[MOTION]

1. Judkoff moves to accept agenda and approve 2022 Winter meeting minutes. Kruis seconds. 6-0-0 CV
2. Crawley moves to keep/approve existing Title and Scope. Kruis seconds. 7-0-0 CV
3. Crawley moves to create a hybrid meeting chair position. Haberl seconds. 6-0-0 CNV
4. Crawley moves to approve the 6 seminars as proposed above for Winter 2023 meeting. Kruis seconds. 6-0-0 CNV
5. Haberl moves to adjourn. Kruis seconds. No objections!

[ACTION]

1. Muehleisen to follow up with Crawley regarding the seminar – Nationwide Modeling of Buildings.

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Connection Instructions

- Enter name and email address and then click Join as Guest at the prompt you get from the link below:
  https://ashrae.webex.com/ashrae/j.php?MTID=me1c2f882a5a7963087999b1ffe6b1ac6

Call to Order and Introduction of Members (10 min, Muehleisen) 4:00

- Ralph Muehleisen, Chair
- Neal Kruis, Vice-Chair
- Hyojin Kim, Secretary
- Brian Ball, Simulation and Component Models Subcommittee Chair
- Jeff Haberl, Honors, Awards, and History Subcommittee Chair
- Ron Judkoff, Multi-scale Building Modeling Subcommittee Chair
- Brian Kastl, Program Subcommittee Chair
- Jeannie Kim, Webmaster
- Tim McDowell, Research Subcommittee Chair
- Joel Neymark, Standards Subcommittee Chair
- John Pruett, Handbook Subcommittee Chair
- Amanda Smith, Data-driven Modeling Subcommittee Chair

Reciting of Code of Ethics Commitment (1 min, Muehleisen) 4:10

- 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.

Call of Voting Members (3 min, Kruis) 4:11

Present?	Last	First	Term Ends	Company	Email
X	Miller	Clayton	2025	Nat. U. of Singapore	clayton@nus.edu.sg
X	Crawley	Dru	2024	Bently	dru.crawley@bentley.com
X - Arrived late	Haberl	Jeff	2024	Texas A&M	jhaberl@tamu.edu
X - Left early	Judkoff	Ron	2024	NREL	ron.judkoff@nrel.gov
X	Kim	Hyojin	2022	NJIT	hyojin.kim@njit.edu
X	Kruis	Neal	2024	Big Ladder	neal.kruis@bigladdersoftware.com
X	Muehleisen	Ralph	2022	Argonne	rmuehleisen@anl.gov
	Rao	Sagar	2023	AEI	sagar.rao@outlook.com
	Wang	Liping	2025	U. of Wyoming	

6 VM: Quorum achieved.

Accept agenda & approve minutes of 2022 Winter meeting minutes (2 min, Muehleisen) 4:13

- Agenda updates since distribution: Addition of FG requirements

[MOTION 1]   Judkoff moves to accept agenda and approve 2022 Winter meeting minutes. Kruis seconds. 6-0-0 CV

Review TC 4.7 Scope (3 min, Muehleisen) 4:15

- **Title**: TC 4.7 Energy Calculations
- **Scope:** TC 4.7 identifies, evaluates, develops, and recommends procedures for calculating energy performance of the built environment.

We updated this 2.5 years ago to be consistent with some of the changes of our sister committees. Does anyone see any needed changes?

Chair willing to entertain a motion to vote to maintain current Title and Scope and revisit again in Atlanta

[MOTION 2]   Crawley moves to keep/approve existing Title and Scope. Kruis seconds. 7-0-0 CV (Haberl joins late.)

Discussion: Should we revise our scope to include carbon emissions? We can create an ad-hoc committee after meeting to review/discuss this further.

Basecamp (2 min, Muehleisen) 4:18

This is a reminder that we have moved all our primary communications for TC 4.7 to Basecamp.

We use the calendar for meetings, we send emails to the TC through basecamp and we post minutes and files there. The web page is kept up to date with minutes and meeting info for people not in the TC, but our main TC business is all on Basecamp.

I have tried to add people to basecamp when they are added to the roster but that sometimes falls through the cracks.

We also have a lot of long time and fairly inactive members of the TC not on Basecamp.

If you are part of TC 4.7 and are not on Basecamp please let anyone in the TC 4.7 leadership group know and we'll get you added. Actually anyone who is currently part of TC 4.7 Basecamp has the ability to add new members so you just need to ask someone who on it now and who knows how to add.

Membership (10 min, Muehleisen) 4:20

- Changes in TC 4.7 Leadership
  - Jeannie Kim has replaced Joshua New as Webmaster.

  - In July, Ralph is finishing his term as Chair. You will all be in more capable hands as Neal will take over as Chair, Hyojin Kim will take over as VC. But we have not identified anyone to take over as secretary and no one has approached us asking to be considered

- We are actively looking for a new person to take over as Secretary starting in July. By agreeing to become Secretary you are agreeing, in principle, for a 6 year job moving from Secretary Vice Chair to Chair. The idea of the succession is to improve continuity. But, the expectation is that you will be available and active in helping lead the TC over the next several years and are expected to attend both the Annual and Winter meetings if possible when they are being held in person.

  The standard progression is Secretary 2 years -> VC 2 years -> Chair 2 years -> Happy retirement from anything 4.7 for 2 years -> Then come back and help out where needed

  The role of the Secretary is to be the primary minute taker in various committee meetings (subcommittees, executive meetings, main TC meetings) and final minute assembler (which means making as many of the subcommittee meetings as possible), work with the vice-chair in reviewing the roster and work with chair and vice-chair in planning committee activities, recruiting new member and new leadership, and generally help provide input to the various subcommittees

  Anyone who has been reasonably active in the committee and has interest in a longer term role in TC leadership should contact Ralph, Neal, or Hyojin to express their interest.

- Voting Members: (Currently at 9)
  - Ralph is rolling off as VM. We'd like to add one more to get to 9. Anyone interested who isn't associated with the same company as a current VM will be considered..

- Roster changes of PCM to CM were submitted on time to ASHRAE before the Annual Meeting in June but it seems that yet again, they didn't all take (i.e. change of Anthony Fontanini to Amanda Smith). Please contact Muehleisen if you had thought you should be converted and were not or were supposed.

Announcements/Liaisons (20 min, Muehleisen) 4:30

- Vance Payne (Section 4 Liaison)

Payne introduced TAC's new initiatives such as automated roster change and online activity forms. This is his last meeting serving as Section 4 Liaison. Questions to AskTAC@ashrae.net.

- Natascha Milesi-Ferretti (Research Liaison)

No report.

- Jeff Boldt (Handbook Liaison)

No report.

- Since our TC is functioning well (we develop handbook content, we have seminars and papers, we generate RTAR and WS, we have active standards development, we have active subcommittees) I have opted NOT to start doing Management by Objective. The chair also feels that a good TPS functions the much the same as a vision statement so I have opted not to create a committee to create a vision statement.

