



MINUTES
ASHRAE TC 4.7 ENERGY CALCULATIONS – MAIN MEETING
KCCC ROOM 2215A
KANSAS CITY, MO
TUESDAY, JUNE 25 2019, 6:00 PM – 8:30 PM

Note: TC 4.7 inadvertently had two voting members from the same organization (NREL) on the roster: Judkoff & Fontanini. During this meeting, one of the two abstained from official votes (as noted below).

MOTIONS:

- **Approve agenda and Atlanta meeting minutes. Motion: Neymark, 2nd: Pruett 8-0-1 CNV (Judkoff abstaining)**
- **TC 4.7 add the contents of an occupancy guideline to the Energy Calculations chapter of the Handbook. Motion: Balbach, Second: Fontanini. 6-2-2 (Judkoff and Crawley abstaining)**
- **TC 4.7 recommends the development of a new standard with the Title, Purpose, and Scope provided during the discussion. Motion: Crawley, Second: Neymark. 8-0-1 CNV (Fontanini abstaining)**
- **TC 4.7 Nominates Supriya Goel as the chair for the proposed standard. Motion: Crawley, Second: Neymark. 8-0-1 CNV (Fontanini abstaining)**
- **Adjourn. Motion: Fontanini, Second: Neymark**

ACTION ITEMS:

- **Balbach to address dual membership from NREL with emergency roster change.**

1. **Reciting of Code of Ethics Commitment and Introductions** (5 minutes) Balbach

Commitment to the ASHRAE Code of Ethics: In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, and we shall avoid all real or perceived conflicts of interest.

2. **Call of Voting Members** (2 min) Kruis
10 present 👍, 1 absent: Muehleisen 🙋

3. **Review TC 4.7 Scope:** Balbach

TC 4.7 is concerned with identifying, evaluating, developing, and recommending procedures for calculating energy performance of the built environment.

4. **Accept Agenda & approve Atlanta meeting minutes** (8 minutes) Balbach

MOTION: Approve agenda and Atlanta meeting minutes. Motion: Neymark, 2nd: Pruett 8-0-1 CNV (Judkoff abstaining)

5. **Announcements/Liaisons** (5 minutes) Balbach

- Dennis Wessel (Section 4 Liaison)
- Mike Pouchak (Research Liaison)
- Bass Abushakra (Handbook Liaison)

Idea about adding "Guideline" as 5-10 pages to chapter.

MOTION: TC 4.7 add the contents of an occupancy guideline to the Energy Calculations chapter of the Handbook. Motion: Balbach, Second: Fontanini. 6-2-2 (Judkoff and Crawley abstaining)

Reasons for No votes:

Neymark: It would be good to have more information on content and worried this will lead to imbalance. Handbook subcommittee should handle this.

Balbach: Needs more information.

- Nominating ASHRAE Fellows: Haberl

6. **Chair Remarks** (5 minutes) Balbach

- Updated ASHRAE Strategic Plan

- Highlights from TC Chairs Breakfast (Update, FG Re-organization)
- 2019 ASHRAE BPAC Conference September 25 – 27, Denver, CO
- 2020 Building Performance Analysis Conference and SimBuild, Chicago, IL
- Future conferences - Chicago, Phoenix, Las Vegas

6+ ½ Discussion of proposed new standard

Goel

“Evaluating Ruleset Implementation in Building Performance Modeling Software”

MOTION: TC 4.7 recommends the development of a new standard with the Title, Purpose, and Scope provided during the discussion. Motion: Crawley, Second: Neymark. 8-0-1 CNV (Fontanini abstaining)

MOTION: TC 4.7 Nominates Supriya Goel as the chair for the proposed standard. Motion: Crawley, Second: Neymark. 8-0-1 CNV (Fontanini abstaining)

7. **Membership** (5 minutes)

Balbach

- Voting - currently have 11 Voting members (up to 18 is allowed)
 Jeff Haberl and Dru Crawley to roll off On Jun 30
 Neal Kruis and Alamelu Brooks to roll on July 1st.

ACTION: Balbach to address dual membership from NREL with emergency roster change.

- <http://tc0407.ashraetcs.org/membership.php>

8. **Subcommittee Reports**

8.1 Multiscale Building Energy Modeling (10 minutes)

Judkoff

Committee action needed to support development of new ASHRAE Standard for Rulesets

8.2 Data-Driven Modeling (10 minutes)

Fontanini

8.3 Simulation and Component Models (10 minutes)

Huang / Lee

Committee action needed to accept recommendation of PMS of replacement chair for 1661 RP PMS Tim McDowell

8.4 Research (15 minutes)

Haberl

8.4.1. Research Projects

- Upcoming RTAR's and WS's submission to RAC dates:
 - o August 15: for RAC Fall meeting consideration
 - o December 15: for RAC Winter meeting consideration
- Completed Projects
- Awarded Projects
- Approved RTAR
- Approved WS
- Returned WS with Comments
- Rejected RTAR to be Revisited
- WS, RTAR, Requests for Co-sponsorship
- New RTAR

8.5 Handbook (10 minutes)

Pruett

- 8.6 Program (15 minutes) Kastl
- 8.7 Historical (5 minutes) Haberl
- 8.8 Standards (15 minutes) Neymark
- 8.9 Web Site (5 minutes) (<https://tc0407.ashraetcs.org/>) New

9. Related activities reports (10 minutes)

- SPC 191 Standard for the Efficient Use of Water in Building and Mechanical Systems
- MTG IAST, Impact of ASHRAE Standards And Technology On Energy Savings/ Performance
- MTG OBB Occupant Behavior in Buildings
- MTG BIM Building Information Modeling
- MTG ACR Air Change Rates (Contact Dennis Knight to join this MTG)
- TC 1.5 Emerging Technology Applications
- TC 2.8 Building Environmental Impacts and Sustainability
- TC 4.1 Load Calculation Data and Procedures
- TC 4.2 Climatic Information
- TC 4.3 Infiltration & Ventilation Requirements
- TC 4.5 Fenestration
- TC 6.5 Radiant Heating and Cooling
- TC 7.5 Smart Building Systems
- TC 7.6 Building Energy Performance
- TC 9.12 Tall Buildings
- Guideline 14
- 90.1
- BuildingSMART (formerly IAI International Alliance for Interoperability)
- IBPSA: USA, Canada, World
- IEA Annex 66 Occupant Patterns

- 10. Awards Nomination (5 min) Balbach
- 11. New business Balbach
- 11. Adjourn Balbach

