



MINUTES  
ASHRAE TC 4.7 ENERGY CALCULATIONS – MAIN MEETING  
ANNUAL 2021 VIRTUAL CONFERENCE  
FRI. JUN 18, 2021, 12:00 PM – 2:00 PM EDT

**Motions:**

- **Motion by JN, seconded by SR: TC 4.7 recommends acceptance of the TPS for the proposed new Standard “Schema-Based Building Data Model Protocols”. Passed. Vote: 6-0-0-3 CNV; (3 absent)**
- **Motion by JN, seconded by JH: TC 4.7 recommends Timothy McDowell as Chair of the proposed new SPC “Schema-Based Building Data Model Protocols” Passed: Vote: 6-0-0-3 CNV; (3 absent)**
- **Motion to adjourn by JN seconded by: JH. , Passed 6-0-0-4 Chair voting**

**Action Items:**

- **No New Action Items**

**Outstanding Action Items from Winter Meeting:**

- **Muehleisen to create an ad hoc committee to create a Vision and MOB for presentation and voting at Next TC 4.7 Meeting.**

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## Connection Instructions

Zoom: <https://ashrae-org.zoom.us/j/97766028831?pwd=UEZlWDRNFZlVqQytsTjBmU3Zubis5dz09>

Meeting ID: 977 6602 8831

Passcode: 383708

Find your local number: <https://ashrae-org.zoom.us/u/abAQE1k2AO>

### Call to Order and Introduction of Members (5 min, Muehleisen)

- Ralph Muehleisen, Chair
- Neal Kruis, Vice-Chair
- Alamelu Brooks, Secretary
- Brian Kastl, Program Subcommittee Chair
- Joshua New, Webmaster
- John Pruet, Handbook Subcommittee Chair
- Tim McDowell, Research Subcommittee Chair
- Joel Neymark, Standards Subcommittee Chair
- Ron Judkoff, Multi-scale Building Modeling Subcommittee Chair
- Anthony Fontanini, Data-driven Modeling Subcommittee Chair
- Edwin Lee, Simulation and Component Models Subcommittee Chair

### Attendance form

<https://forms.gle/XUVU3wG7zvbNkTsQ8> put in zoom chat

### Reciting of Code of Ethics Commitment (2 min, Muehleisen)

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 (5 min, Muehleisen)

Present?	Last	First	Email
	Cook	Malcolm	malcolm.cook@lboro.ac.uk
X	Crawley	Dru	dru.crawley@bentley.com
X	Haberl	Jeff	jhaberl@tamu.edu
X	Judkoff	Ron	ron.judkoff@nrel.gov
X	Kim	Hyojin	hyojin.kim@njit.edu
	Kruis	Neal	neal.kruis@bigladdersoftware.com
X	Muehleisen	Ralph	rmuehleisen@anl.gov
X	Neymark	Joel	neymarkj@msn.com
X	Pruett	John	jap@zmm.com
X	Rao	Sagar	sagar.rao@outlook.com

### Accept agenda & approve minutes of Winter Virtual meeting (2 min, Muehleisen)

- **Agenda Additions in Green:**

○

### TC Communications Methods (2 min, Muehleisen)

- Reminder that we have moved to Basecamp for all our committee communication. New PCM are added to Basecamp by chair. Anyone else who wants to be added can ask anyone already on the basecamp TC 4.7 site to add them (R. Muehleisen, N. Kruis, or A. Brooks are recommended)

## Membership (5 min, Muehleisen)

- We think that all PCM to CM mistakes have been corrected. Contact Muehleisen if you think you should have been converted.
- Conversion of PCM to CM is related to your activity in the committee - attendance at meetings and activity within committee functions (research, programs, handbook, etc). If you are a PCM and think you are ready to convert, contact Muehleisen and/or Kruis. PCM must convert to CM within 2 years or you roll off
- Voting roster is currently 10. Malcolm Cook, Joel Neymark, and John Pruett are rolling off leaving us with 7
  - Clayton Miller has agreed to replace Malcolm as Non-Quorum VM putting us back at 8
  - We should look to add 1 or 3 more to get an odd number.

