MINUTES OF MEETING

IEA EBC Annex 68, 9th Expert Meeting
COPENHAGEN 11-12 MARCH 2019

Minutes by Prof. Carsten Rode, DTU Civil Engineering (July 14, 2019)

Venue: Technical University of Denmark, Kgs. Lyngby (Copenhagen), Denmark.

ATTENDANCE LIST - appended in the end
References in these minutes to meeting participants will, as usual, be given by their first name.

AIMS AND SCOPE OF MEETING (summary in retrospect)

The IEA-Annex 68 Expert Meeting was the last meeting in the working phase of the project, and we shared the progress in each subtask of the project, and discussed the reporting of the work. In addition, a few technical presentations were given within each subtask. Furthermore, we also discussed what will be next during the following: Reporting phase & possible follow-up project. The meeting was held only in general sessions with all meeting participants, except the first:

- (Subtask 1: Defining the metrics)
- Subtask 2: Pollutant loads in residential buildings
- Subtask 3: Modeling – review, gap analysis and categorization
- Subtask 4: Strategies for design and control of buildings
- Subtask 5: Field measurements and case studies

AGENDA

Monday 11 March 2019

8:00-8:30	Registration Meeting Room S09, DTU Conference Centre, Building 101, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark	
8:30-9:30	• Subtask leader meeting	
9:30-10:00	• Welcome address • Presentation of agenda and discussion of aims for the meeting	Chair: Carsten Rode
10:00-11:00	Session 1a – Subtask 2 • Status for Subtask 2, Menghao Qin, Technical University of Denmark • Scientific Presentations	Chair: Menghao Qin
11:00-11:15	Coffee Break and Networking	
11:15-12:00	Session 1b – Subtask 2 • Common Exercises pertaining to Subtask 2 • Report of Subtask 2 • Presentation and discussion of Database	Chair: Menghao Qin

12:00-13:00	Lunch ♦ Group photo	
13:00-15:00	Session 2 – Subtask 3 ♦ Status for Subtask 3, John Grunewald, TU Dresden ♦ Scientific Presentations ♦ Common Exercises pertaining to Subtask 3 ♦ Report of Subtask 3	Chairs: John Grunewald Jensen Zhang
15:00-15:20	Coffee Break and Networking	
15:20-18:00 (Public session)	Session 3 – Subtask 4 ♦ Status of Subtask 4, Jakub Kolarik, Technical Univ. of Denmark ♦ Scientific Presentations ♦ "Activities" pertaining to Subtask 4 ♦ Report of Subtask 4 – "The Guide" ♦ Sneak peak of Subtask 5 (5 minutes) ♦ Business interaction	Chairs: Jakub Kolarik Guangyu Cao
18:30	Dinner - Hotel Fortunen, Ved Fortunen 33, 2800 Kgs. Lyngby	All

Tuesday 12 March 2019

Time	Meeting Room S09	
8:30-10:30	Session 4 – Subtask 5 ♦ Status of Subtask 5, Jelle Laverge, U. Ghent ♦ Scientific Presentations ♦ Common Exercises pertaining to Subtask 5 ♦ Report of Subtask 5	Chairs Jelle Laverge Fitsum Tariku
10:30-10:50	Coffee Break and Networking	
10:50-12:15	Discussion of follow-up Annex	Chairs: Jelle Laverge Carsten Rode
12:15-13:00	Lunch	
13:00-14:30	Planning of reporting phase Who does what – authorships Meetings – where and when Conferences Publications Webinar(s) Collaboration: ASHRAE, AIVC, REHVA, … AOB	Carsten Rode Subtask leaders All
14:30-15:00	Coffee Break and Networking	
15:00-16:00	Continuation of the afternoon session and adjournment	All
16:00-16:30	Subtask leaders' wrap-up	Subtask leaders

Monday, 11 Mar. 2019

Start of the meeting and review of agenda

Rode Carsten welcomed everyone to DTU, the Technical University of Denmark and introduced the agenda, which mirrored the Aims and scope of the meeting as mentioned above.

1. ST 2 session

There are six scientific presentations in the ST2 session. All presentations can be found at the SharePoint.

