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LETTER TO THE EDITOR

Discussion of "On the three-dimensional bending theory of crack plates", *Int. J. Solids Structures*, Vol. 25, No. 5, pp. 497–513 (1989)

Folias (1989) has extended the method of analysis he has used earlier (Folias, 1975) in the analysis of a uniform extension of an infinite plate containing a through the thickness line crack to that of an infinite cracked plate under bending. According to him (Folias, 1989, p. 511), "A comparison of the analytical results with those of Iyengar *et al.* (1988) shows an excellent agreement up to 60–70% of the plate thickness." This comparison is shown in Figs 3–5 of the paper. The above statement needs further justification or modification in view of the following three observations which may change the numerical results for comparison.

(1) The results of the author's analysis are for an infinite plate while those of Iyengar *et al.* (1988) are for a finite plate. To compare these two sets of results, the author has applied a correction factor 1.19 as given by Isida (1966) and shows a good agreement. However, it is to be pointed out that there are two corrections to be applied to the infinite plate results: one for the effect of the ratio L/B and another for the ratio c/B, since the plate is finite in both the x and y directions. Isida's results will give the correction for the ratio c/B and not for the ratio L/B as stated in the paper (footnote to p. 511 of Folias, 1989). Also Isida's results are for an infinite strip, i.e. for very large ratios of L/B. The results of Iyengar *et al.* used for comparison by the author are for $c/B = 0.5$ and $L/B = 0.5$ (Figs 3 and 10 of Iyengar *et al.*, 1988). As per Isida's analysis, the correction factor for $c/B = 0.5$ is about 1.19. However, the correction for $L/B = 0.5$ remains to be applied. From sheet 1.1.1 of Rooke and Cartwright (1974) the correction factor for $c/B = 0.5$ and $L/B = 0.5$ is about 1.95. Hence, with this correction factor applied instead of 1.19, the agreement between the two sets of results will diminish.

(2) The correction factors that are applied to the results of the infinite plate in order to compare them with those of the finite plate, as discussed above, are valid for a two-dimensional case (a strip) and for extensional loading. However, the problem under discussion is a three-dimensional one and the loading is a bending moment. From sheet 1.1.2 of Rooke and Cartwright (1974) the correction factor for an infinite strip under a bending moment for $c/B = 0.5$ is about 1.03 as against 1.19 for the extensional case. Further, the additional correction to take into account of $L/B = 0.5$ under bending is not available. Hence the two sets of results, i.e. of Folias and of Iyengar *et al.*, are not strictly comparable due to the non-availability of reasonable correction factors for a three-dimensional finite plate under bending. In fact, it should be possible to obtain these correction factors by employing the solutions of Folias and Iyengar *et al.*

(3) The comparison of the results given by Folias (1989) in Figs 3–5 of his paper are for c/h (crack length/thickness) ratios 3, 1 and 0.25:† in the notation used by Iyengar *et al.*, this ratio is $a/h = 1/\eta$. The thickness parameter used in all the figures of their paper is η, i.e. h/a which corresponds to the reciprocal of the parameter c/h used by Folias. However, in comparing the two sets of results, Folias seems to have used the results corresponding to $\eta = 3$, 1 and 0.25 (see Fig. 10 of Iyengar *et al.*, 1988). This comparison is not compatible since the two parameters c/h and η are not one and the same. If values corresponding to $1/\eta$ are used, there will be large deviations both qualitatively and quantitatively in the two sets of results. For example, in Iyengar *et al.*'s results, as the cracklength/thickness ratio

† There is a discrepancy in the values of c/h in Figs 3 and 5 as shown in the figure titles and inside the figures.

increases, the value of SIF at any thickness level decreases whereas in the author's results the SIF increases. This difference needs to be explained.

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