- Agenda Update 1 from Chair's Breakfast: There is a new Manual of Procedures (MOP) for FG. It now *requires* that we develop a Vision statement. I'll leave it to the incoming chair to decide how he wants to do that

- Agenda Update 2: It was suggested that FG consider creating a new position called "Web Meeting Chair" with the purpose of running the online portion of any hybrid meetings. He/she is responsible for working with ASHRAE to make sure the proper web meeting is set up and the room has the necessary items (conference call microphones, camera if wanted) for meetings. I think it's a great idea and hereby create that position and am offering to be the first person hold it if we do not have someone else interested.

[MOTION 3]   Crawley moves to create a hybrid meeting chair position. Haberl seconds. 6-0-0 CNV

Subcommittee Reports (60 min, Various) 4:50

- Standards (A summary of activities is attached to this meeting minutes.)   Neymark
140, 205P, 209, 229P, 232P are within TC 4.7

140-2020: Method of Test for Evaluating Building Performance Simulation Software.
 Highlights includes: Acceptance Criteria to Standard 140 – Formal online ballot for public review expected in July. Airside HVAC BESTEST Volume 2 test suite development in progress, Whole Building Model Tests led by PNNL – medium office building test specs development in progress. There will be a stakeholder meeting to further improve 140 by collecting feedback beyond the SSPC 140, which will be organized by Muehleisen.

205P: Standard Representation of Performance Data for HVAC&R and Other Facility Equipment.
 Had 3 public reviews to date, will enter 4th ISC public review, and hope for final publication Autumn 2022.

209-2018: Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings.
 Committee was reformed in 221. Trying to be SSPC.

229P: Protocols for Evaluating Ruleset Implementation in Building Performance Modeling Software.
 Several working groups (e.g., developing schema ruleset model report, ruleset checking tool). Targeting public review for 2023.

232P: Schema-Based Building Data Model Protocols.
 Define data structures and convention. Part of work is funded by US DOE through IBPSA.

- Honors, Awards, and History   Haberl
2 candidates in the pipeline – plan to work on this in summer.

- Web Site (*https://tc0407.ashraetcs.org/*)   Kim
Website is up to date.

- Handbook   Pruett
11 attendees. Primary focus was to review the status of tasks assigned last January. Proposed a new section on Level of Detail (LoD) in Building Energy Modeling for different use cases/stages of the project. Discussed a chapter restructuring to simplify a split into two chapters in the future.

- Program   Kastl
Two seminars submitted: One accepted (Hong) - Understanding and Analysis of Inter-Building Effects to Inform Decision Making on Urban Buildings. The other one (Wangda), Carbon Accounting in Modeling, wasn't accepted but encouraged.

For Atlanta we have about 6 potential seminars: Due date is August 9th. System is down and won't be back up for a couple weeks.
 RP1661 Results
 Grid Interactive Buildings (Tianzhen Hong chair)
 Empirical Validation and Uncertainty (Muehleisen chair)
 Modernization in Simulation Engines (Edwin Lee Chair)

[ACTION 1] Muehleisen to follow up with Crawley regarding the seminar – Nationwide Modeling of Buildings.

When choosing speakers, get variety. ASHRAE does not want and will not usually accept from just one company.

Handbook committee is interested in a seminar not previously discussed about Level of Detail. Agreed to assign this to Program - MBEM.

Atlanta has a program we need to look at carefully:

Building Simulation and Virtual Design in Construction: The practices of energy modeling and building performance simulation using existing simulation tools, software development, and future simulation research and applications is ever evolving. The papers and programs in this track inform designers, engineers, building energy simulation modelers, and energy consultants and practitioners in the use of various strategies methods for building simulation & virtual design in construction
Track Chair: Alekhya Kaianathbhatta alekhya_k@rogers.com

One of Tampa Tracks is Decarbonization.

[MOTION 4] Crawley moves to approve the 6 seminars as proposed above for Winter 2023 meeting. Kruis seconds. 6-0-0 CNV

- Research   McDowell

ASHRAE is planning to fund 8 projects this fall. There are new PES training videos. If there is a project monitoring subcommittee (PMS), those have to be posted in advance and fully announced on ASHRAE websites. RAC's new initiative to develop a new web-based process of RTAR/research project submission/documents.

RP-1661 Development and Validation of Dynamic Models for the Evaluation of Chilled-Water Systems Control Strategies in the ASHRAE Handbook (PI Wangda Zuo): Has completed primary work. Final report pending.

RP-1816 Load Profiles for Hospital Imaging Equipment: Haberl in PMS. Interim report as of June 2022. Making a progress/slightly behind. Targeting to finish by next meeting.

1857-WS Improved Simplified Methodology for Describing and Calculating Heat Conduction between Buildings and the Ground: WS Accepted by RAC.

1920-RTAR: Dropped.

1921-RTAR: Targeting to complete WS this summer.

- Simulation and Component Models (SCM)   Ball

1661-RP updates from the project team. Discussed program ideas such as modernizations in simulation engines/RP-1661 results.

- Data-Driven Modeling (DDM)   Smith

1 WS in progress. No active RP.

New program ideas/discussion: Seminar on combining DDM and physics-based models (Wang), breaking down data silos between IEEE and ASHRAE researchers (Farhad), and ML-based methods for building performance simulation (Wang).

- Multiscale Building Energy Modeling (MBEM)   Judkoff

A survey report done by Haberl at TAMU is available on Basecamp. He plans to interview a few more modelers and update/issue a revised report.

Joe wants to keep pursing a new RTAR idea on reduced weather data sets in simulation. Contact him if you are interested.

Related Activities Reports 8 min, Various) 5:50

- 90.1: No report.
- TC 4.1

Discussion of research on load calculation. Handbook revision.
- TC 4.2

NASA's The Power Project now has data in EPW format.

- TC 4.4

New HOF chapter. Discussion on decarbonization.
- TC 7.6

Green Book updates. Virtual energy audit handbook
- MTGs

Guideline 14 update is nearing completion with a lot more info on calibration and instrumentation.
- IBPSA-USA

BPAC/SimBuild conference this September 14-16 in Chicago. Certification committee looking at various certifications related to modeling. Developing more educational materials. BEM Hackathon at 2022 BPAC/SimBuild – an overnight event (funding from DOE, student scholarship).
- IBPSA-World

IBPSA world board ballot should have been out. Abstracts due for 2023 in Shanghai due Oct. 29th. E. Koldrup is new conference chair.
- Others

American Modelica Conference in Dallas Oct. 26-28. Contact Wangda Zuo.

ASHRAE is holding the 1st decarbonization in Greece.

New business (2 min, Muehleisen) 5:58

Thank you all for your support over the last 2 years while I was chair, especially Neal. I owe you a *lot* of beer my friend. In my TC 4.7 retirement I plan to sleep in Sunday mornings at ASHRAE now because I don't need to attend the way too early Chair's breakfast anymore.

With that I turn my virtual gavel over to Neal.

Adjourn (Kruis) 6:00

[MOTION 5]   Haberl moves to adjourn. Kruis seconds. No objections!

See you in ATLANTA.

