

IEA EBC Annex 68 – Subtask 4, Strategies for design and control of buildings

Jakub Kolarik^{1*} and Gilles Rusaounen²

*1 Department of Civil Engineering
Technical University of Denmark
2800 Kgs. Lyngby
Denmark
E-mail: jakol@byg.dtu.dk*

*2 CETHIL - INSA de LYON
Bat Sadi Carnot
9 rue de la Physique
69621 Villeurbanne Cedex
France*

1 SUBTASK 4 - OBJECTIVES

The objectives of Subtask 4 are to develop design and control strategies for energy efficient ventilation in residential buildings which ensure high indoor air quality. The strategies must go beyond the current common practice and actively utilize recent research findings regarding indoor air pollutants and combined heat, air and moisture transfer as well as benefit from recent advances in sensor technology and controls.

2 WORK DESCRIPTION

Subtask 4 will utilize results of previous subtasks (metrics models and databases developed in the Subtasks 1, 2 and 3) together with existing knowledge to devise optimal and practically applicable design and control strategies (see Figure 1). The strategies will take into account requirements for IAQ based on current standards, particular building codes in different countries, as well as newly developed metrics based on health effects. Moreover, the type of ventilation systems (decentralized ventilation, active overflow systems etc.) and air supply mode (e.g. intermittent vs. continuous ventilation) will be considered with respect to different building types. Optimal strategy is understood as one that takes into account building energy performance, user comfort and health conditions.

Use of models and databases developed under the Annex will enable addressing new paradigms for multi-scale and local thermal and air quality management including demand controlled ventilation in residences that considers indoor/outdoor transport of pollutants. The subtask will study and make benefit from recent advances in sensor technology and model based control to identify ways to optimize the indoor air quality without penalizing on the energy efficiency. With this respect, the subtask should seek to establish correlation factors between IAQ and energy consumption. With a base in scientific methods employed in the project, the ambition is that such correlations can be used in future standards and by legislators when specifying regulations for IAQ requirements in highly energy efficient buildings.

Because of the complexity of the assignment described above, the Subtask 4 will invite different stakeholders to actively participate in the project, share their practical experiences and provide feedback to the subtask work. Target stakeholders are mainly building designers, companies that provide ventilation systems and controls as well as housing associations, producers of prefabricated houses and facility management companies.

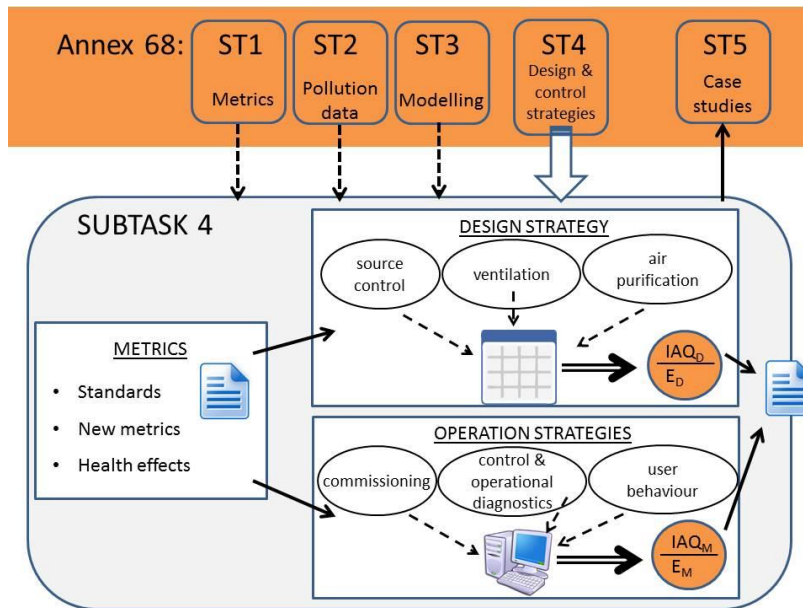


Figure 1 - Schematic overview over composition of Subtask 4; IAQ_D/E_D and IAQ_M/E_M refer to designed and measured correlation factors between IAQ and energy use respectively

3 SUMMARY OF PLANNED ACTIVITIES

4.1 STATE OF THE ART: Review of relevant international activities related to IAQ design and control in residences.

4.2 DESIGN STRATEGY: Determination of an innovative design strategy - using tools and methods from Subtasks 1, 2 and 3 to evaluate design alternatives for several building types. The design strategy should also account for different typologies of ventilation systems.

4.3 CONTROL/OPERATION: Investigation of possible operation strategies - systems designed by means of methodology developed in 4.2 must be operated in a reasonable way to ensure that the designed operational parameters are met. Outcome from Subtasks 1, 2 and 3 can be also applied here, but it needs to be supported by suitable systems for operational diagnostics (for example air quality sensors). This task includes also assessment of suitability of different control strategies and operation modes.

4.4 GUIDEBOOK: Preparation Annex 68 guidebook: This activity will comprise completion of a guidebook on design and operation of ventilation in residential buildings to reach impeccable indoor air quality occupancy with minimum possible energy consumption. The guidebook will summarize results of previous subtask activities. The guidebook will be divided into sections related to design, operation and communication to building managers and occupants. The guidebook will be main outcome of the Subtask 4.