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# Study of thermal comfort in underground construction based on field measurements and questionnaires in China

Yong Li <sup>a,b,\*</sup>, Shibin Geng <sup>b,\*</sup>, Xiaosong Zhang <sup>a</sup>, HuaZhang <sup>b</sup>

a, Southeast University. Nanjing 210007, PR China.

b, Institute of military environmental Teaching & Research, PLA Univ. of Sci. & Tech. Nanjing 210007, PR China

Corresponding author. Tel.: +86 15996275349, [lgdxbing121@163.com](mailto:lgdxbing121@163.com) (Li) [lgdxbing121@126.com](mailto:lgdxbing121@126.com) (Geng)

## ABSTRACT

Underground buildings have the potential to reduce energy demand in comparison to conventional aboveground buildings. In China, previous studies on thermal comfort have been mainly focused on the building environment, such as offices, residential and non-residential buildings, but rarely on underground construction, especially the air-defence basement. To investigate the thermal comfort conditions in the unique and complex underground construction, comparative thermal comfort surveys including field measurements and questionnaires have been carried out in different underground air-defence basement in 95 nationwide typical cities. As a result, the mean thermal sensation (AMTS) from questionnaires is compared with PMV calculated based on the field data in different cities, and significant discrepancies are found. The occupant's actual cool feeling is larger in the cooler side, but occupants may sense the warmth as being less severe than the PMV predicts in warmer side. In addition, the neutral temperature model for underground construction is developed, and the thermal acceptability and preference are discussed. It shows that thermal acceptable temperature range is unsymmetrically distributed with respect to the thermal neutral temperature and changes with the ground temperature. Ultimately, the recommend temperature ranges for different cities through thermal comfort model are discussed based on psychrometric chart.

Keywords: thermal sensation; underground construction; thermal neutral temperature; acceptable temperature ranges

## 1. Introduction

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