Upcoming Meetings

- Feb. 4-8, 2023 – Atlanta, GA
- June 24-28, 2023 – Tampa, FL
- Jan. 20-24, 2024 – Chicago, IL
- June 22-26, 2024 – Indianapolis, IN
- Feb. 8-12, 2025 – Orlando, FL
- June 21-25, 2025 – Phoenix, AZ

Appendix A: Resources

- ASHRAE's Research Proposal Process:
  - https://www.ashrae.org/file%20library/technical%20resources/research/ashrae-research-flowchart-r6.pdf
- 4.7 Committee Home Page:
  - http://tc0407.ashraetcs.org/
- 4.7 BaseCamp Page:
  - https://3.basecamp.com/3106353/projects/8174587

Appendix B: 2022 Annual (Toronto) Program Tracks

The 2022 ASHRAE Annual Conference technical program is comprised of eight tracks, selected to represent areas of focus common among ASHRAE membership.

Track	Description
1	**Fundamentals and Applications: Fundamentals and Applications:** Fundamentals are the foundation for understanding applications in engineering. Key components of ASHRAE fundamentals include thermodynamics, psychometrics, 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:** Erik D Sanchez esanchez@prmech.com
2	**HVAC&R Systems and Equipment**: **HVAC&R 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 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:** Marites Calad mcalad@norman-wright.com
3	**Research Summit**: Active research, and the exchange of those research findings, are critical to the development of our HVAC&R industry and built environment. The 9th annual research summit invites researchers to share those results, including ASHRAE-sponsored research and research of interest to the ASHRAE community. Researchers are invited to present papers, extended abstracts, seminars, forums or participate in panel discussions. The Research Summit includes a partnership with ASHRAE's archival journal, *Science and Technology for the Built Environment*. **Track Chair:** Brian Fronk brian.fronk@oregonstate.eduEnvironment
4	**Connected Buildings, Connected Communities:** As buildings become smarter, and as sensor systems, internet connectivity and data collection become more ubiquitous, there are substantial opportunities to improve the performance and efficiency of buildings. Similarly, as renewable energy resources, including wind and solar energy and energy storage, becoming increasingly common, buildings can be used as electric grid assets, to strategically support energy efficiency and demand flexibility. To accomplish this requires many stakeholders, coordinated efforts and a diversity of buildings and buildings systems components and controls. **Track Chair:** Ahmed Abdel Salam ahmed.abdel-salam@usask.ca
5	**Cold Climate Building System Design, Operation and Resilience:** The design, construction and operation of buildings in cold climate regions which experience extreme winter conditions require specific considerations for the building envelope and HVAC&R systems and resulting thermal and hygrothermal performance. Resilience in the face of extreme temperature shifts, and in some cases remoteness and permafrost, should be considered to ensure building maintain interior design conditions. This track covers efforts and topics specifically focused on buildings, building systems and equipment in cold, arctic and subarctic climates. **Track Chair:** Davide Ziviani dziviani@purdue.edu
6	**IAQ, Energy Use, Comfort and Health of Sustainable Buildings:** Indoor environmental quality, energy use and efficiency and occupant comfort and health are all priorities buildings must balance. Sustainability priorities in buildings continue to increase, requiring careful consideration of how to achieve sustainability goals without sacrificing other building functions and owner/operator priorities. This track covers each of these topics, and how they interact and impact one another. **Track Chair:** Rafi Karim rkarim@aeieng.com

Track	Description
7	**Professional Development and Education:** As members of a professional organization, we not only participate for the great value of technical exchange, but also the interpersonal exchange. We recognize that the single greatest strength of our organization is its membership. This track is designed to allow those professionals and educators an opportunity to develop and share knowledge in the areas of presentation skills, leadership, team-building, understanding various business operations, lean collaboration strategies, interpersonal skills, etc., and an opportunity for educators to share knowledge in the teaching and education of current and future generations of professionals. Submissions to this track may lend themselves to interactive session types such as workshops, panels and forums. **Track Chair:** Maggie Moninski maggie.moninski@gmail.com
8	**Buildings in the Aftermath of COVID-19:** The pandemic has had significant impacts on how buildings are used, and the priorities associated with building operations to ensure a healthy environment for occupants. More people are working remotely; commercial building interior design and functionality and occupant use of these buildings, ventilation and system needs and building owner, operator and occupant priorities have been impacted. This track covers these topics as our buildings transition to design and operation in the aftermath of the pandemic. **Track Chair:** Andy Cochrane acochrane@industrialairinc.com

Appendix C: 2023 Winter (Atlanta) Program Tracks

The 2022 ASHRAE Winter Conference technical program is comprised of nine tracks, selected to represent areas of focus common among ASHRAE membership.

Track	Description
1	**Fundamentals and Applications:** Fundamentals are the foundation for understanding applications in engineering. Key components of ASHRAE fundamentals include thermodynamics, psychometrics, 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:** Anoop Peediayakkan peediayakkan@gmail.com
2	**HVAC&R 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 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:** Billy Austin baustin@shultzeg.com
3	**Refrigerants and Refrigeration:** Refrigeration systems generate and use cold for a range of processes, from food preparation and conservation to vaccine preservation, to long-term protection of fragile ancient inks of historic documents and others. Differences in technologies and equipment, performances, refrigerants, etc., may hide synergies from which both industrial and commercial systems might benefit, also, but not only, from the points of view of reducing direct and indirect GHG emissions **Track Chair:** Brian Fonk brian.fronk@oregonstate.edu
4	**Grid Resilience and Thermal Storage:** Resilience is a highlighted aspect of the current ASHRAE strategic plan. Methods of designing buildings and HVAC&R systems with resilience in mind is paramount to our long-term success. Coupled with energy efficiency, this track is designed to highlight the advancements in grid resilience and thermal storage systems and how they are tied to resilience and energy conservation efforts. **Track Chair:** Nohad Boudani nohadb@inco.com.lb
5	**Pathways to Zero Energy Emissions and Decarbonization:** Climate change and the impact of carbon emissions on our environment has been recognized globally as a high priority. ASHRAE is taking a leading position in the advancement of carbon neutral, net zero energy, and decarbonization strategies in building and HVAC&R design. This track highlights methods being developed to reduce carbon impact on the global environment and the efforts ASHRAE and its members are taking to advance these efforts **Track Chair:** Som Shrestha shresthass@ornl.gov
6	**Multifamily and Residential Buildings:** Multifamily is one of the fast growth building sectors but has

	been underserved. Multifamily buildings present challenges and opportunities on energy codes requirements, energy efficiency opportunities, ventilation and air tightness balance, and equality to address low-income multifamily buildings. This track covers programs and papers on best practices, utility and above-code incentive programs, field studies, and codes and standards requirements. This track also welcomes programs and papers for single family housing and other residential buildings. **Track Chair:** Lina Maged Hashem lina_lmf@hotmail.com
7	**Operations and Maintenance:** Making sure that the design intent of these more complicated HVAC systems is understood by all team members and building operators is key to the building's success. This track will address an array of topics including lessons learned, improvement of process and team communications and effort to improve the installation, startup, O&M and commissioning of HVAC systems **Track Chair:** Suzanne LeViseur sleviseur@haddadeng.com
8	**Building Simulation and Virtual Design in Construction:** The practices of energy modeling and building performance simulation using existing simulation tools, software development, and future simulation research and applications is ever evolving. The papers and programs in this track inform designers, engineers, building energy simulation modelers, and energy consultants and practitioners in the use of various strategies methods for building simulation & virtual design in construction **Track Chair:** Alekhya Kaianathbhatta alekhya_k@rogers.com
9	**Mini Track – Innovative responses to supply chain challenges:** 2021 brought man challenges. One that was highlighted was the fragile status of the global supply chain. This mini track is intended to help members plan for the future disruptions and develop resiliency plans around supply chain by highlighting effective and innovative strategies to mitigate supply chain challenges

