

KATO Shinsuke LAB.

Environmental Tech. for Urban Architecture

Institute of Industrial Science,
Department of Human and Social Systems

<http://venus.iis.u-tokyo.ac.jp>

Environmental Control Engineering for Urban Architecture

Dept. of Architecture

Development of the Liquid Cooling Air-conditioning System for Commercial Buildings

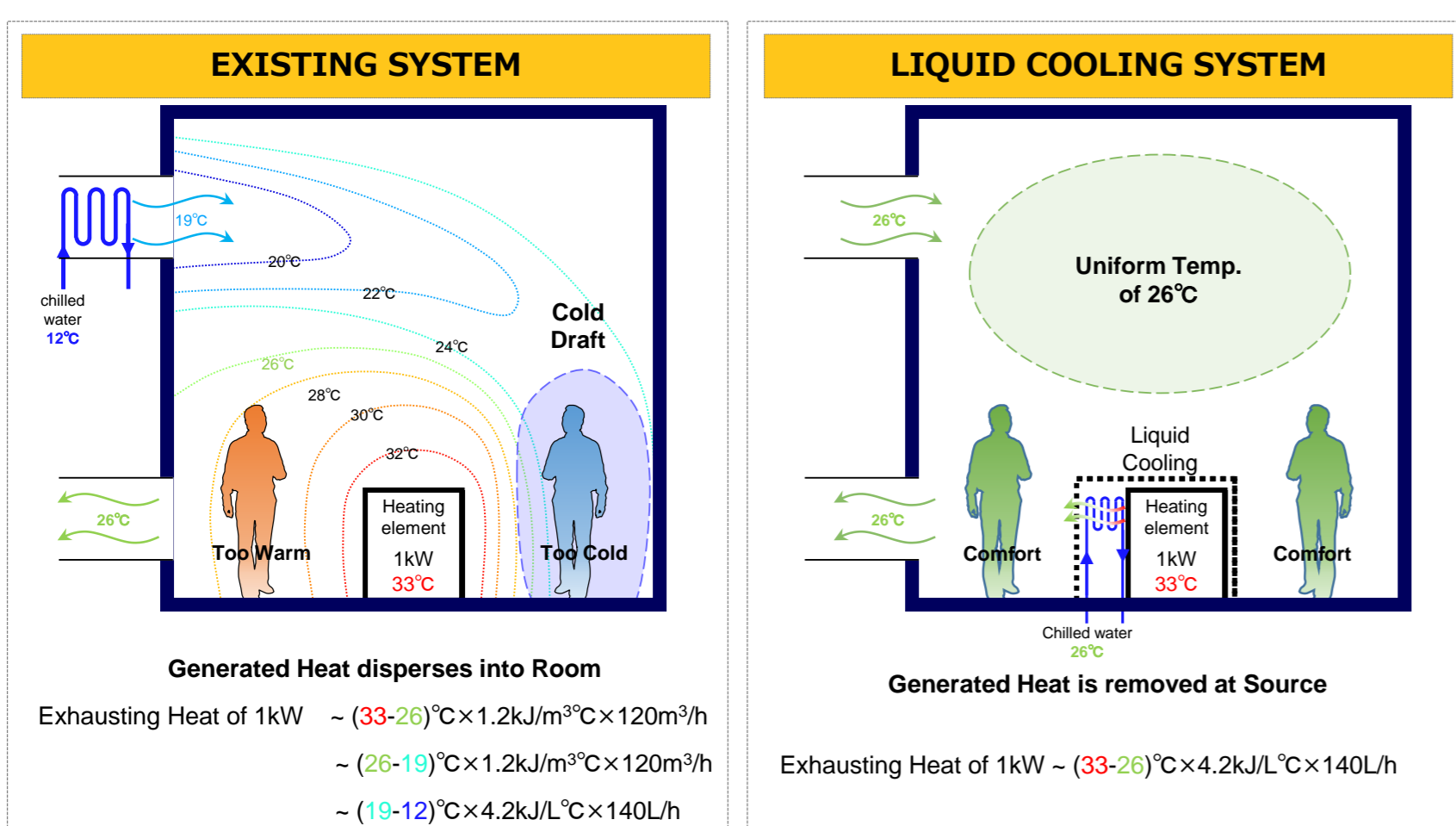


Fig.1 Concept of liquid cooling air-conditioning system

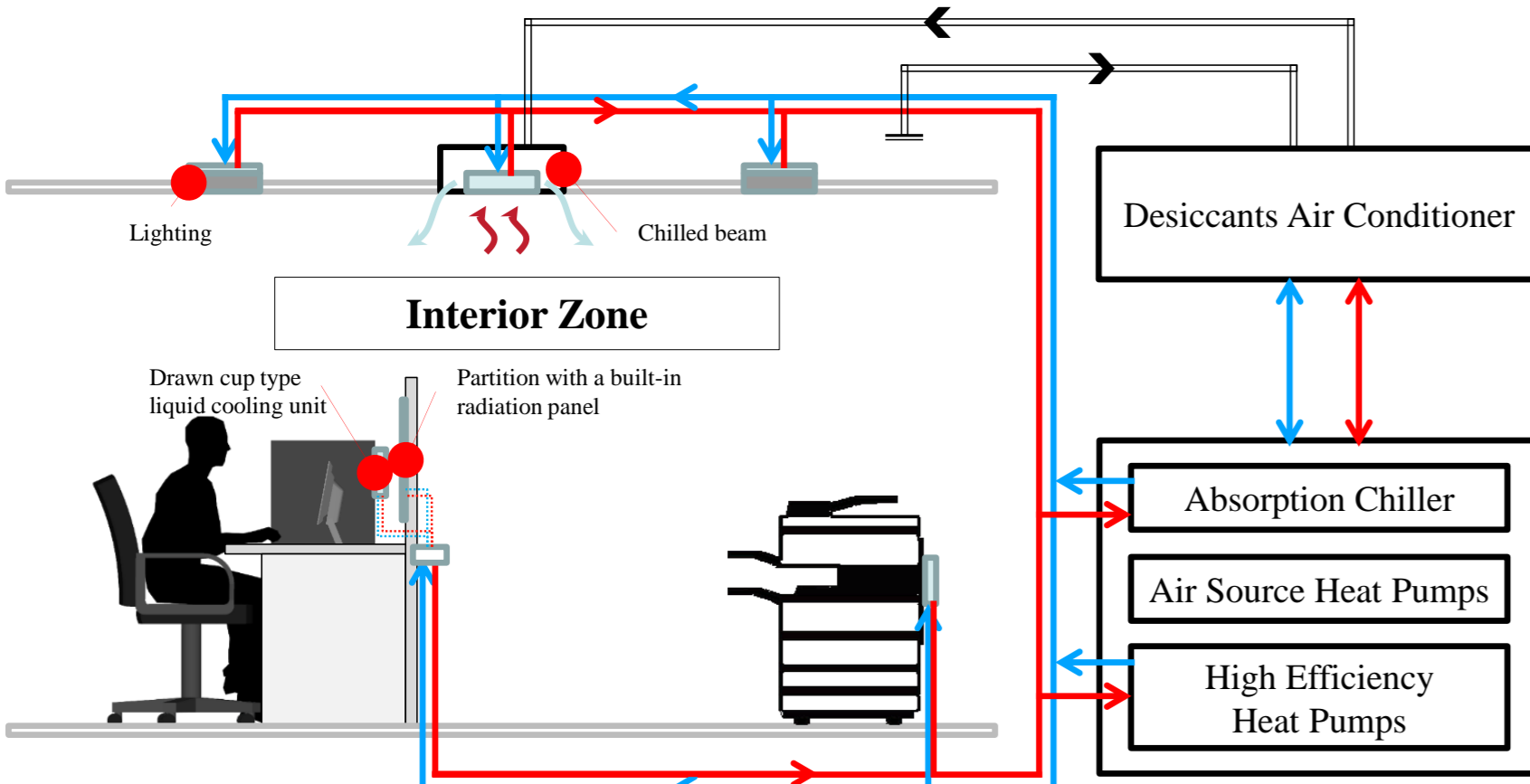


Fig.2 The configuration of the system

What is the Liquid cooling air-conditioning system?

