What is the Stress in Timber Beams?

Extreme fiber stress in bending for a rectangular timber beam is calculated by the following

$f=6M/bh^2$

$=M/S$

where

f= maximum fiber stress, lb/in^2 (MPa)

M= bending moment, lb in (Nm)

h= depth of beam, in (mm)

b= width of beam, in (mm)

S= section modulus (bh2/6 for rectangular section), in^3 (mm^3)

The horizontal shearing stress in a rectangular timber beam is

$H=3V/2bh$

For a rectangular timber beam with a notch in the lower face at the end, the horizontal shearing stress is

$H=(3V/2bd_1)(h/d_1)$

where

h= depth of beam, in (mm)

b= width of beam, in (mm)

H= horizontal shearing stress, lb/in^2 (MPa)

V= total shear, lb (N)

d_1= depth of beam above notch, in (mm)

l= span of beam, in (mm)

P= concentrated load, lb (N)

V_1= modified total end shear, lb (N)

W= total uniformly distributed load, lb (N)

x= distance from reaction to concentrated load in (mm)

For simple beams

Span should be taken as the distance from face to face of supports plus one-half the required length of bearing at each end

For continuous beams

Span should be taken as the distance between the centers of bearing on supports. When determining V, neglect all loads within a distance from either support equal to the depth of the beam.

For concentrated loads

$V^1=[10P(l-x)(x/h)^2]/9l[2+(x/h)^2]$

For uniform loading

$V^1=W[(1-2h/l)]/2$

The sum of the V^1 values from these equation should be substituted for V in the equation above and then the corresponding H value is calculated. This value is then checked with tables of allowable unit stresses for end-grain bearing.

Source: http://www.engineeringcivil.com/what-is-the-stress-in-timber-beams.html