- Paper and conference paper abstracts dates are already past.
- Monday July 25, 2022 – Conference Papers Due – Submitted for Review
- Tuesday August 9, 2022 – Debate, Panel, Seminar Form, Workshop Proposals Due
- Monday August 15, 2022 – Conference Paper Abstract Accept / Revise / Reject Notifications
- Monday August 29, 2022 – Revised Conference Papers, Technical Papers Due
- Friday September 23, 2022 – Conference Paper Accept / Reject Notifications
- Monday October 10, 2022 – Debate, Panel, Seminar, Forum Workshop Accept / Reject Notifications

Appendix D: List of Attendees

- Total = 43
- VM   = 7
- CM   = 16
- PCM = 2
- G   = 18
- YEA   = 6

Hybrid (Toronto) 2022	Virtual (LV) 2022	Virtual (Phoenix) 2022	Last Name	First Name	Affiliation	E-mail	Voting Status	YEA
☐	☐	☐	Abdel Salam	Ahmed	Nortek	ahaabdelsalam@gmail.com		☑
☐	☐	☐	Abdelsalam	Mohammed R. H.	Enbridge	mohamed_rany2008@yahoo.com		☐
☐	☐	☐	Abushakra	Bass	U.S. Military Academy	datadigm-analytics@outlook.com	CM	☐
☐	☐	☐	Adair	Daric	Henderson Engineers Inc	daric.adair@gmail.com	PCM	☑
☐	☐	☐	Adams	Christopher	Insight Partners	cadams@pace-adams.com	CTTC Chair	☐
☑	☑	☐	Adams	Mark	ORNL	adamsmb@ornl.gov	CM	☑
☐	☐	☐	Ali Younes	Hassan		hassan@griffin-consultants.com		☑
☐	☐	☐	Alkhailil	Rami	Inteleqa Energy Solutions	rami.alkhalil@gmail.com		☐
☐	☐	☐	Alkhalil	Rami	Inteleqa Energy Solutions	rami.alkhalil@gmail.com	PCM	☐
☐	☐	☐	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		☐
☐	☐	☐	Armstrong	Peter	Masdar Institute	parmstr@mit.edu		☐
☐	☐	☐	Asaee	S. Rasoul	Carleton Universityq	asaee@dal.ca	PCM	☑
☐	☐	☐	Ashukov	Artem	Remak a.s	green.ashukov@gmail.com		☐
☐	☐	☐	Axley	James	Yale School of Architecture	james.axley@yale.edu	CM	☐
☐	☐	☐	Azizi Yeganah	Amirmahyar	SC Engineers, Inc.	mahyar.yeganeh@gmail.com	PCM	☐
☐	☐	☐	Babriya	Vipulkumar	Steven Winter Associates	vbabriya@swinter.com	PCM	☑
☐	☐	☐	Bae	Nuri	Univ. of Michigan	nuri@unich.edu		☐
☐	☐	☐	Bahnfleth	William	Penn State Univ	wbahnfleth@psu.edu	CM	☐
☐	☐	☐	Baines	Mark	UL	mark.baines@ul.com		☐
☐	☐	☐	Baker	Chris	The Weidt Group	chrisb@twgi.com	CM	☐
☐	☐	☐	Bakos	Panagiotis		bakospan@gmail.com		☑
☐	☐	☐	Balaras	Constantinos	NOA	costas@noa.gr	CM	☐
☐	☑	☐	Balbach	Chris	PSD	cbalbach@psdconsulting.com		☐
☑	☑	☐	Ball	Brian	NREL	brian.ball@nrel.gov		☐
☑	☐	☐	Baltazar	Juan-Carlos	TAMU	jcbaltazar@tamu.edu	PCM	☐
☐	☐	☐	Bannister	Carsen	National Research Council, Canada	carsen.banister@nrc-carc.gc.ga		☐
☑	☐	☐	Barnaby	Chip		chipbarnaby@gmail.com	CM	☐
☐	☐	☐	Basarkar	Mangesh	LBNL	mangesh.basarkar@pge.com	CM	☐
☐	☐	☐	Basso	Darlan	Fluar Engenharia	darlan.basso@yahoo.com.br	PCM	☑
☐	☐	☐	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.ca	CM	☐
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☐	☐	☐	Bhandari	Mahabir	ORNL	bhandarims@ornl.gov		☐
☐	☐	☐	Bhargava	Akshay	TRC Worldwide Engineering MEP	abhargava@trcww.com	PCM	☑
☐	☐	☐	Bilderbeck	Mike	Pickering Firm	mbilderbeck@pickeringfirm.com		☐
☐	☐	☐	Bist	Nikhilesh	CEPT University	nikhilesh241192@gmail.com	PCM	☑
☐	☐	☐	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.edu	CM	☐
☐	☐	☐	Brink	Holly	Arup	holly.brink@arup.com	PCM	☑
☐	☐	☐	Briscoe	Casey	Ingersoll Rand	Casey.Briscoe@trane.com	CM	☑
☐	☑	☐	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		☐
☑	☑	☐	Buckley	Liam	IES Ltd.	liam.buckley@iesve.com	CM	☑
☐	☐	☐	Butler	Trevor		butler.engineer@gmail.com	PCM	☐
☐	☐	☐	Camit	Rex	Seneca College	rcamit@myseneca.ca	PCM	☐
☐	☐	☐	Carling	Par	EQUA	par.carling@equa.se		☐
☐	☐	☐	Carpenter	Patrick	Fac Perf Engr	facperfeng@comcast.net	CM	☐
☐	☐	☐	Caton	Nick	Schneider Electric	nicholas.caton@se.com		☐
☐	☐	☐	Chandler	Julie	DNV GL	julie.chandler@dnvgl.com		☐
☐	☐	☐	Chen	Yixing	LBNL	Yixingchen@lbnl.gov		☐
☐	☐	☐	Chidester	James	Batson Inc.	jchidester@batson.com	CM	☐
☐	☐	☐	Chigullapalli	Sruti	Intel	sruti.chigullapalli@intel.com	PCM	☑
☐	☐	☐	Cho	Heejin	Mississippi State Univ	cho@me.msstate.edu	CM	☑
☐	☐	☐	Cho	Soolyeon	NC State U.	scho3@ncsu.edu		☐
☐	☐	☐	Christian	Jeff	ORNL	christianje@ornl.gov	CM	☐