10:00 - 10:15	Subtask ST2 summary and status (Menghao Qin)
10:15 - 10:30	Model-based testing and evaluation of indoor VOC emission sources (Jensen Zhang)
10:30 - 10:45	Effects of simulated solar irradiation on indoor VOC concentrations - a full-scale chamber investigation (Jensen Zhang)
10:45 - 11:00	Measurements and analysis on indoor air pollutants of residential buildings in Shanghai (Chen Huang & Chanjuan Sun)
11:15 - 11:30	Pollutant loads of volatile organic compounds simulation in residential buildings (Weihui Liang)
11:30 - 11:45	Estimating formaldehyde emission rates at the house scale from in situ campaigns (Gaëlle Guyot)
11:45-12:00	Definition of a reference residential building prototype for evaluating IAQ and Energy efficiency strategies in France. (Marc Abadie)

First, Dr Menghao Qin from the Technical University of Denmark reported the progress and current status of the Subtask. This subtask has organized a literature survey and made researcher contacts to gather relevant data and existing knowledge on major pollutant sources and loads in residential buildings due to building materials and assemblies, including existing source and sink models. A series of datasets have been identified.

Two experiments were completed: The first one is to study the combined effects of temperature and humidity on VOC emissions from different building materials. Different VOCs are measured for two different materials. Experimental tests and preliminary analysis of test data have been completed. The second is a field measurement in the P+ building, China to study the relationship between IAQ and different ventilation/ air cleaning strategies and building energy consumption. The tests were started in March 2017, and the plan was to carry out measurements in four seasons. The first round (one year) was completed. The test data will also be used to validate the models developed in Subtask 3.

Additional small-scale environmental chamber tests were conducted at Syracuse University to investigate the adsorption and desorption of VOCs and SVOCs on building materials and furnishing. The data will be combined with previous data to further evaluate and develop sink models.

A theoretical correlation between the emission rate and indoor temperature and relative humidity has been derived. A procedure for the definition of reference buildings for estimating the pollution loads, IAQ and energy analysis for different countries/climates has been proposed. A method and procedure of using a full-scale chamber to evaluate the effects of emission sources and sinks, ventilation and air cleaning on IAQ is developed.

Subtask 2 has published 3 common exercises based on the following descriptions: (1) A procedure for definition of reference buildings for estimating the pollution loads, IAQ and energy analysis for different countries/climates. (2) A method and procedure of using a full-scale chamber to evaluate the effects of emission sources and sinks, ventilation and air cleaning on IAQ. (3) Development of a Procedure for Estimating the Parameters of Mechanistic Emission Source Models from Chamber Testing Data.

Dr Jensen Zhang from Syracuse University gave two presentations. One is about the Model-based testing and evaluation of indoor VOC emission sources, which is one of the main research activities of ST2. His second presentation: Effects of simulated solar irradiation on indoor VOC concentrations - a full-scale chamber investigation. It is a new research topic but relevant to the subtask.

Dr Chanjuan Sun from University of Shanghai for Science and Technology gave a presentation entitled: Measurements and analysis on indoor air pollutants of residential buildings in Shanghai. Their work is mainly focused on the field measurement, which could be used for model validation.

Dr Weihui Liang from Nanjing University gave a presentation on Pollutant loads of volatile organic compounds simulation in residential buildings. The research is based on her PhD thesis and recent experiments. The database and IAQ simulation tool is an important contribution to ST2.

Dr Gaëe Guyot from Cerema France gave a presentation entitled: Estimating formaldehyde emission rates at the house scale from in situ campaigns. The data could be used for simply IAQ calculations.

Dr Marc Abadie from La Rochelle University gave a presentation about Definition of a reference residential building prototype for evaluating IAQ and Energy efficiency strategies in France. It is a direct contribution to the common exercises 1 of ST2.

