Int. J. Solids Structures Vol. 21, No. 4, p. 425, 1985
Printed in the U.S.A.

0020-7683/85 $3.00 + .00

REPLY TO DISCUSSION: BUCKLING AND POSTBUCKLING OF THE LYING SHEET†

C. Y. WANG
Michigan State University, East Lansing, MI 48824-1027, U.S.A.

Professor Hobbs correctly pointed out that my article[1] on the buckling of the lying sheet can be applied to the vertical buckling of railroad tracks. Using linear beam theory, Martinet[2] and later Nusayr and Paslay[3] found the buckling force of a *symmetric*, *infinite* sheet. The nonlinear postbuckling problem was first attempted by Kerr[4] who modeled the symmetric problem by two rigid connected segments. Exact numerical solution was obtained by Wang[5]. The present article[1] studies the *asymmetric* case, which can be applied to the buckling of railways and pipelines that have joints[6]. I may add that the critical buckling load or "safe load" of these problems cannot be determined from a small-slope linear analysis.

It is indeed possible to study the effects of bottom imperfection. Such an analysis, for the symmetric, segmented model, was performed by Kerr[4]. The effect of thermal elongation is equivalent to a compressive displacement and can be predicted by the present work.

Of a different nature is the lateral buckling of railroad tracks, which does not have one-sided constraint as in the present article[1]. On the other hand, there is no reason to believe the local resistance of lateral buckling is uniform or even proportional to displacement as in the Winkler foundation. I am not sure lateral buckling can be analyzed in the same way as vertical buckling.

REFERENCES

1. C. Y. Wang, Buckling and postbuckling of the lying sheet. *Int. J. Solids Structures* **20**, 351–358 (1984).
2. M. A. Martinet, Flambement des voies sans joints sur ballast et rail de grande longueur. *Rev. Gen. Chemins de Fer* **55**, 212–230 (1936).
3. A. M. Nusayr and P. R. Paslay, Buckling of an infinite sheet with one sided constraint. *J. Appl. Mech.* **39**, 302–303 (1972).
4. A. D. Kerr, A model study for vertical track buckling. *High Speed Ground Trans. J.* **7**, 351–368 (1973).
5. C. Y Wang, The ridging of heavy elastica. *Zeit Angew. Math. Mech.* **61**, 125–126 (1981).
6. A. D. Kerr, Etude relative a la stabilite de la voie ferree dans le plan vertical. *Rail Int.* **5**, 169–183 (1974).

† Author's reply to R. E. Hobbs' discussion on "Buckling and Postbuckling of the Lying Sheet" *Int. J. Solids Structures* **20** 351–358, 1984.