

# TIMBER GRADING, DEFECTS AND SEASONING - MANUAL



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## Introduction

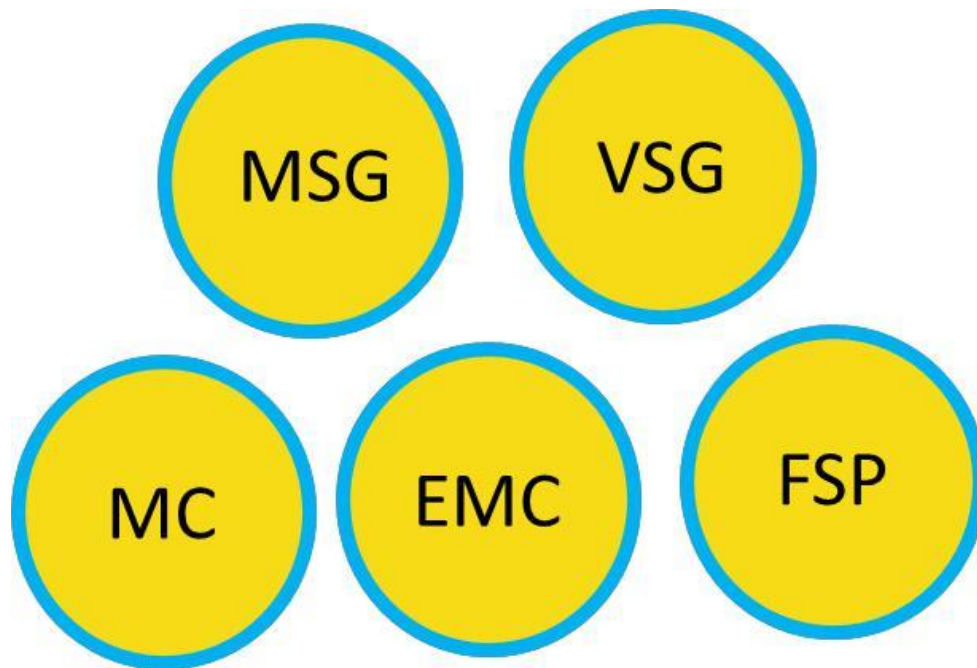
In Manual 1 Timber Classification, Property and Use, we looked at the different ways we classify timber in New Zealand. We also looked at some uses and properties of timber. In this manual we are going to take a closer look at timber grading i.e:

- timber grade categories
- timber groups and grades

We will also look at NZ3602 standards for timber use and:

- some timber defects
- timber seasoning methods

You will learn a few abbreviations that relate to timber grading and seasoning such as:



Timber grading and seasoning abbreviations

## Timber grade categories



Under the New Zealand Timber Grading Rules (NZS 3631), timber grades are divided into **two main grade categories**. These are:

### A. Appearance grades



Appearance grades are used for various finishing purposes in long lengths, for recovery of short lengths for factory use, and for utility purposes. In the appearance grades, the principal concern relates to defects and blemishes that may affect the drying and machining properties and the appearance of the timber in the dressed state.

### B. Structural grades



Structural grades include **framing** and **engineering** grades where defects that affect the timber's strength and stiffness are of primary concern. Engineering grades require special selection and may not be available from stock.

There are two other minor categories of low grade timbers.

- **Cuttings:** a low appearance grade capable of yielding clear cuttings
- **Boxing:** the lowest grade of timber

**Timber grade categories**



Structural

Appearance



Low grade timber

Cuttings	Boxing
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## 1. Visual grading

Visual grading is the conventional way timber is graded by a visual inspection to limit the size and frequency of defects. This method is suitable for appearance grades but has some limitations with structural grades. The visual defects present may lead the grader to believe the timber is weaker or stronger than it really is.

