A.S. Chepurnenko, V.I. Andreev, B.M. Yazyev

DEVELOPMENT OF A MODEL OF AN EQUAL STRESS CYLINDER BASED ON MOHR'S STRENGTH THEORY

The authors have employed analytical methods to identify the nature of dependence of the elastic modulus distribution over the thickness of a cylinder, loaded by internal pressure *p*, if the equivalent stress is the same in all points, according to Mohr's theory of strength. The problem in which dependence of an elastic modulus is to be identified along the radius, and the stress value is available, is called the inverse problem. The idea of the method is that if a certain area of a body has the value of its elastic modulus lower than the one in the homogeneous material, stresses in this area are also reduced. The problem is solved for the case of plane strain and plane stress in the elastic formulation. It is proven that assurance of artificial heterogeneity reduces the maximal equivalent stress. Therefore, we have taken two variants of shells: one having inner radius a = 1 m and outer radius b = 2 m, the other one having inner radius a = 1 m and outer radius b = 0.52 m. The value of the maximal equivalent stress calculated using Mohr's theory reduces almost two-fold in the first case and 1.5-fold in the second case. Moreover, the use of non-uniform thick-walled cylinders can significantly reduce their thickness with the value of the internal pressure being the same. In our case, the shell thickness reduces from 1 m to 0.52 m, which is almost 2 times. We also proven that the first, second and third strength theories in the case of an axisymmetric problem are the special cases of Mohr's strength theory. This result coincides with well-known analytical and numerical solutions.

Key words: thick-walled cylinder, optimization, Mohr's strength theory, inverse elastic problem.

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A b o u t t h e a u t h o r s: **Chepurnenko Anton Sergeevich** — student, **Rostov State University of Civil Engineering (RSUSE)**, 162 Sotsialisticheskaya St., Rostov-on-Don, 344022, Russian Federation; anton_chepurnenk@mail.ru;

Andreev Vladimir Igorevich — Doctor of Technical Sciences, Professor, Associate Member of RAACS, Chair, Department of Strength of Materials, **Moscow State University of Civil Engineering (MGSU)**, 26 Yaroslavskoe shosse, Moscow, 129337, Russian Federation; asv@mgsu.ru; +7 (499) 483-55-57;

Yazyev Batyr Meretovich — Doctor of Technical Sciences, Professor, Chair, Department of Strength of Materials, **Rostov State University of Civil Engineering (RSUCE)**, 162 Sotsialisticheskaya St., Rostov-on-Don, 344022, Russian Federation; 277588@rambler.ru; +7 (863) 201-91-09.

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