



Draft Agenda

ASHRAE TC 4.7 Energy Calculations - Main Meeting

6/25/2024 Indianapolis Summer Meeting

4-6:30 PM ET

Hybrid: JW Marriott, White River D (1) onsite, Link below for online

Chair: Neal Kruis (neal.kruis@bigladdersoftware.com)

[MOTION]

1. **Crawley moves to approve Indianapolis Agenda. Fontanini seconds. Approved 7-0-0 CNV.**
2. **Crawley moves to approve Chicago Minutes. Pruett seconds. Approved 7-0-0 CNV.**
3. **Kruis moves to approve Chapter 19 for submission to ASHRAE. Crawley seconds. Approved 7-0-0 CNV.**
4. **Pruett moves to adjourn. J. Kim seconds. Approved 7-0-0 CNV.**

[ACTION]

1. **Chair and Vice Chair of TC4.7 and TC7.6 to meet and make a plan for moving forward regarding the TC names and scopes.**

JOIN MEETING REMOTELY

https://teams.microsoft.com/join/19%3ameeting_ZGY2NTZmNmEtYjk2ZC00YThiLTk0M2QtNjQzYmRmODI0NDY0%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 \[15 min\] Welcome, Call to Order & Introductions \(Kruis\)](#)

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

[4:16 \[4 min\] Call of Voting Members \(H. Kim\)](#)

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

[4:25 \[5 min\] Announcements/Liaisons \(Kruis\)](#)

[4:30 \[5 min\] TC 4.7 Title & Scope Update \(Kruis\)](#)

[4:35 \[2 min\] Basecamp \(Kruis\)](#)

[4:37 \[5 min\] Membership \(Kruis\)](#)

[4:42 \[13 min\] Website \(J. Kim\)](#)

[4:55 \[64 min\] Subcommittee Reports](#)

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

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

[5:15 \[8 min\] Handbook \(Baltazar\)](#)

[5:23 \[10 min\] Program](#)

[5:33 \[10 min\] Research \(McDowell\)](#)

[5:43 \[8 min\] Physics-Based Modeling \(Lee\)](#)

[5:51 \[8 min\] Data-Driven Modeling \(McNeill\)](#)

[5:59 \[10 min\] Related Activities Reports](#)

[6:09 \[6 min\] New Business](#)

[6:15 Adjourn](#)

[Appendix A: Upcoming Meetings](#)

[Appendix B: Resources](#)

4:00 [15 min] Welcome, Call to Order & Introductions (Kruis)

- Neal Kruis, Chair
- Hyojin Kim, Vice-Chair
- John Pruett, Secretary
- Juan Carlos Baltazar, Handbook Chair
- Brian Kastl, Program Chair
- Tim McDowell, Research Chair
- Joel Neymark, Standards Chair
- Jeannie Kim, Webmaster
- Ron Judkoff, Physics-Based Modeling Subcommittee Chair
- James McNeill, Data-Driven Modeling Subcommittee Chair
- Jeff Haberl, Honors, Awards, and History Subcommittee Chair
- Ralph Muehleisen, Web/Hybrid Meeting Guru

Meeting started at 4:03pm by Kruis.

4:15 [1 min] Review Code of Ethics Commitment (Kruis)

In this and all other 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 we shall avoid all real or perceived conflicts of interests.

ASHRAE Code of Ethics has been updated to the following:

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.

4:16 [4 min] Call of Voting Members (H. Kim)

Present?	Last	First	Term Ends	Company	Email
	Miller	Clayton	2025	Nat. U. of Singapore	clayton@nus.edu.sg
x	Crawley	Dru	2024	Bently	dbcrawley@gmail.com
x	DeGraw	Jason	2027	ORNL	jason.degraw@gmail.com
x	Fontanini	Anthony	2026	NREL	anthony.fontanini@nrel.gov
x virtual	Haberl	Jeff	2024	Texas A&M	jhaberl@tamu.edu
x	Kim	Hyojin	2026	NJIT	hyojin.kim@njit.edu

x	Kim	Jeannie	2027	Argonne National Lab	jihyun.kim@anl.gov
x	Kruis	Neal	2024	Big Ladder	neal.kruis@bigladdersoftware.com
x	Pruett	John	2026	ZMM	jap@zmm.com

4:20 [5 min] Approve Agenda & Past Minutes (Kruis)

[2024 Chicago Winter Minutes](#)

[Motion 1] Crawley moves to approve Indianapolis Agenda. Fontanini seconds. Approved 7-0-0 CNV.

