2.7. Flat Rectangular Plywood Panels

2.71. Buckling Criteria.

2.711. *General.* When buckling occurs in plywood panels at loads less than the required design loads, the resulting redistribution of stresses must be considered in the analysis of the structure. The buckling criteria in this section are based on mathematical analyses and are confirmed by experiments for stresses below the proportional limit. Visible buckling may occur at lower stresses than those indicated by these criteria, due to the imperfections and eccentric loadings which usually exist in structures. Experiments have indicated, however, that the redistribution of stresses due to buckling corresponds more closely to the degree of buckling indicated by these theoretical criteria than it does to visible buckling. These criteria can, therefore, be used in various parameters for plotting test results or design allowables against the degree of buckling, and to compute the degree of buckling in a structure. This is done in sections 2.72 and 2.760.

Since the mathematical analyses are based on the assumption of elastic behavior, these criteria cannot be directly applied when the stresses are above proportional limit. The behavior at such stresses has been investigated experimentally for some cases, as described in sections 2.72 and 2.760. Because of the low modulus of elasticity of wood across the grain it is difficult to approach clamped-edge conditions.

2.712. *Compression* ($\beta=0°$ *or* $90°$). The critical buckling stress of flat rectangular plywood panels subjected to uniform compressive stress is given by the following formula (ref. 2–55).

$$F_{cer}=H_c\frac{\sqrt{E_{fu}E_{fz}}}{\lambda_f}\left(\frac{t}{a}\right)^2 \qquad (2:72)$$

in which H_c depends upon the edge conditions of the panel and other considerations in the following cases.

Case I. All edges simply supported.

$$H_c=\frac{\pi^2}{12}\left[\left(\frac{r}{m}\right)^2+\left(\frac{m}{r}\right)^2+2k\right] \qquad (2:73)$$

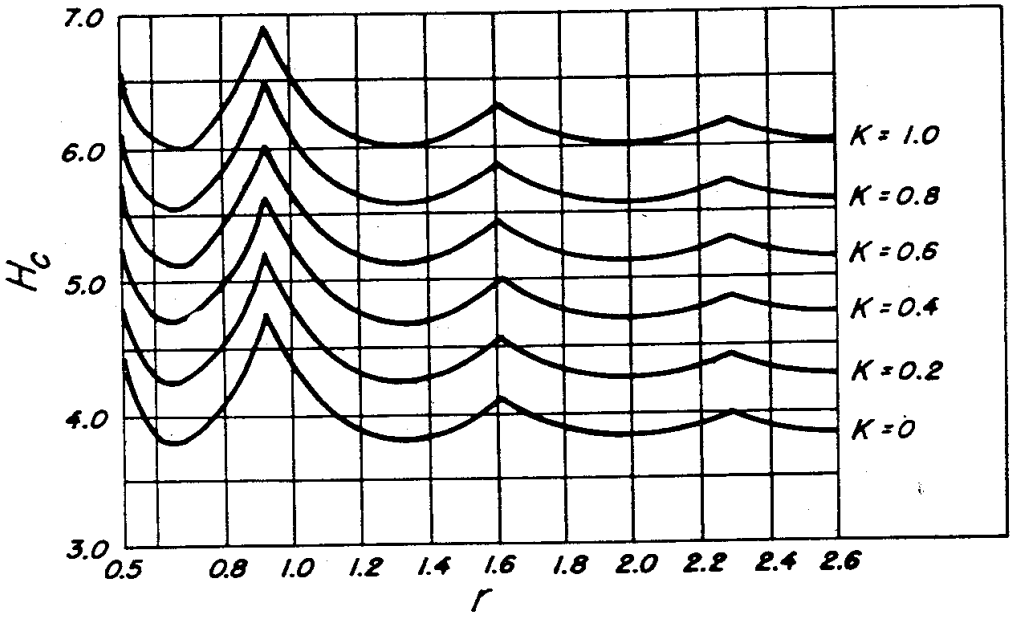

Figure 2–24. Plot of equation (2:73)