

**AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND  
 AIR CONDITIONING ENGINEERS, INC.**

1791Tullie Circle, NE / Atlanta, GA30329  
 (404) 636-8400

**TC/TG/TRG MINUTES COVER SHEET**

(Minutes of all TC/TG/TRG Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO.:	<b>4.10</b>		TC/TG/TRG TITLE:	<b>INDOOR ENVIRONMENTAL MODELING</b>			
DATE OF MEETING:	January 20, 2014		LOCATION:	New York, NY			
DATE ISSUED:	March 31, 2014		RECORDED BY:	Atila Novoselac			
VOTING MEMBERS	TERM		PRESEN T	OFFICERS		TERM	
	On	Off				On	Off
Bennett, Jamie	11	15	✓	Chair	Bennett, Jamie	13	15
Horstman, Ray	11	15	X	Vice Chair	Novoselac, Atila	13	15
VanGilder, Jim	11	15	✓	Secretary	Wang, Liangzhu (Leon)	13	14
Wang, Liangzhu (Leon)	11	14	X	Programs	Koupriyanov, Mikhail	12	N/A
Yang, Xudong	12	16	✓	Research	Zuo, Wangda	06	N/A
Khalifa, Ezzat	12	16	✓	Handbook	Lo, James	13	N/A
Zuo, Wangda	12	16	✓	Membership	Lin, Charlie	13	N/A
Atila Novoselac	13	17	✓	Web Page	Lo, James	13	N/A
Malcolm Cook	13	17	X	Honors and Awards	Horstman, Ray	05	N/A
Zhai, John	13	17	✓	ALI	Zhai, John	04	N/A
Lin, Chengxian (Charlie)	13	17	✓				
Hosni, Mohammad (Mo)	13	17	✓				

Technical Committee 4.10 – Indoor Environmental Modeling  
 These minutes are a **DRAFT** until voted upon by the committee.

<b>ATTENDANCE</b>			
<b>MEMBERS</b>	<b>PRESENT</b>	<b>MEMBERS</b>	<b>PRESENT</b>
Atila Novoselac	✓	Carolyn M L Kerr	
Cheng-Xian Lin	✓	Man-Hoe Kim	
Malcolm John Cook		Allan T Kirkpatrick	
Mohammad H Hosni	✓	Kevin D Knappmiller	
James W VanGilder	✓	Kelly J Knight	
Zhiqiang Zhai	✓	Alexy Kolesnikov	
Wangda Zuo	✓	Mrs Isabelle A Lavedrine	
Xudong Yang	✓	Hal Levin	
H Ezzat Khalifa	✓	Chao-Hsin Lin	✓
Raymond H Horstman		Cheng-Xian Lin	
Liangzhu Wang		SHICHAO LIU	✓
James S Bennett	✓	Iain A MacDonald	
Jose Luis Correa		Andrew P Manning	
Ghani Ramdani		James McNeill, Jr	
William S Dols		Arsen K Melikov	
David S Ensor		Lingjun Meng	
Mikhail Koupriyanov	✓	Shuzo Murakami	
James Lo	✓	Amy B Musser	
Eric W Adams		Peter Vilhelm Nielsen	
Thamir R Al-Alusi		Bjarne Wilkens Olesen	
Peter R Armstrong		Ms Ulrike Passe	✓
A J Baker		Ronald L Petersen	
David Banks		Ms Janice C Peterson	
Sherif Barakat		Duncan A Phillips	
Ian Beausoleil-Morrison		Hamid Rahai	
Bryan R Becker, P.E.		Julian Rimmer	
Jonathan M Berkoe		Richard D Rivers	
Byron P Blackmore		Ms Lisa J Rogers	
John C Chai		J Greg Sanchez	
Walid Chakroun		Takao Sawachi	
Chun Chen	✓	Walter R Schwarz	
Qingyan (Yan) Chen	✓	George J Sestak	
Daniel R Clark		Mark James Seymour	
O Sandro Tavares Conceição		Ray Sinclair	
Jie Cui		Ahmad K. Sleiti	
Charles H Culp III		Chang W Sohn	
Jason W DeGraw	✓	Jelena Srebric	
Ery Djunaedy		Liangcai Tan	
Gregory M Dobbs		Kevin Y Teichman	
Steven J Emmerich		Dean T Tompkins	