Interested members should contact Muehleisen. By becoming a VM you are

- committing to attending all main meetings and interim meetings if possible. And we like it if VM can make at least some of the subcommittee meetings.
- committing to be prompt in reviewing and voting via email ballots
- committing to be active when you attend

VM must be a member (we really want you to be a full CM and not a PCM but will make exceptions)  
VM cannot be from same company as another VM

Joel notes that with a non-quorum vm maybe we want an even number total.

## Announcements/Liaisons (20 min, Muehleisen)

- Jamie Bennett (Section 4 Liaison)

New TC Activity form. Make sure we use the same one.

Jamie also showed an MBO (Management by Objective) spreadsheet for TC to use as a template

- Natascha Milesi-Ferretti (Research Liaison)
- Bass Abushakra (Handbook Liaison)

## Review TC 4.7 Title and Scope Review (5 min, Muehleisen)

- We voted in Annual 2020 to change scope to: **TC 4.7 identifies, evaluates, develops, and recommends procedures for calculating energy performance of the built environment.**

**Current Title and Scope:**

**Title: Energy Calculations**

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

- Thoughts?

## Development of TC 4.7 Vision and Measurable Objectives (5 min, Muehleisen)

**Outstanding Action Item: Muehleisen still needs to create an ad hoc committee and schedule a meeting in March or April to develop a Vision and MBOs and to be able to present and vote on at Las Vegas Winter Meeting.**

- Anyone interested in joining a VMBO committee? We will meet at least once, maybe twice, this fall for an hour or so each meeting. Ralph will bring examples of Vision and MOB from other committees to the meeting.

Dru volunteers - hopefully july/aug for first meeting.

Daniel Villa

Alamelu Brooks

## TC/FG Motions (2 min, Muehleisen - unless covered by Jamie Bennet)

- ASHRAE is implementing a new way for TC's to make "formal motions" to ASHRAE leadership in the way that Regional Chapters can. They hope that we work with our Section head to bring ideas and problems to leadership rather than use the new mechanism but it's being put in place. TAC will be making examples of these available to TC/FG leadership to share with TC/FG.

[asktac@ashrae.net](mailto:asktac@ashrae.net)

This is for anybody to reach tac and leadership. You can also get in touch with Jamie Bennet or the TAC Chair (incoming chair is Larry Smith)

## Subcommittee Reports (60 min, Various)

- Handbook Pruett

Handbook SC meeting on June 10. Discussed last cycle work that did NOT get incorporated into the published/printed version. They hope to get them in the online and the PDF version. This happened to 4.1 and in part, to 4.2 too.

We do have the updated master file for our ongoing work.  
See handbook notes for the full list of topics to address in the next version.  
Planning an open meeting in January to discuss new topics.

- Program Kastl
- Research McDowell
- Standards Neymark

- As an offshoot of work on 205 and 229, McDowell and Kruis and several others are looking to create a new standard:

### **Title: ASHRAE 2XX: Schema-Based Building Data Model Protocols**

**Purpose:** Define building data structures and conventions for data exchange among building performance and HVAC&R software.

**Scope:** This standard applies to schema-based building data models.

## **Motion (JN): TC 4.7 recommends acceptance of the TPS for the proposed new Standard "Schema-Based Building Data Model Protocols"**

### **Second: Sagar seconded**

### **Vote: 6-0-0-3 CNV; (3 absent)**

## **Motion (JN): TC 4.7 recommends Timothy McDowell as Chair of the proposed new SPC "Schema-Based Building Data Model Protocols"**

### **Second: Jeff Haberl seconded**

### **Vote: 6-0-0-3 CNV; (3 absent)**

- 140: Method of Test for Evaluating Building Performance Simulation Software

See notes at bottom of this document.

- 205: Representation of Performance Data for HVAC&R and Other Facility Equipment

Out for PPR3 today. PPR ends Aug 2.

- 209: Energy Simulation Aided Design for Buildings

Jason is getting the gang back together! 209 is being revised. Jason reported 1st meeting with 44 people, 23 VM. Voted to recommend that IBPSA be co-sponsor. 209 committee looking for feedback on users and organizations that reference or who didn't reference but wanted to.

- 229: Protocols for Evaluating Ruleset Implementation

Supriya Goel is chair, Jason Glaser is co-chair. Jason reported out. Development is primarily schema development so far. There is also a test case development team.

