

# Accepted Manuscript

Human responses to high humidity in elevated temperatures for people in hot-humid climates

Ling Jin, Yufeng Zhang, Zhongjun Zhang



PII: S0360-1323(16)30523-6

DOI: [10.1016/j.buildenv.2016.12.028](https://doi.org/10.1016/j.buildenv.2016.12.028)

Reference: BAE 4758

To appear in: *Building and Environment*

Received Date: 29 October 2016

Revised Date: 17 December 2016

Accepted Date: 19 December 2016

Please cite this article as: Jin L, Zhang Y, Zhang Z, Human responses to high humidity in elevated temperatures for people in hot-humid climates, *Building and Environment* (2017), doi: 10.1016/j.buildenv.2016.12.028.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Human responses to high humidity in elevated temperatures for people in hot-humid climates

Ling Jin<sup>a</sup>, Yufeng Zhang<sup>b</sup>, Zhongjun Zhang<sup>b</sup>

<sup>a</sup>College of Water Conservancy and Civil Engineering, South China Agricultural University, Wushan, Guangzhou, PR China

<sup>b</sup>State Key Laboratory of Subtropical Building Science, Department of Architecture, South China University of Technology, Wushan, Guangzhou, 510640, PR China

Corresponding author: Prof. Yufeng Zhang, zhanguf@scut.edu.cn, +8618664866529 (tel), +862087110164 (fax)

**Abstract:** The impact of high humidity at high temperatures on the thermal and humid responses of people in hot-humid climates is critical for ensuring a suitable indoor environmental quality and promoting the energy efficiency of buildings. Thirty healthy young people (15 males and 15 females), who were born and raised in hot-humid areas of China, were recruited as subjects. Six experimental conditions with high levels of air temperature ( $T_a$ ) and relative humidity (RH) ( $29^\circ\text{C}/50\%$ ,  $29^\circ\text{C}/70\%$ ,  $29^\circ\text{C}/90\%$ ,  $32^\circ\text{C}/50\%$ ,  $32^\circ\text{C}/70\%$ ,  $32^\circ\text{C}/90\%$ ), with one extreme hot condition and two cool conditions, were tested. Both psychological and physiological responses were collected. The results indicate that the impact of humidity on human responses was not significant when the relative humidity was below 70% and was significant and increased with an increase in air temperature when the relative humidity was above 70%. The relationships between the thermal and humid responses and the  $ET^*$  or RH were identified as linear or polynomial functions. The upper limit for people in hot-humid climates who engaged in sedentary activity and dressed in summer clothing (0.57 clo) was determined to be  $30.3^\circ\text{C}$  in  $ET^*$  for the 90% acceptable range and  $32.3^\circ\text{C}$  in  $ET^*$  for the 80% acceptable range. This study provides useful information for the humidity requirements of indoor environments in hot-humid climates.

**Key words:** humid response; elevated temperature; hot-humid climate; thermal comfort

**Highlights:**

Thermal and humid physical and psychological responses of people in hot-humid climates are collected.

Thermal and humid adaptation of subjects in hot-humid climates is analyzed.

We report the combinations of  $T_a$  and RH for the upper limit for people in hot-humid climates.

## I. Introduction

Summer is long, hot and humid in the hot-humid areas of southern China, and the building energy consumptions for cooling and dehumidification have extensively

Download English Version:

<https://daneshyari.com/en/article/4917423>

Download Persian Version:

<https://daneshyari.com/article/4917423>

[Daneshyari.com](https://daneshyari.com)