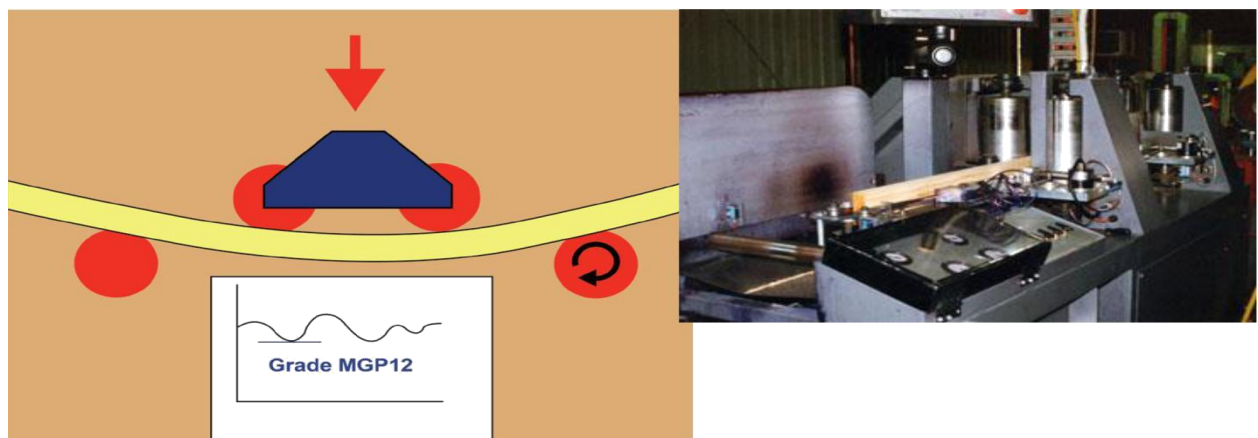
Graded timber can be produced by two methods. Both methods involve random selection of timber to be tested to confirm the stiffness and strength. Timber that is sorted for strength through machine stress grading (MSG) has a visual over-ride to down grade timber with defects like oversize knots, warps and other defects. Smaller sawmills may produce Visually Stress Graded (VSG) timber to meet NZ3631. All timber is called Stress Graded (SG) with a number allocated after it as to its dedicated use.

## 2. Stress Grading (SG)





Stress grading by machine determines the grade of timber based on its strength and bending stiffness (bending strength) rather than its visual appearance. The timber is passed through a machine and a pressure roller applies a force that places the timber under a stress load (see below). Machine stressed timber have slightly bigger knots than visual stressed timber.

The timber is marked with an ink dye to identify its grade.

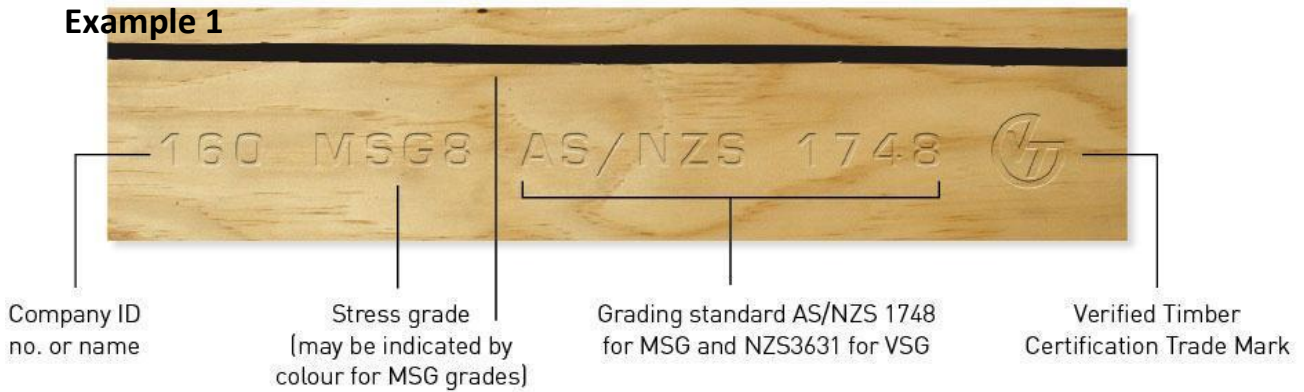
Machine stress grading



## The grading system

Grade	Colour marks MSG	Bending strength (MPa)	Bending stiffness (GPa)	Typical end use
SG10		20.0	10.0	Engineering grade where design requires higher strength and/or stiffness
SG8		14.0	8.0	Lintels, floor joists, roof beams, general framing and trusses
SG8		11.7	6.5	Decking joists, veranda posts, Pergola and other outdoor timbers
SG6 (wet) New grade		7.5	4.8	Wet treated house framing equal to SG6 (dry) when dry
SG12		28.0	12.0	Engineering grade where design requires higher strength and/or stiffness
SG10		20.0	10.0	Engineering grade where design requires higher strength and/or stiffness
SG8		14.0	8.0	Lintels, floor joists, roof beams, general framing and trusses
SG6		10.0	6.0	Lesser load bearing walls, truss webbing

### Example 1



The date of production may sometimes be marked.

