## Research on Earthquake Resistant Materials in Mountain Tunnels Crossing Fault

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# Research on Earthquake Resistant Materials in Mountain Tunnels crossing Fault

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**Keywords:** fault, stiffness, seismic decrease layer, lining

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## Introduction

In the past, the influence of earthquake to tunnel is thought very small, but in recent years, seismic damage to tunnel shows that the influence at the site of fault is great[1]. Earthquake of ChiChi in Taiwan proves that the tunnel in the area of fault almost can not avoid to be damaged in earthquakes [2]. In Wenchuan earthquake, F8 fault(LK22+115) is near the left entrance of Longxi tunnel, such seismic damage as fall, fissure and movement of concrete lining occurred at the site of nearby and in the fault (LK22+011~LK22+220)[3],[4]. In Zipingpu tunnel, some fissures occurred at bottom in the area of LK770~LK14+85 and at roof and wall in the area of LK835~LK14+850, geological survey that F11-2 fault is just across these damage area[5].

How to design anti seismic material in lining of crossing fault mountain tunnel is worth studying. The measures to resist influence of earthquake to tunnel in meizoseismal area in existing railway and road codes are adding the thickness of lining or reinforcing full section[6],[7],[8]. In allusion to the prescription of these codes, three models of original material, enhancing stiffness and that of adding seismic decrease layer are built. The finite element software MIDAS is used to compare these anti seismic material models. The stress, displacement and acceleration of the lining in different materials are got. The research has reference value to the anti seismic design of tunnel lining.

## 1 establishment of models

The finite element models of crossing fault tunnel are built on the basis of dynamic principle and actual geologic design. The size of the model is 55 meters in length, 30 meters in width, 20 meters in height. There is a 5-meter-wide fault across tunnel in the middle of model. The three models have same rock and fault material, but the lining materials are different. The lining material of original model is c20, that of enhancing stiffness model is c40, that of the last model is c20 and adding rubber as seismic decrease layer. The material parameters and elements are shown in table1, and finite element model is shown as Fig.1.