BRE

digest

Guide to machine strength grading of timber

Digest 476

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Machine strength grading of timber has been used commercially for at least 30 years, but, for many people involved with the process, it has remained a specialised subject. Timber enters a grading machine at one end and leaves the other having been given a strength class with no obvious means of how this is achieved.
Without knowing the theory and practice of grading, misunderstandings are likely to arise. The main aim of this Digest is to improve knowledge of the process of machine strength grading and to highlight the benefits.
It also explains some aspects of statistics, the concept of distribution, and modification and adjustment factors which are integral to timber grading practice.

Timber is one of the UK's most important raw materials. It is also one of its major imports. When timber is considered as a structural material, specifiers will be concerned mostly with its strength and stiffness properties, although its light weight and ease of cutting and fixing are important advantages compared with steel, concrete and other materials.

When structural timber is produced at the sawmill, some pieces can be eight or more times stronger than others of the same size and species mainly owing to differences in density of the fibre material and the presence, to a greater or lesser extent, of defects such as knots and sloping grain. It is this strength variability which poses the greatest impediment to the efficient use of timber as a structural material. The only way to overcome this and create a basis for achieving greater efficiency in use is to sort timber into grades based on strength. The pieces which qualify for the better grades are assigned higher working stresses and can be therefore used in smaller sections or over longer spans. The process of sorting timber on the basis of strength is known as strength grading*. Two methods of strength grading are available: one is based on visual inspection and the other by using a grading machine.

While visual grading is better than no grading at all, a disadvantage of visual strength grading is that it is rather inefficient since wood structure and density (which influence strength) may not be sufficiently taken into consideration by visual inspection. Another disadvantage is that economic constraints do not allow for slow deliberate examination of each piece and consequently only a rough estimate can be made of the more obvious defects. Therefore the grading rules must be set conservatively. Clearly a machine grading process which minimises the need to assess these factors visually is preferable and in some cases necessary.

Machine strength grading usually sorts timber directly into classes. These classes are divisions of timber strength into which 'species and grade' combinations of similar strength are allocated.

* Formerly referred to as stress grading.

Forestry Commission