- Web Site (<https://tc0407.ashraetcs.org/>) New
- New not present
- Data-Driven Modeling (DDM) Smith
- Smith not
- Simulation and Component Models (SCM) Lee
- Multiscale Building Energy Modeling (MBEM) Judkoff

12 attendees - there was a time glitch. Hopefully we'll be back to 30 at a live meeting.

Jeff Haberl and one of his students did a survey of community/urban scale modeling gaps/needs. SC asked jeff to try to make this info public so the world knows too. Erik K. will be organizing a second call related to "warm up" in modeling.

- Honors, Awards and Historical (HAH) Haberl

HAH met a couple times and have identified a couple members and are putting them in the pipeline for Fellowship. On track to get more recognition of 4.7 membership.

Jeff is working on a few more historical paper to understand where our simulation comes from. He has a student with a thesis at the TAMU website. Some of the earliest work is with NASA simulating spacecraft. Look at the [onebuilding.org](http://onebuilding.org) website for more info.

### Related Activities Reports (10 min, Various)

- 90.1
- TC 4.1
- TC 4.2 Dru:TC 4.2 just republished design conditions, 169 addenda coming out.
- TC 4.4
- TC 7.6
- MTGs
- IBPSA-USA Tim: IBPSA USA meeting will be virtual in July. Look for an announcement. Working hard to get new committees on several topics. Looking for more.
- IBPSA-World Dru: BS2021 are still hoping to have meeting in person. You can pay \$300 to publish paper if you cannot attend. IBPSA Board recommended postponing but BS2021 organizing committee wants to go forth.
- Others

Tim: ASHRAE BPAC conference will be in Nov in Denver. Hybrid in person / virtual conference.

Jeff: Former performance metric protocol is reorganizing to be a full performance metrics guideline. Hyojin Kim is heavily involved with this.

### New business (Muehleisen)

Dru: Book Las Vegas hotels early. Prices are low.  
Dru: There is a discussion of potential hybrid meetings in future.

### Adjourn (Muehleisen)

Motion to adjourn by : Joel, seconded by: Jeff haberl.

6-0-0-4 Chair voting

### Upcoming Paper and Proposal Deadlines:

**Monday, April 12, 2021:** Conference Paper Abstracts, Technical Papers Due

**Friday, April 30, 2021:** Conference Paper Abstract Accept/Reject Notifications

**Friday, June 18, 2021:** Website Opens for Program Proposals

**Monday, July 12, 2021:** Conference Papers Due

**Monday, August 2, 2021:** Debate, Panel, Seminar, Forum, Workshop and Debate Proposals Due

**Friday, August 6, 2021:** Revised Conference Papers/Final Technical Papers Due

**Monday, August 23, 2021:** Conference Paper Accept/Revise/Reject Notifications

## Upcoming Meetings

- January 31, 2022 – Las Vegas, NV
- June 25, 2022 – Toronto, ON (No tracks posted yet)
- Nothing after Annual 2022 posted

## 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 Winter(Las Vegas) Program Tracks

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

Track	Description	Track Chair
1	<b>HVAC&amp;R Systems and Equipment:</b> 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.	Anoop Peediyakkan  <a href="mailto:peediyakkan@gmail.com">peediyakkan@gmail.com</a>
2	<b>Fundamentals and Applications:</b> 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.	Bob Cox  <a href="mailto:bob.cox@jacobs.com">bob.cox@jacobs.com</a>
3	<b>Refrigerants and Refrigeration:</b> 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.	Billy Austin  <a href="mailto:baustin@shultzeg.com">baustin@shultzeg.com</a>

