

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

1791 Tullie Circle, NE / Atlanta, GA30329
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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:	January 14, 2019		LOCATION:	Houston, TX			
DATE ISSUED:	January 28, 2018		RECORDED BY:	Wangda Zuo/James Lo			
VOTING MEMBERS	TERM		PRESENT	OFFICERS		TERM	
	On	Off				On	Off
Van Gilder, Jim	18	22	✓	Chair	Koupriyanov, Mikhail	17	19
Koupriyanov, Mikhail	16	20	✓	Vice Chair	Zuo, Wangda	17	19
Bennet, Jamie	16	20	X	Secretary	Lo, James	17	19
Lin, Charlie	17	21	✓	Programs	VanGilder, Jim	17	19
Leon Wang	17	21	✓	Research	Lin, Charlie	17	19
Rim, Donghyun	17	21	✓	Handbook	Rim, Donhyun	13	18
Zuo, Wangda	17	21	✓	Membership	Wang, Leon	18	20
Phyfe, Duncan	18	22	✓	Web Page	Dols, William Stuart	19	N/A
Dols, Stuart	17	21	X	Honors and Awards	Lin, Chao-Hsin	16	N/A
Chen, QingYan	17	21	X	ALI	Zhai, John	04	N/A
Xudong Yang	17	21	X				
Zhang, Tim	16	20	X				

Attendance List: See Appendix B

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

Society Liaisons, etc.		PRESENT
Wessel, Dennis	TAC Section Head	✓
Mike Pouchak	RAC Research Liaison	
Meredith, David	Prof. Devt. Committee	
James Aswegan	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)	
Larry Ackers	Handbook Liaison (Fundamental)	
Harris Sheinman	Handbook Liaison (Applications)	

Call to order by Chairman: (Mike Koupriyanov) at 2:15 p.m.

Welcome by Chair

Self-Introductions of attendees

Roll call (Mike Koupriyanov) – voting members

Zhang, Tim (int.)	X	Xudong, Yang (int.)	X
Koupriyanov, Mikhail	✓	Van Gilder, Jim	✓
Bennet, Jamie	X	Phyfe, Duncan	✓
Stuart Dols	X	Leon Wang	✓
Wangda Zuo	✓	Rim, Donghyun	✓
Yan Chen	X	Lin, Charlie	✓

Attendance

- **7 of 9** non-international voting members were present
- **1 of 3** international voting members were present
- **Quorum achieved** without counting the Chair
- Non-voting officers present: n/a

Minutes from Las Vegas meeting

- Call Approval of Houston minutes
- Correction at page 3: Chaor-Hsin Lin’s voting member should be valid until 2021 and he will roll off on 2021.
 - **Vote: (7-0-0)**
 - **Minutes approved**

ASHRAE Staff

- ASHRAE standard committee is looking for experts in reviewing standards in different areas, especially international members.
- Minutes especially research minutes should be forwarded to RL4@ASHRAE.net

Section Head (Wessel, Dennis):

- Potential new TC on resiliency

Announcements

- Need to select next secretary by summer meeting: Information is released and call for volunteers
- ASHRAE’s policy on contacting external parties
- ASHRE’s plan to re-organize the FGs
 - Members expressed their concerns on the reorganization and their negative impacts on the TC operations.
 - Coordinate offline meeting with volunteers are extremely difficult
- Motion: TC 4.10 is against the proposed change. (Vote: 7-0-0)

Membership (Leon wang)

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- Officers (Starting from January 2019)
 - n/a
- Voting Members
 - Rolled off VM in July 2018: James Lo, Chao-Hsin Lin. Chao-Hsin was rolled off mistakenly. To correct it, Chao-Hsin will be rolled on in July 2019.
 - Rolled on VM in July 2018: Duncan Phyfe, Jim Van Gilder, Chao-Hsin Lin

Standards/Guidelines ()
 N/A

Research (Charlie Lin)

The research subcommittee met on Sunday (01/13) at 5:00-6:00 pm. There were 20 attendees in the meeting. Revolving submission deadlines: March 15, May 15th, August 15th, and December 15th.

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

Project s	PMS	Title	Status
1675-RP	Jim, Mark, John, (Greg), Wangda	Guidance for CFD Modeling of Data Centers	<ul style="list-style-type: none"> • Experiments will be conducted at Georgia Tech • Server simulators have been ordered and is waiting for production and shipping • PMS believe that at least 2 in-person meetings are needed. Thus, a 1-year non-cost extension is needed. • Motion: TC 4.10 authorizes to reinstate the funding to the contractor • Vote: 6-0-1 (Charline the contractor abstains) • Motion: Grand a one-year non-extension to the RP-1675 to 3/31/2020. • Vote: 6-0-1 (Charline the contractor abstains)
Bidding	PMS	Title	Status
			No project for bidding this time
WSs	Author(s)	Title	Status
1744	Malcolm Cook, James Lo, Jordan Clark, Duncan, and Mike	Guidelines for Accurate CFD Modeling of Natural Ventilation	<ul style="list-style-type: none"> • Co-authors will revise the RTAR and send it to Malcolm for his review. Charlie to follow with the authors • James Lo indicates withdraw from co-authorship due to new ASHRAE rule for author-bidder conflict
1827	Ray Horstman	Particle Inhalation Modeling of Aircraft Cabins as Sparse Non-	<ul style="list-style-type: none"> • Motion: TC4.10 vote to approve the re-submission of the WS