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

4:25 [5 min] Announcements/Liaisons (Kruis)

- Discussed at TC Chair breakfast - Link for new website for ASHRAE Subject Matter Experts (SMEs): [SMEs for Government Outreach Events](#)
 - Muehleisen suggested anyone interested in becoming an SME should check with their employer first.
- TAC Section 4 (Kyle Glusenkamp)

Pat Marks is stepping down as our Section Head. Kyle Glusenkamp is new Section Head. Pat presented Neal with Certificate of Appreciation from ASHRAE.
- Research (Dennis Landsberg)
- Handbook (???)
- Duncan Phillips, outgoing Chair of TC9.12 (Tall Buildings) requesting co-sponsorship of Seminar for Orlando on utilizing different weather data for varying elevations (0 m vs. 600 m): does it change decision making? TC4.2 will also co-sponsor. May extend into a two session track.

4:30 [5 min] TC 4.7 Title & Scope Update (Kruis)

Title: TC 4.7 Building Energy Modeling

Scope: TC 4.7 identifies, evaluates, develops, and recommends procedures for calculating performance of the built environment, including energy, emissions, and economics.

Proposed Title: Building Performance Modeling

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

Discussion with TC7.6 regarding the proposed changes. TC7.6 members had mixed opinions of the TC4.7 proposed changes. Most of the concerns regard the potential overlap and the similar wording.

[Action 1] Chair and Vice Chair of both TC's to meet and make a plan for moving forward regarding the TC names and scopes.

4:35 [2 min] Basecamp (Kruis)

All correspondence through Basecamp. Contact Chair to be added.

Chair adds new members to Basecamp when they join the TC.

4:37 [5 min] Membership (Kruis)

- Changes in TC 4.7 Leadership (7/1)
 - Chair: H. Kim
 - Vice Chair: Pruett
 - Secretary: Baltazar (also still Handbook)
- Changes in TC 4.7 Leadership (future)
 - Honors, Awards [and History](#): Haberl → Muehleisen
 - Program: Kastl → J. Kim
 - Webmaster: J. Kim → Fine
 - Handbook: Baltazar → Hong
- Voting Members
 - Rolling off in June 2024:
 - Kruis
 - Haberl
 - Crawley
 - Rolling on in July 2024:
 - Neymark
 - Taylor
 - Baltazar
- 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

4:42 [13 min] Website (J. Kim)

<http://tc0407.ashraetcs.org/>

Website has been updated with all agendas and meeting minutes. Membership link is solely controlled by ASHRAE. Home page lists meeting information and general information about TC4.7 and how to join.

4:55 [64 min] Subcommittee Reports

4:55 [15 min] Standards (Neymark)

- 140: Method of Test for Evaluating Building Performance Simulation Software
 1. SSPC 140 - on continuous maintenance.
 2. Standard 140 (including Acceptance Criteria) promulgation (Glazer, McDowell)
 - 90.1 ECB recommended 140-2023; 90.1 planning Addendum AT
 - Next IECC version will be referencing 140-2020 + its Addenda A, B
 - Title 24 in 45-day review that includes reference 140-2023 (include AccCrit Annex A3)
 - NECB (Canada), plans to include 140-2023 in 2027
 - IBPSA-US National BEM Certification Portal is live;
<https://www.ibpsa.us/resources/national-bem-certification-program/>
 3. Test suite in industry simulation trials
 - The Argonne/ETNA (EdF data) empirical validation test suite (Neymark and Muehleisen) The initial test suite applying artificial climate steady-state data focuses on developing base case models of twin test cells and extension cases for validating surface heat transfer modeling. It is in 2nd round of field trials, with 7 programs participating.
 4. Next test suite scheduled for industry simulation trials
 - Compliance Modeling Tests (Chen, Zhang)
 - Software-to-software comparative tests for building types applied in Standard 90.1, beginning with medium office building
 - PNNL project team developed prelim spec and is addressing comments.
 - Planning for field trials after completion of initial test spec.
 5. Other test suite ready for industry simulation trials
 - Multizone Modeling (McDowell)
 - 5 test cases (solar radiation and shading), developed by IEA task, adapted for 140
 - Field trials planned after ETNA and Compliance suite trials
 6. Other DOE empirical validation test suites in development
 - The NREL iUnit project (Simmons) applies a transportable modular apartment unit, also with data collection in artificial and natural climate configurations. NREL wrapping up in 2024. Wrap-up document will include data, draft spec and next steps applying iUnit data, analysis, and spec completion following ETNA process.
 - For ORNL/FRP project (Im and Jung), data collected for a multi-zone test facility with typical HVAC and air-distribution systems. Simulation trials by ORNL and Argonne Lab with two modeling tools. Draft spec developed.
 7. Other test suite in progress
 - Airside HVAC BESTEST Volume 2 test suite (Neymark)
 - Comparative tests supplementary to current analytical verification tests
 - Development delayed for ETNA empirical validation (see below).