4	<p><b>Buildings at 360°:</b> Buildings use a large share of a country's final energy, in particular for heating, cooling and various services. Papers and presentations explaining methods, equipment, systems and solutions to satisfy occupants' needs, to guarantee buildings' performances and resilience, and to save resources (energy, water, etc.) will fit this track.</p>	<p>Nohad Boudani</p> <p><a href="mailto:nohadb@inco.com.lb">nohadb@inco.com.lb</a></p>
5	<p><b>Energy System Integration:</b> Energy is the omnipresent reality of our daily lives (e.g., electricity for appliances and equipment, heat and cold for industrial processes and commercial purposes). Once used, part of the input the energy is wasted as heat/cold or as exhaust byproducts, thus contributing to the pollution of soil, water and air. The integration of various energy sources/grids with buildings, processes and transportation allows to better exploit the available energy (renewables, in particular) while reducing the said waste through a circular approach to energy usage. Papers on renewables, fossil fuels, grid integration, aggregation, demand-side flexibility, smart devices, IoT, synthetic hydrogen and synthetic fuels, CCUS, electrification would fit this track.</p>	<p>Scott Peach</p> <p><a href="mailto:sp@sp.engineering">sp@sp.engineering</a></p>
6	<p><b>Environmental Health and IEQ in the International Arena:</b> We spend a large part of our days indoors to live, work, practice gym, etc. Indoor environment is essential for our comfort, well-being, health, productivity, but is often treated and regulated differently in various parts of the world due to local conditions, circumstances, history, traditions. Presentations that explain local norms and trends are welcome to increase the knowledge on such an important topic, with an eye also on energy usage.</p>	<p>Som Shrestha</p> <p><a href="mailto:shresthass@ornl.gov">shresthass@ornl.gov</a></p>
7	<p><b>HVAC for Industrial and Commercial Purposes - Challenges and Opportunities:</b> How to guarantee a set point within the required tolerances in a large industrial facility? How to increase the overall energy efficiency of a commercial facility through HVAC systems? What are the lessons that can be learnt from in terms of equipment, installation, commissioning, etc. and that can be transferred to other types of facilities; and vice versa? This is the track where such topics can find suitable space.</p>	<p>Bert Phillips</p> <p><a href="mailto:phillips@unies.mb.ca">phillips@unies.mb.ca</a></p>
8	<p><b>Refrigerants, Safety, Performances:</b> Be it for cooling and refrigeration, be it for heating, refrigerants are at the heart of vapor compression cycles. Space cooling and refrigeration for food cold chains and medical purposes are forecast to grow in the coming decades; the same can be envisaged for residential-, commercial- and industrial-grade heat pumps. The choice of refrigerant plays an important role, along with control and safety features of the equipment, both to maximize performances, and to minimize direct and indirect GHG emissions (the former are usually associated to runtime leakages and end-of-life incomplete recovery of the refrigerant, whereas the latter are associated to the consumed energy). Presentations in this track present advancements and developments about flammability of refrigerants (e.g., HFOs, naturals, etc.), that can reduce the direct emissions, but that may have safety, regulatory and performance issues when deployed on the field.</p>	<p>Gary Debes</p> <p><a href="mailto:gary.debes@comcast.net">gary.debes@comcast.net</a></p>

Notes:

- **Action Item (Alamelu/Ralph): Circulate January meeting minutes for letter ballot.**
  - **RM: Add this action item to the Basecamp action items**

