GUIDELINES FOR SAMPLING A GROWTH AREA
FOR DERIVING MACHINE SETTINGS
AND VISUAL GRADING ASSIGNMENTS

> Sampling guidelines are now included in Annex A of EN 14081-2:2018, but the general principles apply also to visual grading.

These guidelines are written because rules that cover every eventuality in sampling cannot be given in the standard. Although sampling is partly subjective it has a major influence on the safety of grading machine settings / visual grading assignments - and consequently the safety of timber structures. Those people doing reports are therefore required to use their knowledge and experience, and that of others, when designing the sampling strategy. It is important that whatever decisions are made are justified in the report.

1. The overall requirement is that the timber tested is representative of the timber to be graded in production with these machine settings or visual grading assignments. The aim is for the sample to resemble this timber population in terms of: the mean and variance of grade determining properties; and the variation in correllations between the grade determining properties and those characteristics assessed during grading (visual grading criteria for visual grading and IP for machine grading). This means that sampling strategy should not be designed in order to maximise yield (beyond increasing the number of specimens to reduce statistical uncertainty).

2. The first thing to consider is the size of the growth area (source from which timber is intended to be strength graded) and the variation within it of factors that affect timber quality. If there is knowledge from previous research on the variability of the timber in the growth area this can be used to select the sources strategically.

3. The availability of knowledge about the variability within the growth area should influence the number of locations sampled. If weak areas are known, they should be taken into account accordingly. Where there is a lack of knowledge, more locations should be used and/or contain more specimens.

The species combination should reflect industrial practice (current or intended). If species are graded together without being differentiated, then the sampling should be based on that species combination. This should be described in the report. For the sampling, it is not necessary to be able to identify the species of specific specimens – only to know that the species is within the species combination and that the ratio of species in the sampling is broadly similar to that in practice. However, for this grading to work the species must be sufficiently similar, and this must be considered and justified in the report. If species are, or could be, differentiated in production, the consequence of this should be considered and justified in the report - and in this case it is likely that the species will need to be identified in the sampling in order to do that.

4. Ideally, the timber to be tested should be specimens taken from normal sawmill production (sawn or planed) provided the source is known well enough to meet the sampling criteria.

5. Pieces that have defects that would be rejected by visual override inspection should not be included, since these would not be included in the graded timber.

6. Sampling based on selecting logs is acceptable provided normal sawing patterns are used (non-standard sawing patterns may make the sample unrepresentative), and a sufficient number and diversity of logs are selected such that the sampling is not made to be unrepresentative.

7. It is important that the length of the specimens is sufficient to enable a choice to be made for the critical section. However, care should be taken to avoid biasing the sample through selection of unusually long lengths compared to industrial practice.

8. The range of cross-section dimension should be representative of the timber to be graded in production with these settings or assignments (unless justified otherwise). For machine grading - remember that the range of sizes (thickness and width) permitted to be graded is ± 10% of the tested sizes

9. If there is concern that the grading may not work correctly in certain circumstances (e.g. certain sizes, or sources, or for species in the combination), authors can add additional calculations and checks to those in the standard procedure – and explain those in the report.

<u>Some additional advice on preparing reports:</u>

When you do testing and prepare reports for new machine settings, and visual grading assignments, you are doing work vital to ensuring the safety of structural timber. The TG1 committee is part of the process that helps you achieve this.

The following advice is not a complete list, but it provides some examples of how to approach this work.

Since grading is a safety critical issue, the justifications for discarding suspect test results are different from normal scientific research. Acceptable reasons include:
•   The specimen would be rejected manually by the EN14081-1 visual override criteria
•   The test data is bad due to some error or problem (confirmed by more than just the result being an unexpected value).

Similarly, if a grading machine measurement is known to be in error, this should not be removed or corrected without good reason, such as:
•   The machine marks a bad or incomplete measurement as a reject
•   The measurement is missing and so cannot be used in the calculation
•   It is known that the error is a machine or operator mistake that is unlikely to happen in normal production
Machine measurement errors that might also happen in production, and result in a piece of timber being graded higher than it would without the error, should be kept in the analysis, since these are representative of real grading machine performance.

In any case, the data should be thoroughly checked to find any anomalies, and determine the causes of them to decide on the best cause of action.

In some cases the best course of action depends on the situation, and should be the one that results in the safest grading situation. Examples are when:
•   The failure outside the central test span / in the grips
•   The time to maximum force is shorter or longer than the EN408 expectation
•   The test is stopped prematurely because the force or deflection capacity is exceeded
In the last example, when the data is included, it may be necessary to consider how it affects the calculations of means and standard deviations.

If there is any doubt the action should be the one that results in the safest grading situation. It is not safe to exclude measurements simply because the result looks different from the others, or brings down the grading potential. These could be genuine measurements that are key to making your sampling representative.

TG1 can only help you produce safe grading settings if they have the information to inform the discussions and decisions – so when specimens that are sampled are removed from the dataset, this should be summarised in the report. It is good practice to investigate suspicious measurements as soon as possible, so you can confirm what happened by looking at the broken specimen or the test machine records.