

**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.:	4.10		TC/TG/TRG TITLE:	INDOOR ENVIRONMENTAL MODELING			
DATE OF MEETING:	June 29, 2015		LOCATION:	Atlanta GA			
DATE ISSUED:	October 26, 2015		RECORDED BY:	Mike Koupriyanov			
VOTING MEMBERS	TERM		PRESENT	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	Koupriyanov, Mikhail	14	15
Wang, Liangzhu (Leon)	11	14	✓	Programs	Jim VanGilder	14	N/A
Yang, Xudong	12	16	✓	Research	Zuo, Wangda	13	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	X				
Mike Koupriyanov	14	18	✓				
James Lo	14	18	✓				

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

Additional Attendance	
Name	Status
Shinsuke Kato	Corresponding Member
Donghyun Rim	Corresponding Member
Richard Rivers	Guest
Gang Tan	Guest
Jonathan Sullivan	Guest
Jennifer Logue	Guest
W. Stuart Dols	Guest
Paolo Tronville	Guest

Society Liaisons, etc.		PRESENT
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
Yang, Xudong (internat.)	Yes	Zhai, John	Yes
Khalifa, Ezzat	Yes	Lin, Charlie	Yes
Mike Koupriyanov	Yes	Hosni, Mo	No
		James Lo	Yes

Attendance

- **10 of 11** non-international voting members were present
- **1 of 2** international voting members was present
- **Quorum achieved** without counting the Chair
- Non-voting officers present: None

Minutes from Seattle meeting

- Discussion and comments on
- Call Approval of Chicago minutes
 - **Vote: (10-0-0-0)**
 - **Chicago minutes approved**

Announcements (Jamie Bennett)

- RAC to emphasize interest in residential buildings
- Automated membership process on website – provisional corresponding member
- Website format is being changed
- People attending meetings electronically – TC 4.2 is beta testing
- New RAC guidelines regarding research project monitoring and funding, if deliverable aren't delivered funding can be stopped
- New section head is Dennis Wessel, Chapter of Technology Transfer office liaison is Harris Sheinman
- Chao-Hsin Lin rolls back on as VM in June
 - Still an opportunity to get involved in IEA: Annex 69 Project. Contact is Carsten Rode from the Technical University of Denmark (car@byg.dtu.dk)

Membership (Charlie Lin)

- New officers
 - Membership Chair: Reza Ghias
 - Honors and Awards: Chao-Hsin Lin
 - Research Chair: Charlie Lin
 - Secretary: Wangda Zuo

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- o Vice Chair: Mike Koupriyanov
- o Chair: Atila Novoselac
- Voting Members
 - o Rolled on (July 2015): Chao-Hsin Lin
 - o Rolled off (July 2015): Jamie Bennett
 - o Rolled off (July 2015): Ezzat Khalifa
 - o Roster action for Reza Ghias

Research (Wangda Zuo)

The research subcommittee met on Sunday (06/28) at 5:00-6:00 pm. There were _ 12 _ attendees in the meeting. Note: Revolving submission deadlines: **May 15th, August 15th, and December 15th.**

Current Projects

Projects	PMS	Title	Status
No projects out for bid at this time			

Proposals in Progress

Type	Designation	Author(s)	Title	Status
WS	1675	Jim Van Gilder Mark Seymour	Guidance for CFD Modeling of Data Centers	<ul style="list-style-type: none"> •RAC Approved the WS with comments •Reduce PES members from 7 to 5 •Explicitly require that a general purpose CFD tool has to be used
RTAR	1744	Malcolm Cook Panagiota Karava	CFD Boundary Conditions for Modeling Naturally Ventilated Indoor Spaces	<ul style="list-style-type: none"> •WS is expected to be submitted to TC by April 15, 2016. •An online meeting in October is planned •Still looking for participants.
RTAR	N/A	Ray Horstman	CFD Prediction of Sparse Particle Distributions	<ul style="list-style-type: none"> •RTAR is circulating among the TC for an email vote •Comments were raised (See below) •A revote will be needed after the concern is addressed <ul style="list-style-type: none"> •RTAR will be dropped off the list unless progress has been made or a new champion identified.

Comments for RTAR “CFD Prediction of Sparse Particle Distributions”

- Since the focus is on aircraft cabin, it’s better to add aircraft cabin in the title.
- This is likely Phase I of a large project, so maybe possible to add Phase I also in the title. Need to specify the objective of Phase I and longer term objectives.
- If the focus is on infectious disease in cabin, then may need to seek co-sponsorship from TC93 Transportation Air Conditioning (the Phase I may not need, if only on modeling).
- Please leave the estimated budget to a smaller range, or a single number (e.g., \$120 K, or \$110-120 k).
- We need to add a size distribution of the particles and state whether the simulation is to be for steady state, unsteady cyclical (breathing) or impulsive unsteady (coughing).
- If the particles are submicron, they will follow the flow (this is the basis of all the well-established PIV measurements seeded with micron or submicron particles).