- Visions and MbO: Ralph volunteers Neal to chair + Ralph on this group
- **Action (RM/AB): Add Handbook new topic ideas from Handbook SubC notes to these notes**
- **Action (RM/JP): Provide feedback to TAC re Handbook snafu**
  - **And generally find out what happened**
  - Dru: Handbook staff did not distribute any handbook chapter proofs to any TC. Dru has discussed with Mark Owen. May discuss with Jeff Littleton.
- **Research (TM): ASHRAE hasn't indicated research budget if any for 2022**
  - 1661 good progress
  - 1816 (JH): good progress, some delay with covid to access equipment in hospitals
  - Other RTARs and WS
    - JH: abbreviated weather data (TC 4.2 & 4.7), TPM:
- **Standards (JN)**
  - Schema development (TM, Chair)
    - RM showed the final version of the ASHRAE "New Standard or Guideline Project Proposal Form "New-Std-Data-Models\_v2.docx"; this was distributed to the TC VMs and TC executive committee members Jun 10, 2021
    - JH: need to include an inverse model too.
    - TM/RM: Begin with specific to 205/229/IBPSA-BDE and consider to expand later
  - **Motion (JN): TC 4.7 recommends acceptance of the TPS for the proposed new Standard "Schema-Based Building Data Model Protocols"**
    - Second: Sagar Rao seconded
    - Vote: 6-0-0-3 CNV
  - **Motion (JN): TC 4.7 recommends Timothy McDowell as Chair of the proposed new SPC "Schema-Based Building Data Model Protocols"**
    - Second: Jeff Haberl seconded
    - Vote: 6-0-0-3 CNV
  - Updates on 140 (JN):
    - 140-2020 CM revision
      - Published May 2021, integrates Addenda a (thermal fabric update) and b (TPS) with 140-2017
      - Working to get reference into 90.1-2022
    - Weather Drivers Test Suite (led by T. McDowell)
      - Completed 2 rounds of simulation trials
      - Next: Propose example results and distribute to SSPC 140
    - Airside HVAC Volume 2 test spec (led by J. Neymark):
      - Adds annual-hourly comparative test cases to the volume 1 steady-state analytical verification cases
      - Initial draft spec in progress.
    - Acceptance Criteria (led by J. Glazer)
      - Working group getting into how to statistically assess the many software-developer results that have been generated for the 140 test suites over the years; this for the purpose of informing acceptance criteria
    - DOE empirical validation test suites (DOE and Labs):
      - Argonne Lab, LBNL, NREL and ORNL are making progress on empirical data generation and empirical validation test specs.
    - 90.1 PRM test paradigms (new from A. Roth and M. Karpman)
      - Address with 140-tests the building types applied in Standard 90.1 Performance Rating Method
      - New test-suite paradigm relative to the more diagnostic isolated-building-physics test suites applied so far in 140.
    - Upcoming stakeholder meeting (led by R. Muehleisen)
      - DOE seeks further feedback from modeling community (beyond SSPC 140) on how to further improve Standard 140
      - Next meeting to focus on 140 testing automation, etc
      - Contact Ralph Muehleisen if you are interested in attending.
  - 
  - Updates on 205 (TM reporting)
    - Public review (PPR3) started today [6/18/21], comments by 8/2/2021
    - New equipment initiated

- Updates on 209 (JG, Chair)
  - Published in 2018, TC 4.7 approved the revision committee
  - 1st meeting with 44 people, 23 voting members
  - Forming work groups now
  - Any ideas/feedback from organizations who reference 209, let JG know,
- Updates on 229 (JG, Vice Chair)
  - Testing of rulesets (Appendix G, Title 24, etc.)
  - July 12th, next meeting scheduled - working on the schema now
- **Multiscale Building Energy Modeling (RJ)**
  - Survey on community scale modeling needs by JH and his students.
  - Erik Kolderup, warm-up/cool-down energy calculations, 2nd phone call will be scheduled.
  - Idea of resiliency, passive design in urban scale modeling
- **Honors, Awards and Historical (JH)**
  - ASHRAE awards of high performing TC 4.7 members, in progress now.
  - RJ: getting people to update their profiles and research, suggest younger members to update more often.
- **Others: ASHRAE BPAC conference (TMc)**
  - Hybrid in-person & virtual (hybrid) conference in Denver
- **Others: ASHRAE BPAC conference (JH)**
  - JH: Performance metric protocols becoming a guideline, HK leading.

#### Additional Notes from Chat:

- **Erik Kolderup**

If people are interested in participating in completing an RTAR for a potential research project on Warm-up/Cool-down energy calculations, keep your eyes open for a Doodle poll to schedule a meeting. Or contact me at erik@kolderupconsulting.com. Here's a Google Doc with the current draft: [https://docs.google.com/document/d/1NXz\\_0NYgQPV-yiwpoq1JCCrzyRfbVyuq2sh2jNRnf88/edit?usp=sharing](https://docs.google.com/document/d/1NXz_0NYgQPV-yiwpoq1JCCrzyRfbVyuq2sh2jNRnf88/edit?usp=sharing).
- **Joe Huang**

It's occurred to me that when TIm asked me to talk about a Research topic I brought up in SC, I actually brought up a wrong topic that did not require Full TC action. I should have mentioned resubmitting WS-1748 on Hybrid Ventilation Phase Two that had rolled off RAC's plans. I would like to just resubmit this as a WS, which would require a TC vote. If there's time remaining at the end of the meeting, I can describe.