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Researches on Sound Environment in Futian Underground Railway Station

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Abstract

Futian Railway Station, an underground station located in the downtown of Futian District, Shenzhen, went into operation in November 2015. It was the first underground station being in the center of downtown in China, the biggest underground station in Asia and had the fastest train passing through in the world. The passenger transformation hall in Basement one, the waiting hall in Basement two, and the railway platform in Basement three all got into trouble of acoustics. The highlight issues were the Reverberation Time (RT) and the Speech Transmission Index (STI) in such a huge narrow space. The acoustic lab of school of architecture, Tsinghua University, by studying the acoustic environment in similar narrow spaces in China and doing some computer simulation analysis, solved this acoustic problem successfully.

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Keywords: creep; underground railway station; sound environment; reverberation time; speech transmission index.

1. Introduction

Noise, as one of the most spread pollutions, impacts life, work and even health. For those railway stations on the ground, sound energy will runaway beyond the station through the opens. But for an underground railway station, an enclosed space, sound energy can only gather inside the station, which will end up with bad sound environment, high level of noise and low speech articulation.

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Disaster prevention always takes the priority during a design of an underground space. When something happens, urgent evacuation is crucial. Bad sound environment will make the emergency broadcast unclear. The panic crowd will make the space more and more noisy even unable to communicate. The loss of life and property cannot be calculated. Therefore, proper acoustic treatment is necessary in an underground railway station. Unfortunately, large-scale issues on sound environment of indoors space of railway station have published in foreign country, but very little in China [2].

Futian underground station is one stop on the Guangzhou-Shenzhen-Hongkong railway line. And it is the first underground railway station in the middle of a city in China. Futian underground station stands on the west of the citizen square of Futian district, on the north of Fuzhong Road, on the south of Fuhua Road, and along the Yitian Road.



Fig. 1. Location of Futian Railway Station

The length of the station is 1023 m, and the area of it is 151504 m², and the deepest point of it is -31 m. Basement one (B1) is the passenger transformation hall, and basement two (B2) is the waiting hall, and basement three (B3) are the railway platforms. There are 4 platforms and 8 railways. Two platforms are 450 m long and 12 m wide. The other two is 220 m long and 10.5 m wide.

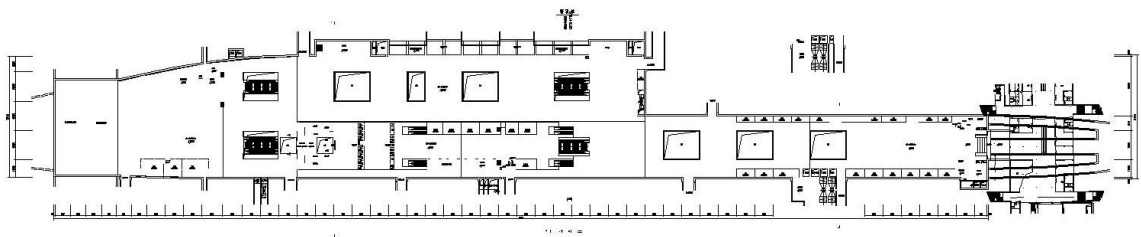


Fig. 2. Plan of Basement one

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