10th International Symposium on Heating, Ventilation and Air Conditioning, ISHVAC2017, 19-22 October 2017, Jinan, China

Relationship between Human Thermal Comfort and Indoor Thermal Environment Parameters in Various Climatic Regions of China

Lin Duanmu\textsuperscript{a}, *, Xingwei Sun\textsuperscript{a}, Quan Jin\textsuperscript{b}, Zhiqiang Zhai\textsuperscript{a,c}

\textsuperscript{a}First affiliation, Dalian University of Technology, Dalian 116024, China
\textsuperscript{b}Second affiliation, Chalmers University of Technology, Gothenburg SE-41296, Sweden
\textsuperscript{c}Third affiliation, University Colorado at Boulder, Boulder, CO, 80309-0428, USA

Abstract

Architectural design is based on the reliability and rationality of construction standards. The thermal comfort standard is a very important part of construction standards. In this study, Chinese researches about the field survey of various areas were summarized. The distribution range of thermal comfort temperature and neutral temperature were obtained by using the PMV evaluation index. The neutral temperature of different types of buildings in different seasons was summarized. Its relationship with indoor parameters was analyzed in detail. These findings provide a basis for the formulation of building specifications and architectural design in future.

© 2017 The Authors. Published by Elsevier Ltd.
Peer-review under responsibility of the scientific committee of the 10th International Symposium on Heating, Ventilation and Air Conditioning.

Keywords: The building standards, Thermal comfort, Temperature, Climatic region;

1. Introduction

The specifications of building thermal comfort include the temperature, humidity, wind speed and others, which can directly affect the thermal environment and building energy consumption. With the improvement of living standards of people, people paid more attention to the comfort of the living environment. How to make the building thermal comfort standards meet the needs of human body becomes more and more important [1].

Due to the difference of the geographical location, architectural function, living environment, personnel status, the thermal comfort specifications are different, the impact of different parameters is different [2]. The main purpose of

* Corresponding author. Tel.: 0411-84709612; fax: +86 411 84674141.
E-mail address: duanmu@dlut.edu.cn

1877-7058 © 2017 The Authors. Published by Elsevier Ltd.
Peer-review under responsibility of the scientific committee of the 10th International Symposium on Heating, Ventilation and Air Conditioning.
10.1016/j.proeng.2017.09.913
this paper is to give some suggestions about the thermal comfort in a more reasonable and energy efficient way without reducing the indoor comfort level.

In this paper, 71 papers about thermal comfort investigation in China in the past 21 years from 1995 to now are introduced, and the thermal comfort range and thermal neutral temperature of different climate zones and different types of buildings are systematically summarized. The relationship between the statistical results of the thermal neutral temperature and the measured temperature is analyzed in detail, which provides a reference for the future design of the building and the building specifications.

2. Methods

The climate in China is divided into severe cold areas, cold areas, hot summer and cold winter areas, hot summer and warm winter areas and warm areas, while China is divided into North and south by the Qinling and Huaihe. The research of this paper involves all seasons and different populations in China.

In order to illustrate the representativeness of the samples, the paper summarizes the geographical distribution of the literature as shown in Figure 1, in which the circle represents the summer, the triangle represents the transition season, and the box represents the winter. According to Figure 1, we can see that these samples mainly distribute in northeast China, north China, the central and western regions and the southern coastal areas.

Fig. 1. Geographical distribution of the sample

In this paper, the type of the buildings contains a wide range, as shown in Figure 2. The proportion of residential buildings and schools are more, and other types of buildings are less. The ventilation and heating ways of these buildings are shown in Figure 3. For rural areas, the majority of rural buildings use natural ventilation in summer and self-heating in winter. Urban buildings mostly use natural ventilation combined with mechanical ventilation, and mostly use central heating in winter, use natural ventilation in transition season. As for schools and other places, they mostly use natural ventilation in summer and central heating in winter. Shopping malls, subways, railway stations and other public buildings, mostly adopt mechanical ventilation and central heating.

In this paper, the majority of people’s activities is sedentary or mild activity, more than 80% of the literature set the human metabolic rate between 1.0met and 1.3met, most of the research set the data to 1.2met.

In different literatures, there are some differences in indoor temperature and humidity. There are a great relationship between the indoor temperature and the building’s cooling or heating way. People's living habits also related to the indoor temperature, so the data is irregular. Most of the data is within the scope of human thermal comfort, but in several buildings people feel uncomfortable at the current temperature of the room.
دریافت فوری
متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات