MC 2020

PEOPLE AND BUILDINGS

Book of Abstracts

10th Masters Conference

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Edited by

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9:30	INFORMAL SOUND AND VIDEO CHECKS
10:00	WELCOME TO MC2020 **Luisa Brotas**

SESSION 1 10:10 - 11:20

10:10	**The influence of occupant activities and behaviour on indoor humidity of Chinese residential buildings** **Yuhan Qin and Hector Altamirano-Medina** University College London Both high and low humidity problems are widely happening in China. With the goal of investigating the influence of occupant activities and behaviour on indoor humidity of Chinese residential buildings, a questionnaire survey was designed and applied for the collection of household activities and behaviour linked to moisture and its related consequences. Based on a household moisture calculator developed by UKCMB, the indoor moisture production was calculated. Through statistical analysis and discussion, it can be concluded that a large amount of moisture is caused by occupancy, cooking, baths and showers, and washing and drying clothes indoor Chinese houses. Furthermore, mould and condensation are most common in bathrooms and kitchens. In consideration of the actual window opening behaviour and the heating and cooling system control in the participants' dwellings, inhabitants should increase natural ventilation when or after washing clothes, taking showers and cooking.
10:20	**Vapour pressure excess as indicator of mould growth** **Yiling Shuai and Hector Altamirano-Medina** University College London Moisture is the key factor for mould growth. Previous research has focused on the relationship between relative humidity and mould development. However, this parameter is defined by temperature and water vapour content, so it cannot reflect in isolation the effect of moisture on mould growth. After analysing vapour pressure excess (VPX) calculated from apartments in a student accommodation, we found that: (1) VPX in warm months cannot be used as indicators for mould growth; (2) Although there was not too much difference between weekday and weekend VPX, higher VPX was calculated on weekends; (3) The lowest VPX usually occurred in the afternoons, while the highest at night before bedtime; (4) On the coldest weekend, VPX in rooms with visible mould was higher than on rooms without mould, indicating an excess of moisture in contaminated rooms. Opening windows for ventilation in winter could reduce the possibility of condensation and mould growth.

10:30	**The effect of energy efficient measures on rhinovirus transmission** **Zehao Deng and Hector Altamirano-Medina** University College London The UK government is improving the energy efficiency of buildings through retrofit, which can decrease unintended heat losses. Nevertheless, it can also bring side effects like the increase in the risk of airborne disease transmission. This paper aimed to understand how the refurbishment of the buildings can affect rhinovirus transmission. The five-stage refurbishment of the E. ON research house was selected and the Wells-Riley equation was used. Two more coefficients were added to the equation to detect the effects of indoor temperature and relative humidity. The main result was the improvement of the airtightness during the refurbishment process can increase the risk of infection. Secondly, higher occupancy caused little differences in the probability of transmission. If more than one occupant is infected, the probability of subsequent transmission could be higher. As a result of the refurbishments, changes on the indoor temperature and relative humidity could affect the rhinovirus transmission.
10:40	**Thermal Comfort and Health of Older People During COVID-19** **Zehra Nur Disci** University of Sheffield The purpose of this research is to investigate the effect of temperature differences in self-isolation conditions on the health and thermal comfort of the older people during the COVID19 pandemic at home. In addition, it is the examination of the impact of lockdown at home on thermal awareness. In this study, two methods, transverse and longitudinal, were used for the field study of thermal comfort. The transverse study is a survey study with a sample size of 121. The longitudinal study includes a survey study consisting of 419 data obtained from 2 people during the COVID-19 outbreak in the summer of 2020. As a result of the research, it was seen that temperature changes negatively affect the comfort of the older people. Another finding is that when the participants spend a long time in the same environment, their thermal awareness increases.
10:50	**Mitigating Daylight Issues in Organic Towns through Environmental Strategies: A Case Study of the Walled City, Lahore** **Lalarukh Sohail** University of Westminster Inadequate daylight is a real possibility in dense urban neighborhoods, regardless of the amount of natural daylight available in the geographical location. A typical neighborhood in the Walled City of Lahore, Pakistan was selected as the study area. The research aimed to understand how daylight suffers in these neighborhoods, and explore daylight mitigation strategies. The research also estimated artificial lighting loads, pre- and post-mitigation. Daylight simulations were conducted to generalize rules to identify urban geometries having poor daylight performance, and measures needed to improve the situation in these areas. The research shows that while both excess and inadequate daylighting is an issue in most parts of the study area, it can be mitigated in most problematic areas. In the worst-affected areas, artificial lighting is required for almost 6 hours during daytime. Effective mitigation can bring it down to around 2 hours, an improvement of almost 65% (Sohail, 2020).