MOTION: Adjourn. Motion: Fontanini, Second: Neymark

Kansas City 19	Atlanta 19	Houston 18	Last Name	First Name	Affiliation	E-mail	Category	YEA
			Abdel Salam	Ahmed	Nortek	ahaabdelsalam@gmail.com		X
			Abdelsalam	Mohammed R. H.	Enbridge	mohamed_rany2008@yahoo.com	PCM	X
X	X	X	Abushakra	Bass	U.S. Military Academy	datadigm-analytics@outlook.com	CM	
X			Adair	Daric	Henderson Engineers Inc	daric.adair@gmail.com	PCM	X
X	X	X	Adams	Mark	ORNL	adamsmb@ornl.gov		X
			Ali Younes	Hassan		hassan@griffin-consultants.com		X
			Alkhalilil	Rami	Intelega Energy Solutions	rami.alkhalil@gmail.com		
			Ananthachar	Vinay	Green Banyan Consulting	vinay.ananthachar@gmail.com	CM	
			Anderson	JR	Anderson Engineering	JRHazel@BellSouth.net		
			Archibald	A.	Alabama Solar Association	archi42@gmail.com		
X	X		Armstrong	Peter	Masdar Institute	parmstr@mit.edu		
			Asaee	S. Rasoul	Carleton Universityq	asaee@dal.ca	PCM	X
			Ashukov	Artem	Remak a.s	green.ashukov@gmail.com		
			Axley	James	Yale School of Architecture	james.axley@yale.edu	CM	
			Babriya	Vipulkumar	Steven Winter Associates	vbabriya@swinter.com	PCM	X
			Bae	Nuri	Univ. of Michigan	nuri@unich.edu		
			Bahnfleth	William	Penn State Univ	wbahnfleth@psu.edu	CM	
	X		Baines	Mark	UL	mark.baines@ul.com		
			Baker	Chris	The Weidt Group	chrisb@twgi.com	CM	
			Bakos	Panagiotis		bakospan@gmail.com		X
			Balaras	Costas	NOA	costas@noa.gr	CM	
X	X	X	Balbach	Chris	PSD	cbalbach@psdconsulting.com	VM	
X	X		Baltazar	Juan-Carlos	TAMU	jcbaltazar@tamu.edu	PCM	
			Bannister	Carsen	National Research Council, Canada	carsen.banister@nrc-carc.gc.ca		
X	X	X	Barnaby	Chip		chipbarnaby@gmail.com	CM	
			Basarkar	Mangesh	LBNL	mangesh.basarkar@pge.com	CM	
			Bauman	Fred	UC Berkeley	fbauman@berkeley.edu	CM	
			Bdawi	Shahed	Seapal Trading & Investment	shahdsalah94@gmail.com	PCM	
			Beausoleil-Morrison	Ian	Carleton Univers.	ian_beausoleil-Morrison@carleton.	CM	
X			Bhandari	Mahabir	ORNL	bhandarims@ornl.gov		
			Bhargava	Akshay	TRC Worldwide Engineering MEP	abhargava@trcww.com	PCM	X
			Bilderbeck	Mike	Pickering Firm	mbilderbeck@pickeringfirm.com		
			Bist	Nikhilesh	CEPT University	nikhilesh241192@gmail.com	PCM	X
			Black III	Albert	McClure Engineering	ablack@mcclureeng.com	CM	
			Bosworth	David	BuildLab	bosworth@buildlab.net		
			Bourassa	Norman	LBNL	njbourassa@lbl.gov	CM	
			Brandemuehl	Michael	Colorado	michael.brandemuehl@colorado.ec	CM	
			Briscoe	Casey	Ingersoll Rand	Casey.Briscoe@trane.com	CM	X
X	X		Brooks	Alamelu	ICF International	alamelub@gmail.com		
			Brophy	Andy	SSR	abrophy89@gmail.com		
			Bruning	Steven	Newcomb & Boyd	sbruning@newcomb-boyd.com	CM	
			Bucking	Scott	Carleton Univers.	scott.bucking@carlton.ca		
X	X	X	Buckley	Liam	IES Ltd.	liam.buckley@iesve.com	CM	X
			Butler	Trevor		butler.engineer@gmail.com	PCM	
	X		Camit	Rex	Seneca College	rcamit@myseneca.ca	PCM	
			Carling	Par	EQUA	par.carling@equa.se		
X	X	X	Carpenter	Patrick	Fac Perf Engr	facperfeng@comcast.net	CM	
X			Caton	Nick	Schneider Electric	nicholas.caton@se.com		
			Chandler	Julie	DNV GL	julie.chandler@dnvgl.com	PCM	
			Chen	Yixing	LBNL	Yixingchen@lbl.gov		
			Chidester	James	Batson Inc.	jchidester@batson.com	CM	
			Chigullapalli	Sruti	Intel	sruti.chigullapalli@intel.com	PCM	X
			Cho	Heejin	Mississippi State Univ	cho@me.msstate.edu	CM	X
			Cho	Soolyeon	NC State U.	scho3@ncsu.edu		
			Christian	Jeff	ORNL	christianje@ornl.gov	CM	
			Chude	Ricson		ricson.chude@sce.com	PCM	
			Claridge	David	Texas A&M University	dclaridge@tamu.edu	CM	
			Clark	Jordan	UT-Austin	jdclark@utexas.edu		
			Cockerham	Keith	Loring Engineers	kcockerham@DLBassociates.com	CM	
			Coffey	Brian		brian.edward.coffey@gmail.com	CM	
			Colliver	Donald	University of Kentucky	dcolliver@uky.edu	CM	
			Collyer	Breesa	PG&E	brk8@pge.com		
X			Cook	Malcolm	Loughborough Univ	malcolm.cook@lboro.ac.uk	VM	
			Cornick	Steve	Nat'l Research Council Canada	Steve.Cornick@nrc.ca		
X	X		Correa	Jose	AME Group	josecorrea@amegroup.ca		
X	X	X	Crawley	Dru	Bentley	dru.crawley@bentley.com	VM	
			Cumali	Zulfi	Energy System	zulfi@cumali.com	CM	
X			Curcija	Charlie	LBNL	dccurcija@lbl.gov	PCM	
			Dahdolan	Mohd-Eslam	U. of Nebraska	mdahdolan@unomaha.edu		
			Dahlhausen	Matthew	University of Maryland	matthew.dahlhausen@gmail.com	PCM	X
			Davidovic	Branko		branko.davidovic@yandex.com	PCM	
			Davidson	Tom	DLB Associates	t davidson@dlbassociates.com		
			Degelman	Larry	TAMU	ldegelman@suddenlink.net	CM	
X	X	X	DeGraw	Jason	NREL	jason.degraw@nrel.gov	CM	

