

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

1791Tullie 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 22, 2018		LOCATION:	Chicago, IL			
DATE ISSUED:	March 23, 2018		RECORDED BY:	James Lo			
VOTING MEMBERS	TERM		PRESENT	OFFICERS		TERM	
	On	Off				On	Off
Zhang, Tim	16	20	✓	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	16	20	✓	Programs	VanGilder, Jim	17	19
Ghias, Reza	16	20	X	Research	Lin, Charlie	17	19
Rim, Donghyun	17	21	✓	Handbook	Lo, James	13	18
Zuo, Wangda	17	21	✓	Membership	VanGilder, Jim	18	20
Lin, Chao-Hsin	17	21	✓	Web Page	Lo, James	13	N/A
Dols, Stuart	17	21	X	Honors and Awards	Lin, Chao-Hsin	16	N/A
Chen, QingYan	17	21	✓	ALI	Zhai, John	04	N/A
Xudong Yang	17	21	✓				
Lo, James	14	18	✓				

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.)	✓	Xudong, Yang (int.)	✓
Koupriyanov, Mikhail	✓	Lo, James	✓
Bennet, Jamie	X	Lin, Chao-Hsin	✓
Stuart Dols	X	Ghias, Reza	X
Wangda Zuo	✓	Rim, Donghyun	✓
Yan Chen	✓	Lin, Charlie	✓

Attendance

- **7 of 10** non-international voting members were present
- **2 of 2** international voting members were present
- **Quorum achieved** without counting the Chair
- Non-voting officers present: Jim VanGilder

Minutes from Las Vegas meeting

- Call Approval of Las Vegas minutes
 - **Vote: (9-0-0)**
 - **Minutes approved**

ASHRAE Staff

- ASHRAE standard committee is looking for experts in reviewing standards in different areas, especially international members.

Section Head (Wessel, Dennis):

- Potential new TC on resiliency and disaster prevention
- ASHRAE 125 Anniversary Historical session for Houston Summer meeting, due 3/31/2018

Announcements

- TC should reaffirm the mission statement/scope every few years and vote on it
- Online roster update is now available

Membership (Jim VanGilder)

- Officers (Starting from July 2018)
 - Donghyun Rim will replace James Lo as Application Chapter Chair starting July 2018. James remains until then due to the completion of the application handbook chapter.
 - Reza Ghias can no longer participate in ASHRAE meetings, Jim VanGilder acts as membership chair instead for this meeting. Leon Wang will replace Reza starting in Houston Meeting.
- Voting Members
 - Rolling off (July 2018): James Lo
 - Potentially to replace Reza with Duncan Phyfe, also need to replace James

Standards/Guidelines (Mike Koupriyanov)

Open discussion – develop standard for CFD codes similar to standard 140 (Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs) developed by TC 4.7. Membership generally thought it is a good idea but the specifics of the standard are hard to nail down, similar to the effort of the application handbook chapter.

Research (Charlie Lin)

The research subcommittee met on Sunday (01/21) at 5:00-6:00 pm. There were 16 attendees in the meeting. Note: Revolving submission deadlines: **May 15th**, **August 15th**, and **December 15th**.

Current Projects

Projects	PMS	Title	Status
RP-1675	Jim VanGilder, Mark Seymour, Wangda Zuo, John Groenewold, Greg Jeffers	Guidance for CFD Modeling of Data Centers	<ul style="list-style-type: none"> Lab testing to be subcontracted to another institution TC voted (9-0) to approve subcontracting

Proposals in Progress

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"> James will follow with Malcolm on the specifics Plan to submit WS for 8/15/2018 deadline
RTARs	Author(s)	Title	Status
1827	Ray Horstman	Particle Inhalation Modeling of Aircraft Cabins as Sparse Non- uniform Spaces Phase I	<ul style="list-style-type: none"> RAC: accept with comments Revised, and submitted to RL. Waiting for RL response
1828	Chao-Hsin Lin	Flow Characteristics of Installed Flex Ducts	<ul style="list-style-type: none"> Jamie and Chao to develop this further
New	Ray Horstman	Compensating for Sky Temperature Using Indoor Environmental Modeling of Environmental Test Chambers	<ul style="list-style-type: none"> No new discussion Ray was not present to lead discussion
New	Anthony Fontanini, Leon Wang, Donghyun Rim	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
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 Vaughn

