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Reply to comments by R. Piltner on "A high precision element with a central circular hole" [Int. J. Solids Struct. 36 (1999) 5485–5497]

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We wish to thank Prof. R. Piltner for his valuable comments, and our responses are as follows:

1. It is indeed negligence on our side for missing some important references. The problem arose because we were not aware that our proposed method was classified as a Trefftz method and, hence, we missed some of the related papers. This negligence was mainly due to the fact that the development of the proposed element was a spin-off from our project, entitled 'Size and clustering effects on non-linear fracture of thin films', in which the behaviour of a crack propagating towards many clusters of voids/inclusions was studied. The total number of voids/inclusions to be modeled was in the order of tens of thousands (Cleri et al., 1998). There was a need to develop elements containing holes/inclusions to scale down the problem in finite element modeling. Thus, we began to develop such element and our main focus was the free boundary stresses at the voids, the stresses at the interface between the matrix and inclusions as well as the stresses at the crack tips.

2. There are various approaches for constructing special finite elements with hole and internal crack (Fan and Long, 1992). The approach adopted in our paper was combined application of the complex potential and weighted residual methods. The complex potential method was employed to define the strain functions in the element domain and the weighted residual method (the version of collocation point method) was used to satisfy the compatibility conditions along the inter-element boundary. In the weighted residual method, the compatibility conditions along the boundary are satisfied approximately. Since the version of collocation point method was used, only the compatibility conditions at collocation points (the nodal points) were satisfied. However, from the results of a series of numerical examples, the proposed element was found to be accurate and reliable.

References

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Fan, Z., Long, Y.Q., 1992. Subregion mixed finite element analysis of V-notched plates. Int. J. Fract. 56, 333–344.

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