			Delgado	Omar	Amec Foster Wheeler	odelgado@enermechpr.com	PCM	
			Dempsey	Patrick	Cannon Design	pdempsey@cannondesign.com	CM	X
X			Denson	Clark	SSR	cdenson@ssr-inc.com		
			Deringer	Joseph	Building Science Analytics	jderinger@su-per-b.org	CM	
			Desai	Arjun		arjun.desai.mtech16@cept.ac.in	PCM	X
			Dong	Bing	UTSA	bing.dong@utsa.edu	CM	
			Dong	Jin	ORNL	dongj@ornl.gov	CM	X
			Duckett	Sarah	Arup	sarah.duckett@arup.com	PCM	X
			Eley	Charles	COMNET	charles@eley.com		
	X		Ellis	Peter	Big Ladder Software	peter.ellis@bigladdersoftware.com	CM	
			Fallahi	Ali	Fraunhofer CSE	afallahi@fraunhofer.org		
			Feng	Jingjuan	Taylor Engineering	dovefeng@gmail.com	PCM	X
			Feng	Wei	LBN L	weifeng@lbl.gov		
			Fine	Jamie	U. of Toronto	jamie.fine@ryerson.ca	PCM	X
			Firrantello	Joseph	PSU	j.firratello@gmail.com		
			Fisher	Dan	Oklahoma State Uni	DFisher@okstate.edu	CM	
X		X	Fontanini	Anthony	NREL	anthony.fontanini@nrel.gov	VM	X
			Frame	Sara	Eaton's Energy Solutions Group	sara.a.frame@eaton.com		
	X		Fridlyand	Alex	Gas Technology Institute	alex.fridlyand@gastechnology.org	PCM	X
			Friedman	Glenn	Taylor Engineering	gfriedman@taylor-engineering.com		
	X		Fu	Yangyang	University of Colorado - Boulder	yangyang.fu@colorado.edu	PCM	X
X	X		Fu	Hongxiang	Texas A&M University	caspera@tamu.edu	PCM	X
			Gallagher	John		j.gallagher@tcd.ie	PCM	X
			Garcia	Felipe	Crothall Healthcare	filipe.garcia@mountsinai.org	PCM	X
			Gardner	Carol	Cobalt Engineering	gems@spiritone.com	CM	
			Garg	Vishal	IIITH	vishal@iiit.ac.ion@uest		
	X		Garrison	Eric	U. of Tennessee Knoxville	egarris4@vols.utt.edu		
			Gentry	Shaw		sgentry@goss-eng.com	CM	
X			Glazer	Jason	GARD Analytics	jglazer@gard.com		
			Gmitter	Nick	DLB Associates	ngmitter@dlbassociates.com		
			Gopal	Raj	Gopal Associates	rgopalrmr@yahoo.com		
			Gowri	Krishnan	Autodesk	krishnan.gowri@autodesk.com		
X			Grahovac	Milica	LBNL	mgrahovac@lbl.gov		
			Griffin	David	Etc Group, LLC	eldergriffin@gmail.com		
			Griffith	Brent			CM	
			Gu	Lixing	FSEC	gu@fsec.ucf.edu		
			Gudeman	Sarah	Morrissey Engineering	sgudeman@morriseyengineering.	PCM	X
X	X	X	Haberl	Jeff	TAMU	jhaberl@tamu.edu	VM	
			Hackel	Scott	Seventhwave	shackel@seventhwave.org	CM	
X			Haddad	Kamel	NRCAN	khaddad@nrcan.gc.ca	CM	
			Han	Guiyuan	PSU	GOH5067@psu.edu		
			Han	Xu	U. of Miami	xhan425@gmail.com		
			Hartley	Doug	Working Buildings	DEHartley@workingbuildings.com		
X			Haves	Philip	LBNL	phaves@lbl.gov	CM	
			Hoffman	Michael	University of Arizona	hoffmanm@email.arizona.edu	PCM	
			Hogan	Byron	Nailor	byronhogan@yahoo.com		
			Hong	Tianzhen	LBNL	thong@lbl.gov	CM	
			Hou	Danlin	U. of Miami	dxh574@miami.edu		
			Howard	Jeff	Kwhours Inc	jhoward@kwhours.com		
X	X	X	Huang	Joe	White Box Techn.	yjuang@whiteboxtechnologies.com	CM	
			Huizar	Antonio	KW Engineering	antonio.huizar@gmail.com	CM	
			Hydras	Kinga	US GSA	kinga.hydras@gmail.com	CM	
			Ignjatovic	Marko	University of Nis	marko.ignjatovic@live.com	PCM	
		X	Im	Piljae	ORNL	imp1@ornl.gov		
			Ingram	Jonathan		jonathan.ingram@pec1.com	PCM	X
			Jain	Swapnil	Design2Occupancy	swapniljain2050@gmail.com	PCM	X
			Jain	Semant	Goodman Mfg	semant.jain@goodmanmfg.com		
			Jarnagin	Ronald		ron.jarnagin@att.net	CM	
			Javed	Hassan	Masdar, Abu Dhabi	hjaved@masdar.ac.ae		
			Jones	Jerold	U. of Texas	jwjones@mail.utexas.edu	CM	
X	X	X	Judkoff	Ron	NREL	ron.judkoff@nrel.gov	VM	
			Judson	Scott	Noresco	sjudson@noresco.com	PCM	
			Jump	David	QUEST	djump@quest-world.com		
			Juratli	Farhan	Nakheel	Farhan.Juratli@nakheel.com	PCM	
			Kamel	Ehsan	New York Inst. Of Technology	ekamel01@nyit.edu	PCM	X
			Karava	Panagioton	Purdue	pkarava@purdue.edu		
X	X	X	Kastl	Brian	AAON	briankastlpe@gmail.com		
			Kelly	George	NIST	GEKelly134@wmconnect.com	CM	
			Kelsey	Jim	KW Engineering	kelsey@kw-engineering.com		
			Kennedy	Stephen	Georgia Power Co.	sdkenney@southernco.com	CM	
			Kennedy	Mike	Mike Kennedy Inc	mikekennedy@energysims.com		
			Kennedy	John	Autodesk	john.kennedy@autodesk.com		
			Khan	Muhammad	Allana Buick & Bers	mkhan@abbac.com	PCM	X
X	X		Kim	Hyojin	Catholic University	kiml@cua.edu	VM	
			Kim	Chul	Texas A&M University	chulkim0503@gmail.com		

			Kingsley	Michael	OBG	michael.kingsley@obg.com	PCM	
			Kinney	Kris	KECG	kinneyecg@gmail.com	CM	
			Klapper	Louis	Antares Group	lklapper@antaresgroupinc.com	PCM	X
			Knebel	David		deknebel@gmail.com	CM	
			Knudson	Russell	Strang Inc	RKnudson@strang-inc.com		X
X	X	X	Kolderup	Erik	Kolderup Consulting	erik@kolderupconsulting.com	CM	
		X	Koran	Bill	SBW Consulting	bill.koran@sbwconsulting.com	CM	
			Kosny	Jan	Fraunhofer CSE	jkosny@fraunhofer.org	CM	
			Kota	Sandeep	Texas A&M University	radhakrishn10@yahoo.com		
X	X	X	Koupriyanov	Mike	Price Industries	Mikek@priceindustries.com	PCM	X
			Krarti	Moncef	U. of colorado	krarti@colorado.edu	CM	
			Kreider	Jan	Kreider & Associates	jfk@well.com	CM	
X	X	X	Kruis	Neal	Big Ladder Software	neal.kruis@bigladdersoftware.com	CM	X
			Kummert	Michael	Polytech Montreal	michael.kummert@polymtl.ca		
			Lau	Josephine	U. of Nebraska	jlau3@unl.edu	PCM	
			Lebrun	Jean	U. De Liege	j.lebrun@ulg.ac.be	CM	
X	X	X	Lee	Edwin	NREL	edwin.lee@nrel.gov	PCM	X
			Lee	Sang Hoon	LBNL	sanghlee@lbl.gov		
			Li	Siwei	Daikin North America	fiona.lee.0911@gmail.com		X
			Li	Zhaoura	UTSA	jl469@myutsa.edu		
X	X		Li	Qi	ANL	qi.li@anl.gov		
X			Lin	Cheng-Xian	Florida Int. University	lincx@fiu.edu		
			Lisenbee	Larry		lrbee@bellsouth.net	CM	
			Liu	Mingsheng	Building Energy Solutions & Technology	mliu@bes-tech.net	CM	
			Liu	Shichao	UT-Austin	liu.shichao@utexas.edu	PCM	
			Liu	Xiaobing	ORNL	liux@ornl.gov		
		X	Long	Nicholas	NREL	nicholas.long@nrel.gov		
			Longbrake	Kyle	Wiley Wilson	klongbrake@wileywilson.com	CM	X
			Lou	Dong	UTRC	luod@utrc.utc.edu	CM	
			Lu	Xing	U. of Miami	terranceluxing@gmail.com		
			Luflok	Peter	7ACTech			
	X	X	Lutz	Jim		jdLutz@hotwaterresearch.net	PCM	
		X	Lyons	Peter	Peter Lyons & Asso.	peter.lyons@fenestralia.com	CM	
			MacCormac	Patrick	Baskervill	pmaccormac@baskervill.com	PCM	X
			MacDonald	Iain	NRC Canada	iain.macdonald@nrc.gc.ca	CM	
X	X		Macumber	Daniel	NREL	daniel.macumber@nrel.gov	PCM	
			Malherek	Elyse	Weidt Group	elysem@twgi.com		
			Malhotra	Mini	ORNL	malhotram@ornl.gov	CM	
X	X	X	McDowell	Tim	TESS	Mcdowell@tess-inc.com	CM	
			McFadden	Galen	UTSA	srj874@gmyutsa.edu		
			McHugh	Jonathan	MEC	jon@nchughenergy.com		
			McNeill	James	Affiliated Engineers	jmcneill@afieng.com		
			Meyer	Jeffrey	Honeywell		CM	
X	X		Miller	Clayton	NUS	clayton@nus.edu.sg		
			Mitchell	John		mitchell@engr.wisc.edu	CM	
			Miura	Mayumi	Azbil Co.	m.miura.pe@azbil.com		
	X	X	Muehleisen	Ralph	Argonne	rmuehleisen@anl.gov	VM	
			Mukhopadhyay	Jaya	U. of Montana	jaya.mukhopadhyay@montana.edu	CM	
			Nall	Daniel		dannall@mindspring.com	CM	
			Nelson	Ron	IMT	ron@imt.org		
X	X	X	New	Joshua	ORNL	newjr@ornl.gov	VM	
X	X	X	Neymark	Joel	J. Neymark & Asso	neymarkj@msn.com	VM	
			Ng	Lisa	NIST	lisa.ng@nist.gov		
			Nino	Victor	Modine Manufacturing Company	v.g.nino@na.modine.com	PCM	
			Norford	Leslie	MIT	lnorford@mit.edu	CM	
			O'Brien	Liam	Carleton University	liam.obrien@carleton.ca		
			O'Keefe	Michael	Big Ladder Software	michael.okeefe@bigladdersoftware.		
			O'Neill	Zheng	Univ. of Alabama	zhengoneill@gmail.com	CM	
			Odea	Shona	DLR Group	sodea@dlrgroup.com	PCM	X
			Oh	Sukjoon	TAMU			
			Ohern	Sean		sohern@exponent.com	CM	X
			Pahade	Akshay	Design2Occupancy	apahade@outlook.com	PCM	X
			Pamoukov	Stoil		spamoukov@msa-phx.com	PCM	X
			Pang	Xiufeng	LBNL	xpang@lbl.gov	CM	
			Paulus	Mitch	Texas A&M University	paulusm@msoe.edu	CM	X
			Pegu	Bishakha	Arizona State Univ	bpegu@asu.edu	PCM	X
		X	Pegues	Jim	Carrier	james.f.pegues@carrier.utc.com		
			Phelan	Jerry	Bayer Material Sci.	jerry.phelan@bayer.com		
			Porst	Kinga	GSA	kinga.porst@gsa.gov		
X	X	X	Pouchak	Michael	RAC Research Liason Section 4	RL4@ashrae.net		
			Premkumar	Siddarth	Gilbert Mechanical	spremkumar@gilbertmech.com	CM	X
			Priyadarshi	Sahil		sahil.priyadarshi.mtech16@cept.ac.in	CM	X
X	X	X	Pruett	John	ZMM, Inc.	jap@zmm.com	VM	
			Ramey	Ron	Aero Building Solutions	ramey.ronald@gmail.com	PCM	X