### Example 2

MSG grade – indicated by the colour black



**Red Stag Timber**  
Company name

Grading standard AS/NZS 1748

Verified timber certification trade mark of auditing agency – i.e the people who check that timber has been properly graded

Building consent authorities (Councils) require consent documents to specify the timber grade to be used. The timber actually used in construction must be at least the grade specified in design; otherwise major remedial work might be required.

Because the properties of visually-graded timber are identical to the equivalent machine grade, you can substitute between them – for example, VSG8 can be substituted for MSG8 and vice versa. Likewise, you can substitute a higher grade than specified. However, it would pay to check with the relevant council prior to making any substitution.

## NZS 3602 and timber use

Any timber- or wood-based product used in a building must comply with **NZS 3602** (Code of practice for specifying timber and wood based products for use in building). This standard specifies the following characteristics required to make the timber suitable for its end use:

- species
- grade to comply with NZS 3631
- size to comply with NZS 3601
- finish
- preservative treatment to comply with NZS 3640
- moisture content table 4 NZS 3602

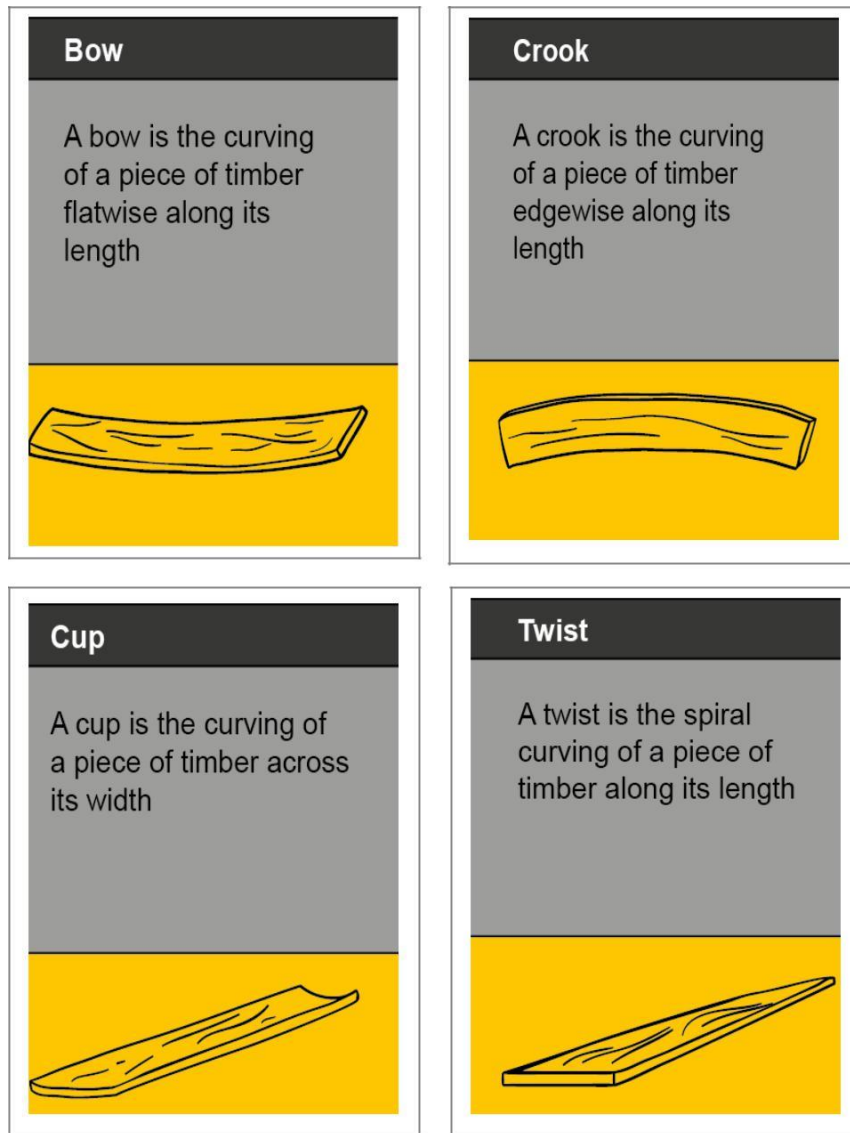
Complete the table below with your tutor.