Liquid cooling system consists of an liquid cooling unit and radiant cooling system as a heat transfer media with water, and performs load processing efficiency by suppressing the diffusion of the internal heat load.

Features of the system

This system can improve the efficiency of heat source equipment because indoor cooling is possible by the high-temperature chilled water. Furthermore, it is possible to improve the efficiency of load control and to maintain the indoor thermal comfort due to remove the heat at the source.

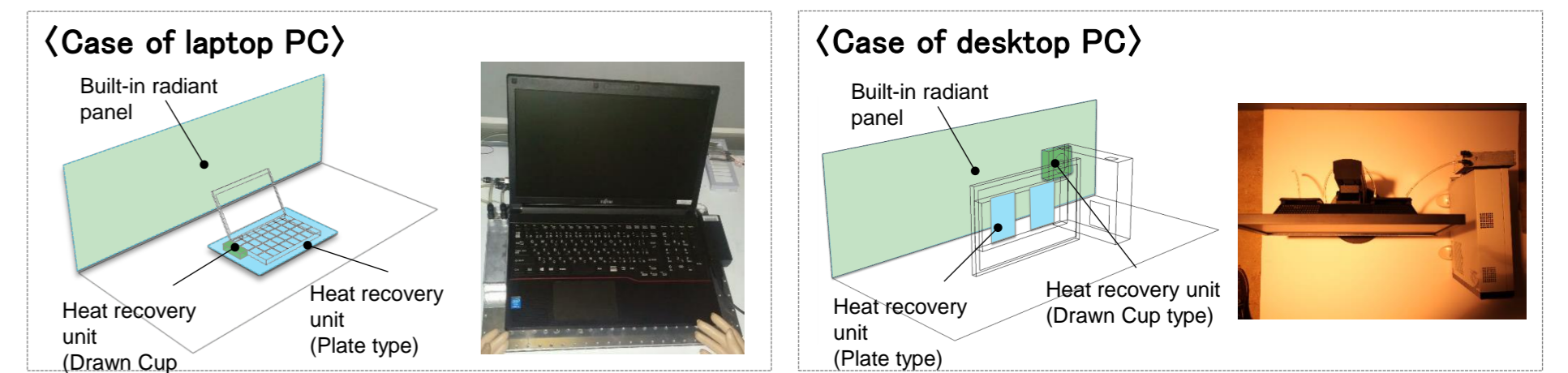


Fig.3 The configuration of OA equipment and the recovery units

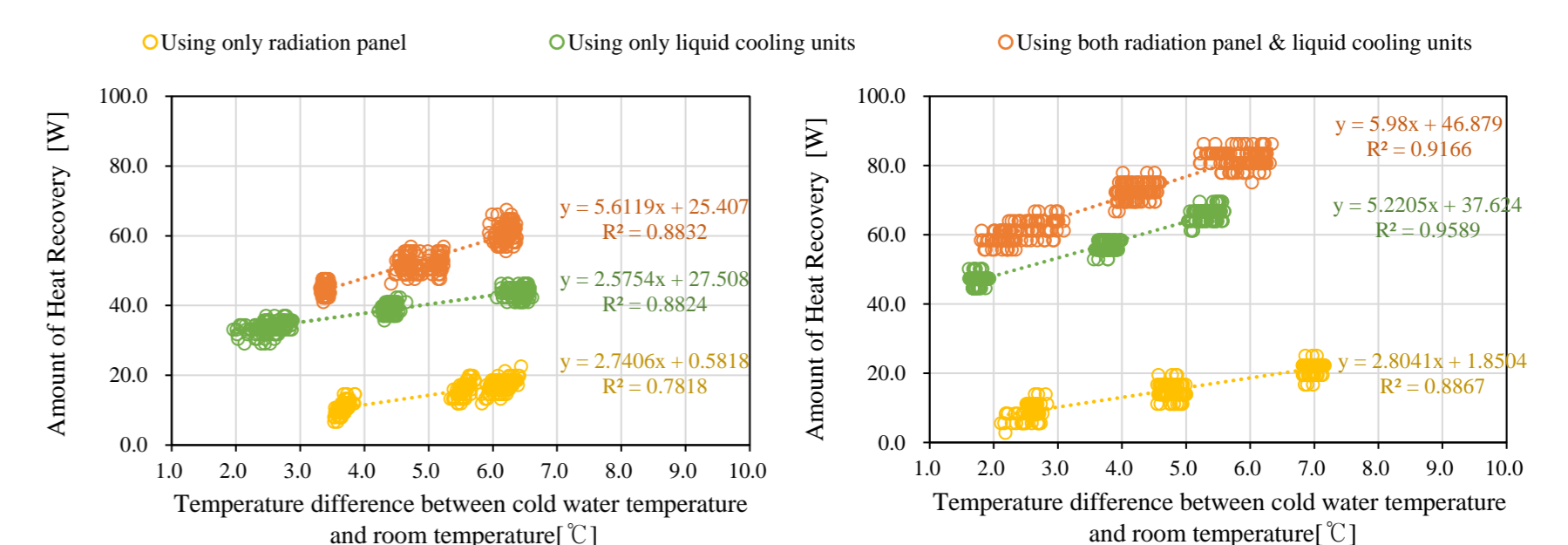


Fig.4 Changes of the heat recovery performance

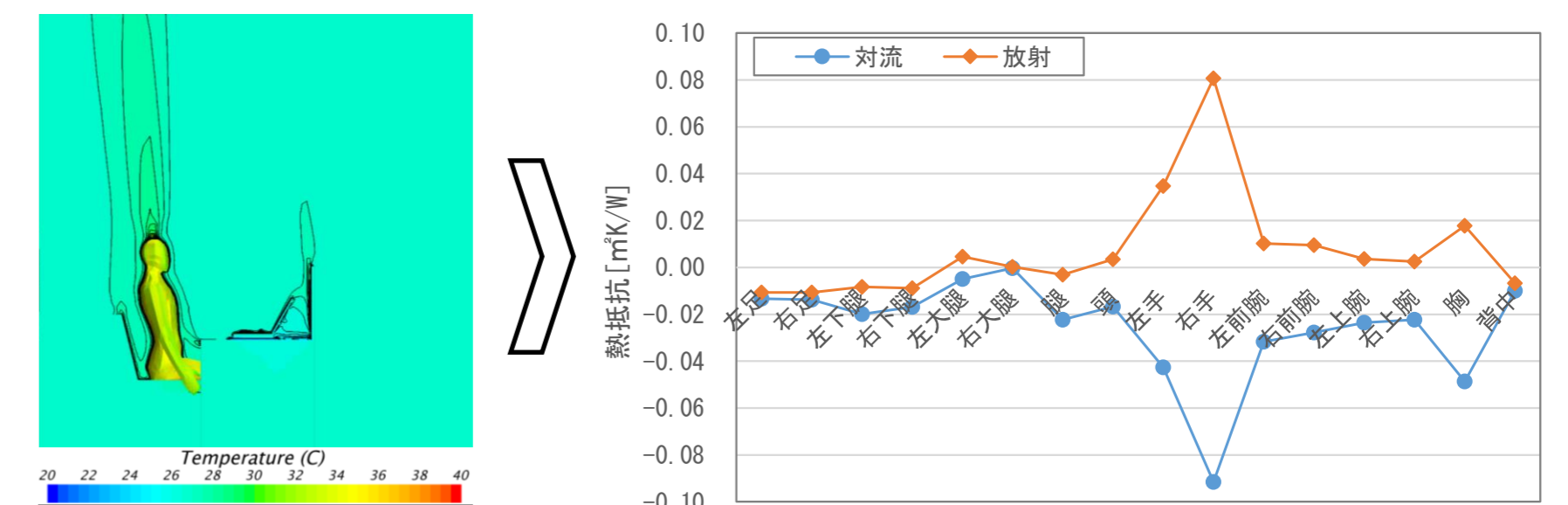


Fig.5. Calculated surface thermal resistance from the skin surface temperature (Case of desktop PC)