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RTARs	Author(s)	Title	Status
		uniform Spaces Phase I	<ul style="list-style-type: none"> • Vote: 7-0-0
1828	Chao-Hsin Lin, James	Flow Characteristics of Installed Flex Ducts	<ul style="list-style-type: none"> • RTAR submitted to RAC 05/15/2017, not accepted • Chao-Hsin attended TC 5.2 meeting for co-sponsorship • to be revised per TC 5.2 comments
New	Ray Horstman	Compensating for Sky Temperature Using Indoor Environmental Modeling of Environmental Test Chambers	<ul style="list-style-type: none"> • Was not submitted to RAC Liaison suggestions • Revised version received with a new title and clarified scope. • More discussions are needed. • Charlie to communicate with Ray about it.
New	Donghyun Rim, Anthony Fontanini, Leon	Constructing Surrogate and Reduced Order Models for Stratified Flows	<ul style="list-style-type: none"> • RTAR drafted 06/25/2017 • Revision to be done based on discussions • To be sent to TC 4.10 members
New	Duncan Phyfe, Tengfei (Tim) Zhang	Water Vapor Condensation on Building Skins Considering Seasonal and Diurnal Meteorological Condition	<ul style="list-style-type: none"> • Discussed in the meetings • To be revised
New	Shichao Liu, Leo Wang, Mohammad Heidarinejad	Thermal comfort and air quality enhancement with ceiling fans integrated with mechanical or natural ventilation systems	<ul style="list-style-type: none"> • RTAR drafted 01/08/2019 • Discussed in Atlanta meeting • To be revised
New	Jim VanGilder	Indoor Environmental Modeling with an Enhanced Potential Flow Model	<ul style="list-style-type: none"> • RTAR on hold due to patent related reasons • To talk to Mike Vaugh

Co-Sponsorships on RTAR/WS

- n/a

New Ideas:

- Radiation model in CFD, possible co-sponsorship from TC 6.5. (Mike Koupriyanov, Reza Ghias). RTAR to be developed.
- Mixed mode ventilation: CFD and thermal comfort (Mahroo Eftekhari). RTAR will be developed. Malcolm to contact Mahroo.

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- Ventilation effectiveness by SSPC 62.1, looking for co-sponsor with TC 4.10, possible RTAR in the next couple of weeks (Malcolm).
- CFD modeling of chemical reaction in building. With experimental data. (Donghyun, Atila, Shamia). RTAR to be developed.
- Benchmark cases for CFD (Jim, Mike, James, Duncan). Being discussed.
- Open source CFD (Jim, Mike). To be worked on after completion of handbook.

Handbook (Donghyun Rim)

The Handbook subcommittee met on Sunday (01/13) from 3:00 to 4:00 pm. There were **10** attendees.

- The Application chapter is going to be published soon.
- Fundamental chapter will be revised and is due on July 31, 2019.

Program (James VanGilder)

The Program Subcommittee met on Sunday (01/13) from 4:00-5:00pm.

Houston, Summer 2018			
Session Type	Session Title	Session Chair	Speakers
Seminar	Challenge of Using Open Source CFD tools Seminar 28: Monday 9:45-10:45	Mike Koupriyanov	Wangda Zuo (FFD) Duncan Phyfe (OpenFOAM) Bruno Perazzo (CONTAM)
Seminar	Modeling Megastructures, Arenas, etc. Seminar 34: Monday 11:00-12:00	Duncan Phyfe	Leon Wang (Tunnel) Mike Koupriyanov (Large Lobby)
Seminar	Transient Temperature Changes in the Data Center: Should We Be Worried? Seminar 59: Tuesday 11:00-12:30	Nick Gangemi	Jim VanGilder (Power Failure) Kourosh Nematı (Air/water-side failure) Mark Seymour (When needed)

Kansas City, Summer 2019			
Session Type	Session Title	Session Chair	Speakers
Seminar	Balancing energy and effectiveness Originally planned for Atlanta (Track 6)	Gang Tan	Mark Seymour (data center) Wangda Zuo (HVAC thermostat) Wangda Zuo (Data Center) Jamie Bennett Xudong Yang (Dynamic energy consumption)
Seminar	Modeling Transient Events Part 1: External Factors Which Affect the Indoor Environment	Duncan Phyfe	Wangda Zuo (Modelica, data center) James Lo (wind effects) Duncan Phillips (external effects) Mohamed Heidarinejad (parking garage) Yang-Seon Kim
Seminar	Modeling Transient Events Part 2: The Indoor Environment	Duncan Phyfe	Duncan Phillips (building ventilation) Jim VanGilder (Data center CRAH thermal mass) Leon Wang (PCM Thermal storage, commercial buildings)