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Brian Carl Englert		Claus Topp	
Elliott B Gordon		Paolo M Tronville	
David T Grimsrud		Bradley Tully	
Richard A Grot		Athanasios Tzempelikos	
Yanzheng Guan		Paul R VanderMeulen	
Fariborz Haghghat		Mrs Diotima A Von Kempfski	
John D Hall		George N Walton	
Jan L M Hensen		Xinlei Wang	
Mark Hernandez		Michael S Waring	
Daniel J Hirnikel		Christopher G Wark	
Daniel Int-Hout, III		Alexander Willman	
Gregory R Jeffers		Dexian Zhang	
Mingang Jin		Jianshun S Zhang	
Gordon G Jones		Tengfei (Tim) Zhang	
Mrs Tracey Nawrocki Jumper		Wei Zhang	
Kai Kang		XuanHang Zhang	
Panagiota Karava		Yuanhui Zhang	
Shinsuke Kato		Zhao Zhang	
Richard M Kelso			

<b>ADDITIONAL ATTENDANCE</b>			
Reza Ghias	Mathew Dahlhausen	AJ Rao	Shichao Liu
Susan Hayes	Yang Wang	Jiyiing Liu	Atefeh Mohammadpour
Amin Engarnevis	Ruoyu You	Guiyuan Han	
Justin Nekam	Jianjun Hu	Guangyu Cao	

<b>Society Liaisons, etc.</b>		<b>PRESENT</b>
LeViseur, Suzanne	TAC Section Head	
Meredith, David	Prof. Devt. Committee	
Henderson, Hugh	Research Liaison	
Reeves, George	Standards Liaison	
Hosni, Mo	Program Liaison	
Bahnfleth, William	TAC Chairman	
Ferguson, Kimball	Special Publications Liaison	
Ramspeck, Claire	Staff Liaison (Standards)	
Gulledge, Charles E.	TEGA Liaison	
Vaughn, Michael	Staff Liaison (Research)	
Aswegan, James	Handbook Liason	✓
Bilderbeck, Mike	TAC Section 4 Head	✓

**Call to order by Chairman:** (Jamie Bennett) at 2:15 p.m.

**Welcome** by Jamie Bennett

**Self-Introductions of attendees**

**Roll call** (Charlie Lin) – voting members

Bennett, Jamie	Yes	Zuo, Wangda	Yes
Horstman, Ray	No	Atila Novoselac	Yes
VanGilder, Jim	Yes	Malcolm Cook (internat.)	No
Wang, Leon	No	Zhai, John	Yes
Yang, Xudong (internat.)	Yes	Lin, Charlie	Yes
Khalifa, Ezzat	Yes	Hosni, Mo	Yes

**Attendance**

- **8 of 10** non-international voting members were present
- **1 of 2** international voting members was present
- **Quorum achieved** without counting the Chair
- Non-voting officers present: Mike Koupriyanov (Program), James Lo (Handbook)

**Minutes from Denver meeting**

- Discussion and comments on
- Call Approval of Denver minutes
  - **Vote: (8-0-0-8)**
  - **Denver minutes approved**

**Announcements** (Jamie Bennett)

- Notes from chair's breakfast.
- Chao-Hsin Lin announces the visit to Boeing.
  - Since the next meeting is in Seattle, WA, Boeing Company would like to organize a tour for ASHRAE members.
  - The hosts will be Chao-Hsin Lin and Atila Novoselac will collect the names of members of ASHRAE TC 4.10 interested in this visit.