Co-Sponsorships on RTAR/WS

- Co-Sponsor SSPC 62.1 “Emission Rates of Volatile Organic Compounds in Commercial Buildings” (Author: Lisa Ng). Similar to RP-1596. Xudong is interested.
- Co-sponsor WS 1748 “Assess and Implement Natural and Hybrid Ventilation Models in Whole-building Energy Simulations (Phase 2)” (led by TC 4.7, Authors: Tony Fontanini, Joe Huang). The

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WS has received comments from RAC for revision/re-submission. To be voted and submitted in Houston.

- Co-sponsor RTAR “Improving Hospital Operating Room Air Distribution using Alternative Unidirectional Diffusers and Air Curtain Systems” (led by TC 9.6). Information cited from TC 9.6 Chicago meeting minutes: “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. Mike: TC 5.3 co-sponsorship was sought as well.
- Co-sponsor “WS1730 – 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). Still in discussions, 1st draft WS is written and is targeted for vote in TC 4.4 in Las Vegas. Project title changed. Anthony to check with TC 4.4 to see whether TC 4.10 co-sponsorship is still needed. No CFD needed.

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.
- Right velocity for plug flow (Jamie Bennett), industrial painting process, will start the RTAR development after Long Beach meeting.
- 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).

Handbook (James Lo)

The Handbook subcommittee met on Sunday (01/21) at 3:00-4:00 pm. There were **8** attendees.

- Discussion on one review request from an anonymous submitter. The official response to the request is as followed: “The TC believes the review request is misguide as the **fundamental** handbook chapter in reference should not include specific devices, in this case, unvented combustion appliance. This, however, can be addressed as an example in application handbook.” Per Mark Owens’ email, since the submitter provided no contact information, no formal response is required from ASHRAE nor the TC.
- All examples are due 3/15/2018
- James Lo to complete draft for subcommittee distribution and edits by 4/30/2018
- Distribution to VMs by 5/30/2018
- Need to vote on it during Houston Meeting
- Final Draft due to ASHRAE 7/01/2018

Program (James VanGilder)

The Program Subcommittee met on Sunday (01/21) from 4:00-5:00pm. The submission deadline for Chicago seminars is August 1, 2017.

ASHRAE Chicago, Winter 2018			
Session Type	Session Title	Session Chair	Contributing Authors
Seminar	CFD Modeling throughout the Building Lifecycle (Tuesday, 1:30 PM - 3:00 PM)	Jinchao Yuan	Mark Seymour Jamie Bennett Duncan Phyfe
Seminar	Using Optimization for Airflow Management in Data Centers and Operating Rooms (Wednesday, 8:00 AM - 9:30 AM)	Jim VanGilder	Charlie Lin Ramin Rezaei Jim VanGilder Mehran Salehi

ASHRAE Houston, Summer 2018			
Session Type	Session Title	Session Chair	Speakers
Seminar	Faster, Cheaper, More Accessible: Reduced Order Modeling of Indoor Environments (resubmission)	Jim VanGilder	Dustin Demetriou Tim Zhang Wangda Zuo Yan Chen Leon Wang
Seminar	High CO ₂ (other contaminants) levels in schools (resubmission)	Donghun Rim	Mike Koupriyanov Atila Novoselac Brian Meneghan Duncan Phyfe Xudong Yang Ramin Rezaei
Seminar	Inverse Modeling	Leon Wang	John Zhai Tim Zhang (HVAC Design) Yan Chen (HVAC design)

