	Minutes **ASHRAE TC 4.7 Energy Calculations - Main Meeting** 6/27/2023 Tampa Summer Meeting 4-6:30 PM ET Hybrid: Tampa Marriott Waterside, Meeting Room 5 (2) onsite, Link below for online Chair: Neal Kruis (neal.kruis@bigladdersoftware.com)

[MOTION]

1. **Crawley moved to approve Tampa Agenda. Seconded by Fontanini. Approved 5-0-0 CNV**
2. **Crawley moved to approve Atlanta Minutes. Seconded by Pruett. Approved 5-0-0 CNV**
3. **Pruett moved to approve cosponsorship of program for Chicago with TC6.8. Seconded by Crawley. Approved 4-0-1 CNV.**
4. **Crawley moved to cosponsor WS1947 with TC2.5, 2.10, 4.2. Seconded by Fontanini. Approved 5-0-0 CNV.**
5. **Crawley moved to combine SCM and MBEM. Seconded by Fontanini. Approved 6-0-0 CNV**
6. **Pruett moved to adjourn. Seconded by Fontanini.**

[ACTION]

1. **Jeannie and Neal to follow up with TAC on website requirements.**
2. **Kruis to add discussion of content for website at next meeting.**
3. **Start a Mentor / Mentee program for TC4.7. Ralph will help coordinate. Add to agenda for Chicago.**
4. **New subcommittee name to be determined at Chicago if not before.**
5. **Add names of TC's to Related Activities Reports list.**

Connection Instructions
Call to Order & Introductions (10 min, Kruis) 4:00
Review Code of Ethics Commitment (1 min, Kruis) 4:10
Call of Voting Members (3 min, H. Kim) 4:11
Accept agenda & approve 2023 Winter meeting minutes (2 min, Kruis) 4:14
Review TC 4.7 Title & Scope (4 min Kruis/Crawly) 4:16
Basecamp (5 min, Kruis) 4:20
Membership (10 min, Kruis) 4:25
Announcements/Liaisons (10 min, Kruis) 4:35
Subcommittee Reports (62 min) 4:45
- Standards (15 min, Neymark) 4:45
- Honors, Awards, and History (5 min, Haberl) 5:00
- Website (2 min, J. Kim) 5:05

Connection Instructions

JOIN WEBEX MEETING
https://ashrae.webex.com/ashrae/j.php?MTID=mb9319cbd11407af23b1b261e72e5591f

Call to Order & Introductions (10 min, Kruis) 4:00

- 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, Multi-scale Building Modeling Subcommittee Chair
- James McNeill, Data-driven Modeling Subcommittee Chair
- Brian Ball, Simulation and Component Models Subcommittee Chair
- Jeff Haberl, Honors, Awards, and History Subcommittee Chair
- Ralph Muehleisen, Web/Hybrid Meeting Guru

Review Code of Ethics Commitment (1 min, Kruis) 4:10

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.

Call of Voting Members (3 min, H. Kim) 4:11

5 VMs: Quorum achieved.

Present?	Last	First	Term Ends	Company	Email
	Miller	Clayton	2025	Nat. U. of Singapore	clayton@nus.edu.sg
x	Crawley	Dru	2024	Bently	dru.crawley@bentley.com
x	Fontanini	Anthony	2026	NREL	anthony.fontanini@nrel.gov
x* (late)	Haberl	Jeff	2024	Texas A&M	jhaberl@tamu.edu
x	Kim	Hyojin	2026	NJIT	hyojin.kim@njit.edu
x	Kruis	Neal	2024	Big Ladder	neal.kruis@bigladdersoftware.com
x	Pruett	John	2026	ZMM	jap@zmm.com
x*	Rao	Sagar	2023	AEI	sagar.rao@outlook.com
	Wang	Liping	2025	U. of Wyoming	lwang12@uwyo.edu

Accept agenda & approve 2023 Winter meeting minutes (2 min, Kruis) 4:14

[Motion 1] Crawley moves to approve Tampa Agenda. Fontanini seconds. Approved 5-0-0 CNV
[Motion 2] Crawley moves to approve Atlanta Minutes. Pruett seconds. Approved 5-0-0 CNV

Review TC 4.7 Title & Scope (4 min Kruis/Crawly) 4:16

Title: TC 4.7 Energy Calculations
Scope: TC 4.7 identifies, evaluates, develops, and recommends procedures for calculating energy performance of the built environment.
Has been started. Will have something for TC in Chicago (2024 Annual Meeting).