Hybrid (Toronto) 2022	Virtual (LV) 2022	Virtual (Phoenix) 2022	Last Name	First Name	Affiliation	E-mail	Voting Status	YEA
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☐	☐	☐	Cockerham	Keith	Loring Engineers	kcockerham@DLBassociates.com	CM	☐
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☐	☐	☐	Collyer	Breesa	PG&E	brk8@pge.com		☐
☐	☐	☐	Cook	Malcolm	Loughborough Univ	malcolm.cook@lboro.ac.uk	CM	☐
☐	☐	☐	Cornick	Steve	Nat'l Research Council Canada	Steve.Cornick@nrc.ca		☐
☐	☐	☐	Correa	Jose	AME Group	josecorrea@amegroup.ca		☐
☐	☐	☐	Cox	Bryce	Jacobs/Oregon State	brycecox@colebreit.com	PCM	☐
☑	☐	☐	Crawley	Dru	Bentley	dru.crawley@bentley.com	VM	☐
☐	☐	☐	Cumali	Zulfi	Energy System	zulfi@cumali.com	CM	☐
☐	☐	☐	Curcija	Charlie	LBNL	dccurcija@lbl.gov	PCM	☐
☐	☐	☐	Dahdolan	Mohd-Eslam	U. of Nebraska	mdahdolan@unomaha.edu		☐
☑	☑	☐	Dahlhausen	Matthew	NREL	matthew.dahlhausen@gmail.com	CM	☑
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☐	☐	☐	Khan	Muhammad	Allana Buick & Bers	mkhan@abbae.com	PCM	☑
☑	☑	☐	Kim	Hyojin	New Jersey Intitute of Technology	hyojin.kim@njit.edu	VM	☐
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Hybrid (Toronto) 2022	Virtual (LV) 2022	Virtual (Phoenix) 2022	Last Name	First Name	Affiliation	E-mail	Voting Status	YEA
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☐	☐	☐	Laughman	Christopher	Mitsubishi Electric Research Lab	crlaugh@gmail.com	CM	☐
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☐	☐	☐	Ledezma Unzueta	Olman	Valenzuela & Asociados SRL	olman.jlu@outlook.com	PCM	☑
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☐	☐	☐	Mendon	Vrushali	Resource Refocus LLC	Resource Refocus LLC	PCM	☑
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Appendix E: Subcommittee Meeting Minutes

- Standards Subcommittee
- Multiscale Building Energy Modeling Subcommittee
- Simulation and Component Models Subcommittee
- Data Driven Modeling Subcommittee
- Handbook Subcommittee

TC 4.7 Standards Subcommittee Report – 2022Jun28 (submitted to TC 4.7 Jun 28, 2022)

The TC 4.7 Standards SubC did not hold a conference call this cycle. Notes below summarize actitivities based on communications with relevant PC chairs – mostly from the current meeting with general content descriptions from previous meetings.

General

TC 4.7 is cognizant TC for the following five Standards:

- 140 that is on continuous maintenance
- 209 that is published, and recently reopen for revisions
- 205P and 229P that are in later and earlier stages of development, respectively
- 232P that is recently approved by ASHRAE StdsC and is just forming
- These will be described by their respective officers below.

140-2020: Method of Test for Evaluating Building Performance Simulation Software
(Neymark/McDowell)
- **Standard 140, first published in 2001, is widely referenced** (ASHRAE 90.1, 90.2, 189.1; IECC; and others)
    o New: 90.1-2019, Addendum BE, published Jan 2002, refs 140-2020 (except Secs. 7,8)
        ▪ Adds the updated Building Thermal Fabric tests to 90.1's requirements
    o ASHRAE 90.2-2018 Addendum A (published 2021) updates to 140-2017
        ▪ Adds Airside HVAC Eqpt analytical verification tests to 90.2's requirements
- **Weather Drivers Test Suite led by Tim McDowell**
    o Test models' ability to accurately process weather data
    o Proposed addendum completed Publication Public Review on June 20. No comments were received. Next step is work with ASHRAE Staff on addendum publication.
    o Congratulations to Tim!
- **90.1 ECB/140 Acceptance Criteria WG led by Jason Glazer and Tim McDowell**
    o This attaches normative acceptance criteria to Standard 140
    o Specific 140 test cases to be applied and range bounds for determining acceptable results are prepared, and addendum language finalized (major progress since January)
    o SSPC 140 straw polled unanimously to proceed with on-line public review ballot, pending completion of informative language addressing guidance to AHJs citing 140 about untested versions of *software*.
    o Formal online ballot for public review expected in July.
- **Airside HVAC BESTEST Volume 2 test suite led by Neymark**
    o Airside 2 builds more realistic annual hourly software-to-software comparative tests off of Airside 1 steady-state tests that compare software to analytical solutions.
    o Test spec development in progress, though delayed this cycle for Weather Drivers, Acceptance Criteria, and Empirical Validation activities.
- **DOE empirical validation test suites**
    o Work by Argonne Lab, LBNL, NREL, and ORNL
    o The labs are making good progress on empirical data generation and empirical validation test specifications intended for Standard 140.
- **Whole Building Model (WBM) Tests , led by Jian Zhang of PNNL**
    o This would address building types applied in Standard 90.1 and is a different testing paradigm than the more diagnostic isolated-physics test suites applied so far for Std 140.

- o Work on feasibility of developing medium office building test specs interpretable by multiple programs is in progress; beginning with three programs.

- **140 Stakeholder meeting topic poll to happen soon.**
  - o DOE seeks to gather feedback from beyond the SSPC 140 membership on how to further improve Standard 140
  - o Topic possibilities: acceptance critieria, whole building model tests, automation, user manual, etc
  - o Contact Ralph Muehleisen if you are interested in attending.
- Other test suites for consideration within Standard 140 are included in a "Prioritization Roadmap" document posted at: http://data.ashrae.org/standard140/
- Other items we are working on include Automation of the standard and a User's Manual – both intended to facilitate use of the Standard and led by Jason Glazer.

205P: *Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment* (Barnaby/Kruis) – Barnaby reporting

- 205 is developing a scheme for adapting machine readable schema information from a common base source; this promotes consistency of data content/format.
- Has had 3 public reviews of the full document to date
- Will enter 4th ISC public review (review open only on sections that had comments) that is minor changes in a couple weeks, and hoping for final publication Autumn 2022
- First pub will have data models standardized for air-cooled chillers, DX refrigeration, electric motors and drives, etc (there are 7 equipment types total)
- Planning to continue as an SSPC: disband, then reform and will be seeking new members
- New technical activity is applying Heat Pump Design Model (HPDM), which is a physics-based model, to generate 205-format data.