The structure and content of the final report of ST2 has been discussed. The responsible editors and contributors/authors are identified. (see the following table)

Title	**Authors**
Introduction	Menghao Qin and Jensen Zhang
Definition of reference buildings	Zhenlei Liu and Jensen Zhang
Model-based testing and evaluation of VOC emissions and sorption	Zhenlei Liu, Andreas Nikolai, John Grunewald and Jensen Zhang
Effects of temperature and relative humidity on emissions	Weihui Liang, Menghao Qin, and Xudong Yang
Database of VOC emissions for IAQ simulations	Zhenlei Liu, Andreas Nikolai, John Grunewald, Marc Abadie and Jensen Zhang
Summary and Conclusions	Menghao Qin and Jensen Zhang

Common Exercise 1，2，3	Menghao Qin, Jensen Zhang, Marc Abadie, Chuanjuan Sun, Jakub Kolarik, Esfund Burman, Klaas De Jonge/Jelle Laverge, Ülar Palmiste, Fitsum Tariku ….

The next steps regarding preparation of the guide are the following:

- Contributors provide first draft as agreed with the editors latest by September 15, 2019
- Draft for Annex 68 internal review October 30, 2019

2. ST3 session

13:00-15:00 Session 2 – Subtask 3

Status for Subtask 3 by John Grunewald, TU Dresden

John Grunewald presented the overall status of ST3. During the last period, the focus of the work was on the Similarity approach for VOC diffusion and storage and on continuation of the common exercise.

Scientific Presentations

Similarity approach by John Grunewald

John Grunewald presented the achievements of evaluation of the data provided by Zhenlei. From preliminary investigations, the hypothesis was established that the diffusion similarity factor decreases with the decadal logarithm of the partition coefficient. This hypothesis was derived by evaluation of the VOC database content of the CHAMPS-BES software (unreferenced data). The underlying idea is that higher partition coefficients correspond with higher VOC concentrations absorbed by the material. From moisture measurements of vapor diffusion coefficients, it is known that the apparent diffusion resistance decreases with higher moisture contents due to liquid shortcuts and capillary flow in tiny pores.

It was shown that all materials analyses support the initially supposed trend. It can be concluded that the diffusion similarity factor systematically decreases with higher partition coefficients. The slope of the curves is clearly material dependent property. Further analysis steps must target to minimize the uncertainty in material identification.

The results from this investigation are reported in the final report.

3D common exercise results by Dirk Weiß

The contributors to the 3D common exercise are basically the same as the contributors to the report of subtask 3 listed below. Since TU Dresden coordinates the evaluation of all incoming results, Dirk Weiß presented the evaluation of all contributor's results in one scientific presentation.

TU Dresden provided an Excel

Report of Subtask 3 by John Grunewald

Contributors are (more authors may be added):

John Grunewald (john.grunewald@tu-dresden.de), Dresden University of Technology, Germany
Jianshun Zhang (jszhang@syr.edu), Syracuse University, USA
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Zhenlei Liu <zliu138@syr.edu>, Syracuse University, USA
Klaas Calle <Klaas.Calle@UGent.be>, Gent University, Belgium

The ST3 report consists of nine chapters. Major parts of the report are already completed. The current focus is the completion of the 3D common exercise (Chapter 6).

1	Introduction	(completed)
2	Modelling VOC/pollutant transport in DELPHIN 6	(completed)
3	Modelling VOC transport and emission in materials – similarity approach	(completed)
4	Reference cases with problem description, input parameters	(completed)
5	Common exercise 2D cases – building envelope systems simulation	(completed)
6	Common exercise 3D cases – whole building simulation	(in progress)
7	Classification of available tools according to their strengths and weaknesses	(pending)
8	Feature requests from the gap analysis of available tools	(pending)
9	Proposals for improvement of quality assurance standards	(pending)

It is planned to write the pending parts during the next three months and to deliver a first draft of the written report in September 2019.

A nationally funded project “SimQuality” has been started by 01.08.2018. SimQuality will build upon the Annex 68 achievements and it will continue the elaboration of reference cases and validated solutions.