11:00	**Encouraging more walking: Effects of gender and street brightness on reassurance at night** **Ezgi Erturk** University of Sheffield Walking has significant benefits and opportunities and is encouraged by governments and non-governmental organizations. This study aims to determine the effect of street brightness on personal perceptions of safety which causes a reduction on walking activities at night, particularly for women. 9 pictures of streets in the city of Sheffield in the United Kingdom, were manipulated to be dim or bright. These images were presented in a survey to 210 participants with questions about perceived safety walking down streets at night. The result showed that people generally lack reassurance with the dim streets. The rate of perceived reassurance increases significantly at bright streets. Despite women feeling safer in bright streets compared to the dim streets, women felt less safe than men in both the dim and bright streets. The participants, in particular women, stated that the most important aspect in selecting a route at night is quality street lighting. When looking at the physical activities of participants, women and men have a similar rate of walking activity at night, although women feel less safe than men. The results show that women tend to walk more than men and women can be more active at night by walking if good lighting is provided on the streets. By providing quality lighting on streets, people can be encouraged to walk and cycle at night.
11:10	**Comparison between working/studying in a University environment and working/studying at home: Effect of the perception of thermal control on people's thermal comfort and satisfaction in the UK** **Daniela Valencia Arango** University of Sheffield The research approach on the perception of control and thermal environment satisfaction has mainly been directed to non-domestic spaces. Many studies have been carried in office buildings and Universities, trying to connect energy efficiency, worker or student productivity, and thermal comfort. Little has been explored on the subject in domestic spaces. The results of this research show a significant positive correlation between control satisfaction and temperature satisfaction (R2=0.453). However, their perception of control over the thermal environment was heavily dependent on whether they were at the university or home with 81% of respondents reported being “satisfied” with the amount of control at home while 68% reported being “dissatisfied” with their amount of thermal control at the university. This difference was also large when separating the sample by gender or age. By giving effective personal thermal control devices people will feel more satisfied with their thermal environment.
11:20	BREAK

SESSION 2 11:30 - 13:00

11:30

Adaptive & Climate Responsive Facades for Commercial Buildings in Dubai

Mary-Joe Daccache

University of Westminster

The government's regulations, crisis of climate change, population growth, commercial building's energy consumption and their inoperable facades acting as barriers between the indoor and outdoor conditions are all problematic issues that will result in an increase in energy demand, uncomfortable conditions for users and deterioration of the environmental performance of buildings. The design study focuses on multicriteria analysis to prove a parametric method of work offering guidelines to achieve adaptive and climate responsive facades. Using critical observation of literature review and occupant satisfaction survey, an environmental assessment of built precedents is done to deduce and implement useful envelope strategies on a shoebox model where analytic work is done including parameters of the outdoor, indoor and envelope conditions. The outcome is a series of parametric studies with varying results of energy and daylight responding to the variable input conditions. The parametric design offers solutions to commercial buildings' envelopes to ensure comfortable indoor conditions in relation to the outdoor microclimate and the conflicting requirements of Dubai's hot dry climate. The design study is done in collaboration with Hilson Moran for their future use as design recommendations and to potentially influence the architectural practice in Dubai and similar climatic regions.

11:40

Carbon Neutral Urban Block in Athens – 2050

Eleni-Marina Maragkaki

University of Westminster

Athens' extensive urbanisation, lack of green areas and the extreme heat caused by more frequent heat waves, indicate the need for actions towards indoor and outdoor comfort, which is related to the energy consumption of the buildings. This work's aim is to create a carbon neutral block in Athens - 2050. The optimization of the block's form based on principles of environmental design and climatic analysis was created in order to enhance its environmental benefits. Simulations on the energy performance of the block and calculations on the ability to cover the energy loads by renewables were conducted. Finally, to meet the zero-carbon neutrality, connection with the neighbouring blocks was established. The results demonstrate the benefits of a bioclimatic, carbon neutral building design in Athens and provide a practical prototype which can be adapted in other projects, thereby enabling the shift to a more efficient and environmentally friendly built environment.

11:50

The Retrofit of '70s Office Buildings Curtain Walls in London

Alessandro Cirillo

University of Westminster

The built environment accounts for 44% of the UK emissions, of which 18% is from the non-domestic buildings. Although new buildings are becoming more environmentally friendly, low retrofit rate offsets this trend. The retrofit of curtain walls of the '70s is here analysed as they present similar issues like poor insulation, fire risk, air infiltration and absence of natural ventilation which affect both internal comfort and energy demand negatively. The methodology includes thermal and energy analyses of the Euston tower, which results are used to inform an analytical model representing a more extensive buildings stock. Orientation, occupation, window to wall ratio and floor height are examined as the main factors influencing internal gains, and different passive design solutions are tested to reduce them. The new facade module includes alu-timber windows frame, shading devices, reduced G value, different WWR and natural ventilation strategies which result in a significant environmental performance improvement.

