

质疑岩石巴西圆盘拉伸强度试验

喻勇

(西南交通大学 应用力学与工程系, 四川 成都 610031)

收稿日期 2003-7-24 修回日期 2003-10-2 网络版发布日期 2007-2-8 接受日期 2003-7-24

摘要 指出人们使用了40多年的巴西圆盘试验拉伸强度公式是来自二维问题的弹性力学解答, 而实际情况并不满足该公式所要求的平面应力或平面应力条件。分析指出, 在三维条件下影响试样应力分布的因素有试样高径比和材料的泊松比。通过40次三维有限元分析, 得到了高径比和泊松比对试样拉应力分布影响的规律。发现了试样中最大拉应力出现在试样端面的中心, 并拟合出了最大拉应力的计算公式。根据Griffith强度理论和Mohr强度理论, 计算了试样中的最大等效力, 发现试样的破坏不可能满足中心起裂条件。由于加载点应力集中的影响, 试样必然从端面加载点处起裂破坏。因此认为巴西试验方法已不适合用于测试岩石类脆性材料的抗拉强度。

关键词 [岩石力学](#); [巴西试验](#); [抗拉强度](#); [高径比](#); [泊松比](#); [三维有限元法](#); [强度理论](#); [岩石](#)

分类号

QUESTIONING THE VALIDITY OF THE BRAZILIAN TEST FOR DETERMINING TENSILE STRENGTH OF ROCKS

YU Yong

(Department of Applied Mechanics and Engineering, Southwest Jiaotong University, Chengdu 610031, China)

Abstract

The extensively used formula for estimating the tensile strength of rocks under the Brazilian test is based on the 2D elastic theory and only suitable for very long or very short cylinders. However, the size of specimen in practice does not meet these preconditions. Under 3D conditions, it is found out that height- to-diameter ratio and Poisson's ratio are two factors influencing the stress distributions in rock cylinders. Through 40 3D FEM simulations, the influences of the height-to-diameter ratio and Poisson's ratio upon the stress distribution within the specimen were studied. It is found that the largest tensile stress within the specimen is always at the center of end surface. A fitting formula of largest tensile stress is presented. Lastly, the largest equivalent stresses bases on Griffith strength theory and Mohr strength theory were

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(165KB\)](#)
- ▶ [\[HTML全文\]\(OKB\)](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

相关信息

- ▶ [本刊中 包含](#)
- ▶ [“岩石力学; 巴西试验; 抗拉强度; 高径比; 泊松比; 三维有限元法; 强度理论; 岩石” 的相关文章](#)
- ▶ 本文作者相关文章
- [喻勇](#)

calculated. And it is found the largest equivalent stress is not at the center of the end surface of cylinder but always at the loading point of the end surface. Therefore, the Brazilian test is not suitable to measure the tensile strength of rock-like materials.

Key words [rock mechanics](#); [Brazilian test](#); [tensile strength](#); [height-to-diameter ratio](#); [Poisson's ratio](#); [3D FEM](#); [strength theory](#); [rock](#)

DOI:

通讯作者