



Draft Minutes

(These draft minutes have not been approved and are not the official, approved record until approved by this committee.)

ASHRAE TC 4.7 Energy Calculations - Main Meeting

6/24/2025 Phoenix Annual Meeting

4-6:30 PM MST

Hybrid: Sheraton Phoenix Downtown, Maryvale B (Level 2) onsite,

Link below for online

Chair: Hyojin Kim (hyojin.kim@njit.edu)

[MOTION]

1. Neymark moves to approve Phoenix Agenda. Taylor seconds. Approved 7-0-0 CNV.
2. Pruett moves to approve Orlando Minutes. Neymark seconds. Approved 7-0-0 CNV.
3. Neymark moves to approve changes to TC4.7 Title and Scope. Pruett seconds. Approved 7-0-0 CNV.
4. Pruett moves to adjourn. Neymark seconds. Approved 7-0-0 CNV.

[ACTION]

1. Chair to forward vote results and proposed Title and Scope to Kyle Gluesenkamp (Section 4.0 Chair) for TAC approval.
2. Chair will work with Edwin Lee and Jamie Fine to add RPs to website.
3. Juan Carlos to schedule transition meeting with new Handbook chair.
4. By July 1 get feedback from TC4.7 members on Whole Life Carbon Calculation Methodology for Building Systems.

JOIN MEETING REMOTELY

https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZWU4YmQ5NjUtYTJmOS00Mjc2LWI1NzEtM2VhYjdmNTI2ZmQ1%40thread.v2/0?context=%7b%22Tid%22%3a%220cfca185-25f7-49e3-8ae7-704d5326e285%22%2c%22Oid%22%3a%22f7c57e31-4772-40b2-8487-e1874634f92a%22%7d

[4:00 \[15 min\] Call to Order, Introductions & Welcome to New Attendees \(H. Kim\)](#)

[4:15 \[1 min\] Review Code of Ethics Commitment \(H. Kim\)](#)

[4:16 \[4 min\] Call of Voting Members \(Pruett\)](#)

[4:20 \[5 min\] Approve Agenda & Past Minutes \(H. Kim\)](#)

[4:25 \[5 min\] Announcements/Liaisons \(H. Kim\)](#)

[4:30 \[10 min\] TC 4.7 Title & Scope Update \(H. Kim\)](#)

[4:40 \[2 min\] Basecamp \(H. Kim\)](#)

[4:42 \[5 min\] Membership \(H. Kim\)](#)

[4:47 \[8 min\] Website \(Fine\)](#)

[4:55 \[70 min\] Subcommittee Reports](#)

[4:55 \[15 min\] Standards \(Neymark\)](#)

[5:10 \[10 min\] Honors, Awards, and History \(Muehleisen\)](#)

[5:20 \[5 min\] Handbook \(Baltazar\)](#)

[5:25 \[10 min\] Program \(J. Kim\)](#)

[5:35 \[10 min\] Research \(McDowell\)](#)

[5:45 \[10 min\] Physics-Based Modeling \(Judkoff\)](#)

[5:55 \[10 min\] Data-Driven Modeling \(Sharma\)](#)

[6:05 \[10 min\] Related Activities Reports](#)

[6:15 \[15 min\] New Business](#)

[6:30 Adjourn](#)

[Appendix A: Upcoming Meetings](#)

[Appendix B: Resources](#)

[Appendix C: Future Program Tracks](#)

4:00 [15 min] Call to Order, Introductions & Welcome to New Attendees (H. Kim)

- Hyojin Kim, Chair
- John Pruett, Vice-Chair
- Juan Carlos Baltazar, Secretary
- Juan Carlos Baltazar, Handbook Chair
- Jeannie Kim, Program Chair
- Tim McDowell, Research Chair
- Joel Neymark, Standards Chair
- Jamie Fine, Webmaster
- Ron Judkoff, Physics-Based Modeling (PBM) Subcommittee Chair
- Himanshu Sharma, Data-Driven Modeling (DDM) Subcommittee Chair
- Ralph Muehleisen, Honors, Awards, and History Subcommittee Chair
- Jeannie Kim, Web/Hybrid Meeting Guru

Meeting started at 4:02 by H. Kim.

