

(b) The extreme fibre stress does not exceed the elastic limit in tension or compression.

Within these limitations the theory is rational and consistent with the results of experiments in timber. Beyond these limits the theory fails, but the breaking load is still expressed by the same equation $W = \frac{2bh^2}{3z}f$ where f is not the actual stress on the extreme fibre, but what that stress *would be* if the theory were applicable beyond the elastic limit.

NEELY'S THEORY.

The considerations upon which Mr. Neely's theory is founded are:—

1. The first hypothesis of the ordinary theory is true for all loads up to rupture, and, therefore, the strain is, even at rupture, proportional to the distance from the neutral axis.

2. The second is true for any fibre on which the stress is within the elastic limit.

3. If the stress on any fibre exceeds the elastic limit, it is not proportional to the strain, and the position of the neutral axis is altered.

For stresses beyond the elastic limit the distribution of stress and the position of the neutral axis are determined from the following additional considerations:—

4. The tensile strength of timber is much greater than the compression-endwise strength. The elastic limit in either case is almost as great as the ultimate strength. Young's modulus is the same for both.

5. Wood tested in tension breaks suddenly as soon as the ultimate load is reached; tested in compression-endwise, it undergoes considerable distortion while sustaining the maximum load.

6. The elastic limit of a beam (shown on the load-deflection diagram, as the point where it ceases to be a straight line), is reached at the same time as the elastic limit of the extreme compression fibre.

7. A "long" beam will sustain an increasing load after the extreme compression fibre has been loaded to its ultimate strength; the compression fibres continue to be mashed down while the neutral plane is lowered, and the stress on the tension fibres increased until the beam "fails in tension."