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Author	前田, 昭彦(Meda, Akihiko)
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The Plastic Collapse of Aluminium Rings

Akihiko MAEDA*

The problems of column buckling, and the concepts to be used in the design of slender metal columns, have been a constant concern of structural engineers. In order to clarify these problems, the behaviour of ring specimens having rectangular cross section, in compression and bending, was analyzed.

The direct measurement of buckling loads of columns has been popular so far, but in this method, the conditions of end-fitting might be remarkably influential. Therefore, unless ideal conditions of end-fitting are performed, a number of problems might arise in actual analysis.

In this paper, the experiment was performed as follows: The collapse loads P_c were plotted in the ordinate and the ratios t^2/R_m of the second power of thickness to mean radii R_m in the abscissa.

By comparing the expression obtained by this experiment, with the expression connecting the yield stress with the collapse load in plastic design, the yield stress σ_r , in compression and bending, was obtained. The results were as follows.

The value of the stress was constant and 2% lower than that of standard yield strength.

The relation between P_c and t^2/R_m was found to be a linear one,

$$P_c = K \cdot (t^2/R_m).$$

It was seen that the strength of members in compression and bending can be calculated by this method.

*前田昭彦