Simulation on Periodic & Spatial Indoor Thermal Environment & Energy in Buildings

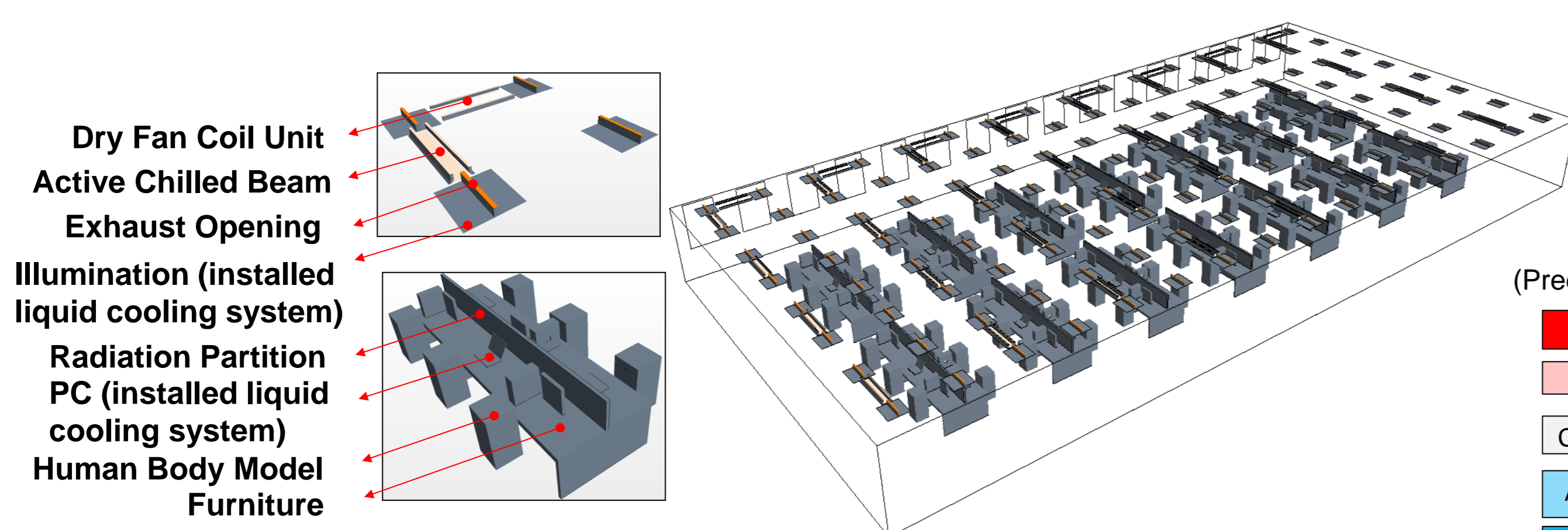


Fig. 1 The ZEB criterion office model with Liquid Cooling air-conditioning system

