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# The Methodology of Standard Building Selection for Residential Buildings in Hot Summer and Cold Winter Zone of China Based on Architectural Typology

Xue-chen GUI, Yi-teng Ma, Shu-qin Chen<sup>\*</sup>, Jian Ge

College of Civil Engineering and Architecture, Zhejiang University

## Abstract

The hot summer and cold winter zone in China plays a crucial part in both the population and economy of the nation. Such zone is characterized as hot and stuffy in summer, while cold and wet in winter. Due to such hostile climate conditions, many existing buildings in such zone suffer from poor thermal performance either in the envelope or indoor environment. With the advance of the social economy, there is an increasing demand for improving the indoor thermal environment. Hence an energy-efficient and low-cost retrofit of these buildings has become a priority in such zone. Due to the enormous types of buildings in this zone, it becomes highly important to identify standard buildings for each type, as to offer guidance for designing proper retrofit strategies correspondingly. To achieve that, this study develops a performance index system (PIS) based on architectural typology, demonstrated through examples of residential buildings. The PIS consists of construction year, plane form, floor area, building orientation, number of floors, building structure and the types of cold and heat sources. Three hundred and four residential buildings in an administrative region of Hangzhou were selected to collect relevant data of the index system. Through correlation and cluster analysis, the classification indexes of these residential buildings are calculated based on the influence of each performance index on the electricity energy consumption throughout the year, and six types of buildings are finally refined as representative standard types. The methodology of standard building selection through PIS proposed in this study is not restricted to residential buildings, and thus provides an efficient methodological support for the classification and retrofit of many types of existing buildings in the hot summer and cold winter zone in China.

**Keywords:** architectural typology; standard building selection; residential building; hot summer and cold winter zone

## 1. Introduction

The hot summer and cold winter zone in China is a densely-populated and well-developed region in terms of economy, population and industry. The gross domestic product (GDP) of this region accounts for approximately 45% of the country, and the regional population has reached 550 million, among which 300 million live in urban areas Error! Reference source not found.. In terms of climate conditions, the annual average temperature in the coldest month is 0-10 °C, 5-10 °C lower than other regions in the rest of the world at the same latitude; the average

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