X	X	X	Rao	Sagar	Affiliated Engineers	sagar.rao@outlook.com		
			Rastogi	Parag	abnco	rastogi.parag@gmail.com	PCM	X
			Reading	Robert	NORESKO	rreading@noresco.com	CM	X
			Reddy	T. Agami	Arizona State Univ	reddyta@asu.edu		
			Rees	Simon	University of Leeds	S.J.Rees@leeds.ac.uk	CM	
			Reid	Joseph	RFS Engineering	joepreid@gmail.com	PCM	X
			Reilly	Sue	Group 14 Eng.	sreilly@group14eng.com	CM	
			Rizvi	Anwar	Hyder Consulting	anwarrazarizvi@gmail.com	PCM	
X			Roth	Amir	DOE	amir.roth@ee.doe.gov		
			Saad	Mohammed R. H.		badruddinsaad14@gmail.com	PCM	X
			Sahlin	Per	EQUA	per.sahlin@equa.se		
			Sanchez	Jamie		jaimesanchezuk@gmail.com		
			Sanyal	Jibo	ORNL	sanyalj@ornl.gov	CM	
			Selin	Markus	EQUA	markus.selin@equa.se		
			Seymour	Mark	Future Facilities	mark.seymour@futurefacilities.com		
			Shah	Dipak		dshah2k@hotmail.com	CM	
	X		Shah	Archan	U. of Colorado	archan.shah@colorado.edu		X
			Sharma	Chandan	FSEC	csharma@fsec.ucf.edu		
			Sheinman	Harris	CTT Liaison	hsheinma@heety.com		
			Shirey	Don	EPRI	don.shirey@epri.com		
			Shrestha	Som	ORNL	shresthas@ornl.gov	CM	
			Shukov	Artem	Remak AS	green.ashukov@gmail.com		
			Siddiqui	Abdullah	Council Engineers	asiddiqui@counselengineers.com	PCM	X
			Singh	Ravindra		rsingh@baltimoreaircoil.com		X
	X	X	Smith	Amanda	University of Utah	amanda.d.smith@utah.edu	CM	
			Smith	Verson	Smith Energy Engineers	vern@smithenergyengineers.com	CM	
			Snyder	Steven	Johnson Controls	steven.c.snyder@jci.com		
			Sobrevilla	Andres	Munters	andres.sobrevilla@munters.com	CM	
			Sommer	Klaus		klaus.sommer@fh-koeln.de	CM	
			Sonderegger	Robert	Itron, Inc.	Robert.sonderegger@itron.com	CM	
			Sowell	Edward	Ayers Sowell Assoc.	ed_c1@efsowell.us	CM	
			Spitler	Jeff	OSU	spitler@okstate.edu	CM	
			Stovall	Therese	ORNL	stovalltk@ornl.gov		
			Strand	Richard	U of I	rkstrand@illinois.edu	CM	
			Studer	Eric	TNZ EnergyConsulting	studer@TNZEnergy.com		
			Subbarao	Kris	PNNL	kris.subbarao@pnnl.gov	CM	
			Sun	Kaiyu	LBNL	ksun@lbl.gov		
			Suslov	Vladimir	Armstrong	vsuslov@armstrongfluidtechnology.	PCM	X
			Swartz	Keith	Energy Center of Wi	kswartz@ecw.org		
			Swenka	Matt	The Weidt Group	matts@twgi.com		
			Syed	Imran		imransyed85@gmail.com		
X			Tabares	Paulo	Colorado School of Mines	tabares@mines.edu		
			Takahashi	Ken		ktakahashi@integralgroup.com		X
			Taylor	Russ	UTRC	taylorrd@utrc.unc.com	CM	
			Theron	Sumayyah	Cyclone Energy Group	sumayyah.theron@gmail.com	PCM	
			Tinkler	Greg		greg@tinkler.us	PCM	
			Traboulsi	Samir	Thermotrade	traboulsi.samir@gmail.com	CM	
			Trcka	Marija	UTRC	trckam@utrc.unc.co		
			Ullah	Tania	NIST	tania.ullah@nist.gov		
			Varela	Ignacio	Heatcraft	ignacio.chaparro@heatcraftprd.com		
			Vawter	Kathryn		kv.vawter@gmail.com		
X	X	X	Villa	Daniel	Sandia National Lab	dlvilla@sandia.gov		
			Walton	George	NIST	gnwalton@verizon.net	CM	
			Walton	Shawn	BGIS	shawn.walton@hotmail.com	PCM	
			Wang	Liping	Univ. of Wyoming	lwang@lbl.gov		
			Wang	Jing	U. of Miami	wjwx1097@miami.edu		
			Wang	Xiujian	U. of Miami	oliverwang624@gmail.com		
			Wen	Jin	Drexel	jinwen@drexel.edu	CM	
			Werner	Luke	ERI	luke@ERIpacific.com		
X		X	Wessel	Dennis	Section Head			
			West	Scott	HFA	scott.west@hfa-ae.com		
X	X	X	Wetter	Michael	LBNL	mwetter@lbl.gov	CM	
			Witte	Mike	GARD Analytics	mjwitte@gard.com	CM	
			Wong	Edmund	Arup	edmund.wong@arup.com		
			Wray	Craig		pharmeng@shaw.ca	CM	
			Wright	John	Loughborough University	j.a.wright@lboro.ac.uk	CM	
			Wright	Burton	Kelly Wright & Associates	buzz@kwmech.com	PCM	

