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隧道纵向剪切传递效应及其一维解析

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摘要　基于弹性地基梁理论，对隧道在纵向不均匀沉降作用下纵向和横向断面的内力及其相互联系进行了剖析，并首次提出了隧道纵向剪切传递效应的概念及其初等解析方法。通过分析4种典型纵向沉降模式下隧道纵向剪切传递及其对横向内力的影响，得出了隧道纵向变形剪切传递是隧道纵向不均匀沉降导致隧道横断面产生附加弯曲内力的内在力学机理这一重要结论。这将为隧道设计考虑纵向变形作用影响，从而将纵向与横向设计统一起来提供了理论依据，为完善现行隧道设计方法提供了重要参考。同时，纵向剪切传递这一概念可以递延到一般长条形地下结构，具有更为普遍的意义。

关键词　隧道工程；纵向沉降；纵向剪切传递；势能原理；附加内力

分类号

LONGITUDINAL SHEAR TRANSFER OF TUNNEL AND ITS 1D ANALYTICAL SOLUTION

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Abstract

By analysis of the internal force components in longitudinal and cross sections of a circular tunnel and their correlations under uneven subsidence，based on the elastic foundation beam(EFB) theory and potential theory，the concept of longitudinal shear transfer and its solution are proposed. In addition，additional internal forces produced by longitudinal shear transfer under 4 typical forms of subsidence are analyzed and it¢s concluded that the additional internal forces vary significantly with the subsidence forms and the critical values turn out not to be at the places of maximum subsidence. It¢s suggested that the effect of longitudinal shear transfer should be taken into consideration for improved tunnel design.

Key words tunneling engineering；longitudinal settlement；longitudinal shear transfer；potential theory；additional internal forces

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