8. Other SSPC 140 items include Automation of processing submitted results (Glazer) and a User's Manual (Witte), and updating the Standard 140 Roadmap (McDowell) comprising a summary of prospective new test suites for Standard 140 (see <http://data.ashrae.org/standard140/>)
- 205: Representation of Performance Data for HVAC&R and Other Facility Equipment
 1. SSPC 205 - on continuous maintenance.
 2. 205 is a scheme for adapting 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
 3. Recently published as 205-2023 with standardized data models for water-cooled chillers, DX refrigeration, electric, fans, motors and drives, etc (there are 7 equipment types total)
 4. Three new addenda (A, B, C) are completed related to cleaning up public review comments are published
 5. Two additional addenda are close to P/PR: air-cooled chillers; HRV and ERV
 6. Also working on addenda to address: VRF, fenestration, fan-coil units and unitary heat pumps
 7. Other activities (DOE/Argonne project team is working to apply and promote the standard):
 - Manufacturer outreach: developing relationships to encourage providing data/maps
 - Applying detailed Heat Pump Design Module (HPDM) by ORNL to develop performance
 - EnergyPlus has a component that can read a 205 model
 - 209: Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings
 1. SSPC 209 - on continuous maintenance.
 2. PC reformed in 2021 as SSPC: 40+ members (VMs and NVMs)
 3. 13 topical Working Groups (e.g., facades, quality assurance, etc)
 4. Addenda are up to Addendum L
 5. Recently approved addenda by IBPSA StdsC (admin/process approval only)
 - c: adds a new informative Appendix G on Predictive Energy Modeling
 - e: modifies the purpose and analysis of Modeling Cycle #1 with other changes for clarity.
 - f: modifies Modeling Cycle #7, Energy Simulation-Aided Value Engineering, renaming it Response Design Alternative Modeling. among other changes.
 6. Other addenda in various stages of P/PR:
 - TPS (this includes BPS modeling process)
 - minor language revisions
 - carbon calculations appendix
 - future weather appendix
 - level of detail appendix
 7. Plan for publication is 209-2024

- 229P: Protocols for Evaluating Ruleset Application in Building Performance Models
 1. SPC 229P - 229 not officially published.
 2. 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)
 3. The standard defines a schema that can be read for the purpose of ruleset checking
 4. Working groups for:
 - schema ruleset model report (RMR);
 - ruleset checking
 - terminology of the standard
 5. Progress:
 - Finished first P/PR with 101 comments.
 - PC is reviewing the comments and likely another full PR integrating revisions to address comments

- 232P: Common Content and Specifications for Building Data Schemas
 1. SPC 232P - 232 not officially published.
 2. 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 implies a single method for how to describe data models.
 3. Areas of focus include time-series and time-stamp schema
 4. First public review has 2 comments for editorial revisions.
 5. Publication forthcoming: paperwork to be submitted in the next 2 weeks with publication expected by end of year (ASHRAE has a backlog).
 6. Other potential users of this “meta” standard include
 - ASHRAE 169: climate information (weather) data modeling
 - RESNET

140, 205, 229P and 232P will become joint ASHRAE/IBPSA publications. Approved by IBPSA Standards Committee. Will be voted on by IBPSA Board of Directors at their meeting July 10, 2024.