ASHRAE Atlanta, Winter 2019			
Session Type	Session Title	Session Chair	Speakers
Seminar	Open Source vs. Commercial CFD tools	Mike Koupriyanov	Leon Wang (FDS) Jason DeGraw James McNeil Stuart Dols Yan Chen (OpenFOAM) Duncan Phyfe (OpenFOAM, Atlanta)
Seminar	Modeling Reactive Surfaces in Indoor Environments	Ez Khalifa	Gang Tan Donghyun Rim Duncan Phyfe Atila Novoselac (Atlanta)
Seminar	Balancing energy and effectiveness	Gang Tan	Mark Seymour (data center) Wangda Zuo (HVAC thermostat) Jamie Bennett
Seminar	Modeling Megastructures, Arenas, etc. Leon: Tunnel Mike: Large lobby	Mike Koupriyanov	Leon Wang (Tunnel) Mike Koupriyanov (Large Lobby) Duncan
Seminar	Modeling transient events for the indoor environment	Duncan Phyfe	Jim VanGilder (data center thermal/flow network) Wangda Zuo (HVAC control)

			Mike Koupriyanov Office, radiant slab) Donghyun Rim (chemical reactions) James Lo (wind) Mark Seymour (data center CFD) Duncan (Industrial)
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Future Conferences			
Session Type	Session Title	Session Chair	Speakers
Seminar	Aircraft Cabins (Kansas City 2019)	Jamie Bennett	Jamie Bennett Ray Horstman Yan Chen Tim Zhang
Seminar	Chilled Beams	Mike Koupriyanov	Mike Koupriyanov
Seminar	Modeling Melting and Freezing	Ez Khalifa	Gang Tan (TEC, phase change)

Deadlines

Conference	Type	Seminar	Conference Paper Abstract	Full Technical Paper	Final Conference Paper
Houston 2018	Summer	Feb 9 2018	Aug 28 2017	Dec 2017	Aug 28 2017
Atlanta 2019	Winter	Aug 2018	Mar 2018	Jul 2018	Mar 2018
Kansas City 2019	Summer	Feb 2019	Aug 2018	Dec 2018	Aug 2018

Web site activity (James Lo):

- Nothing to report

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*

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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.

Honors and Awards (Chao-Hsin)

N/A

New Business

VMs voted 9-0-0 in favor to endorse the ASHRAE Conference Track on Optimization in HVAC&R from TC 1.13 for the 2019 summer conference.

Agenda Suggestions for Next Meeting

N/A

Call to adjourn by chair: (Mike) at 4:05 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.

Appendix B: Attendance list

Name	Affiliation	Email
Donghyun Rim	Penn State	drim@psu.edu
Yan Chen	Purdue U	yanchen@purdue.edu
Wangda Zuo	University of Colorado Boulder	wangda.zuo@colorado.edu
Gang Tan	University of Wyoming	gtan@uwyo.edu
Cheng-Xian (Charlie) Lin	FIU	lincx@fiu.edu
Xudong Yang	Tsinghua University	xyang@tsinghua.edu.cn
Jason DeGraw	NREL	jason.degraw@nrel.gov
Jeff Franklin	Airflow Sciences Corporation	jfranklin@airflowsciences.com
James Sweeney	Texas A&M Uni	jsweeney@tamu.edu
Jinchao Yuan	University of Idaho	jcyuan@uidaho.edu
Ali Fallahi	Lawrence Tech University	afallahi@ltu.edu
Shamia Hoque	University of South Carolina	hoques@cec.sc.edu
James Lo	Drexel University	james.lo@drexel.edu
Jim VanGilder	Schneider Electric	jim.vangilder@schneider-electric.com
Leon Wang	Concordia University	leon.wang@concordia.ca
duncan phyfe	Alden	dphyfe@aldenlab.com
Anuj Mistry	Daikin US Corporation	anuj.mistry@daikin.com
Shen Yang	Tsinghua University	yangshen0925@yeah.net
Mohammad Heidarinejad	Illinois Institute of Technology	muh182@iit.edu
Elizabeth Balke	Taylor Engineering	ecbalke@gmail.com
Tim Zhang	Dalian U Tech, Tianjin U	tzhang@dlut.edu.cn
Chao-Hsin Lin	Boeing Company	Chao-Hsin.Lin@Boeing.com
Mike Koupriyanov	Price Industries Ltd.	MikeK@priceindustries.com
Atila Novoselac	UT at Austin	atila@mail.utexas.edu