**Membership** (Charlie Lin)

- Changes in officers
  - Leon Wang resigning as Secretary due to difficulty attending meetings
  - Looking for a replacement (six-year commitment)
  - Atila Novoselac will serve as interim secretary
- Changes in Voting Members (effective July 2014, After Summer 2014 meeting)
  - Rolling off: Leon Wang
  - Rolling on: James Lo, Mikhail Koupriyanov

**Research** (Wangda Zuo)

The research subcommittee met on Sunday (01/19) from 5:00 to 6:00 pm. There were 19 attendees.

Note: Revolving submission deadlines: **May 15<sup>th</sup>**, **August 15<sup>th</sup>**, and **December 15<sup>th</sup>**.

Current RP reports

- PMS of RP 1512 (CFD resources for particle modeling)
  - Project finished and the final report submitted to PMS
  - The PMS chair, Jamie Bennett, reported on the project and proposed project acceptance
  - After discussion, the TC **Voted (7-0-1-8)**: 7 yes, 0 no, and 1 abstain. The abstain voting member was the project PI, Atila Novoselac, who left the room during the vote. **The final report for ASHRAE RP 1512 was approved.**
- PS of RP 1458-RP (Modeling Person-to-Person Contaminant Transport in a Mechanically Ventilated Room)
  - The project PMS chair, Chao-Hsin Lin, was not present, but the project PI, Yan Chen, reported on the project. Project has been finished and the final report submitted to PMS. Since the PMS chair was not present the vote is postpone for online vote after the meeting.
  - TC Chair called a letter vote on Tuesday, January 21<sup>st</sup>: TC voted 8-0-0 to accept the final report. **The final report for ASHRAE RP 1458 was approved.**

Work Statements

- 1675-WS (Experimental Benchmark Data for Data Center Numerical Modeling) Jim prepared the WS but bypassing the RTAR. Mark will attend the meeting on Wednesday with RAC to check the details.

New RTARs

- “Guidelines for the Accurate Use of CFD for Modeling Naturally Ventilated Indoor Spaces” Malcolm Cook sent the RTAR to 4.10 members for review, just before the meeting. It needs to be reviewed and prepared for the submission to RAC.
- “CFD Prediction of Sparse Particle Distributions” Ray Horstman to prepare initial version of RTAR.

Co-sponsored projects

- RP-1675 is co-sponsored by TC9.9

**Current Status of TC 4.10 RTARs, WSs, and Projects.**

<b>Projects</b>	<b>PMS</b>	<b>Title</b>	<b>Status</b>
1512-RP	Jamie Bennett PMS Chair	CFD Resource Decisions in Particle Transport Modeling, PI: Atila Novoselac	• PMS vote unanimously Yes for final project report
1458-RP	Julian Rimmer PMS Chair	Modeling Person-to-Person Contaminant Transport in a Mechanically Ventilated Room, PI: Yan Chen	• Need official vote results from PMS, check with Julian
<b>Bidding</b>	<b>PMS</b>	<b>Title</b>	<b>Status</b>
We have no projects out for bid at this time.			
<b>WSs</b>	<b>Author(s)</b>	<b>Title</b>	<b>Status</b>
1675-WS	Jim Van Gilder, Mark Seymour	Experimental Benchmark Data for Data Center Numerical Modeling	• Submitted the WS for August deadline, Rejected by RAC • Mark will attend the meeting on

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Wednesday with RAC			
RTARs	Author(s)	Title	Status
New	Malcolm Cook (Panagiota Karava, and James Lo)	CFD Boundary Conditions for Modeling Naturally Ventilated Indoor Spaces	• RTAR was sent to all attendance and 4.10 members for review
New	Ray Horstman	CFD Prediction of Sparse Particle Distributions	• Zuo will check it with Ray.
New	TBD	Modeling Particulate Surface Sorption	• Need a new lead author • In contact with Brian Kraffefer for possible new lead author.