Current RP reports

- None at this time.

Work Statements

- 1675-WS “Experimental Benchmark Data for Data Center Numerical Modeling”
 - Approved by RAC with comments

New RTARs

- RTAR-1744 “Guidelines for the Accurate Use of CFD for Modeling Naturally Ventilated Indoor Spaces”
 - Accepted unanimously by RAC
- “CFD Prediction of Sparse Particle Distributions”
 - Not all voting members have read the RTAR, an e-mail vote will be done some time after the meeting

Co-sponsored projects

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

External Requests

- RTAR-1748 “Assess and Implement Natural and Hybrid Ventilation Models in Whole-building Energy Simulations (Phase 2)” (led by TC 4.7, Author: Tony Fontanini, Joe Huang).
 - The WS has been developed and will seek comments and approval from TC 4.7.
 - TC 4.10 will vote the WS by email.
- “Improving Hospital Operating Room Air Distribution using Alternative Unidirectional Diffusers and Air Curtain Systems” (led by TC 9.6)
 - This RTAR has been prepared by Reg and Leon from Price and should be reviewed further by the Research Sub Committee and TC 9.6 and then if approved be submitted to RAC. Jeff Hardin will review.” TC 4.10 will waiting for the updates from the authors.
 - No action needed now.RTAR-1730 “Research to Determine The Pressure Coefficients &
- RTAR-1730 “Research to Determine The Pressure Coefficients & Pressure Drop For Standard Venting Strategies & Components In Attic Spaces With Sloped Roofs” (led by TC 4.4, Authors: Anthony Fontanini and Roodvoets)
 - First draft WS is written and is targeted for the vote in TC 4.4 in Orlando.

New Ideas

- Radiation model in CFD, possible co-sponsorship from TC 6.5. (Mike Koupriyanov, Reza Ghias)
- Flexible ducts (Chao-Hsin Lin, Jamie Bennett, Wangda Zuo), need to identify the use case and needs for ASHRAE, possible co-sponsorship from TC 5.2
- Right velocity for plug flow (Jamie Bennett), industrial painting process, will start the RTAR development after Orlando meeting

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- Reduced order model of CFD for control and optimization (Charlie Lin, Anthony Fontanini)
- Big data, how to use big data for buildings. A lot of discussion, not conclusion yet.
- Moisture transportation through the wall with CFD (Reza Ghias will develop a RTAR)
- Auto tune of CFD model for data center (Jim Van Gilde)

Handbook (James Lo)

The Handbook Subcommittee met on Sunday (06/28) from 3:00-4:00pm

- The deadline is June 2017 for changes to the fundamentals chapter, no changes at this point
- New applications chapter is a work in progress, we did not meet the 2015 deadline
- One hour working session held on Sunday (06/28) from 3:00-4:00pm, brainstormed ideas
- Applications chapter
 - Draft of a portion of the chapter is complete
 - Soft limit for chapter length is approximately 10 pages with 5 examples
 - Need guidance regarding model selection

Program (James VanGilder)

The Program Subcommittee met on Sunday (06/28) from 4:00-5:00pm.

ASHRAE Atlanta, Summer 2015			
Session Type	Session Title	Session Chair	Contributing Authors
Seminar	Calibrating Operational CFD Models for Real Data Centers (Co-sponsored with TC9.9)	Nick Gangemi	Ez Khalifa Jim VanGilder Mark Seymour
Seminar	Moisture in Buildings and Envelopes: Simulation, Modeling, and Design	Jonathan Sullivan	Sean O'Brien Florian Antretter Mike Koupriyanov
Seminar	Improving IAQ in Energy Efficient Building Ventilation: Practical Experience from Experts	Wangda Zuo	Mike Koupriyanov Reza Ghias

ASHRAE Orlando, Winter 2016			
Session Type	Session Title	Session Chair	Contributing Authors
Workshop	Practical Use of CFD for Everyday Design of the Built Environment (Re-submission)	Reza Ghias	Mike Koupriyanov Byron Jones Gursaran Mathur Shan He
Seminar	Ventilation Energy Consumption, Industrial Ventilation/Sustainability (Verify interest at main meeting)	Gang Tan	Jamie Bennett Yan Chen Panagiota Karava (tentative) Leon Wang
Seminar	Heating in Cold Climates (Maybe include empiricism)	Reza Ghias	Atila Novoselac Mike Koupriyanov Xudong Yang Ulrike Pässe
Seminar	Alternative Modeling Methods Cutting Edge Technologies in Orlando	Atila Novoselac	Wangda (FFD) Jim (PFM) John Zhai (Coarse)

