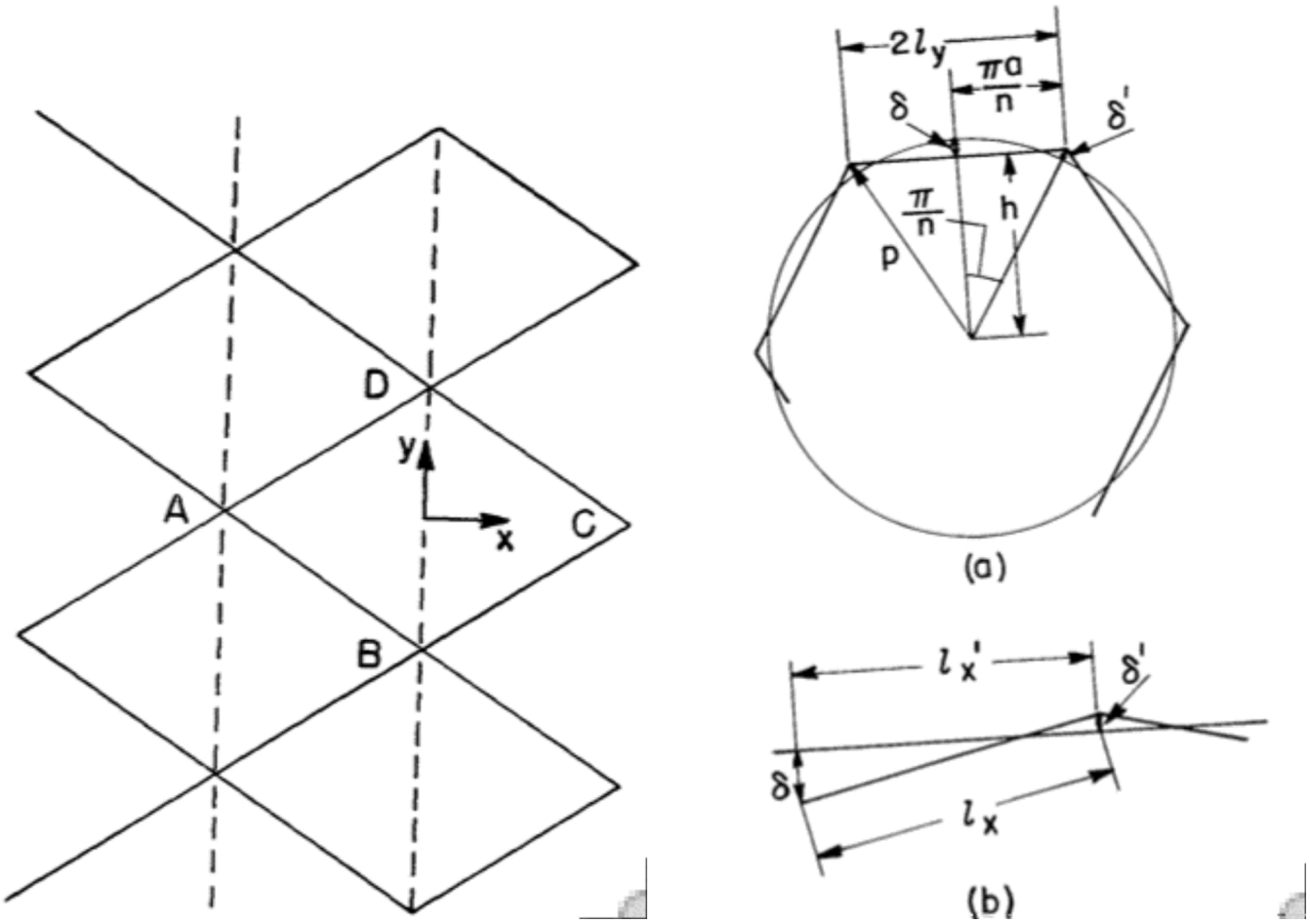

This is the famous Yoshimura Post-buckling pattern as originally postulated and developed mathematically by Yoshimaru Yoshimura in the report: “On The Mechanism Of Buckling Of A Circular Cylindrical Shell Under Axial Compression”, NACA-TM-1390, July 1955

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Selected Publications:

Yoshimura, Y.: “Theory of Thin Shells with Finite Deformation”. Rep. Inst. Sci.and Tech., Tokyo Univ., 2, 1948, p. 167; 3, 1949, p. 19.

Yoshimura,Y.: “Local Buckling of Circular Cylindrical Shells and Scale Effects”. Proc. of the 1st Japan National Congress for Appl. Mech., 1951.

Y. Yoshimura, “On The Mechanism Of Buckling Of A Circular Cylindrical Shell Under Axial Compression”, NACA-TM-1390, July 1955

ABSTRACT: The present paper deals with the buckling of a circular cylindrical shell under axial compression from the viewpoint of energy and the characteristics of deformation. It is shown first, both theoretically and experimentally, that the reason why the buckling of a cylindrical shell is quite different from that of a flat plate is attributable to the existence of a nearly developable surface far apart from the original cylindrical surface. Based upon this result, the experimental fact that the buckling is really not general but local, that is, that the buckled region is limited axially to a range of 1.5 times the wave length of the lobe, is explained by the theoretical result that the minimum buckling load is smaller in the local buckling than in the general buckling case. The occurrence of local buckling is affirmed also from the viewpoint of the energy barrier to be jumped over during buckling, and from a comparison of the theoretical post-buckling state with the experimental results. Finally, the local buckling with the load applied by a spring is analyzed, and it is proved that the minimum buckling load increased with an increase of rigidity of the spring.

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"Lower buckling stress of circular cylindrical shells subjected to torsion", Journal of the Aeronautical Sciences, Vol. 24, No. 3 (1957), pp. 211-216.
ABSTRACT: The critical stress for torsional buckling of circular cylindrical shells obtained from the linear theory with small deformation is considerably greater than for the experimental stress. The present paper clarifies the cause of this discrepancy between theory and experiments on the assumption that the torsional buckling, as well as the compressive buckling, is a Durchschlag phenomenon. Based on the experimental fact that the buckled surface is approximately developable (the mean surface being drum-shapped), the equilibrium state after buckling was calculated by means of the minimum principle of potential energy, and, for the case of buckling under constant load, the lower buckling stress was obtained, which is considerably smaller than the upper buckling stress and which explains the experimental results approximately. In the case of buckling under constant angle of torsion there exists no lower stress.