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延安Q_2黄土统计损伤本构模型研究

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STUDY ON CONSTITUTIVE MODEL OF STATISTICAL DAMAGE FOR YAN AN Q_2 LOESS

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全文: PDF (3606 KB) HTML (KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 中国黄土的物理力学性质改变具有明显的地域性,是一种特殊土体。以延安Q_2黄土在不同围压和含水量下进行常规三轴试验获得的数据为基础,运用岩石统计损伤理论对延安Q_2黄土的损伤本构模型进行研究。在考虑损伤门槛值对延安Q_2黄土损伤变量的影响下,建立了延安Q_2黄土在三轴压缩条件下的统计损伤本构模型,统计损伤本构方程中的参数通过对试验结果进行线性回归求得。试验和分析表明:在半对数坐标下,延安Q_2黄土初始损伤点为三轴应力应变曲线的峰值拐点,对应的应力值为损伤应力门槛值。当施加的应力低于损伤门槛值时,应力应变曲线为线弹性关系,延安Q_2黄土不发生损伤; 而当施加的应力超过损伤门槛值时,延安Q_2黄土发生损伤,并且随着施加的应力增大,损伤不断扩大。将统计损伤理论曲线与试验曲线进行对比,发现二者基本吻合,表明考虑损伤门槛值的延安Q_2黄土统计损伤本构模型能较好的反映该地区黄土的变形破坏特征,对该区黄土地区岩土工程设计具有参考和借鉴作用。

关键词: 延安Q_2黄土 统计损伤 本构模型

Abstract: The physical and mechanical properties of loess at different regions in China have significant differences. Based on the data from ordinary triaxial test of Yan'an Q_2 loess under different confining pressures and misture contents, this paper establishes the constitutive model of triaxial statistical damage for Yan'an Q_2 loess by introducing rock statistical damage theory in the damage constitutive model of Yan'an Q_2 loess. In the meantime, the paper considers the effect of damage threshold on Yan'an Q_2 loess damage variable as well. In addition, the parameters in damage constructive equation are calculated by linear regression on the test results. The experiment and analysis present that in semilogarithmic coordinates, the initial damage point is the peak inflection point of triaxial stress-strain curve of Yan'an Q_2 loess. The corresponding value of damage point is also the damage stress threshold. The Yan'an Q_2 loess cannot damage and the stress and strain can be in linear elastic relationship when applied stress is less than damage threshold. Conversely, Yan'an Q_2 loess can begin to damage. And the damage of Yan'an Q_2 loess can enlarge with the increase of applied stress. Finally, statistical damage curve shows good agreements with test curve. This paper indicates that with the consideration of damage threshold, loess statistical damage constitutive model can better reflect the characteristics of Yan'an Q_2 loess deformation and failure, with a reference for geotechnical engineering design in the loess plateau.

Key words: Yan'an Q_2 loess Statistical damage Constitutive model

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