3. ST4 session

15:20 – 15:25	Welcome to the public session, agenda (Jakub Kolarik)
15:25 – 15:45	Introduction to Annex 68 (Carsten Rode)
15:45 – 16:00	Subtask 4 summary and status (Jakub Kolarik)
16:00 – 16:20	“The effect of room temperature control by air- or operative temperature on thermal comfort and energy use” (Bjarne W. Olesen)
16:20 – 16:40	“Modelling room based residential ventilation” (Kevin Smith)
16:40 – 16:55	“Residential ventilation in the view of the newly accepted European standard EN 16798” (Bjarne W. Olesen)
16:55 – 17:00	Short “stretch your legs” break

17:00 – 17:15	Requirements, guidelines, barriers and challenges with respect to ventilation in low energy residences (Daria Zukowska-Tejsen)
17:15 – 17:30	Focus on design and operation and "The Annex 68 Guide" (Jakub Kolarik)
17:30 – 17:45	Summary of Subtask 5 - Field measurements and case studies (Jelle Laverge)
17:45 – 18:00	Open discussion – questions, feedback and reflections from the audience

Main presentation from the ST4 session can be found here.

Scientific presentations were done by Bjarne Olesen ("The effect of room temperature control by air- or operative temperature on thermal comfort and energy use", "Residential ventilation in the view of the newly accepted European standard EN 16798") and Kevin M. Smith ("Modelling room based residential ventilation").

Status of Subtask 4

Activity 1 – review of the written knowledge and stakeholder survey is finished. Manuscript of a peer reviewed paper was submitted to International Journal of Ventilation at beginning of March 2019. The paper summarizes results from literature review as well as stakeholder survey. Authors of the paper are: Daria Zukowska, Gabriel Rojas, Esfand Burman, Gaelle Guyot, Maria del Carmen Bocanegra-Yanez, Jelle Laverge, Guangyu Cao and Jakub Kolarik. Daria Zukowska presented results regarding activity during the expert meeting. Presentation can be found here. Activity 1 provided also material for chapter 2 in the Annex Guide (Activity 4). The draft of the material can be found in Sharepoint.

Activity 2 and 3 – Several annex participant contributed with case studies, which will be used in the Guide. One-slide summaries can be seen in Sharepoint. The case studies will be described on 2-page summaries with references in the Guide.

Activity 4 – "The Annex 68 guide for practitioners: Current challenges, innovative solutions and case studies on indoor air quality design and control in residences". Table 1 presents the table of contents of the guide. At the time of the expert meeting, 15 contributions were collected. There additional contributions (2 from the UK and one from AU) were received on 11.3. Table 2 gives an overview about the contributions divided in particular chapters.

Table 1 – Table of contents and responsible editors

1/INTRODUCTION	Jakub Kolarik & Carsten Rode
2/STATE OF THE ART AND CURRENT CHALLENGES How do we design residential ventilation today?	Daria Zukowska Esfand Burman
3/DESIGN Ways to design residential ventilation in the future/How to overcome nowadays challenges?	Gabriel Rojas Guangyu Chao
4/OPERATION Towards better performance, user satisfaction and easier maintenance	Jakub Kolarik Kevin Smith
5/CONCLUSIONS and OUTLOOK	Carsten Rode