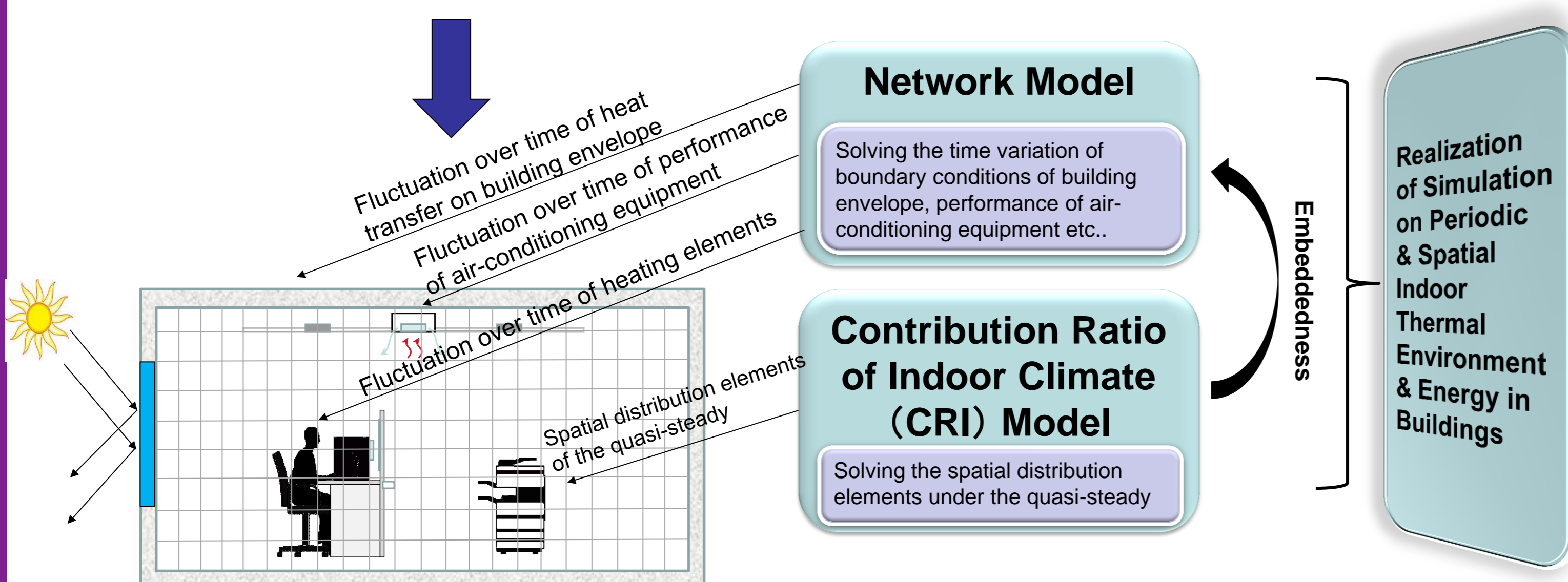
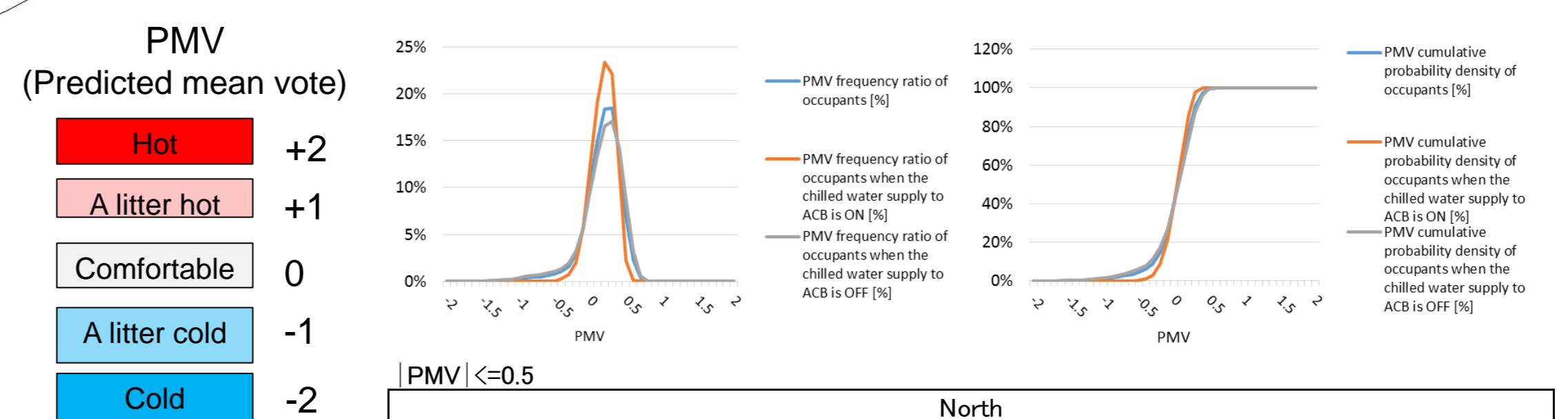


Fig. 2 Simulation method

In this study, with the aim of realizing the prediction of periodic and spatial indoor thermal environment and analyzing energy consumption in a ZEB criterion office model with Liquid cooling air-conditioning system, the method of embedding contribution ratio of indoor climate (CRI) model into the network model was used.