209-2018 (ASHRAE/IBPSA): *Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings* (Glazer/Kolderup) – Kolderup reporting

- o PC reformed in 2021: initially with 20 VMs, 17 NVMs
- o 13 topical Working Groups (e.g., facades, quality assurance, etc)
- o PC is reforming as an SSPC; Dru reported this has been approved by StdsC
- o Addenda planned topically, with initial addenda later in 2022 and further addenda continuing into 2023 and beyond.

229P: *Protocols for Evaluating Ruleset Implementation in Building Performance Modeling Software* (Goel/Glazer) – Kruis reporting

- Protocols are for evaluating models from defined rule sets, e.g., for baseline and proposed models.
- PNNL is funded for this project and doing the heavy lifting (with committee review)
- Working groups for:
  - o schema ruleset model report (RMR);
  - o ruleset checking
  - o terminology of the standard
- Early progress is outlining the Standard
- Public review planned for 2023.

232P: *Schema-Based Building Data Model Protocols* (McDowell)

- Defines data structures and conventions that would be used for BPS models, but not defining data models themselves; draws/evolved from 205
- 229 needs data structures, and grew out of work with IBPSA building data exchange committee
- Approved for going forward in December 2021 with McDowell as Chair
- Members recruited and assigned to PC in the Spring, with first meeting in May
- Working on IBPSA co-sponsorship – ASHRAE and IBPSA standards committees are engaged
- Publication is planned for 2025.

	Minutes
ASHRAE®	**TC 4.7 Simulation and Component Models Subcommittee** 6/27/2022 Toronto Annual Meeting 7-8 PM EDT Hybrid: Sheraton Cedar (M) onsite, Link below for online Chair: Brian Ball (brian.ball@nrel.gov)

Connection Instructions

Microsoft Teams meeting

Join on your computer or mobile app

Click here to join the meeting

Or call in (audio only)

+1 630-556-7958,,128918613#   United States, Big Rock

Phone Conference ID: 128 918 613#

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Basecamp Announcement Link:
https://3.basecamp.com/3106353/buckets/8174587/schedule_entries/5049130266

Call to Order & Introductions

- Ralph Muehleisen, Committee Chair
- Neal Kruis, Committee Vice-Chair
- Hyojin Kim, Secretary
- Brian Kastl, Committee Program Chair
- Jeannie Kim, Committee Webmaster
- John Pruett, Committee Handbook Chair
- Tim McDowell, Committee Research Chair
- Joel Neymark, Committee Standards Chair
- Ron Judkoff, Multi-scale Building Modeling Subcommittee Chair
- Amanda Smith, Data-driven Modeling Subcommittee Chair
- Brian Ball, Simulation and Component Models Subcommittee Chair

Research

Ongoing Research Projects (5 min)

- **1661-RP**: Development and Validation of Dynamic Models for the Evaluation of Chilled-Water Systems Control Strategies in the ASHRAE Handbook.
  - Technical work is complete and the draft of the final report submitted on April 30th. Wangda's Ph.D. student **Cary** will provide updates in person.

Work Statements

- None that i am aware of

Draft RTARs

- None that I am aware of

New Research Topics (8 items from spreadsheet) (5 min each)

- Optimizing the use of reduced weather data sets in simulations *(champion: **Jason Glazer**)*
  - Rough RTAR has been taken to 4.2 and waiting for comments. Joe will circulate to 4.7.
  - Positive comments internall
  - Circulated with 4.2 and 4.7 in march, but not getting any traction.
- Automated Thermal Zoning (champion: **Jeff Haberl**)
  - TAMU thesis on the topic - Jeff will nudge the author.

- ○ Jeff's student has a publication and will work to convert to RTAR.

- Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulations - Phase 2 (was 1748-WS) *(champion: **Joe Huang**)*
  - ○ Joe contacted the RL for review and got the older comments from RAC. Joe will review the comments and make any needed changes.
  - ○ The RL requested responses to original RAC comments.

- Development of a Reference Building Information Model (BIM) for Daylighting Optimization *(champion: ~~Joe Huang~~ **Jeff Haberl**)*
  - ○ Jeff discussed with 4.5 - two possible RTARs
  - ○ Had wrong champion in spreadsheet, Jeff Haberl will get this going again

- Follow-on to RP-1588 (WindowModeling): Address Future Work Recommendations *(champion: **Joe Huang**)*
  - ○ Joe and Neal have continued discussions but no conclusions yet.
  - ○ Ideas still going around but nothing actionable yet

- Optimizing Change-Over Mixed-Mode Cooling Systems for Using Building Simulation *(champion: **Liping Wang**)*
  - ○ Liping is still interested in the topic and is looking for helpers
  - ○ Archived

- Update publication of HVAC 1/2 toolkits, and loads toolkit into a single publication (champion: **Ralph Muehleisen**)
  - ○ Ralph will follow-up with helpers.
  - ○ Will switch to PTAR

- Impact of Capturing Occupant Movement in a Building *(champion: **NONE**)*
  - ○ Not sure what a research project would look like. Maybe start with a program of the existing research.
  - ○ Archived no champion

Program

Program Submissions

- Not aware of any current program submissions.
- Due date Aug 9th for workshop proposals: Winter 2023, Atlanta, GA. Track 8: Building Simulation and Virtual Design in Construction (link in appendix below)

Program Ideas (5 min)

- 1661: Development and Validation of Dynamic Models for the Evaluation of Chilled-Water Systems Control Strategies in the ASHRAE Handbook. (Wangda)

- - ○ Is this still of interest?
  - (planned) Modernizations in Simulation Engines
    - ○ Edwin willing to try again on this?
    - ○ Chair: Edwin
    - ○ Possible speakers: Lee, Liam Buckley? (IES), McDowell (TRNSYS), Kruis
  - (idea) Advanced scripting interacting with simulation engines: 2023 annual
    - ○ Chair: Edwin
    - ○ Possible speakers: Edwin (EnergyPlus), Nick (FMUs / Modelica), Tim (TRNSYS)

Other Topics for Discussion (5 min)

- Action items are here:
  https://3.basecamp.com/3106353/buckets/8174587/todosets/1152573944
- ?

Attendance:

- Neal Kruis
- Cary Faulkner, CU Boulder
- Ralph Muehleisen
- Jeannie Kim
- Nicholas Long, NREL
- Nader
- Brian Kastl, AAON
- Liping Wang, Univ Wyoming
- Erik Kolderup
- Tianzhen Hong
- Danniel Villa
- Tim McDowell
- Joel Neymark
- Aaron Boranian
- Chip Barnaby
- Joshua New
- Yilin Jiang, Univ of Oklahoma, Yilin.jiang@ou.edu
- Nathan Kegel, DLR Group, nkegel@dlrgroup.com
- Liam Buckley, IES ltd.
- Troy Harvey, PassiveLogic, troy@passivelogic.com
- Hyojin Kim (Online)
- Brian Ball (Online)
- Jeff Haberl (Online)
- James Mcneill (Online)
- Joe Huang (Online)
- Ron Judkoff (Online)
- Mark Adams (Online)
- Edwin Lee (Online)

