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ON CHARACTERISING FRACTURE RESISTANCE IN MODE-I DELAMINATION

Leo Škec[1], Giulio Alfano[2] and Gordan Jelenić[3]

[1] Department of Mechanical, Aerospace and Civil Engineering, Brunel University London, Kingston Lane, Uxbridge, UB8 3PH, UK, leo.skec@brunel.ac.uk
[2] Department of Mechanical, Aerospace and Civil Engineering, Brunel University London, Kingston Lane, Uxbridge, UB8 3PH, UK, giulio.alfano@brunel.ac.uk
[3] Faculty of Civil Engineering, University of Rijeka, Radmile Matejčić 3, 51000 Rijeka, Croatia, gordan.jelenic@uniri.hr

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In this work we focus on the mode-I quasi-static crack propagation in adhesive joints or composite laminates. For this problems a number of different standards have been approved [1]. The most widely used are based on the double cantilever beam (DCB) test and on linear elastic fracture mechanics (LEFM) but differ in some aspects of the testing procedure and the recommended data-reduction schemes. The applicability of these methods is still a matter of debate in the scientific community, particularly in the case of ductile interfaces. We revisit the accuracy of the most used standards and compare it with other methods based on either LEFM or J-integral theory [2]. All the methods analysed in our work are based on either Euler-Bernoulli or Timoshenko beam theories. We present a number of numerical examples where we compare different expressions for fracture resistance obtained with different methods. The input for the analysis, which includes applied load, cross-head displacement and rotation, crack length and cohesive zone length, is obtained from the numerical model which simulates real experiments. In these simulations, we use a Timoshenko beam model with a bi-linear CZM [3, 4] which allows us accurate comparison with analytical formulas for fracture resistance based on Euler-Bernoulli and Timoshenko beam theory.

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