Table 2 – Contributions to the Annex Guide – status March 2019

Chapter	Editors	Contribution title	Author/s	Pages
1/Introduction	Carsten Rode Jakub Kolarik	-	-	~3
2/STATE OF THE ART AND CURRENT CHALLENGES How do we design residential ventilation today?	Daria Zukowska-Tejsen Esfand Burman		Daria Zukowska, Gabriel Rojas, Esfand Burman, Gaelle Guyot, Maria del Carmen Bocanegra-Yanez, Jelle Laverge, Guangyu Cao and Jakub Kolarik	13
3/DESIGN Ways to design residential ventilation in the future	Gabriel Rojas Guangyu Chao	Investigation of enlarged risk of VOC exposure due to floor heating systems with dynamic simulations	Klaas De Jonge, Arnold Janssens, Jelle Laverge – Ghent University, Belgium	
		Control strategies for mechanical ventilation in Danish low-energy apartment buildings	Jakub Kolarik, Johan Bojsen, Mathias J. Larsen, Daria Zukowska-Tejsen	
		Influence of multizone air leakage on IAQ performance in residential buildings	Gaëlle Guyot, Hugo Geoffroy, Michel Ondarts, Evelyne Gonze and Monika Woloszyn	
		Towards a better integration of indoor air quality and health issues in low-energy dwellings: Development of a performance-based approach for ventilation	Gaëlle Guyot	
		List of key pollutants for design	Marc Abadie	
		Definition of a Reference Residential Building Prototype for Evaluating IAQ and Energy Efficiency Strategies	Jensen Zhang and Zhenlei Liu	
		How to include temperature dependent emissions	Menghao Quin	
		Detailed modelling of IAQ to improve ventilation design in low energy houses	María del Carmen Bocanegra-Yáñez	16
4/OPERATION Towards better performance and user satisfaction	Jakub Kolarik Kevin Smith	House owners' experience and satisfaction with Danish Low-energy houses - focus on ventilation	Henrik N. Knudsen	
		Ventilation performance and indoor air pollutants diagnosis in 21 French low energy homes	Gaëlle Guyot, Adeline Bailly, Anne-Marie Bernard, Gabrielle Perez, Claire-Sophie Coeudevez, Suzanne Déoux, Sandra Berlin, Enora Parent, Alexis Huet, Sylvain Berthault, Romuald Jobert, Damien Labaume	
		Development and test of quality management approach for ventilation and indoor air quality in single-family buildings	Sandrine Charrier, Gaëlle Guyot, Romuald Jobert, François-Rémi Carrié, and Claire-Sophie Coeudevez	
		Applications of the Promevent protocol for ventilation systems inspection in French regulation and certification programs	Adeline Bailly Mélois and Laure Mouradian	
		Long-term durability of humidity-based demand-controlled ventilation: results of a ten years monitoring in residential buildings	Elsa Jardinier, François Parsy, Gaëlle Guyot, and Stéphane Berthin	
		Practical use of the Annex68 IAQ Dashboard	Marc Abadie	
		Mechanical ventilation system in deep energy renovation of a multi-story building with prefabricated modular panels	Targo Kalamees, Ülar Palmiste	14
5/Conclusions and outlook	Carsten Rode			5
			Total number of pages:	**51**

The next steps regarding preparation of the guide are the following:

- Editorial review of the particular chapters. Editors will review the contributions and ask contributors for eventual corrections at latest by May 31, 2019.
- Contributors provide next version as agreed with the editors latest by September 15, 2019
- Draft for Annex 68 internal review October 15, 2019

Friday 28 Sep-2018

4. ST5 session

08:30 – 08:40	Overview of status of ST5 (Jelle Laverge)
08:40 – 09:05	Update on controlled experiments and measurement guide (Sarah Paralovo)
09:05 – 09:20	HVAC and VOC emissions (Klaas De Jonge)
09:20 – 09:30	Integrated IAQ / Passive tracer test (Sarah Paralovo)
09:30 – 09:45	Case study New Zealand (Manfred Plagmann)
09:45 – 10:00	Case study France (Gaëlle Guyot)
10:00 – 10:15	Case study Austria (Gabriel Rojas)
10:15 – 10:30	Case study Denmark (Christopher Johnston)

Presentations are on DTU-Share

Status of the Subtask 5

Deliverable 1: Controlled experiments

All experiments have been carried out and the draft reports are available. Finishing the reports is the plan for the next months. Responsible: UGent (Sarah Paralovo)

Deliverable 2: Measurement guide

Draft is available for comment from the participants. Suggestions to include a number of preferred combinations of measurements for different types of case studies were made and will be implemented. Responsible: UGent (Sarah Paralovo)

Deliverable 3: List of case studies

The template for the case study reporting is available. We ask all participants to make sure that they send in their contribution in time (September 1st). Below is a table with all expected contributions. Responsible: BCIT (Fitsum Tariku)

Table 1 – expected case study contributions as presented at expert meetings

Oslo	Treteknisk UCL
Syracuse	VITO DTU
Dresden	OQAI CEREMA UGent
Nottingham	USST

	Saint Gobain UGent
Shanghai	USST Tsinghua UNL IBR BCIT DTU
Syracuse	Branz BCIT UCL
Copenhagen	CEREMA Branz DTU

Timing:

Draft reports: September 1st
Final reports: October 1st

5. Discussion of follow-up Annex

This part of the meeting starting with a brain storming session on ideas and needs regarding topics for a follow-up project.