4:15 [1 min] Review Code of Ethics Commitment (H. Kim)

In ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, inclusiveness and respect for others, which exemplify our core values of excellence, commitment, integrity, collaboration, volunteerism and diversity, and shall avoid all real or perceived conflicts of interest. Our culture is one of inclusiveness, acknowledging the inherent value and dignity of each individual. We celebrate diverse and inclusive communities, understanding that doing so fuels better, more creative and more thoughtful ideas, solutions and strategies for the Society and the communities our Society serves. We respect and welcome all. (See full Code of Ethics: <https://www.ashrae.org/about/governance/code-of-ethics>)

4:16 [4 min] Call of Voting Members (Pruett)

Present?	Last	First	Term Ends	Company	Email
	Miller	Clayton	2025	Nat. U. of Singapore	clayton@nus.edu.sg
X	Baltazar	Juan Carlos	2028	Texas A&M University	juan-carlosbaltazar@tamu.edu
X	DeGraw	Jason	2027	ORNL	jason.degraw@gmail.com
X	Fontanini	Anthony	2026	NREL	anthony.fontanini@nrel.gov
X	Kim	Hyojin	2026	NJIT	hyojin.kim@njit.edu
X	Kim	Jeannie	2027	Argonne National Lab	jihyun.kim@anl.gov
X	Neymark	Joel	2028	J. Neymark & Associates	neymarkj@msn.com
X	Pruett	John	2026	ZMM	jap@zmm.com
X	Taylor	Russell	2028	Carrier	rdt.vma131@gmail.com

4:20 [5 min] Approve Agenda & Past Minutes (H. Kim)

[2025 Orlando Winter Minutes](#)

[Motion 1] Neymark moves to approve Phoenix Agenda. Taylor seconds. Approved 7-0-0 CNV.

[Motion 2] Pruett moves to approve Orlando Minutes. Neymark seconds. Approved 7-0-0 CNV.

4:25 [5 min] Announcements/Liaisons (H. Kim)

- Electronic ballot results (April 15 to 18) for the approval of co-sponsorship of the Center of Excellence for Building Decarbonization (CEBD) WS “Whole-Life Carbon Gap Analysis”: Moved by H. Kim, seconded by Neymark, and approved with a vote of 6-0-0-2-CNV (In favor - Against - Abstaining - Not Present).
- Electronic ballot results (May 12 to 14) for the approval of co-sponsorship of the RTAR “Optimizing Abbreviated Weather Year Files for Faster Simulation Time with Minimal Accuracy Loss”: Moved by Baltazar, seconded by Neymark, and approved with a vote of 7-0-0-1-CNV (In favor - Against - Abstaining - Not Present).
- TAC Section 4 (Kyle Gluesenkamp)
 - [Aligning with the Strategic Plan will help the approval process of RTARs and Programs.](#)
 - [Jeff H. suggested having online participation option for future Chair Breakfast meetings.](#)
- Research (Dennis Landsberg)
- Handbook (Bob McFarlane)

4:30 [10 min] TC 4.7 Title & Scope Update (H. Kim)

- As approved by TC 4.7 at the 2024 Chicago Winter Meeting:
 - Title: TC 4.7 Building Performance Modeling
 - Scope: TC 4.7 identifies, evaluates, develops, and recommends procedures for calculating performance of the built environment, including energy, emissions, and economics.
- Revised scope at the 2024 Indianapolis Annual Meeting (no voting conducted):
 - Scope: TC 4.7 identifies, evaluates, develops, and recommends procedures for calculating energy and environmental performance of the built environment.
- Coordination with TC 7.6 per TAC’s suggestion:
 - TC 7.6 has shared concerns about potential overlap and similar wording.
 - [Outcome from the leadership meeting with TC 7.6 on August 27, 2024]: TC 7.6 will address a potential title/scope change for their TC, and further discussion will be postponed until their deliberations are received.
- [Final Proposal from TC 4.7 Leadership](#)
 - Title: TC 4.7 Building Energy Modeling
 - Scope: TC 4.7 identifies, evaluates, develops, and recommends procedures for calculating energy and environmental performance of the built environment.

[Motion 3] Neymark moves to approve changes to TC4.7 Title and Scope. Pruett seconds. Approved 7-0-0 CNV.