Upcoming Meetings

- June 25, 2022 - Toronto, ON
- Feb 4, 2023 - Atlanta, GA
- June 24, 2023 - Tampa, FL
- Jan 20, 2024 - Chicago, IL
- June 22, 2024 - Indianapolis, IN
- Feb 8, 2025 - Orlando, FL
- June 21, 2025 - Phoenix, AZ

Appendix A: Resources

- ASHRAE's Research Proposal Process:
    - https://www.ashrae.org/file%20library/technical%20resources/research/ashrae-research-flowchart-r6.pdf
- 4.7 Committee Home Page:
    - http://tc0407.ashraetcs.org/
- 4.7 BaseCamp Page:
    - https://3.basecamp.com/3106353/projects/8174587

Appendix B: Future Program Tracks

https://www.ashrae.org/conferences/2023-winter-conference-atlanta

| 8 | **Building Simulation and Virtual Design in Construction:** The practices of energy modeling and building performance simulation using existing simulation tools, software development, and future simulation research and applications is ever evolving. The papers and programs in this track inform designers, engineers, building energy simulation modelers, and energy consultants and practitioners in the use of various strategies methods for building simulation & virtual design in construction. | Alekhya Kaianathbhatta alekhya_k@rogers.com |

	Minutes **TC 4.7 DDM Subcommittee** 2022-06-27, Toronto Anual Meeting 8-9 pm EDT Hybrid: Sheraton Cedar (M) Onsite; Link below for Online Chair: Amanda Smith, amanda.d.smith@gmail.com

Connection Instructions

Microsoft Teams meeting

Join on your computer or mobile app

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Call to Order & Introductions [5 min]

- Ralph Muehleisen, Committee Chair
- Neal Kruis, Committee Vice-Chair
- Hyojin Kim, Secretary
- Brian Kastl, Committee Program Chair
- Jeannie Kim, Committee Webmaster
- John Pruett, Committee Handbook Chair
- Tim McDowell, Committee Research Chair
- Joel Neymark, Committee Standards Chair
- Ron Judkoff, Multi-scale Building Modeling Subcommittee Chair
- Amanda Smith, Data-driven Modeling Subcommittee Chair
- Brian Ball, Simulation and Component Models Subcommittee Chair

Research

[DDM Agenda](#) from 2021 Annual Conference

Previous [Research Topics](#):
- 1921
  - RTAR accepted; follow up with Hyojin
    - She plans to draft WS, will meet w/ Jeff
- 1920
  - Clayton submitting this as a PTAR rather than RTAR
    - Lots of documentation from competition is online, may not need a publication and would be a slow process. Strike from list.

10 items were assigned to follow up on [in Basecamp](#) after 2021 Annual meeting
- We eliminated several of these while on the calls which were related to tasks we decided to drop.

Ongoing Research Projects

- None

Work Statements in Preparation

- Development of an Improved Toolkit for Analyzing Building Energy Use from Time Series Data: Update to the Inverse Model Toolkit (was 1763-WS)
  - Jeff Haberl says this will be pursued
    - Just need to sit down and write something
    - Downgraded to an idea as the previous RTAR has expired (will need new number in the future)

Draft RTARs

- None

New Research Topics

- Previously in discussion
  - ASHRAE Standard 140 for DDM, Ron Judkoff
    - 6/22 update: Need for method to test calibration--his prior work provides a framework. Wants to move forward, include test cases
      - Joel N. working with him
      - Juan Carlos B. willing to help
  - Automatic Calibration of multiple buildings / ensemble methods, Jeff Haberl
    - 6/22: Survey results were disseminated on Basecamp. Not the final version--will be revised, but worth checking out. Can be used to guide future efforts.
  - Metadata classification, Anthony Fontanini
    - 6/22 update (Clayton Miller): Have discussed the idea with other groups but not much progress to report. Wants to move forward - consider relationship to Brick, Haystack. Data, funding would help move forward. Liping W. will help connect Clayton with relevant DOE PI.
  - Can the Inverse Modeling Toolkit be used for Data Mining, Jeff Haberl
    - 6/22 update: This is dependent on the updating of IMT (was 1763-WS above). Will be wrapped into the tool redo.
  - Connecting data driven models with physics based models, Liping Wang
    - 6/22 update: May be worth doing as a program first to establish research status and gap. Program idea for winter conference. Depending on results, may write up RTAR. Suggestion to reach out to Boptest. Archived in research spreadsheet. Will see what comes out of seminar and check back in.

- New research ideas
  - Inverse tools for daylighting, Jeff Haberl.
    - His lab has found inverse tools do a pretty good job predicting annual performance of windows, etc. (v. Radiance). May require starting with building a library from accurate model. Ron points out there is a similar situation w/ CFD. No clear research development scope for this yet.
  - Interval data processing, Jeff Haberl.
    - ASHRAE could produce a toolkit for this, including standard methods for processing missing data. Some Python libraries, OpenEE meter out there have similar functionality.
      - Farhad Omar: IEEE task force is looking at similar questions on building data for grid services. Discussion indicated interest from several on the call in collaborating with IEEE researchers. Farhad will reach out.
    - Jeff will put ideas down on interval data processing and follow up with those interested.

Program

Program Submissions

- None

Program Ideas [10 min]

- Seminar on combining DDM and Physics-Based Modeling
    - Liping W. w/ Nick Long and possibly David Blum
- Seminar on breaking down data silos between IEEE & ASHRAE researchers, inspired by Farhad's comment above
    - Ralph and Farhad, Nick to be cc'd
- ML-based methods for building performance simulation.
    - Liping, Ralph, Nick/Anthony or other NREL researcher
    - 2023 summer targeted

Attendance:

- Neal Kruis
- Ralph Muehleisen
- Jeannie Kim
- Nicholas Long, NREL
- Liping Wang, Univ Wyoming
- Tim McDowell
- Joel Neymark
- Aaron Boranian
- Yilin Jiang, Univ of Oklahoma, Yilin.jiang@ou.edu
- Nathan Kegel, DLR Group, nkegel@dlrgroup.com
- Liam Buckley, IES ltd.
- Helen Stopps, Toronto Metropolitan University, hstopps@ryerson.ca
- Farhad Omar, NIST, farhad.omar@nist.gov
- Hyojin Kim (Online)
- Brian Ball (Online)
- Jeff Haberl (Online)
- James Mcneill (Online)
- Joe Huang (Online)
- Ron Judkoff (Online)
- Mark Adams (Online)
- Amanda Smith (Online)
- Clayton Miller (Online)
- Yilin Jiang (Online)
- Seungjae Lee (Online)
- Juan Carlos Baltazar (Online)
- Eric (Online)

Upcoming Meetings

- January 31, 2022 – Las Vegas, NV
- Feb. 4-8, 2023 – Atlanta, GA
- June 24-28, 2023 – Tampa, FL

- Jan. 20-24, 2024 – Chicago, IL

Appendix A: Resources

- ASHRAE's Research Proposal Process:
  - https://www.ashrae.org/file%20library/technical%20resources/research/ashrae-research-flowchart-r6.pdf
- 4.7 Committee Home Page:
  - http://tc0407.ashraetcs.org/
- 4.7 BaseCamp Page:
  - https://3.basecamp.com/3106353/projects/8174587