Menghao: Use of VOC-sorbing materials

Jensen: Outdoor pollutants
Indoors, look not only to VOCs
Secondary emissions

Christopher: For practitioners:
- How to come to the point of actually making calculations?
- What can be applied by practitioners?

Dirk: Work flow – how to apply our results in planning and economics

John: Address architects.

Dirk: For new buildings: deal with pollutants

Esfand: There are tools that consider health impacts, e.g. by looking to the triangle: Energy-Health-IAQ in a planning context.

Jensen: Turn focus to deal also with Occupant exposure
Expand to non-residential buildings

Christopher: Can we calculate the emission rates?

Jelle: On residential: We have just begun – there is more to study

Jakub: We lack a way to compare/consider/assess the calculation results

Per Haugaard Denmark has had summation guidelines for the past 6 months. Both dynamic tools and simpler/monthly tools are needed.

Dirk: DGNB has focus on pollutants

Jakub: Pollutants in combination with moisture is not considered. Relevant e.g. for use of recycled materials and for mould.

Furthermore on the white board came the ideas:

- Bounded pollutants and sources
- Sorption and desorption => energy efficient pollutant removal <=> Annex cleeners
  => material properties / basic physics
- Integration and optimization of IAQ control -> tools:
  - models for calculations
  - rules to be quick and dirty
  - big data
  - protocols/workflows for planning => practice
  - integration with BIM

  … for energy, IEQ, health (e.g. regarding particles)
- Mould
- Outdoor pollutants -> particles -> modelling
  -> and more…
- Indoor air chemistry -> SOA
  -> Secondary emissions
- Occupant impact on IAQ -> schedules -> Annex 79
  -> activities …
- Commercial buildings?
- Residential => bedrooms
  => understudied / underestimated
- “nature based” and “recycled”(?) materials

Jelle promised to take all these ideas with him home, and to synthesize them into a more specific proposal (subsequently materialized in a proposal from him dated 5 April 2019 – attached – to be developed further on in spring/summer 2019).

6. Planning of reporting phase

Every subtask has a fine plan for preparing their final report (for subtask 2 also a database) as presented during each of the subtask sessions. The plans also comprise list of co-authors.
The plans need to be coordinated also with the necessary date for the IEA EBC ExCo reception of the fin al reports for their review: during January 2020, and with possible collaboration with the AIVC as co-publisher (carrying out its own review), which is anticipated relevant for the Subtask 4 report – the "Guide". Besides, Annex 68 should carry out its own internal review of the reports, which generally mean that the reports should be completed in a first edition just after summer 2019 – or sooner for Subtask 4.

No more plenary working meetings are planned for the reporting phase. However, Annex participants who participate in some relevant conferences in the fall should convene at these occasions and follow up on the progress regarding reports and discussions on a follow-up Annex.

Meetings – where and when
Subtask leaders will continue their regular phone meetings also during the reporting phase, i.e. as per usual, the third Friday of meth month at 2 pm (European time) in even numbered months.

In addition, a joint conference call may be arranged later in the reporting phase as things begin to converge and materialize. An Annex Closing Session should be considered if a relevant occasion can be identified, say in the first half of 2020.

Conferences (with opportunities to meet)
A **forum** on *Key findings of IEA EBC Annex 68 - Indoor Air Quality Design and Control in Low Energy Residential Buildings* is planned for the IAQVEC 2019 Conference in Bari Italy, September 5-7, 2019. The forum will present the key findings of the work in the project with a focus on the pollutant loads in residential buildings (Subtask 2 related).
Menghao, Weihui, Kevin, Jensen, Jakub and Carsten plan to participate at this event. Annex champion, Prof. Xudong Yang, Tsinghua University, will be a keynote speaker at the conference.

A **topical session on IEA EBC Annex 68** is planned for the **AIVC Conference 2019** in Ghent, Belgium, 15-16 October 2019. The topical session will have focus on the project's Subtask 4 *Strategies for design and control of buildings*, and will highlight the Guide that will result from this subtask.
Jelle, Sarah, Gaëlle, Gabriel, Esfand, Manfred and Carsten plan to participate at this event.