[Action 1] Chair to forward vote results and proposed Title and Scope to Kyle Gluesenkamp (Section Chair 4.0) for TAC approval.

4:40 [2 min] Basecamp (H. Kim)

All correspondence through [Basecamp](#). Copyrighted materials (e.g., Handbook chapter drafts or committee roster) are posted for member use only. Contact Chair to be added.

4:42 [5 min] Membership (H. Kim)

- Changes in TC 4.7 Leadership
 - Handbook: Baltazar → [Piljae Im](#) (July 2025)
 - Web/Hybrid Meeting Guru: Muehleisen → J. Kim
- Voting Members
 - Voting Members:
 - Miller (Non-Quorum) rolling off in June 2025
- Corresponding Membership
 - Attendance sheet has been updated:
 - “Not on Roster”, you have not applied to join the TC (or name on attendance sheet doesn’t align with the roster)
 - If you’ve been attending regularly, and would like to be promoted to CM, indicate on the attendance sheet, or contact the Chair

4:47 [8 min] Website (Fine)

[Action 2] Chair will work with Edwin Lee and Jamie Fine to add RPs to website.

4:55 [70 min] Subcommittee Reports

4:55 [15 min] Standards (Neymark)

- 140: Method of Test for Evaluating Building Performance Simulation Software
- 205: Representation of Performance Data for HVAC&R and Other Facility Equipment
- 209: Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings
- 229P: Protocols for Evaluating Ruleset Application in Building Performance Models
- 232: Common Content and Specifications for Building Data Schemas

140-2023 (ANSI/ASHRAE): Method of Test for Evaluating Building Performance Simulation Software (McDowell) – McDowell reporting [description of std from previous meetings]

- 140 is collection of test suites that function as a “P.E. exam” (core competency tests) for software along with acceptance criteria for a subset of cases. The test suites cover commonly modeled aspects of building thermal fabric and HVAC equipment.

- 140-2023-A: Extended time-series acceptance criteria based on selected daily hourly outputs from the thermal fabric (Section 7) tests: Addendum completed public review; publication coming soon.
- 140-2023-B: ETNA thermal fabric steady-state empirical validation tests: This is 140's first empirical validation test suite. Addendum completed after 4th round of field trials and permission to identify programs in informative example results by field-trial participants. SSPC 140 approval vote to send to Publication/Public review began at Monday (6/23/2025) 140 meeting to be completed as letter ballot.
- Field trials on Energy Efficiency Measure (EEM) modeling tests
 - Software-to-software comparative tests for building types applied in Standard 90.1, beginning with medium office building
 - Simplified base case without weather-driven infiltration and with super-insulated slab (minimized ground h.t.) is in 2nd round of field trials. Results differences are similar to single zone Section 7 comparative tests, which is encouraging.
 - PNNL addressing spec updates based on trial-participant comments.
- Possible future test suites discussed: multi-zone thermal fabric, weather-driven infiltration, empirical validation at ORNL Flexible Research Platform

[Reported from previous meetings or other updates by Stds SubC Chair]

- Standard 140 (including Acceptance Criteria) promulgation (Glazer, McDowell)
 - 90.1 ECB: 90.1 Addendum at (update of 140 citation) was published in March.
 - References of 140-2023 by IECC, CEC (Title 24), NECB (Canada) in various stages of progress.
 - IBPSA-US National BEM Certification Portal is live with 5 programs posted; <https://www.ibpsa.us/resources/national-bem-certification-program/>

205-2023 (ANSI/ASHRAE): Representation of Performance Data for HVAC&R and Other Facility Equipment (Barnaby/Kruis) – Barnaby reporting

- Objective is to adapt machine readable schema information from a common base source; this promotes consistency of data content/format.
- Emphasis is applying performance maps to models, rather than on performance curves
- Currently has standardized data models for water-cooled chillers, DX refrigeration, electric, fans, motors and drives, etc (there are 7 equipment types total)
- 4 addenda in progress:
 - D adds air-cooled chillers
 - E adds heat pumps – addressing comments in progress; defrost representation is a challenge; further research need
 - Referencing 232-2024 (see below)
 - Housekeeping updates
- Voted to co-sponsor an RTAR related to defrost
- Mini-study with chiller manufacturers comparing models applying 205 performance maps versus performance curves, beginning with anonymous results (models not identified)
- A survey has been posted on Basecamp about how equipment performance is currently modeled.