North													
90%	93%	92%	95%	95%	94%	94%	93%	96%	96%	94%	97%	98%	97%
93%	95%	94%	96%	96%	97%	96%	96%	96%	97%	96%	98%	98%	97%
93%	96%	96%	96%	97%	97%	97%	97%	97%	98%	98%	98%	94%	96%
South													
95%	97%	96%	97%	96%	94%	86%	97%	86%	97%	92%	93%	93%	96%
94%	97%	96%	87%	92%	86%	81%	78%	89%	90%	93%	83%	91%	96%
91%	95%	95%	95%	94%	94%	87%	94%	83%	95%	91%	95%	93%	97%

The satisfaction ratio of thermal comfort (|PMV| ≤ 0.5) of all members (84 occupants) over cooling period

Fig. 3 The prediction of PMV over cooling period

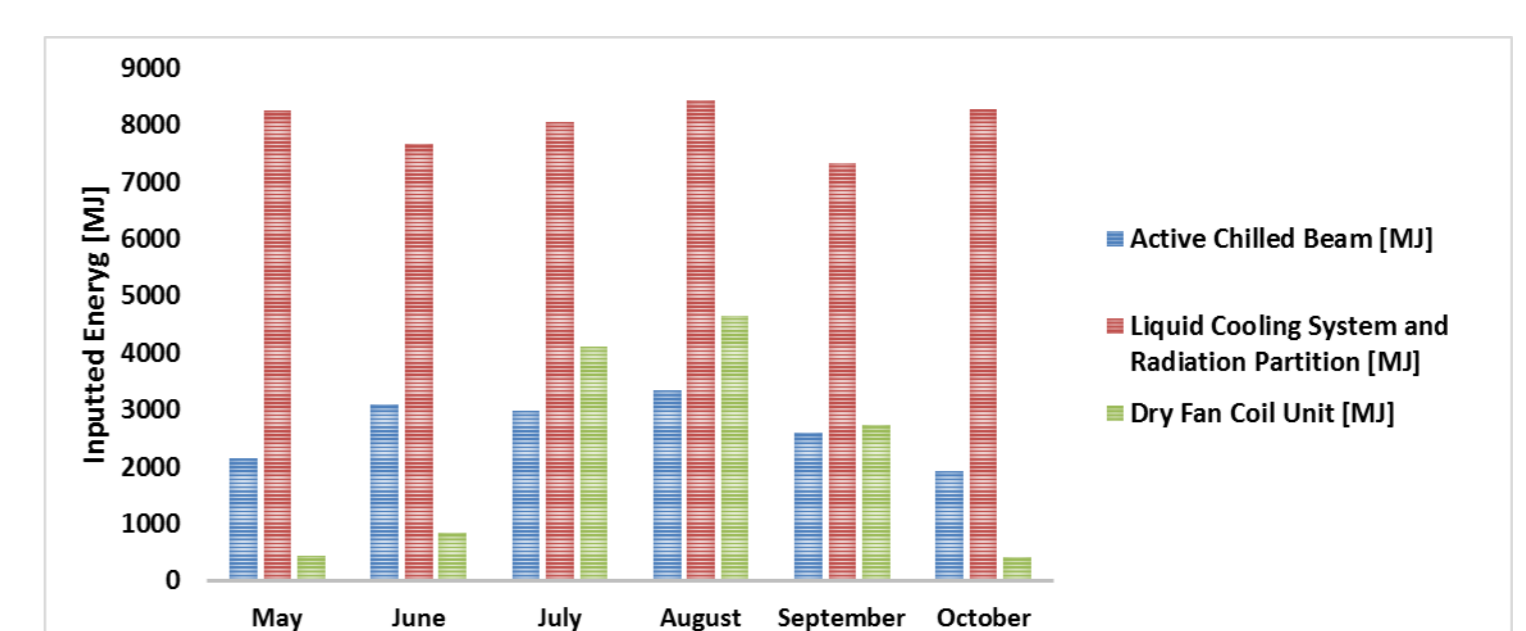


Fig. 4 The inputted energy to air-condition equipment