What are the specified grades for **Radiata pine** for the following end uses?

General description	Specific job	Grade specified
Framing	Studs	_____
	Nogs	_____
Exterior joinery	Window frame	_____
Exterior	Decking	_____
Interior finishing	Shelving	_____

## Timber defects



Types of timber defects

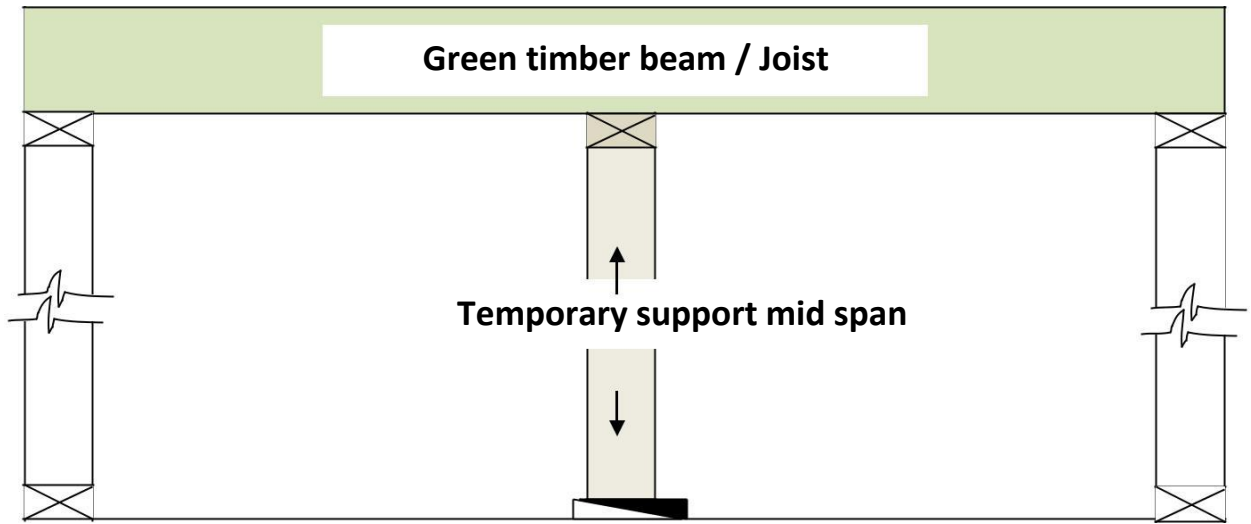
### Permitted timber defects

Timber with defects can still be used for construction purposes, provided that the **defect does not exceed (go over) a certain measurement.**

## Moisture content in green timber

Freshly felled logs contain water in both the cell cavities and the cell walls. This water can weigh more than the dry timber itself. This combined effect (the weight of the wood and the water) reduces the strength of timber. Therefore, green timber may require temporary support while drying (sketch below).

### Joists or beams over large spans



## Hygroscopic moisture

Water vapour from the air is attracted by and soaked up by dry cell walls. As this moisture is soaked up, the timber swells. If the air humidity drops, moisture is evaporated through the cell walls and the timber shrinks.

## Equilibrium moisture content (EMC)



EMC stands for equilibrium moisture content.



Timber left in the open will eventually reach a stage where the moisture content of the timber is in balance with the moisture in the surrounding air. It is then said to have reached equilibrium moisture content (EMC). This would be about 14 - 18% for outside timbers and 12 - 16% for inside timber.