The **workshop CHAMPS 2019** (on Combined Heat, Air, Moisture and Pollutant Simulations) will be held at Nanjing University, Nanjing, China, on the dates, October 20-22, 2019. Results from IEA EBC Annex 68 will play a central role in discussions at the workshop.
Weihui Liang, Chanjuan Sun, Chen Huang, Manfred Plagge and Carsten Rode plan to participate in this event.

Publications
A brainstorm of some relevant publication that could be seen as outcomes of the Annex activity was reiterated:

- A paper related to Subtask 4 has been submitted to *Int. J. of Ventilation* (Jakub)
- A joint paper between Menghao and Syracuse University's Zhenlei Liu submitted to *Bldg. and* Environment.
- Kevin plans a paper on decentralized ventilation and control
- Kevin plans a journal paper on apartment level systems
- Jakub has submitted a paper on VOC sensors for a journal (*Bldg. and Envir.(?))*
- Klaas had/has two Subtask 4 related conference papers for Indoor Air 2018 and Clima 2019.
- Jensen will present a paper related to model principles at IAQVEC2019.
- Jensen has a conference paper on reference buildings and an old paper for Healthy Buildings Asia 2017, Taiwan.
- Furthermore, some relevant papers were presented at the International Building Physics Conference 2018.

Webinar
The Webinar on *Using Metal Oxide Semiconductor (MOS) sensors to measure Volatile Organic Compounds (VOC) for ventilation control* was held with the AIVC on 4 September 2018. A publication about the webinar in the form of a paper in AIVC's VIP-series (Ventilation Information Paper) is still pending, but is expected to be completed by June 2019.

No other webinars will be planned.

7. Subtask leaders' wrap-up

A short subtask leaders meeting was held at the end of the day. The plan for follow up on the continued completion of final reports was slightly discussed, as well as the plan for keeping contact and meeting at future events as outlined in the previous section of the meeting minutes.

8. Closure

For meeting participants who still had opportunity to stay after the meeting, a short visit was arranged to the PASSYS cells of DTU.