209-2024 (ANSI/ASHRAE/IBPSA): Building Performance Simulation Process (Glazer/Crawley/Kolderup) – Kolderup reporting

- Title updated for the 2024 version
- 13 topical Working Groups (e.g., facades, quality assurance, etc)
- Three informative appendices in progress
 - Predictive Modeling
 - Level of Detail
 - Future Weather
- LEED v5 brings in innovation credit options and references 209-2024

229P: Protocols for Evaluating Ruleset Application in Building Performance Models (Goel/Glazer) – Kolderup reporting

- Defines protocols for developing compliance models
- PNNL developing a checking tool for 90.1-2019 modeling, intended to be updated as rule bases change (e.g., for baseline and proposed models)
- The standard defines a schema that can be read for the purpose of ruleset checking
- Working groups for: schema ruleset model report (RMR); ruleset checking; terminology
- Progress: Close to distribution for 2nd P/PR will be a full public review of the standard.

232-2024 (ASHRAE/IBPSA): Common Content and Specifications for Building Data Schemas (McDowell)

- Defines data structures (rules) and conventions that would be used for BPS models, but not defining data models themselves. This draws/evolved from 205 and 229, both of which are describing data models. 232 prescribes a single method for how to describe data models.
- Areas of focus include time-series and time-stamp schema
- Published Autumn 2024
- SSPC status approved in January 2025.

5:10 [10 min] Honors, Awards, and History (Muehleisen)

- [Service to ASHRAE Research Award](#): Jeff Haberl renomination
- [George B. Hightower Technical Achievement Award](#)
- [Action Item from 2025 Orlando] Jeff Haberl and Ralph Muehleisen get together for historical papers of the TC 4.7 group.

5:20 [5 min] Handbook (Baltazar)

Chapter update will be available in July 2025. Proofs reviewed and returned to ASHRAE for publication in 2025 Fundamentals.

[Action 3] Juan Carlos to schedule a transition meeting with the new Handbook chair.

5:25 [10 min] Program (J. Kim)

One program at this conference. Seminar 63. Tomorrow morning.

Lots of ideas and options about program for winter meeting:

- Bass Abushakra is proposing seminar on DDM and ESPCs. Experiences.
- Few submissions on Panels. Panels can have chair and members.

- Presentation templates are strongly recommended.
- Winter conference. 9 ideas currently, 6 possible submissions.

5:35 [10 min] Research (McDowell)

TC 4.7 will have new research liaison. ASHRAE members asked to donate to research. ASHRAE looking for new RTARs and WSs. Online submission coming soon. Looks very much like the online comments database. Supposed to allow better collaboration. Training for PES and PMSC. Must complete before being PES and PMSC. Research projects in progress. Changes being made to Research Template.

5:45 [10 min] Physics-Based Modeling (Judkoff)

[Action 4] By July 1 get feedback from TC4.7 members on Whole Life Carbon Calculation Methodology for Building Systems.

Worked on WS on whole-life guide. Exclusively focused on MEP. Was legitimate gap on building envelope. TC 4.7 asked to cosponsor. Mostly embodied carbon, not much on operational carbon. Did not cover clear role for TC 4.7. TC 4.7 is more involved in operational carbon. TC 4.7 will send comments to improve the WS. Toolkits published together is moving forward: HVAC01, HVAC02, LOADS. Neal is working on one pager for heat pumps with measured performance maps. Discussion of convection coefficients, idea presented if calibrated CFD could be used instead of measurements. Should give better answers than measured coefficients. Program was previously covered for PBM. DOE's qualified software list. Has been delay on this. Ron is coordinating for NREL. Now requires DOE to approve this. Currently very slow.

5:55 [10 min] Data-Driven Modeling (Sharma)

Met Monday. Had discussion on research ideas. Some discussion of whole-building calibration using indoor conditions. Will be follow up on this RTAR. Some discussion about improved WS for inverse modeling. Maharshi will work with Jeff on this. High frequency data for DDM. Some discussion about this, also interactions with DDM and ML will be investigated. Also, discussion about toolkits for automated toolkits for calibration. Ron also has idea for testing calibration methods. Seasonality was also discussed on modeling.