External Requests

- An IEA Annex titled “Whole Building Energy and Environmental Performance (Whole BEE)” is seeking for participants. Contact Person: Carsten Rode [car@byg.dtu.dk](mailto:car@byg.dtu.dk). Interested party will meet at 10:00 am Tuesday in front of registration desk.
- Updates on Request for Support on RTAR/WS
  - TC 4.7 is developing a RTAR/WS titled “Assess and Implement Natural and Hybrid Ventilation Models in Whole-building Energy Simulations (Phase Two)” based on RP-1456 (First Phase). The lead author is Joe Huang from TC 4.7. They are looking for support from TC 4.10. Jason DeGram will contact Joe.
  - TC 9.6 is asking for co-sponsorship of RTAR “Improving Hospital Operating Room Air Distribution using Alternative Unidirectional Diffusers and Air Curtain Systems”. Research committee is in favor of that and TC votes yes on that. On the agenda of TC 9.6 meeting for today, Mike will provide the update.

New Ideas

- Radiation model in CFD.
- Benefit of Embedding CFD into everyday design process (James Lo)

**Handbook (James Lo)**

- The Program Subcommittee met briefly on Sunday (01/19), from 4:30-5:00pm
- In Denver 2013 we voted to submit an outline to the Handbook subcommittee for a new application handbook chapter. The goal of the new chapter is to provide a step by step guide for new users (practitioners and managers) to quickly understand the required knowledge for a valid simulation for both CFD and MZ.
  - The outline was developed by James Lo with inputs from: Yan Chen, Jim VanGilder, Eric Adams, David Banks, Leon Wang, Malcolm Cook, Atila Novoselac, Amy Musser and Stuart Dols.
  - Outline was submitted to the HB committee this meeting (NYC 2014) and was approved 18-0-2 with a flexible deadline 2015 or 2019 (2015 preferred) with following comments: concentrate on step by step guide with about 10 pages limits. Examples should be additional contents provided in CD and online version. The title of the chapter would be "indoor airflow modelling".

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- From March 2014, all paying member will have access to online version of the handbook (no longer special subscription. 2013 number: 22000 paid handbook subscriptions, 6000 online subscriptions.
- Deadline for change in the Fundamental chapter is May 2016.

**Program (Mike Kourpiyanov)**

- The Program Subcommittee met on Sunday (01/19), from 3:30-4:30p.
- New York Program (conference in progress)
  - TC 4.10 Sponsored program for the New York conference
    - Seminar, " CFD for Data Centers Applications Part 1 – Modeling Advancements"
    - Seminar, " CFD for Data Centers Applications Part 2 – Applications"
    - Conference Paper , "Indoor Air Quality: Impact of Variables"
    - Seminar, " How Much Energy Savings Can We Expect from Natural Ventilation?"

<b>ASHRAE Seattle, Summer 2014</b>			
<b>Session Type</b>	<b>Session Title</b>	<b>Session Chair</b>	<b>Contributing Authors</b>
Seminar	Advances in Simulation Research for the Design and Operation of Natural and Mixed Ventilation Systems	Wangda Zuo	James Lo Marija Todorovic Malcolm Cook Panagiota Karava
Seminar	Modeling Industrial Spaces	Chao-Hsin Lin	Yan Chen Reza Ghias Jamie Bennet
Workshop	Practical Use of CFD for Everyday Design of the Built Environment	Mike Kourpiyanov	Reza Ghias Byron Jones Gursaran Mathur Shan He

