



INSTITUT INTERNATIONAL DU FROID
INTERNATIONAL INSTITUTE OF REFRIGERATION

Demand-oriented Non-uniform Indoor Environments

IIR Working Group of Commission E1

TERMS OF REFERENCE

INTRODUCTION

In accordance with Article XIX of the International Agreement concerning the IIR and articles 15 to 18 of the Internal Regulations of the Scientific Council of the IIR, the creation of a Commission E1 Working Group (WG) is proposed. The following terms of Reference (ToR) further define the role of the WG.

BACKGROUND

The building sector accounts for a significant part of total energy consumption. In Europe, almost 40% of energy is used by residential and commercial buildings. In addition, space conditioning accounts for 40% to 60% of building energy end use in European countries. In the USA, HVAC systems constitute 50% of building energy use and 20% of total energy use. The energy consumption of space conditioning is growing rapidly in China. Decreasing the energy consumption of air conditioning is, therefore, important for the whole world.

Indoor environments have traditionally been built for groups. This method does not allow for different parameters for different occupants, resulting in huge energy consumption all over the world. Increasingly comfortable environments are welcomed in developing countries. However, if indoor environments are built in the traditional way in developing countries, the energy consumption of building sector will double, which would be a disaster for the whole world.

Recently, building non-uniform indoor environments and only focusing on occupants has resulted in very high space conditioning efficiency. Different parameters can be maintained in one common space and space conditioning energy consumption decreases greatly. There are several groups in the world that work in this way.

However, there is no platform for them to share their progress. We therefore want to propose a working group on demand-oriented non-uniform indoor environments.

OBJECTIVES

The objectives of the Working Group are:

- to share research progress on demand-oriented non-uniform indoor environments;
- to demonstrate the efficiency of demand-oriented non-uniform indoor environments in real projects;
- to disseminate the knowledge of demand-oriented non-uniform indoor environments.

WORKING GROUP WORK PLAN

Indoor environments are traditionally built with mixed flow ventilation, which results in a high energy consumption. Focusing on occupants or the process area rather than the whole space is a challenge for the science of built environments. The members of this WG will therefore work individually on the theory of demand-oriented non-uniform indoor environments, and share their progress and discuss further work at the annual meeting. Prof. Xianting Li will focus on the theory of non-uniform indoor environments; Prof. Arsen Melikov will focus on personalised ventilation; and Dr. John Lin will focus on stratum ventilation. Until now, there have been no projects that build the indoor environment according to the idea of demand-oriented non-uniform indoor environments. The members of this WG will demonstrate the idea either in laboratory or demonstration projects. Dr. John Lin will focus on the demonstration of stratum ventilation and Prof. Yi Wang will focus on industrial ventilation. In order to make more engineers, building owners, etc. aware of the concept, the working group will collect information about demand-oriented non-uniform indoor environments and their effectiveness, and disseminate this information in different ways.

WORKING GROUP OUTPUT

The annual and final reports on demand-oriented non-uniform indoor environments will be submitted to the IIR. A review paper will be submitted to International Journal of Refrigeration. In addition, an Informatory Note will be written for the IIR after the final report.

IIR COMMISSIONS INVOLVED

Lead Commission: Commission E1

MEMBERSHIP

WG members are expected to be either private members or representatives of corporate members of the IIR with technical expertise that permits them to contribute to the work of the WG.

WORKING GROUP LEADERSHIP

Chair: Xianting Li (Tsinghua University, China)

Vice-Chair: Prof. Arsen Melikov (Technical University of Denmark, Denmark), Dr. John Lin (City University of Hong Kong), Prof. Yi Wang (Xi'an University of Architecture and Technology, China)

Secretary: Dr. Xiaoliang Shao

The Working Group will designate its officers at its first meeting.

STRUCTURE (optional)

The working party shall include 3 subgroups:

- Subgroup A: Theory of Demand-oriented Non-uniform Indoor Environments (Prof. Xianting Li)
- Subgroup B: Application in Residential and Commercial Buildings (Prof. Arsen Melikov and Dr. John Lin)
- Subgroup C: Application in Industrial Buildings (Prof. Yi Wang)

WORKING GROUP FUNDING

- Technical activities: Technical activities will be supported by funding individually secured by the WG participants (B)
- WG management: Project management costs will be covered by the team of Prof. Xianting Li

MEETINGS

The Chair and the Vice-Chair of the Working Group will organise meetings, preferably once a year. The first meeting will be held in November 2017 in Maanshan, Aihui Province, China. Minutes of the meetings shall be prepared by the Secretary and copies shall be sent to the IIR head office, the President of the Science and Technology Council and the President of Commission E1. If the meeting is extended to a workshop, the organisers will prepare proceedings of the papers presented.

WEB PAGE

A web page, hosted by the IIR, will be set up in order to disseminate relevant information and promote the activities of the Working Group and the IIR. It will be periodically updated under the responsibility of the Chair and of the Vice-Chair. It will be linked to the Commission E1 web page on the IIR web site.