Draft Agenda



TC 4.7 Simulation and Component Models Subcommittee

6:00-7:30 pm, Monday, 24 June 2019
2211 Kansas City Convention Center
Kansas City, MO

6:00 Call to order / introductions / changes to the agenda Huang

Announcement: Edwin Lee to take over as S&C Chair at next meeting

6:15 Research Projects

- **1741-RP** Understanding Fan Coil Components and How They Relate to Energy Consumption and Energy Modeling (TC 5.3, TC 7.7, requesting TC 4.7 co-sponsor) Kruis

work being done by U-Louisiana-Lafayette. Ask for no-cost extension. They are yet to start a 205 representation for fan coils.

- **1769-RP** Experimental Evaluation of the Efficiency of Belt Drives for Fans (Request for co- sponsorship from TC 5.1 Fans. **Status:** TC voted 3-2-2 in St. Louis to co-sponsor, accepted by RAC, awarded Jun 2018, no TC 4.7 co-sponsorship)

- **1661-WS** Development and Validation of Dynamic Models for the Evaluation of Chilled-Water Systems Control Strategies in the ASHRAE Handbook (TC 4.7/ TC 7.5 / TC 1.4) PMS chair or contractor Zuo

Tim McDowell is on PMS. PMSC is no longer at company so no PMS meeting called recently. Debugging their Modelica and will do 18,000 runs. TC 47 should plan to make an official request for new PMSC to be appointed.

ACTION: TC47 motion to full TC to approve a new PMSC

1711-RP (TC 1.4) is related. Jeff Stein is on 1661-RP PMS and likely aware of both efforts.

6:25 Draft Work Statements/RTARs

- **1748-WS** Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulations – Phase 2 (TC 4.7 / TC 4.10) **Status according to ASHRAE Fall Research Plan:** not yet approved, must be approved by Oct 1, 2018 anyone with knowledge
RAC returned in Oct. 2018.

ACTION: Fontannini and Haberl will check in with RAC on Status.

- **1813-RTAR** “Development of an Accuracy Test Method for Residential Attic Duct System Simulations in Whole-Building Energy Simulation Programs”, Rejected by RAC June 2018, still alive? Haberl, Malhotra

ACTION: Fontannini, Huang, and Haberl will work on revising and resubmitting. 👍

- **Xxxx-RTAR** Improved Submodels of Air to Air Energy Recovery Exchangers for Use in Building Energy Modeling Software **Status:** No RTAR has been received from sponsoring TC 5.5 as of Dec. 2016 Dieckmann (from TC 5.5)

ACTION: Remove from agenda

- **Pre-RTAR** Development of a Reference Building Information Model (BIM) for Daylighting Optimization (TC 1.5 / TC 4.7) Haberl

[Haberl is working with PIs from a previous project to work on a RTAR.](#)

7:00 **New Research Topics/Research Plan**

-
- New Research Topics (RTARs and WSs can be submitted 4 times a year—six weeks before Winter and Annual meetings and 1 March/1 August.)

Haberl: Resurrecting methods of modeling legacy passive systems. Making a toolkit of software that could be used for educational software.

Balbach: Research on how to model more complex (e.g., split faced) DX coils in large DOAS air handlers.

ACTION: Maddox, Haves, Kastl to develop RTAR to develop “Evaluation and improvement of chilled water and dx coil models for high latent loads.” Will check with DX and Water cooled TCs.

ACTION: Kruis, Haves, McDowell, Qi, and Liping to develop RTAR “Improved interior surface convection algorithms”.

ACTION: McDowell to develop RTAR “Improved sky temperature algorithm”

Haberl: Independent cross-check on models for above code buildings (including delivered savings).

Huang: Comparing attic models. Big problem is interzone heat transfer through the ceiling. Loads calculated using previous timestep. How big is this issue?

- Several new research topics at recent meetings:

7:20 **Program Ideas**

-
- 2020 Winter (Orlando), 2020 Annual (Austin), 2021 Winter (Chicago)

ACTION: Buckley “Comparison of energy models of ASHRAE’s new headquarters”.

ACTION: Liping to search for other potential speakers on “Modeling of indoor farming”.

7:25 **New Business**

7:30 **Adjourn**

Next Meeting: Monday, February 2, 2019 Orlando FL

TC4.7 Data-Driven Models Subcommittee Monday; June 24, 2019, 7:30 PM–9:00 PM

Location: Kansas City, MO; 2211, KCCC

Attendees: Anthony Fontanini, Hyojin Kim, Kamel Haddad, Bass Abushakra, Jeff Haberl, Piljae Im, Nick Caton, Liam Bucklet, Daric Adarn, Daniel Villa, Clayton Miller, Juan-Carlos Baltazar, Joe Huang, Neal Kruis, Ralph Muehleisen, Edwin Lee, Brian Kastl, Erik Kolderup, Doug Maddox, Chris Balbach, Majid Karami, Yeonjin Bae, Jaewan Joe, Jeremy Lerond, Alamelu Brooks, Farshad Khein, Xi Zhao, Scott Judson, Soolyeon Cho, Amir Roth, Hau Li, Zhe Wang

Agenda:

7:30 Call to order / Introductions / Changes to the agenda

- **Changes to the agenda:**
 - Moved discussion of Kaggle competition and Data-driven smart cities to the beginning of the research section
 - Added a potential RTAR topic
 - Added a seminar topic corresponding to the Kaggle Competition for Orlando

7:40: Upcoming Due Dates (5 minutes)

- Annual Meeting 2019 (Kansas City, MO – June 22-26, 2019)
 - **August 2, 2019** – Seminar, Workshop, Forum, Debate, & Panel Proposals Due
 - **August 9, 2019** – Revised Conference Papers/Final Technical Papers Due

7:45: Research: Work Statements / RTAR's (30 minutes)

Kaggle Competition Update (Miller, Balbach)

INFO:

ASHRAE will launch the machine learning competition with the BPAC competition. Cash prizes for the top winners of \$10k with a bit less for the others. This has taken a while because of the involvement of ASHRAE. This was an unsolicited research project through ASHRAE. More info closer to September. Winners will be invited to write a research paper.

The hope is that if this contest is successful, contests will be repeated every couple years. DDM should start thinking of the next contest.

There are 17 or 18 data sources with 1800 buildings and 3500 meters. 3 years of hourly data. This is a prediction contest. Given training data set and weather for training. Given weather data for prediction and predict the test period.

INFO: There will possibly be track in Chicago in 2021 for Machine Learning.

Seminar on Wednesday (in KC) on the history of the "Energy Shootout".

Data-Driven Smart Cities – Proposed new IEA Annex (Balbach)

Meeting in November of 2020. Might be of interest to members of DDM.