<b>New Ideas for Papers, Seminars</b>			
<b>Session Type</b>	<b>Session Title</b>	<b>Session Chair</b>	<b>Contributing Authors</b>
Seminar	Ventilation Energy Consumption, Industrial Ventilation/Sustainability	Ray Sinclair	Jamie Bennett Yan Chen Panagiota Karava (tentative)
Conference Paper	CFD in Healthcare	Wangda Zuo	Malcolm Cook Ken Mead John Zhai
Conference Paper	Airflow Modeling on the Cheap (Open Source etc) resource optimized CFD	Jim VanGilder	Jason DeGraw James McNeil Leon Wang
GPI	Heating in Cold Climates	TBA	TBA
	Indoor environmental modeling in low energy buildings		
	Hybrid Ventilation, Mixed Mode cooling		
	Displacement Ventilation in High Heat gain Applications		
	Advances in Indoor Environmental Modeling		
	CFD in Dangerous Hands (CFD NC17 Edition)		
	CFD for Design Optimization (Room scale)		
	High CO2 (other contaminants) levels in schools		

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	Processing CFD data (different interpretation of results)		
	– good manufacturing practice		

Conference Program Deadlines					
Conference	Type	Seminar	Paper Abstract	Full Technical Paper	Final Conference Paper
Seattle 2014-Summer		Feb. 13, 2014	Sept. 23, 2013	Sept 23, 2013	Jan. 9, 2014
Chicago 2015-Winter		Aug. 11, 2014	Mar. 24, 2014	Apr. 14, 2014	Jul. 7, 2014

- Seattle 2014 - Tracks

- Track 1: Indoor Environment – Health, Comfort and Productivity
- Track 2: Research Summit
- Track 3: Ground Source Heat Pumps: State of the Art Design, Performance and Research
- Track 4: HVAC&R Systems & Equipment
- Track 5: HVAC&R Fundamentals and Applications
- Track 6: Standards, Guidelines and Codes
- Track 7: Refrigeration
- Track 8: Installation, Commissioning, Operation, Maintenance of Existing Buildings
- Track 9: Professional Skills

- Chicago 2015 – Tracks

- Track 1: Systems and Equipment
- Track 2: Fundamentals and Applications
- Track 3: Industrial Facilities
- Track 4: Large Buildings: Mission Critical Facilities and Applications
- Track 5: Energy Efficiency
- Track 6: Life Safety
- Track 7: Design of Energy and Water efficient Systems
- Track 8: Hospital Design and Codes

**Web site activity** (James lo):

- The website needs a major update.
  - Discussion about developing communication over the ASHRAE TC4.10 website and opening it for public access.
    - Identified potential issues about privacy and someone posting inappropriate content. Concluded that the Idea is good but needs further refinement.

**Report of relevant activities in other TCs**

- TC1.2 *Instruments and Measurements* - Arsen Melikov
- TC2.1 *Physiology and Human Environment* - Diotima Von Kempster  
 Ray attended the TC 2.1 meeting: modeling of multi zone body
- TC2.3 *Gaseous Air Contaminants/Removal Equipment* - Gemma Kerr
- TC2.4 *Particulate Air Contaminants/Removal Equipment* - Dave Ensor
- TC4.3 *Ventilation Requirements and Infiltration* – Leon Wang

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TC4.7 Load Calculation and Energy Modeling - need for a new representative  
TC5.3 *Room Air Distribution* - John Jenssen  
TC5.6 *Control of Fire and Smoke* – Kai Kang  
TC5.8 *Industrial Ventilation* – Jamie Bennett  
TC9.3 *Transportation* - Ray Horstman  
TC9.6 *Healthcare Facilities* – James Mcneil  
TC9.9 *Mission Critical Facilities* – Jim VanGilder

**Honors and Awards (Ray Horstman)**

No discussion. Ray has retired, but is expected at the Seattle meeting.

**New Business**

None.

**Agenda Suggestions for Next Meeting**

None.

**Call to adjourn by chairman:** (Jamie Bennett) at 4:00 p.m.

**APPENDIX A: DESCRIPTION OF TC'S SCOPE (FROM WEBSITE)**

TC 4.10 is concerned with developing, evaluating and recommending procedures for predicting indoor environmental conditions including thermal, acoustical, illumination, and air quality for new or existing buildings.