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			Grid) Charlie Lin (R.O.M.)
Seminar	Modeling the Personal Microenvironment (Also Jensen, Peter Nielsen, Yan, Kato)	Ez Khalifa	Ez Khalifa Arsen Melikov Shinsuke Kato Atila's contact?
ASHRAE St Louis, Summer 2016			
Session Type	Session Title	Session Chair	Contributing Authors
Seminar	CFD in Dangerous Hands (CFD NC17 Edition) "Garbage in, garbage out: avoiding"		Mark Seymour Reza Ghias Shichao Liu Mike Koupriyanov
?	Hybrid Ventilation, Mixed Mode cooling	John Sullivan	Malcolm Gang Tan
Seminar	CFD for Design Optimization (Room scale) Parametric Modeling/Optimization	Mike Koupriyanov	Reza Ghias Jim VanGilder Charlie Lin Yan Chen Anthony Fontonini

Other Ideas for Papers, Seminars			
Session Type	Session Title	Session Chair	Contributing Authors
Conference Paper	Airflow Modeling on the Cheap (Open Source etc) resource optimized CFD (Any interest?), FDS?, CONTAM?	Jim VanGilder	Jason DeGraw James McNeil Leon Wang Stuart Dols
	(Pushing the Boundaries of Design) Displacement Ventilation in High Heat gain Applications (Any interest?)	Mike K	Mike Koupriyanov John Sullivan
	Advances in Indoor Environmental Modeling		Mark Seymour
	High CO ₂ (other contaminants) levels in schools tied to productivity		Reza Ghias Mike Koupriyanov
	Processing CFD data (different interpretation of results)		Mark Seymour
	Modeling Reactive Surfaces in Indoor Environments		Ez Khalifa Donghyun Rim
	GMP criteria (manufacturing, indoor environment) – good manufacturing practice		
	Anything on residences?		

Deadlines

Conference	Type	Seminar	Conference Paper Abstract	Full Technical Paper	Final Conference Paper
Atlanta 2015	Summer	Feb 9, 2015	Sep 22, 2014	Feb 13, 2015	Jan 5, 2015
Orlando 2016	Winter	Aug 10, 2015	Mar 23, 2015	Apr 20, 2015	Jul 6, 2015
St. Louis 2016	Summer	Feb 8, 2016	Sep 14, 2015	Feb 15, 2016	Jan 4, 2016
Las Vegas 2017	Winter	Aug 2016	Mar 2016	April 2016	Jul 2016
Long Beach 2017	Summer	Feb 2017	Sep 2016	Feb 2017	Jan 2017

Atlanta 2015 – Tracks

Track 1: Systems and Equipment
Track 2: Fundamentals and Applications
Track 3: Research Summit
Track 4: Refrigeration
Track 5: Building Operation, Maintenance and Optimization/Commissioning
Track 6: Indoor Air Quality
Track 7: Modeling throughout the Building Life Cycle
Track 8: High Performance Buildings
Track 8: Moving Advanced Energy Design Guidance to the Mainstream

Orlando 2016 – Tracks

Track 1: Systems and Equipment
Track 2: Fundamentals and Applications
Track 3: Design Build
Track 4: International Design
Track 5: Standards, Guidelines and Codes
Track 6: Cutting-Edge Technologies
Track 7: The Great Debate
Track 8: Modern Residential Systems

St. Louis 2016 – Tracks

Track 1: Advances in Refrigeration Systems and Alternative Refrigerants
Track 2: Research Summit
Track 3: Fundamentals and Applications
Track 4: HVAC Systems and Equipment
Track 5: Smart Building Systems/Remote Monitoring and Diagnostics
Track 6: Indoor Environment: Health, Comfort, Productivity
Track 7: Professional Skills Beyond Engineering
Track 8: Renewable Energy Systems and Net Zero Buildings

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* – Arsen Melikov, Ray Horstman
TC2.3 *Gaseous Air Contaminants/Removal Equipment*
TC2.4 *Particulate Air Contaminants/Removal Equipment*
TC4.3 *Ventilation Requirements and Infiltration* – Leon Wang
TC4.7 Load Calculation and Energy Modeling
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

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TC9.6 *Healthcare Facilities* – James Mcneil
TC9.9 *Mission Critical Facilities* – Jim VanGilder

Honors and Awards (Ray Horstman)

- Develop indoor modeling award, cash award sponsored by CFD software companies
- Distinguished Service Awards received by Chao-Hsin Lin (Boeing) and Stuart Dolls (NIST).

New Business

None.

Agenda Suggestions for Next Meeting

None.

Call to adjourn by chair: (Jamie Bennett) at 4:15 p.m. Vote 10-0-0.

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.