ACTION: Balbach Post to Basecamp and inform interested parties

Current Work Statements

- Update on WS 1763 – Development of an Improved Toolkit for Analyzing Building Energy Use from Time Series Data: Update to the Inverse Model Toolkit. (Balbach, Koran, Haberl)

Jeff is working on it. It's been pushed back by RAC before with a need for more justification.

Tony: Open EEMeter is available on github and should be considered and reviewed before the WS is finalized.

ACTION: Jeff H and Chris B, Juan Carlos, Fontanini to revise and resubmit.

Current RTARs

- **RTARXXXX - Enhanced Whole-Building Calibrated Simulation Using Measured Indoor Environment Data (Kim)**

Hyojin Kim: This was initially discussed in Guideline 14 meeting. Seeks feedback. Develop standard whole building calibration physics based procedures. Looking for procedures and methods for using multiple data streams and best metrics for checking/improving calibration.

Straw Poll: 13 Yes , 0 Nos,

ACTION ITEM: Hyojin Kim and Jeff Haberl to write RTAR and submit to TC for voting 2 weeks before Aug Deadline

New Research Topics

Potential RTAR Topics		
RTAR Title	Champion(s)?	Status/Notes

Determining when a building's behavior has changed, Re-baselining	A. Fontanini Bass Balbach Added: Juan-Carlos	Important for EPC projects. Keep on the list. Juan Carlos interested to help get going
MGT OBB are interested in co-sponsoring. ACTION: Bass to draft something for Orlando		
Data-driven clustering methods	C. Balbach K. Haddad A. Fontanini	Updates: Fits into/augments the Kaggle. Keep on the list.
Balbach Fontanini: It's not clear yet what the clustering is used for, so wait until after Kaggle. ACTION: Keep on the Docket.		
Fully automated inverse models for building energy predictions		
Fontanini: We have lots of tools, could we automate using those tools. ACTION: Keep on the Docket		
Standard practice of using machine learning models for building energy predictions		
ACTION: Keep on Docket		

- 8:15 Discussion of Program (15 minutes)
- Annual Meeting (Kansas City) Review

- Related Program Information

- Seminar 16: Multiscale Building Energy Modeling, Part 11
 - Sunday, June 23rd – 11:00 am – 12:30 pm, Room: 2102B

This happened.

- Seminar 62: Predictive Analytics for HVAC Engineers: What Is in the Box?
 - Wednesday, June 26th – 8:00 am – 9:30 am, Room: 2102B

Clayton will be speaking.

Winter Meeting 2020 (Orlando)	
Track 1:	HVAC&R Fundamentals and Applications
Track 2:	Systems and Equipment
Track 3:	Refrigeration and Refrigerants
Track 4:	Cutting Edge Approaches
Track 5:	High Efficiency Design and Operation
Track 6:	Big Data and Smart Controls
Track 7:	Ventilation, IAQ and Air Distribution Systems
Track 8:	Standards, Guidelines and Codes

Chicago 2021: Possible Machine Learning and AI Tract

Potential Session Topics				
Meeting	Session Type	Session Title	Tentative Session Chair(s)	Speakers
Hold off until Orlando	Seminar	Are you normal?	L. Wang R. Muehleisen A. Fontanini	Ralph's Post-Doc Qi

Remove from Docket				
	Seminar	Identifying and removing outliers for DDMs	A. Reddy, C. Balbach, L. Wang, J. Balthazar	Update: Bass to ask Agami Reddy to help for KC
Leave on Docket		Track 6. Big data and smart controls.		
		Seminar: How to capture KW savings (do you take a single point in time, a statistical measures, peaks?)	C. Balbach	Nick Caton Hyojin Kim
Orlando	Seminar	Setting up a Kaggle Competition with ASHRAE: Lessons learned	Jeff H.	Gowri Balbach Miller

ACTION: DDM Submit program for “Setting up a Kaggle Competition with ASHRAE: Debrief”.

ACTION: C. Balbach to talk to Tony about releasing old publications.

ACTION: C. Balbach, Nick Caton and Hyojin Kim to plan seminar for How to capture KW savings (do you take a single point in time, a statistical measures, peaks?)

8:30: Handbook: (15 minutes)

8:45: New Business (15 minutes)

9:00: Adjourn

Multi-Scale Building Energy Modeling (MBEM) Subcommittee of TC4.7

Agenda

Kansas City

Tuesday, 25 June 2019

3:30-5:00pm, 2215A KCCC

38 Attendees were present (roster available on request)

Introductions and Agenda Review (5 minutes)

- Sign-up sheet
- Around Room
- Agenda Mods
 - 30 minutes for: Supriya Goel et al want to create a standard for testing the rulesets used for Appendix G (and perhaps other standards). Want to run it through TC-4.7 MBEM.
 - 10 minutes for Neil and Tim to discuss WS-1857, Simplified Method for Calculation of Conduction between Buildings and the Ground.
 - 5 minutes for Tianzhen Hong to discuss MBEM Section for HOF.

Announcements (5 minutes)

- Call for Orlando Program Tracks and schedule (see attachment 1)
- Chris Balbach: Status of ASHRAE TC Reorg.

Program (15 Minutes) (Brian Kastl is new program lead)

- 2019 Summer (KC) Status
 - Sunday 6/23/19: 1:30-3p: Sem 16, MBEM Part 11, Modeling Throughout Building Life Cycle [Roughly 45 people attended.](#)
 - Ralph was to submit V&U session for KC? (LBNL, ORNL, NREL, ANL) Delayed until work is ready.
- 2020 Winter Orlando Proposals
 - SSPC-140 Addendum A, (4.7) “Airside HVAC BESTEST” (Joel & Ron), Ralph will submit for Orlando.
[Track chair contacted and gave thumbs up.](#) 🍑
 - V&U Maybe a session for Austin.

ACTION: Multiscale Part 12 for Orlando: Macumber will find speakers for “Molecules to Models.

- Project Stasio IBPSA Erik Kolderup thinking to submit for KC. Erik does plan to submit “presentation of simulation”

Did not come through. Presentation track set for BPAC conference in Denver. Eric thinking of submitting something on this for Orlando.

- Tianzhen thinking of submitting something on “Performance Gap” for KC.

Maybe for Austin.

New Standard: Supriya Goel (30 min)

“Evaluating Ruleset Implementation in Building Energy Modeling Software”. Develop testing framework for evaluating ruleset implementation.

Long discussion about TPS with a large focus on whether the TPS should exclude residential or not



Vote to move this discussion forward to TC-4.7 main committee meeting 29 in favor, 0 opposed,

Vote of TC 4.7 VM in MBEM meeting to accept current language 8 Y, 2 N.

Research (30 minutes)

Status: Potential RTARS/Work Statements (15 minutes each max)

WS 1816. Load profiles for hospital imaging equipment. TC-4.7 voted to co-sponsor with TC-9.6 on May 10. Jeff Haberl volunteered for PES for this. This will stay in MBEM and not moved to SCM.

Put out for bid, one proposal received. Evaluation of bid was positive. Recommendation put forward to RAC to accept.

RTAR approved by RAC. WS-1857 started by Neal Kruis and Tim McDowell. “Improved simplified methodology for describing and calculating heat conduction through the ground. TC-4.4 will co-sponsor. 90.1 and 4.1 are other potential co-sponsors.

Tim and Neal plan to get it into RAC by August 15. Need more time for TC 4.7 VM to read and comment. Will do online vote or teleconference soon after meeting and then coordinate with co-sponsoring committees.

ACTION: Neal and Tim to work with Chris for an online/teleconference vote. Info sent out to full TC for comments.

APPS: WS-1730 “Research to Determine the Mass Flow Rate Correlations for Standard Venting Strategies & Components in Attic Spaces with Sloped Roofs”. It needs to be submitted by October 2018 (or it will die)(Fontanini). What is status of this?