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

Haberl stepping down. Muehleisen will be taking over as Chair.
 Members can nominate themselves for DSA.
 Muehleisen will describe the process in Orlando.

5:15 [8 min] Handbook (Baltazar)

- Vote to approve Chapter 19 of 2025 edition of the Handbook of Fundamentals

Wrapping up documentation to submit revised chapter to ASHRAE

[Motion 3] Kruis moves to approve Chapter 19 for submission to ASHRAE. Crawley seconds. Approved 7-0-0 CNV.

5:23 [10 min] Program

J. Kim is incoming Chair.

Had 1 cosponsored session at this Conference. Seminar 32

Muehleisen volunteered to assist others wanting to put together submittals for programs.

Submissions due by August 2 for Orlando.

5:33 [10 min] Research (McDowell)

Good time to submit to RAC. Current research budget is \$5.6 million. Planning to fund projects this Fall. Currently beta testing web tool for submitting RTARs.

RPs in progress:

1661: Awaiting final submission of 1 form (by Kruis)

1815: PMS reviewing final report (Haberl).

1816: Project coming up to speed. Delayed by Covid. Meeting scheduled for July

1857: Contractor struggling getting a Visa for the student scheduled to do the work. Should be done this summer.

WS1947: Ready to go out to bid

WS1921: Comments received from RAC

5:43 [8 min] Physics-Based Modeling (Lee)

15 attendees plus 11 virtual.

HVAC Toolkits 1&2 getting updated / upgraded.

Haberl taking on multiple topics with multiple individuals.

Discussion regarding including visitors and new members to help engage them more.

No programs to bring to full committee.

5:51 [8 min] Data-Driven Modeling (McNeill)

Scope reviewed with no changes proposed.

Open discussion with guests and new members regarding their interests in TC4.7

Inverse Model Kit most likely item to move forward, but has a lot of work to be done.

T. Hong is putting together a program on AI for Orlando, and needs speakers.

5:59 [10 min] Related Activities Reports

- TC 4.1: Load Calculation Data and Procedures
Minor revisions to Fundamentals chapters finishing up. Discussion of major revision on residential chapter for next cycle.
- TC 4.2: Climatic Information
Finishing revisions for 2025 Fundamentals. Additional 3000 locations added.
- Other TCs?

TC 9.13 - brand new TC upgraded from TG. Extraterrestrial and Deep Space Conditions. Habitats for space, moon, etc.

- Standard 90.1: Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings
A lot of discussion around PRM (Performance Rating Method), interactions with Standard 140.
Proposal for continuing maintenance. Jason has rolled off as Chair.
- Guideline 14: Measurement of Energy, Demand and Water Savings
Proposed to be a standing Guideline. New edition recently published and now available.
Working to improve and develop new methods for measuring energy and water savings.
- Other Standards/Guidelines?
228, 240, 242 - accounting for carbon
PC Chairs breakfast - all standards are to address carbon
- MTG.RES (DeGraw)
Roadmap to resilience has been rolled out and available on request.
- [IBPSA-USA](#)
Just completed SimBuild Conference in Denver. The first solo conference since 2012. Several committees have been formed - information available from Kruis or McDowell. 6 hour workshop for BEMP certification exam. Muehleisen : Mentoring will be available through IBPSA for TC4.7 and should be used by all ages.
- [IBPSA-World](#)
Next conference will be in Brisbane, Australia next year.
- [CalBEM](#)
California related BEM. Next working group meeting November 21. Can join via website
- Modelica
International conference in Switzerland next year.
- ASHRAE Conference for Integrated Design, Construction & Operations (CIDCO)
CIDCO may become a separate conference in the future.
- Others?
DOE developing new metrics for equipment ratings, all to be rolled out by 2029.

6:09 [6 min] New Business

New MTG being proposed for utility planning, how buildings will be decarbonized, how incentives get developed. Would like TC4.7 to be involved. Fontanini volunteered to serve as TC4.7 liaison.

6:15 Adjourn

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

Appendix A: Upcoming Meetings

- Feb 8, 2025 - Orlando, FL
- June 21, 2025 - Phoenix, AZ
- Jan 31 - Feb 4, 2026 - Las Vegas, NV
- June 27 - July 1, 2026 - Austin, TX

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>