

P-725 The Indoor Thermal Environment and Comfort of the Double Floor Hydronic Ondol System

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ABSTRACT

The purpose of this study is to evaluate the characteristics of indoor thermal environment related to the thermal storage capacity of the two kinds of Ondol heating systems. Physical indoor thermal environments (the floor surface temperature, the vertical temperature, etc.) and thermal comfort indicators (PMV, PPD, OT) have especially been measured. Physical feature conditions, sensory, thermal comfort, humidity sensory, comfort of the lower half of the body were investigated for the survey. In this study a 7scale method was used for thermal sensation and a 4scale method was used for comfort sensation based on Psycho-physical voting scale of ASHRAE(1993). As a result of the measurement of indoor temperature and relative humidity, it appeared to be 20.4°C and 33% in the case of wet Ondol, 19.2°C and 27.3% in the case of double floor Hydronic Ondol. The floor surface temperature showed a peak value of 38.0°C~43.9°C after eleven and a half hours after the starting-point of the heating in the case of wet Ondol, and 31.4°C~40.6°C after eight and a half hours after the start-point of the heating in the case of the double floor hydronic Ondol system. As a result of the survey of the occupants regarding the sensory thermal comfort, 44% and 33% answered as "neither warm nor cool". With regard to the thermal comfort related to the indoor temperature, occupants showed the highest satisfaction in temperatures between 19~20°C and answered as "slightly warm" in temperatures higher than 22°C.

Key words: Thermal environment, Predicted Mean Vote (PMV), Operative Temperature(OT), Double Floor Hydronic Ondol System

P-726 Measurements of Indoor Thermal Environment of the Traditional Houses with Small Courtyard in SAN-IN Area in Summer

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ABSTRACT

A small courtyard *tsuboniwa* often can be found in a traditional house *machiya* in urban areas in Japan. It is designed to provide light and air, as well as to play an aesthetic role. The purpose of this study is to clarify the environmental performance of the traditional vernacular house with small courtyard in San-in area, the western part of the main island of Japan. The climatic observation was conducted at one *machiya* house with *tsuboniwa* for four days in summer. In order to investigate vertical and horizontal temperature distributions, air temperatures were simultaneously measured at sixty points in the *tsuboniwa* and in two rooms adjacent to the north and south sides of it. The sliding screens at south side of the *tsuboniwa* were open during the observation period, but those at north side were closed on the second day. The results showed that the temperatures at the *tsuboniwa*, particularly near the ground, were obviously lower than the outdoor temperature for the daytime. With regard to the room located on the north of the *tsuboniwa*, the air temperatures reached 30 °C and above while the screens were closed, but in the case that the screens were open, the temperature remained below 30 °C. The air temperatures at the room on the south were also below 30 °C in both cases. These findings represent that cool air in the *tsuboniwa* is drawn into the rooms, as already shown by several researches in Kyoto. Therefore, It is suggested that this small courtyard can control indoor thermal environment effectively, as well as introduce daylight and fresh air into the room. Consequently, the traditional house with the *tsuboniwa* can have natural passive performance besides artistic scenery.

Key words: small courtyard; traditional town house; indoor climate; cooling effect; observation