Fontanini sent to RAC. Rejected. Response being formulated to RAC comments.

Check with Jeff

- APPS: Optimizing change-over mixed-mode cooling systems for houses, using building simulation (Liping Wang, Jeff Haberl, Kamal Haddad). Liping had to leave before the MBEM meeting. She is considering updating this WS.

Jeff: No Update.

- RTAR-xxx, Toolkit for Passive Solar and Whole Building Simulations. Transys, Energy Plus. Make it independent from commercial software; like hvac01, and hvac02 toolkits. How to get to netzero. (Jaya; Montana State University) Jeff says this is under construction but is going slowly.

Jeff: No Update. Leave on docket but no action item.

- Jeff H. wants to have more cases for RP 865 – analytical solutions for air side HVAC.

ACTION ITEM: Jeff to call Joel to discuss further

- Follow-on to RP1588 Window Method. Joe H. There is research need to find the differences between the simple monolithic and the detailed model. This would compare the “Windows” detailed model, the 1588 model, and the simple SHGF approach. These would be run on all the prototype models in all the climate zones to determine national impact. Joe H will start, Neal will help, and this can be a very small and defined RTAR. Joe H. said he would start on this.

Joe: No update.

ACTION ITEM: Joe to start this.

New Research Ideas

Updates on related activities (5 minutes)

- Update on SPC 205, *Standard Representation of Performance Simulation Data for HVAC&R...*(Neil Kruis). Units waver is approved (exception to requiring dual units). Now publications is putting together galley's for public review. Just SI units.

McDowell: Currently reviewing public review comments and revising the document.

- IBPSA Project: BIM/GIS and Modelica Framework for building and community energy systems design and operation
 - MODELICA Libraries, Building and City Models, Dissemination. Michael: 2nd year of 5 year project.

New Topics for Discussion

Tianzhen et al writing an MBEM section for TC-4.7 chapter in HOF: Asks for review.

Attachment 1: Tracks and Deadlines for Orlando

ASHRAE Calls for Program Orlando Winter 2020

1. HVAC&R Fundamentals and Applications: Fundamentals are the foundation for understanding applications in engineering. Key components of ASHRAE fundamentals include thermodynamics,

psychrometrics, fluid and mass flow. This track provides opportunities for papers and presentations of varying levels across a large topic base. Concepts, design elements and shared experiences for theoretical and applied concepts of HVAC&R design are included.

Track Chair: Maggie Moninski
maggie.moninski@gmail.com

2. Systems and Equipment: HVAC&R Systems and Equipment are constantly evolving to address the changing requirements of the built environment. Papers and programs in this track will focus on the development of new systems and equipment, improvements to existing systems and equipment and the proper application and operation of systems and equipment.

Track Chair: Sonya Pouncy
sonya.pouncy@gmail.com

3. Refrigeration and Refrigerants: Refrigeration is a critical element of modern life, from preserving food and medicine to maintaining comfort. With significant changes on the horizon for refrigerant regulations, along with new applications for refrigeration systems being frequently applied, there is more need than ever to understand both the fundamental and advanced concepts and issues related to refrigeration. Papers and programs in this track will focus on refrigerants, refrigerant regulation, refrigeration cycles and refrigeration applications.

Track Chair: Stephen Idem
sidem@tntech.edu

4. Cutting Edge Approaches: This track focuses on novel approaches to HVAC&R systems and buildings due to changing energy, economic, and environmental concerns. Papers and programs will focus on emerging approaches such as the critical Water-Energy nexus, natural/emerging refrigerants and other cutting edge approaches pertaining to HVAC&R systems and buildings.

Track Chair: Marianna Vallejo
marianna.vallejo@jacobs.com

5. High Efficiency Design and Operation: Submissions are requested regarding high efficiency design and operation of commercial and residential buildings, including specialty building types.

Track Chair: Ryan MacGillivray
ryan.macgillivray@dwel.com

6. Big Data and Smart Controls: This track examines the use of big data, advanced algorithms, occupancy-based control strategies, data mining and other analytical techniques to economically automate buildings. Given the intersection with the larger world of IT, cybersecurity is also a topic of interest in this track.

Track Chair: Leticia De Oliveira Neves
leneves@gmail.com

7. Ventilation, IAQ and Air Distribution Systems: This track solicits submissions pertaining to the design, operation and study of ventilation and air distribution systems in residential and commercial buildings. The intersection of these systems with respect to indoor air quality and health effects are also of significant interest for this track.

Track Chair: Robert Cox
bob.cox@jacobs.com

8. Standards, Guidelines and Codes: ASHRAE is a leader in the development of standards and guidelines pertaining to the indoor environment; these standards and guidelines are used to shape codes. This track invites submissions pertaining to standards for buildings, HVAC&R systems and IAQ

Track Chair: Lee Riback
lee.riback@gmail.com

SUBMIT PROGRAMS

Deadlines:

Monday, March 18, 2019: Conference Paper Abstracts, Technical Papers and Paper Session Requests Due

Monday, April 22, 2019: Conference Paper Abstract Accept/Reject Notifications

Friday, June 7, 2019: Website Opens for Seminar, Workshop, Forum, Debate, and Panel Proposals

Monday, July 8, 2019: Final Conference Papers Due - Submitted for Review (Includes Bio, Learning Objectives and Methods of Assessment); Request for Conference Paper Sessions Due

Friday, July 26, 2019: Conference Paper Accept/Revise/Reject Notifications

Friday, August 2, 2019: Seminar, Workshop, Forum, Debate, and Panel Proposals Due

Friday, August 9, 2019: Revised Conference Papers/Final Technical Papers Due

Friday, August 26, 2019: Conference and Technical Paper Final Accept/Reject Notifications

Friday, October 4, 2019: Seminar, Workshop, Forum, Debate, and Panel Accept/Reject Notifications

Attachment 2: Paper and Program Type Definitions

Conference Papers are short overview papers (8 pages or less), undergo single blind review and require 2 reviewers per paper.

Technical Papers are full research papers, undergo double-blind review and require 3 reviewers per paper.

Conference Paper Sessions. These sessions present papers on current applications or procedures, as well as papers reporting on research in process. These papers differ from technical papers in that they are shorter in length and undergo a much less stringent peer review.

Debates. Debates highlight hot-button issues. Experts, either on teams or as individuals, present different sides of an issue in debate format. Each participant presents evidence for or against a specific statement or question such as ‘Is Sustainability Really Sustainable?’.

Forums. Forums are “off-the-record” discussions held to promote a free exchange of ideas. Reporting of forums is limited to allow individuals to speak confidentially without concern of criticism. There are no papers attached to these forums.

Panels. Panel discussions can feature a broad range of subjects and explore different perspectives on issues in the industry. A panel may feature discussions about integrated project delivery among designers, builders and facility management professionals.

Seminars. Seminars feature presentations on subjects of current interest. Papers are not available from the Society; however, seminar PowerPoint presentations with audio descriptions of the presentations are posted online.

Technical Paper Sessions. These sessions present papers on current applications or procedures, as well as papers resulting from research on fundamental concepts and basic theory.

Workshops. Workshops enable technical committees and other ASHRAE committees to provide a series of short presentations on a topic requiring specific expertise. These short presentations are provided with an increased emphasis on audience participation and training in a specific set of skills.

Attachment 3: Summary Report to TC-4.7

38 Attendees

Straw Vote to forward the proposed new standard on rule-sets to TC-4.7 for consideration (29-0) (8-2 TC-4.7 voting members)

Research

- WS-1857 (Kruis & McDowell) Simplified Method for Calculating Conduction Between Buildings and the Ground. Soliciting comments from TC-4.7 extended family. Suggest phone call and letter ballot by TC-4.7.