12:00	**Assessing Sub-Saharan African Dwellings for Resilience against mosquitoes: Developing and Testing the tool** **Tiwa Jayeola and Hector Altamirano-Medina** University College London Since over 80% of mosquito bites take place indoors, more needs to be done to protect people from mosquitoes within their homes. In this paper, we review the existing literature on key findings which relate the homes and the built environment to mosquitoes. Following this, we create and test a tool by which attributes of homes and their surroundings can be assessed for likelihood of mosquito ingress and occupant's contracting mosquito-transmitted illnesses. Through the answers to a series of carefully collated questions, the tool highlights the areas that require attention within a home to make it more reliant from mosquitoes. This research found that: (i) The quality of innovation in the design of mosquitoes resilient homes and the environment is negatively affected by the limited number of field studies in this area (ii) Mosquito resilience should be prioritised along with affordability and sustainability in new and existing homes in SSA.
12:10	**Investigation of thermal comfort and Mosquito resilience in new dwellings of urban Accra that adapt natural ventilation** **Stephen A. Ntow and Hector Altamirano-Medina** University College London The world stands the peril of self-inflicted global climate change from the rising emissions of greenhouse gases (GHGs). The Intergovernmental Panel on Climate Change (IPCC) predicts over 1.5°C temperature rise globally by the year 2025 if current greenhouse gas (GHGs) emissions from human activities are not reduced by about 60%. The impact of global warming is likely to increase the spread of vector-borne diseases such as malaria and dengue. This research project investigates the thermal comfort and mosquito activity in new dwellings in Accra. Three scenarios with varied occupancy density were established and assessed using criterion ranges for temperature, CO2 concentration and humidity. Thermal comfort and mosquito activities were assessed according to the criteria. IES-VE (Apache sim) simulation was used to determined conditions within the criteria ranges. The research found that naturally ventilated houses in urban Accra had better thermal comfort and reduced mosquito biting rates and flight indoors.
12:20	**Impact of Intelligent facade in mitigating Urban Heat Island (UHI) Effect** **Shaheen Hussain** Cardiff University The Urban Heat Island (UHI) is a hazard that has been extensively studied in urban climatology as it impacts a community's environment and quality of life. London is perhaps having the longest history in UHI study as compared to any other city in the world and therefore this research work is applied to one of the largest financial development in London city, Canary Wharf that lies in the epicenter of London's UHI. One of the major reasons causing UHI is the material used for building envelopes and urban surfaces. The research thereby attempts to investigate the impact of the intelligent facades on the urban microclimate when applied to buildings of Canary Wharf development. The research is conducted by developing a digital model of the study area using ENVI-met software and studying the impact of the facades by running simulations under summer and winter conditions. The findings demonstrate that intelligent facades aid in lowering the outdoor temperature.

12:30	**Creating a methodology to assess climate change adaptation capacity of residential infrastructure** **Patrick Spencer Grove and Hector Altamirano-Medina** University College London Extreme weather catastrophes have been rising in the past years, as well as the global population that lives in cities. Therefore, we must prepare for the future through systems that help us measure the level of preparedness our infrastructures have to withstand threats related to climate change. A methodology was implemented to design a climate change adaptation evaluation framework for residential infrastructure, which consists of a versatile and straightforward Excel-based tool. The tool shows promising indicators of being a useful instrument to understand climate change-related threats that may affect a dwelling according to location, typology and, inputs such as construction, context and other factors. Areas for improvement are mainly related to input data and its preciseness, the correct interpretation of input selection and the representation of risk in percentage form, which could be questionable.
12:40	**<<Healthy>> Housing for Children Living in Slums: A new assessment tool to score the impact of house environment on children's health** **Diana Galli, Emily Nix and Hector Altamirano-Medina** University College London, University of Liverpool High child mortality rate is associated with extreme poverty and insufficient services, like in slums. To guarantee social equality since childhood, governments should plan improvements in living conditions, starting from interventions on existing housing. Assessing the healthiness of a house for children's health can help in prioritizing interventions. This study proposes a multi-factor assessment tool of house environment that ranks dwellings based on the risk that children (0-5 y/o) living in slums have on contracting five diseases with the highest mortality rate. The ranking scale associates dwelling and environmental factors with selected diseases through ORs. Final scores are standardized through coefficients, customizing results for the specific considered location. The assessment tool was tested on a database from slum's dwellings located in Delhi (India). Results showed usability and clear interpretation of final scores. With further literature, a more accurate and improvement to the tool could be possible.
12:50	**Awards Ceremony / Closing session** **Fergus Nicol**
13:00	END

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