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Letter to the Editor

Comments on "Validation of a medium-frequency computational method for the coupling between a plate and a water-filled cavity"

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Dr. David and Dr. Menelle have performed an extremely valuable investigation on a very important subject [1]. As pointed out by the authors numerical and analytical results are in very good agreement over the entire frequency band under analysis. The correlation between theoretical predictions and experimental results is quite good up to 3500 Hz.

The writers also agree with the concluding remarks made by the authors regarding the "imperfection of the clamping" and find that their reasoning is quite valid. However, another possible and/or additional factor may be considered.

Quite obviously, when tightening the bolts, stresses and strains are induced in a transverse direction to the plate. By Poisson's effect, radial strains are generated. Part of the radial displacements are able to "escape" from the clamped domain but a fraction of the displacements cannot develop freely, due to the clamping action, and in-plane compressive stresses are developed in the plate. The effect of these compressive stresses is hardly noticeable in the case of a rather rigid combination of plate-supporting structure where steel is used (in principle they could be detected with strain gages, optical means, etc.). However, Smith, Matis and the senior author of this discussion showed that in the case of an aluminum plate clamped by a steel clamp one could induce buckling of the circular plate if appropriate torques were applied to the bolts of the clamp [2,3].

Laura had the fortune of discussing this matter early in the 1970s with the late Professor John Snowdon, a great gentleman and scholar and then at Penn State University, who agreed fully with this explanation which describes, partially, the imperfect operation of a real clamp. Clearly, in-plane compressive stresses will lower the natural frequencies of the plate.

Certainly one does not know (at least the writers do not know) if this effect is more pronounced at higher frequencies where shear and rotatory inertia effects are extremely important.

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