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Discussion

Author's response to Comment by Yang Gao and Min-Zhong Wang on "Stress boundary conditions for plate bending" by F.Y.M. Wan [Int. J. Solids Struct. 40 (2003) 4107–4123]

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The author appreciates very much the interest and comments on his recent article in the International Journal of Solids and Structures by Professor Wang (who has made many valuable contributions to elasticity theory including aspects of plate theory related to the present article) and Dr. Gao. The author agrees with Professor Wang and Dr. Gao that the constant a_0 in the expression for the midplane displacement of the plate can be determined using the other singular solution of the problem (as they have done). The resulting solution would correspond to an interior solution with deviations of its edge stresses from the edge data inducing only a boundary layer as required by the condition of rapidly decaying residual state in the theory developed by Gregory and Wan.

On the other hand, the solution of any stress boundary value problem in linear elasticity is determined only up to a rigid body motion. In the paper being discussed, the author merely pointed out that for plates under axi-symmetric loading, a rigid translation in the thickness direction can always be added to any solution of the stress boundary value problem (and hence it would not be unreasonable not to determine a_0). At the same time, a vertical translation is not a boundary layer phenomenon. If we insist on getting only a true interior solution (and not the actual solution of the elasticity problem), any additional rigid translation would be inappropriate and eliminated by the rapidly decaying residual state requirement imposed on the residual boundary value in the theory, leaving us with an interior solution with a_0 given by the expression derived by Professor Wang and Dr. Gao using the other singular solution in the decaying residual state requirement.

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