Participants

"IEA EBC Annex 68 - 7th working meeting", Technical University of Denmark, March 11-12, 2019						
Participant List						
https://doodle.com/poll/qghn6zfz7ufwa3mk						
					Monday 11	Tuesday 12
Family name	**First name**	**Company / institution**	**Country**	**E-mail**	09:30–18:00	08:30–16:30
Abadie	Marc	Université de La Rochelle	France	marc.abadie@univ-lr.fr	OK	OK
Burman	Esfand	University College London	United Kingdom	esfand.burman@ucl.ac.uk	OK	OK
Bühler	Max	Technische Universität Wien	Austria	maximilian.buehler@tuwien.ac.at	OK	OK
Davies	Michael	University College London	United Kingdom	michael.davies@ucl.ac.uk	OK	
De Jonge	Klaas	Universiteit Gent	Belgium	Klaas.DeJonge@UGent.be	OK	OK
Foldbjerg	Peter	VELUX A/S	Denmark	peter.foldbjerg@velux.com	OK	~~(OK)~~
Grunewald	John	Technische Universität Dresden	Germany	John.Grunewald@tu-dresden.de	OK	OK
Guyot	Gaëlle	CEREMA	France	Gaelle.Guyot@cerema.fr	OK	OK
Haugaard	Per	NIRAS A/S	Denmark	peha@niras.dk	OK	OK
Hou	Pumin	Technical University of Denmark	Denmark	pumhou@byg.dtu.dk	OK	
Huang	Chen	University of Shanghai for Science and Technolo	China	hcyhyywj@163.com	OK	OK
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Qin	Menghao	Technical University of Denmark	Denmark	menqin@byg.dtu.dk	OK	OK
Rode	Carsten	Technical University of Denmark	Denmark	car@byg.dtu.dk	OK	OK
Rojas-Kopeinig	Gabriel	Universität Innsbruck	Austria	Gabriel.Rojas-Kopeinig@uibk.ac.at	OK	OK
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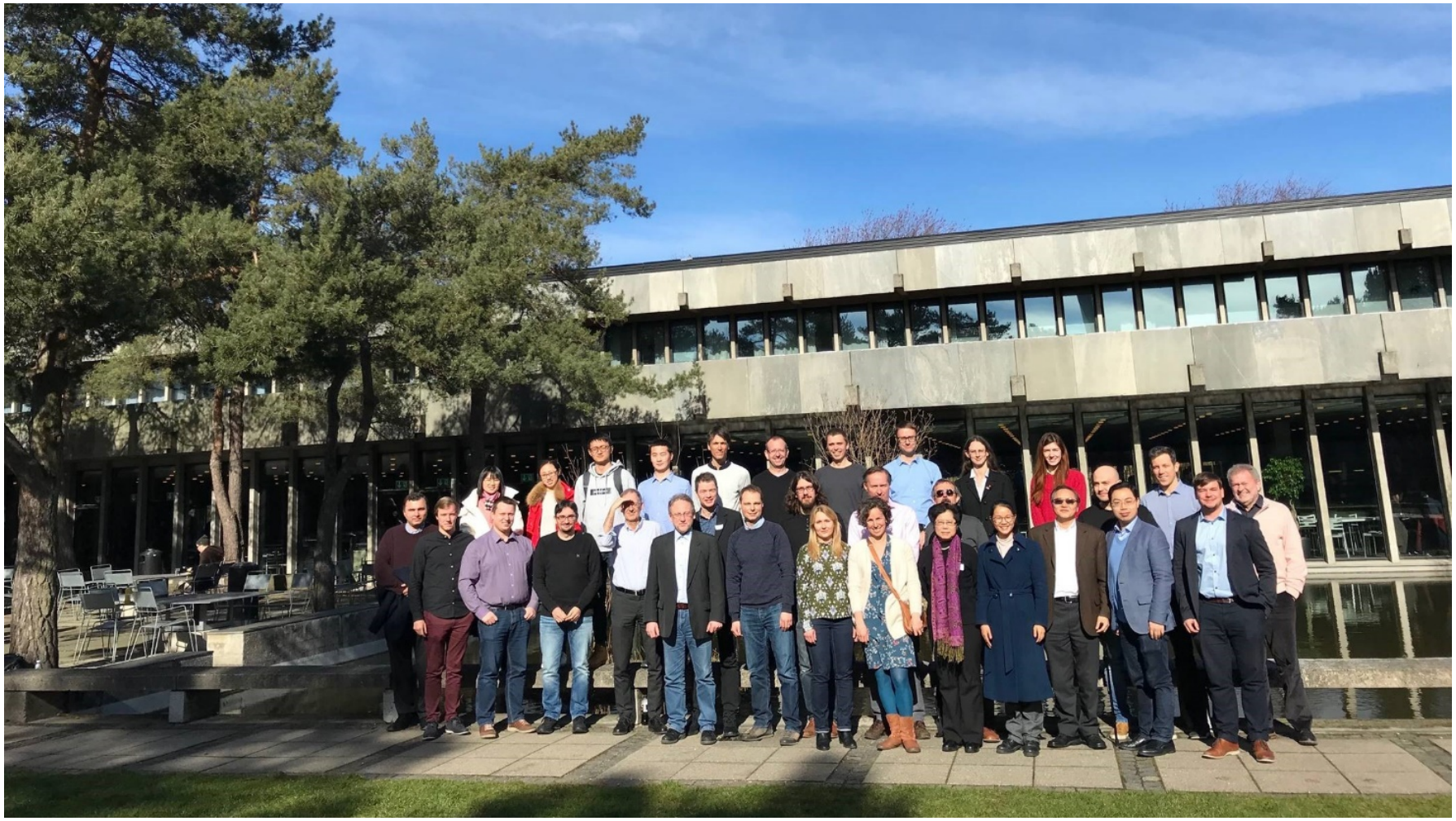
Zukowska	Daria	Technical University of Denmark	Denmark	dz@byg.dtu.dk	OK	OK
Østergaard	Lennart	VELTEK	Denmark	los@veltek.dk	OK	
Total		18	9	33	33	26



Picture 1: Participants in the meeting, 11 March 2019