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			Donghyun Rim student (chemical reactions, prefer winter)
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Orlando, Winter 2020			
Session Type	Session Title	Session Chair	Speakers
Seminar	Modeling Reactive Surfaces in Indoor Environments	Wangda Zou	Gang Tan Donghyun Rim Duncan Phyfe Atila Novoselac
Seminar	Aircraft Cabins	Leon Wang	Mo Hosni Jamie Bennett Ray Horstman Yan Chen Tim Zhang
Seminar	Chilled Beams	Reza Ghias	Mike Koupriyanov John Zhai Yan Chen Jim VanGilder
Seminar	Revisiting good engineering judgement Old School CFD, modeling judgment, Moore's Law, 2D applications, only the necessary physics	Mohamed Heidarinejad	Duncan Phyfe Duncan Phillips Mark Seymour

Future Conferences			
Session Type	Session Title	Session Chair	Speakers
Seminar	Modeling Melting and Freezing	Ez Khalifa	Gang Tan (TEC, phase change) Duncan Phyfe
Seminar	Ventilation Effectiveness Definition Confusion (Co-Sponsor with TC5.3 and MTG-ACR [Mike K.])	Malcolm Cook	Kishor Khankari (MTG Chair) Mike Koupriyanov Duncan Phillips Kishor Khankari
Seminar	Urban Microclimate Impact on Buildings/Indoor Environment		Leon Wang Mohamed Heidarinejad

Deadlines

Conference	Type	Seminar	Conference Paper Abstract Technical Paper	Conference Paper
Kansas City 2019	Summer	Feb 8, 2019	Aug 2018	Dec 2018
Orlando 2020	Winter	Aug 2019	Mar 2019	Jul 2019
Austin 2020	Summer	Feb 2020	Aug 2019	Dec 2019

Web site activity (Stuart Dols):

- N/A

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*
- TC2.6 *Sound and Vibration Control*
- TC4.3 *Ventilation Requirements and Infiltration* – Leon Wang
- TC4.7 *Load Calculation and Energy Modeling*
- TC5.3 *Room Air Distribution* - John Zhai
- TC5.6 *Control of Fire and Smoke* – Kai Kang
- TC9.2 *Industrial Air Conditioning and Ventilation*–Duncan Phyfe
- TC9.3 *Transportation* - Ray Horstman
- TC9.6 *Healthcare Facilities* – James Mcneil
- TC9.9 *Mission Critical Facilities* – Jim VanGilder
- Standard 55 *Thermal Environmental Conditions for Human Occupancy*
- Standard 62.1 *Ventilation for Acceptable Indoor Air Quality* – James Lo
 - New 62.1 revision for 2019 will include revised natural ventilation procedure which provides better guidelines in engineered systems. It is currently under public review.

- TC 5.8 in merged into TC 9.2

Honors and Awards (Chao-Hsin)

Nominate Jensen for research award

New Business

N/A

Agenda Suggestions for Next Meeting

N/A

Call to adjourn by chair: (Mike) at 4:13 p.m. Vote 7-0-0.

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.

Appendix B: Attendance list

Name	Affiliation	Email
Chao-Hsin Lin	The Boeing Company	chao-hsin.lin@boeing.com
Reza Ghias	Rockville	rghias@gmail.com
Eric Garrison	University of Tennessee Knoxville	egarris4@vols.utk.edu
Wei Tian	Schneider Electric	wei.tian@schneider-electric.com
Mohammad Heidarinejad	Illionis Institute of Technology	muh182@iit.edu
Sammy Meleika	Texas A&M University	smeleika@tamu.edu
Chao Ding	Lawrence Berkeley National Lab	chaoding@lbl.gov
Jeff Franklin	Airflow Sciences Corporation	jfranklin@airflowsciences.com
Yang-Seon Kim	Wichita State University	yang-seon.kim@wichita.edu
Meng Kong	Syracuse University	mkong01@syr.edu
Youngbo Won	Penn State University	yxw311@psu.edu
Chunyi Wang	Drexel University	cw497@drexel.edu
Yun Zhang	Drexel University	yz599@drexel.edu
Seungkoo Kang	CDC/NIOSH	ojk3@cdc.gov
Bruno P. P. Barbosa	Fiocruz (Brazil)	bruno.perazzo@fiocruz.br
Mohammadhasan Fathollahzadeh	Colorado School of Mines	mfathollahzadeh@mines.edu
Matthew Brandt	Colorado School of Mines	mabrandt@mymail.mines.edu
Leon Wang	Concordia University	leon.wang@concordia.ca
Duncan phyfe	Alden	dphyfe@aldenlab.com
Wangda Zuo	University of Colorado Boulder	wangda.zuo@colorado.edu
Donghyun Rim	Penn State University	drim@psu.edu
Cheng-Xian (Charlie) Lin	Florida International University	lincx@fiu.edu
Mike Koupriyanov	Price Industries	MikeK@priceindustries.com
Jim VanGilder	Schneider Electric	jim.vangilder@schneider-electric.com

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