

# Changes to the New Zealand Timber Design Standard – NZS3603:1993 Amendment 4

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## Introduction

NZS 3603 is the standard for the design of timber structures. It is used for the design of large timber structures, as well as being the basis for residential timber-framed buildings (NZS3604). It contains design stresses and methods for specific design.

An amendment (No 4) to NZS 3603 has just been released. This amendment incorporates changes to timber grades and their respective design stresses. It reflects changes to the timber resource in NZ, as well as the methods used to grade that timber.

The issues which have been addressed in the amendment include:

- Traditional visual grading rules could not ensure that the NZS 3603 design properties were met.
- The existing set of standards did not fit together under the new NZ Building Code and Approved Solutions framework.
- The timber resource in NZ has changed since the original code was released in 1993, and the grades and species offered to the market since then have changed markedly.
- The relationship between stiffness (MoE) and strength values (such as bending, tension and compression) in the existing code were based on hardwood and Australian softwood species, and were inappropriate for NZ's softwood species.
- Specifiers and users of timber in structures had no certainty that the timber met the suite of design values in the codes.

## The changes to NZS3603

The main elements in the amendment to the standard are:

- 'F' grades (including 'Engineering') have been deleted
- Machine stress graded (MSG) timber grades have been added, being MSG 15, 12, 10, 8 and 6
- Visually stress graded (VSG) grades have been added, VSG10 and 8, as well as No. 1 Framing
- A 'lower-bound' MoE has been defined, to be used for isolated beams
- Strength values have been generally reduced
- A new code, NZS3622, has been referenced

Characteristic stresses (MPa) for dry radiata pine or douglas fir timber (amended code):

Grade	Bending	Compression	Tension	MoE	
				average	lower bound
MSG 12	28.0	25.0	14.0	12,000	9,000
MSG 10 and VSG 10	20.0	20.0	10.0	10,000	7,500
MSG 8	14.0	18.0	8.0	8,000	5,600
VSG 8	14.0	18.0	8.0	8,000	5,400
MSG 6 and VSG No 1 Framing	10.0	15.0	6.0	6,000	4,000

(note: MSG 15 is not likely to be available in NZ)

Characteristic stresses (MPa) for dry radiata pine timber (existing code):

Grade	Bending	Compression parallel	Tension parallel	MoE	
				average	lower bound
Engineering (visual) *	24.5 or 27.7	25.7 or 24.2	13.8 or 12.2	10,500 or 10,000	Not applicable
F11 (machine graded) *	33.9 or 30.4	28.6 or 27.1	16.9 or 15.2	12,000	
F6 (or No 1 Framing)	17.7	20.9	8.8	8,000	

(Note \* - different values refer to a size variation in design stresses)

Comparing the tables, the characteristic stresses in NZS3603 are generally reduced for the same average stiffness grades. Note that the generic 'No 1 Framing' is now an unverified visual grade with significantly reduced structural properties.

The lower-bound MoE value is to be used in the stiffness calculation for isolated members such as beams and lintels. It is a statistical lower bound value, so designers have some certainty that an individual piece will perform at or above this value. The load-sharing factors in NZS3603 can then be used to determine the MoE value for two or three elements. If a load is shared between four or more members, the average value of MoE can be used. Note also that the ratio between the lower bound and average MoE is greater for higher grade timber, as this reflects the lower variation in the population.

## Verification standard NZS3622

A new standard has been published in conjunction with the NZS3603 amendment. Called NZS3622: Verification of Timber Properties, it applies to both machine stress graded (MSG) and visually stress graded (VSG) timber. Timber producers are required to continuously carry out in-mill monitoring of bending strength and stiffness characteristics, to enable them to sell material with the grade label.

NZS3622 also contains requirements for a third party audit process to verify that the production meets stiffness and strength criteria.

## The effect on NZS3604

The tables in NZS3604 are being reviewed to incorporate the changes to NZS3603. As the average stiffness value (MoE) is unchanged between the existing code and the amended one, there are unlikely to be any significant changes. These changes will most probably be limited to lintels, bearers and floor and roof beams.

It is expected that a set of tables will be produced to include an option for the reduced performance of No 1 Framing. These tables are planned to be available by the end of 2005.

In the interim it is very unlikely that there will be any safety issues while the new standards are implemented. The most common type of failure is excessive deflection of lintels, beams or floors resulting in call-backs for builders from the occupants of buildings. Where strength is an issue, there is generally significant load-sharing between adjacent building elements to minimise the risk of any one particular member failing.

## The Effect on Specific Designs

The effect on these structures will include:

### ***Trusses***

These elements have members such as top and bottom chords with a significant strength element. Designers will need to consider higher-strength grades such as MSG 10 or 12. As the availability of this material is likely to be limited to sizes 150mm deep or smaller, LVL recipes such as Hychord or Hyspan will need to be used.

### ***External structures***

The timber used for these structures is generally rough-sawn and of larger dimension. As machine stress graders are limited to framing thicknesses of 35 and 45mm the properties of such members are likely to be assigned a No 1 framing grade, reducing their strength and stiffness. Designers should check to see that the material they require is available in a VSG 8 grade.

### ***The effect on LVL, plywood, glulam and poles***

The changes to NZS3603 (and the introduction of NZS3622) do not apply to LVL, plywood, glue-laminated timber or round timber. These timber products are graded to different processes. There is no need to apply a lower bound MoE value in the design of LVL members.

The amendment to the standard has been released by Standards New Zealand and is currently going through an approval process with the Department of Building and Housing.

[Amendment 4](#) is available on the [Standards New Zealand](#) website.