

8. The stress on any fibre *cannot* exceed the compression endwise strength.

9. "Finally and most important, it appears from (4) and (6), but especially from an examination of the several thousand test results on the several species of conifers made by the Division of Forestry that, *the extreme fibre stress at the elastic limit of a beam is practically identical with the compression endwise strength of the material.*

From these considerations it appears that after the stress in the extreme compression fibre reaches the elastic limit in compression (which is practically the ultimate compressive strength), the fibre strain continues to increase while the stress remains constant; the stress in each of the remaining compression fibres increases according to Hooke's Law, until each in succession reaches the elastic limit, after which it remains constant; at the same time the stresses on the tension side increase according to Hooke's Law (being within the elastic limit in tension), and the neutral axis shifts towards the tension side (so as to always preserve the equality of the total tensile and compressive stresses). Finally, when the ultimate strength of the extreme tension fibre is reached the beam suddenly "fails by tension."

Accordingly in the stress-strain diagram at rupture (Fig. 2).

If HK represents the cross-section of the beam.

MH the stress on the extreme compression fibre.

KL the stress on the extreme tension fibre.

NP the stress on last fibre to reach the elastic limit in compression.

The line MN will be practically straight and vertical, NL will be straight and intersect HK in the neutral axis, and the stress-strain diagram will be composed of the rectangle $MNPH$ and the triangles NOP , and OLK . (The curvature of OL as indicated by the line ORL^1 , where OL^1 is the actual stress on the extreme tension of fibre at rupture, is neglected).

On account of the proportionality of strain to distance from neutral axis, the vertical ordinate may represent (a) distance from neutral axis, or (b) the strain of the fibre. Accordingly HK represents not only the depth of the beam but also the total fibre strain or the sum of the amounts by which the extreme compression fibre is shortened and the extreme tension fibre lengthened. (The scale of strains in Fig. 2 is not the same as in Fig. 1.)

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observedDistance from Neutral Axis.
Distortion or Strain of Fibres.(a)
(b)B
the di
follow
Let s_c s_t s_c y_t