Program

- MBEM 11 KC: Led by Dan Macumber. Had 48 attendees.
- MBEM 12: Dan Macumber will organize for Orlando. "Molecules to Models".
- Airside HVAC Seminar. Ralph will submit for Orlando. Already talked to Track lead. Ron & Joel will speak.
- Project Stasio. Erik Kolderup will organize for Orlando.

Handbook

Tanzhien Hong et al have written an MBEM section for the TC-4.7 chapter in the HOF.

SSPC 140 Meeting Summary – 24Jun2019 (submitted to TC4.7 7/02/19)

Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs.

For Item 2. Chair Announcements

- **140-2017 is current; integrated airside HVAC cases with 140-2014 test suites.**
- **IRS rules** re the deduction for energy efficient **commercial buildings** require software used for assessing tax credits be tested as follows for projects placed in service:
 - o On/after Jan 1,2016: test to 140-2014 (except Secs. 5.2.4, 7, 8) **11 progs (26 vers.) qualified; same as last January**
 - o On or before Dec 31, 2015: test to 140-2007, **13 programs qualified.**
- **New submittals to ron.judkoff@nrel.gov.**
- **Qualified programs listed at <http://energy.gov/eere/buildings/qualified-software-calculating-commercial-building-tax-deductions>** (Last check 09Jun2019).
- **RESNET or DOE list 3** (last check 19Jun2019) tools as either accredited for HERS ratings, “45L” tax credit compliance (DOE). Required tests are NREL’s HERS BESTEST (included since Std 140-2011), along with equipment modeling and other modeling tests developed by RESNET. “45L” submit to DOE (45Lsoftware@ee.doe.gov) **Other submittals to RESNET (<http://www.resnet.us/professional/programs/software>).**
- **ASHRAE 90.1 and 189.1 reference Standard 140;**
 - 90.1-2016, published Fall 2016, references 140-2014 (except Sections 7, 8)
 - 90.1-2019, to be published Nov 2019, refs 140-2017 (except Sections 7, 8).
- **2018 IECC cites 140-2014;** IGCC citation accords with IECC.
- **ASHRAE 90.2-2018 is published,** references Standard 140, Section 7
- **SPLS suggested we update the work plan – for Orlando**
- **SPLS requested title-purpose-scope review – for Orlando**

Building Thermal Fabric Tests Update (140, Section 5.2)

- Address advances in modeling state of the art since 1995
- Revisions to existing test cases and inclusion of additional excursion (parametric sensitivity) test cases is nearing completion in collaboration with SSPC 140.

Test suite progress:

- Final round test spec distributed to sim trial participants (Sep 2018)
 - o 7 programs submitted results. In-progress results are treated as sensitive data, for internal use only.
 - o **Range of disagreement among simulation results is improving** (getting narrower) **since 1995; this is attributable to improvements in the test specifications and the state of the art in modeling since 1995.**
- Next steps (plan):
 - o Final report publication (Nov 2019)
 - o Addendum (Spring/Summer 2020)
 - o Continuous maintenance revision (Autumn 2020).

Referencing of 140-2017 in 90.1-2019:

- o SSPC 90.1 has updated via addendum their reference of 140 for 90.1-2019 to 140-2017; publication of 90.1-2019 expected in November
- o 90.1 ECB/140 collaborative working group met Sunday afternoon
 - Primary objective is to develop acceptance criteria for 140 test results.
 - Preliminary work is beginning.

Prioritization of Possible Test Suites to Develop after Completion of Building Thermal Fabric Tests Update:

- **After polling the PC members we concluded that four test suites can be given the highest priority by the PC members, these include (in alphabetical order):**
 - Airside HVAC BESTEST Volume 2
 - Update of HVAC BESTEST cases applying empirically determined performance maps
 - Weather-Driven Infiltration and Natural Ventilation
 - Weather-Drivers

The following test suites also remain under consideration:

Empirical Validation Tests

- New DOE “Validation and Uncertainty” project tests
 - LBNL Flexlab test cases
 - ORNL FRP test cases
- NREL indoor/outdoor apartment module tests
- “ETNA BESTEST” Empirical Validation Test Spec (JNA, Electricite de France, NREL)

Other Analytical Verification and Comparative Tests

- IEA-34/43 Multi-Zone Test Suite
- More Ground-Coupled Heat Transfer Cases
- 2/3-D conduction cases (e.g., window frames and thermal bridges)
- ASHRAE RP-1052 “Development of an Analytical Verification Test Suite for Whole Building Energy Simulation Programs – Building Thermal Fabric
- Domestic Hot Water
- Standard 205 Performance Map Tests

Empirical Validation: Work sponsored by DOE is in progress. Experimental data is being developed along with simulation results for comparison with empirical data. The participating labs are LBNL (Kohler, Haves), ORNL (Im, New), NREL (Judkoff) and ANL (Muehleisen)

- One year extension of original 3 year project
- Uncertainty analysis:
 - ANL’s analysis us being used to differentiate test case quality (ability to simulate)
- A new project in this is NREL’s indoor/outdoor apartment module that allows empirical determination of exterior wall conductance related inputs, which is difficult to determine without the highly controllable environment that is possible by initially running experiments indoors.

Empirical validation (where program results are compared to empirical data) is much more difficult than comparative testing (comparing software to each other) or analytical verification testing (comparing program results to analytical solution results developed outside of whole building energy sim progs). This is because test specifications are more complex (real experimental facility versus idealized analytical verification or comparative tests for simplicity of input) and inputs must be empirically determined (in addition to the target output results).

Standard 140 Stakeholder Meeting (Muehleisen): Agenda: Working with stakeholders to develop acceptance criteria for use with Standard 140; also possibility of automation of test suites, standardized input (or at least geometry) of tests (flavor of xml), user manual or more examples of using 140. Format is virtual meeting with follow-up at BPAC 2019 (Denver); contact Ralph for info and invite.

References to Standard 140. Standard 140 is referenced by:

- IRS, Standard 90.1
- Standard 189 (High Performance Green Building Design) Appendix D
- Standard 90.2-2018 (new) references Section 7 tests (adapted from HERS BESTEST 1995)
- IECC, IGCC
- The newly developing COMNet (BPI, Energy Foundation et al) User's Manual.
- Implicitly referenced for ASHRAE Building Energy Quotient IF that is based on the COMNet User's Manual;
- RESNET references Section 7 tests.
- Florida Building Commission
- Various international references.

Listing of test suites included in ANSI/ASHRAE Standard 140, Analytical Verification Tests and Comparative Tests (year added to Standard 140 in parenthesis below.)

- NREL/IEA 12/21 "IEA BESTEST", building thermal fabric comparative tests (2001)
- NREL/IEA 22 "HVAC BESTEST Volume 1", working-fluid side analytical verification tests (2004)
- NREL/IEA 22 "HVAC BESTEST Volume 2", working-fluid side comparative (2007)
- NRCan/IEA 22 "Furnace BESTEST", analytical verification and comparative (2007)
- NREL/HERS Council "HERS BESTEST", comparative tests, simplified residential analysis tools (2011)
- NREL/IEA-34/43 "Ground-Coupled Slab-On-Grade In-Depth Tests", analytical verification (2014)
- ASHRAE RP-865 "Air-Side HVAC BESTEST, air-side mechanical equipment analytical verification tests based on ASHRAE 865 RP (2017)

Full SSPC 140 meeting notes are available at <http://sspc140.ashraepcs.org/index.html>.