TC4.7 Handbook Subcommittee

Agenda

2:30pm – 3:30 pm, June 28, 2022

"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."
(See full Code of Ethics: https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics)

1) Sign-in / Introductions
   Convened at: 2:33pm
   Members present: 5 online / 11 in person
   Adjourned at: 3:34pm

2) Chapter restructuring:

   a. General consensus at the January meeting was to reorganize the chapter this cycle (2025 HOF) to simplify a split into two chapters in the future (potentially for the 2029 HOF). Will likely do an interim web meeting (~ October?) to discuss only this topic.

   b. Review of current organization, start realignment of sections (and subsections)

3) ASHRAE is using the 2025 Fundamentals as a trial for using pdf's for editing content. TC's may still use Word document if they choose, but they need to request the Word document directly from ASHRAE, as only the pdf of each chapter will be available via the ASHRAE Authoring Portal. I have already requested the Word doc. As a TC, we will primarily be working via the Word doc, but any member may work in the pdf if they prefer and send to me for inclusion in the Word doc.

4) Assigned Topics / Tasks – Updates:

   a. After we receive the Word doc from ASHRAE, John P. will post on Basecamp. By 2023 Winter Meeting would like multiple reviewers to look at some or all of the chapter for errors and accuracy compared to what we sent to ASHRAE for the 2021 Fundamentals. Volunteers?

   b. Add some content on empirical validation (Standard 140).   Ron J. / Joel N.

   Review what was added in 2021, add weather, some methodology, updates to 140.

   c. Add content on carbon emissions. Multiple sources of emissions. (Standard 209 has working group)   Erik K. / Daniel V.

   No progress yet.

   d. Update references to ground-coupled systems and expand that content to make it more relevant to today's usage and design of those systems.   Jeff H.

   No progress yet.

e. Add content on optimization across multiple buildings   Wangda Z.

    Not present.

f. Combined Heat & Power Systems – Review two chapters by TC1.10 and add
    content to Chapter 19 as applicable   Ralph M.

    No progress yet.

g. Grid Stuff – Review chapter by TC1.9 and add content to Chapter 19 as
    applicable   Ralph M.

    No progress yet.

h. Add content on Elevation Variations – Air property issues, address equipment
    performance, geography vs. tall buildings. Standard 140   Joel N.

    No progress yet.

i. Add new section on modeling thermal resilience. This would include
    weatherization and simulation – equipment changes or building changes to
    improve resilience. How it affects modeling / how modeling affects building
    choices.   Tianzhen H. / Jason D./ Daniel V.

    Will develop outline based on recent studies. Resilience and energy efficiency
    not always in harmony.

j. Add content on Dynamic High Frequency System Modeling – Modelica? Ties to
    grid stuff and controls modeling – 15 minute modeling or less. Additional issues
    that can arise when subhourly modeling.   Michael W. / Ralph M.

    Not present. New champion? Tianzhen will touch base with him.

k. Add content on appropriate simplification – Temporal and Spatial. Create table
    for simplified through complex modeling (with multiple levels) and when to use.
    Provide references to this table in text and add examples (papers). Example of
    Model Simplification – any research? Level of Detail below. Tianzhen H. / Erik K.

l. Add content on thermal zoning - Different zoning for winter vs. summer.
    Research and references? Thesis available?   Jeff H. and student

    Follow up with Jeff (John P to do)

m. Add content on terminal unit systems (Chilled Beams, radiant floors, etc.) –
    active vs. passive. Active systems easy to model; passive systems much more
    difficult to model. Trane has a paper on passive. Contact healthcare designers
    such as AEI.   Sagar R.

    Not present.

n. Add content on renewables.   Jeff H. / Ron J.

    No progress yet.

o. Add content based on RP1741 Fan Coils   Neal K.

    RP is complete. Neal will review results to see applicability to Ch. 19.

p. Add some info on resiliency to passive heating/cooling section   Ron J.

5) Topics previously discussed for consideration:

  a. Neal K. suggested that all future RTAR's from TC4.7 should include verbiage for Handbook inclusion to be part of the deliverables.

  b. NEW TOPIC: Level of Detail (LoD) in Building Energy Modeling – Jeetika Malik, Tianzhen H., Erik K. Proposed section written. Good info to add, but may need some revisions. Validation of the way levels of detail are used. {move to assigned topics} Bulk of the proposed content may go in Standard 209 and just a portion of it would go in Chapter 19 (Dru C). Coordinate with Jason G / Erik K.

  c. Decarbonization. Or does this fall under item 3b? How is this modeled? How is it calculated? Add some content in part 1.5?

  d. Predictive Modeling (determining inputs).

  e. Add some content on code-compliant modeling – commercial vs. residential

  f. Building Energy Modeling for Net Zero (New Chapter section)

  g. Standards under TC4.7's umbrella:

    • Standard 140 {move to assigned: Joel N / Ron J}

    • Standard 205: will be published prior to the 2025 edition of Fundamentals.{move to assigned: Ralph M. and Neal K}

    • Standard 209: is undergoing a revision / update. We will need to update references to Std 209 in Chapter 19. {move to assigned: Erik K}

    • Standard 229: ? Timeframe may extend beyond 2025 Fundamentals.

    • Standard 232P

  h. HVAC Toolkit updates (if any) – Only Toolkit II is listed / referenced. Need to add Toolkit I.   Jeff H.?

  i. Completed RP's – We need to contact the authors of the RP's. Names / contacts?

    • RP 1661 Chiller plant Control Strategies Will be completed soon – Wangda can coordinate to get info for inclusion in Ch 19.
    • RP 1742 Plug Loads (hospitals)
    • Others?

  j. Misc. Ideas

    • Based on the Introduction section of Joe Clarke's book -- "Energy Simulation in Building Design" (2001) 2nd Ed., Routledge – there are a few other topics that could be added in brief: Surface convection, interior and exterior IR exchange, internal gains, moisture. Proposed sections on 1. Boundary Conditions and 2. Moisture
    • Section recommended on recent work by PG&E and LBNL to develop methods to test and validate the predictions of black box models, for example:

        i. Granderson, et. al., "Accuracy of Automated Measurement and Verification (M&V) Techniques for Energy Savings in Commercial Buildings," Applied Energy 173 (2016) p. 296-308.

      ii.   Price, et. al., "Commercial Building Baseline Modeling Software: Performance Metrics and Method Testing with Open Source Models and Implications for Proprietary Software Testing," Final Report, ET no. ET12PGE5312, Sept. 9, 2013, www.etcc-ca.com.

      iii.   Jump, et. al., "Functional Test Protocols for Commercial Building Efficiency Baseline Modeling Software," ET no. ET12PGE5312, Sept. 9, 2013, www.etcc-ca.com.

- Addressing the issue of temperature based control vs. load based control in simulation.
- Also address coupling of models? Applications and general methods? Internal vs. external.

    k.   Atrium Modeling

6) New Ideas?

7) Adjourn