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**A generalization of Prandtl's and Spencer's solutions on axisymmetric viscous flow.** (English)

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Summary: New analytical solutions for axisymmetric deformation of a viscous hollow circular cylinder on a rigid fibre are given. One of the solutions generalizes the famous Prandtl's solution for compression of a rigid perfectly plastic layer between two rough, parallel plates and the other is a modification of Spencer's solution for compression of an axisymmetric rigid perfectly plastic layer on a rigid fibre. All equations are satisfied exactly whereas some boundary conditions are approximated in a standard manner. Special attention is devoted to frictional interface conditions since these conditions result in additional limitations of the applicability of the solution when compared to that based on a rigid perfectly plastic models. In particular, difficulties with the convergence of numerical solutions under certain conditions can be explained with the use of results obtained. Therefore, the solutions can serve as benchmark problems for verifying numerical codes. The solutions are also adopted to predict the brittle fracture of fibres by means of an approach used in previous studies and confirmed by experiment.

**MSC:**

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|---|---|
| 74E30 | Composite and mixture properties |
| 74C10 | Small-strain, rate-dependent theories of plasticity (including theories of viscoplasticity) |
| 74M10 | Friction in solid mechanics |



**Keywords:**

analytical solution; interface conditions; composite materials; brittle fracture; viscoplasticity

**Full Text:** DOI

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