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应用能量守恒原理设计钢纤维喷射混凝土衬砌厚度的方法

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摘要 不同于普通混凝土, 钢纤维混凝土在破坏时由于钢纤维的拔出作用可以消耗大量的能量, 系统地研究钢纤维混凝土的这一本质特征对钢纤维混凝土结构的设计有着重大的指导意义。从室内试验结果出发, 应用概率统计方法对钢纤维喷射混凝土的指标进行了可靠性分析, 得出实际可以接受的保证率下的钢纤维喷射混凝土能量指标, 然后通过相关能量公式的推导, 将韧性试验得到的钢纤维喷射混凝土的能量指标应用于较高等级围岩中隧道衬砌结构的设计。

关键词 [隧道工程; 钢纤维喷射混凝土; 能量; 韧性; 隧道结构设计](#)

分类号

METHOD OF APPLYING ENERGY CONSERVATIVE PRINCIPLE TO STEEL FIBER REINFORCED SHOT-CONCRETE LINING DESIGN

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Abstract

Different from normal concrete, steel fiber reinforced concrete(SFRC) shows great capacity of dissipating energy in its cracking stage because of the pull out effect of steel fibers. It is of great importance for the design of SFRC structures to study intensively on this energy dissipating property of the material. So the failure of structures with SFRC components will be accompanied by energy exchanges between external environment and SFRC components. However, the total energy of the system should remain constant. To obtain the basic data of steel fiber reinforced shot-concrete(SFRSC) energy properties, a great number of experiments on SFRC specimens are carried out. An analysis based on statistical theory is done to get the energy criterion for SFRSC associated with credibility levels. The data provided by these tests act the fundamental database for further study. With rational supposition, the energy dissipating mechanism in SFRSC cracks is studied intensively. And the relation between the amount of energy dissipated in cracking and the form of cracks is proposed so that the energy data obtained in the standard tests could be used in structure design of linings. Finally, the energy dissipation capacity of the shot-concrete lining is calculated and compared with the tunneling-induced energy release of the surrounding rock obtained through finite element analysis.

Key words [tunneling engineering; steel fiber reinforced shot-](#)

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