6:05 [10 min] Related Activities Reports

- TC 4.1: Load Calculation Data and Procedures
 - Decision has been made to rewrite the chapters under TC 4.1. One chapter would be workflow. The other theory. Getting underway now for TC 4.1 Handbook chapter
- TC 4.2: Climatic Information
 - Weather data that gets revised every four years gets into the Handbook. ASHRAE's Weather Data Viewer tool, lots can be done with this. Bin data, 2-dimensional bin data. Dr. Klima is finishing a project on how to downscale weather data. Will include python routines for doing this.

Procedures have been canned to retrieving data from different sources. Deliverable is open source.

- Other TCs?

TC 9.13 extraterrestrial applications for ASHRAE. One RTAR is to develop load calculation for extraterrestrial habitats. Worried about load calculations. NASA doesn't want to use any current building energy models

- Standard 90.1: Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings
Standard 90.1, ECB meetings, much of the effort is a proposal for simplified performance. Comments were very divided and going to full committee for consideration.

- Guideline 14: Measurement of Energy, Demand and Water Savings

Guideline 14 looking into long term M&V. Also, possible new M&V method, Inverse Bin model available soon from the ESL.

- Other Standards/Guidelines?

Guideline 45 making progress. Now out for advisory public review, 60 days until July 29th

- MTG.RES (DeGraw) – nothing to report

- [IBPSA-USA](#)

IBPSA USA gearing up for 2025 Simbuild in Minneapolis, Minn. Looking into every other year conference. IBPSA USA is looking into state of the industry of building energy modeling. Also working on 90.1 software certification. Simbuild, call for papers will come out in July.

- [IBPSA-World](#)

IBPSA World conference in Australia, early registration through June.

- [CalBEM](#)

CalBEM is happening in Sacramento this summer. Registration is open. Free conference.

- Modelica North America
- ASHRAE Conference for Integrated Design, Construction & Operations (CIDCO)
- Others?

6:15 [15 min] New Business

No new business

6:30 Adjourn

[Motion 4] Pruettt moves to adjourn. Neymark seconds. Approved 7-0-0 CNV.

Appendix A: Upcoming Meetings

- Jan. 31 to Feb. 4, 2026 – Las Vegas, NV
- June 27 to July 1, 2026 – Austin, TX
- Jan. 23 to 27, 2027 – Chicago, IL
- June 12 to 16, 2027 – New Orleans, LA

Appendix B: Resources

- ASHRAE's Research Proposal Process:
 - <https://www.ashrae.org/file%20library/technical%20resources/research/ashrae-research-flowchart-r6.pdf>
- ASHRAE Acronym Guide:
 - https://www.ashrae.org/file%20library/about/marketing/final_ashrae-acronyms.pdf
 - Common Acronyms:
 - Research:
 - RTAR: Research Topic Acceptance Request
 - PTAR: Publication Topic Acceptance Request
 - WS: Work Statement
 - RP: Research Project
 - RAC: Research Administration Committee
 - Program:
 - CEC: Conferences and Expositions Committee
 - Standards:
 - SPC: Standard Project Committee
 - SSPC: Standing Standard Project Committee
 - SPLS: Standards Project Liaison Subcommittee (of Standards Committee)
 - MOP: Manual of Procedures
 - SH: Section Head
 - YEA: Young Engineers in ASHRAE
- 4.7 Committee Home Page:
 - <http://tc0407.ashraetcs.org/>
- 4.7 BaseCamp Page:
 - <https://3.basecamp.com/3106353/projects/8174587>

Appendix C: Future Program Tracks

- January 31 to February 4, 2026 – Chicago, IL: <https://www.ashrae.org/conferences/2026-winter-conference/2026-winter-conference-technical-program>
- Friday, August 1, 2025 | Debate, Panel, Seminar, Forum, Workshop, and Debate Proposals Due
- The Conferences and Expositions Committee requests that proposed program submissions for conference technical programs consider ASHRAE's commitment to Diversity, Equity and Inclusion when selecting speakers for programs.