## Recommended moisture content levels

Maximum recommended % moisture content for buildings which are:				
Timber use	Moisture content measured when:	Centrally heated	Irregularly heated <sup>(1)</sup>	Not heated
Weatherboards, exterior joinery, exterior finishing timbers	fixed in place	14-18	14-18	14-18
Ground level suspended floor framing	floor laid	10-14	12-16	14-18
Interior joinery, trims, furniture, flooring	fixed in place	8-12	10-14	12-16

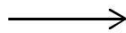
Maximum recommended % moisture content for buildings which are:				
Timber use	Moisture content measured when:	Centrally heated	Irregularly heated <sup>(1)</sup>	Not heated
All framing above ground floor level	fixed linings <sup>(2)</sup>	8-16	12-18	12-18
Roof trusses, lintels, beams and floor joists deeper than 200 mm	erected	12-18	12-20 <sup>(3)</sup>	12-20 <sup>(3)</sup>

**Notes:**

- (1) Buildings heated by open fires, portable electric heaters
- (2) Gib site guide 2006 p. 27 requires maximum 18% MC
- (3) Lintels, beams and upper floor joists may require propping until recommended moisture content is reached.
- (4) Preservative types in timber can affect moisture meter readings.

### Fibre saturation point (FSP)

As timber is seasoned, the water from the cell cavities dries out first, reducing the moisture content to approximately 25-30%.



FSP stands for fibre saturation point.

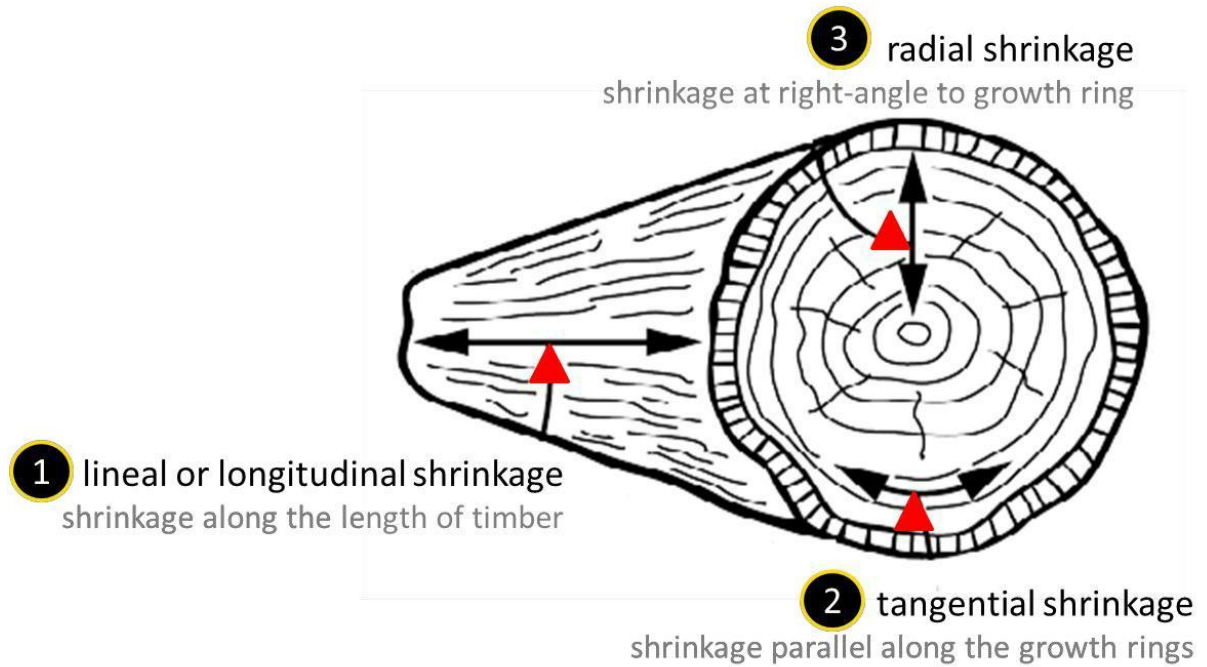


When the cell cavities are empty and the cell structure/walls are still saturated, this is called Fibre Saturation Point (FSP).

Further seasoning below **FSP** dries moisture from the cell walls and causes shrinkage.

## Shrinkage

Timber shrinkage occurs at three different places in timber.



Timber shrinkage

To compare these shrinkages, we can represent them on a graph like this:

