

Pruned Log Descriptors

Good descriptions of pruned logs are in the best interests of all concerned and, although eventually likely to prove most useful to the end-user, should also assist in better informed price negotiations. At present for most purposes pruned log quality can be defined by three elements; basic sawlog quality expressed by PLI; resin pocket incidence expressed as the number per square metre of sawn surface area; and intra-ring checking defined by the index (IRC) developed at Forest Research. Stand level definitions of those three variables are the most frequent and conveniently adopted measures of basic quality. Acknowledging the need not to get overcomplicated, I believe those three stand variables could be combined into Pruned Log Descriptors which may be similar to, but more flexible than, standardised log grades.

There is one additional issue in defining pruned logs for marketing purposes; and that is whether PLI has been calculated from sampling or has been predicted.

My suggestions for PLI based pruned log descriptors are as follows:

1. Pruned logs are identified by P and basic quality is expressed in single increments of Stand PLI; e.g. P6, P7, P8 etc.
2. Stands or logs that are predicted only are identified with a second P; e.g. P6P, P7P etc.
3. Stands that have been sampled will always have a PLI number plus a qualifier for resin pockets according to one of 5 incidence classes ranging from A to E (see following section for details); e.g. P7A, P7C etc. (The suffixes A to E will serve a secondary purpose in confirming that a stand has been physically sampled.)
4. Stands with unacceptably high checking will be identified with a Z. As some predicted stands do get sampled for checking only, a Z may apply to both predicted and sampled stands; e.g. P7PZ for a predicted stand, P7CZ as an example of a sampled stand.

At present, in one mill at least, checking on the IRC scale is either acceptable, if <0.4, or logs are downgraded if >0.4, and not accepted where >1.00. That standard may not suit all and wider consultation is required so the examples in item 4 above may be regarded as a starting point only. Currently the Z is used as an either absent or present flag signalling potential problems when present. However, it would be simple to accommodate say three classes of checking by using X, Y and Z as suffixes if required.

As a point of interest, we have now sampled several stands that were PLI 10+. So far the highest stand PLI recorded has been 11.5.

Resin Pocket Degrade Classes

There are a range of randomly occurring defects which

* *Interface Forest & Mill Ltd*
  Email: jim@interformil.co.nz