Basecamp (5 min, Kruis) 4:20

All correspondence through Basecamp. Many roster members are not on Basecamp.

Membership (10 min, Kruis) 4:25

- Changes in TC 4.7 Leadership
  - DDM Chairs: McNeill & Wang
  - SCM Vice Chair: Lee
- Voting Members
  - Rao rolling off in June
  - DeGraw rolling on in July
  - Wang stepping down due to conflict Will make emergency roster change to add new VM

- 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
- Succession plans for Subcommittee Chairs

Announcements/Liaisons (10 min, Kruis) 4:35

- TAC Section 4 (Pat Marks)
  Pat present and will coordinate roster change.
- Research (Dennis Landsberg)
  Next meeting will be in the fall and will review incoming RTARs at that time.
- Handbook (Jeff Boldt)
- Task Force for Building Decarbonization (Dru Crawly)
  Products & Services Subcommittee disbanded.
  Task Force extended 1 more year with goal to have TC's take over.

Subcommittee Reports (62 min) 4:45

Standards (15 min, Neymark) 4:45

Joel is looking for a Vice Chair. Duties include submitting brief written report of activities of standards (see below) that 4.7 is the cognizant committee for; liaising occasional administrative paperwork when a new PC is initiated via TC 4.7; no separate SubC meeting; experience on a PC is useful. (Overall light lift/low profile.)

TC 4.7 is cognizant TC for the following five Standards:
- ➢ SSPCs 140, 205, and 209 that are on continuous maintenance
- ➢ SPCs 229P and 232P

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

- 140-2020: *Method of Test for Evaluating Building Performance Simulation Software* (Neymark/McDowell) – Neymark reporting (write-up here includes more than was reported vocally)
    - New Chair as of July 1: Tim McDowell
    - Continuing maintenance revision will be released later this year. Includes some restructuring.
    - Cosponsorship by IBPSA pending approval by ASHRAE Board.
    - Standard 140, first published in 2001, is widely referenced (ASHRAE 90.1, 90.2, 189.1; IECC; and others)

        - New: 90.1-2022, published Dec 2022, refs 140-2020 (except Secs. 7,8)
        - ASHRAE 90.2-2018 Addendum A (published 2021) updates to 140-2017
    - New incoming 140 Chair = Tim McDowell, begins 4-yr term July 1
        - We counted 41 attendees at plenary 140 (25 of them in-person), which is growing; and evidence that in-person attendance at ASHRAE is ramping back up
    - 90.1 ECB/140 “Acceptance Criteria and Referencing” WG led by Jason Glazer and Tim McDowell
        - 90.1 committee is working on updating its reference to Standard 140 for 90.1-2025. It will likely reference 140-2023 and is working on other referencing language refinements.
        - Referencing proposal under development by IECC-C (commercial) code was accepted; IECC’s public review on that and other unrelated revs closes June 30th
    - IECC-R (residential) referencing of Standard 140, Section 7, also in progress
        - In late March passed two compliance paths: RESNET’s path that references 140 and second 405/406 path. Still needs to go to public review, should be in coming months.
    - 140-2023 Continuous Maintenance Revision
        - The CM revision is planned for publication this Fall
        - It includes existing 140-2020 + Addendum A (Weather Drivers test suite) and Addendum B (acceptance critiera)
        - SSPC 140 voted to approve an editorial reorganization of the Standard document developed by McDowell, which facilitates adding new test suites and other material to the Standard.
    - DOE empirical validation test suites. Test specifications intended for Standard 140 are being developed by Argonne, NREL and ORNL
        - The Argonne/ETNA (EdF data) test suite (led by Muehleisen and Neymark) is scheduled for release this summer; we are planning for late July. 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. Contact Muehleisen and Neymark if you are interested in participating in simulation trials.
        - The NREL iUnit project (led by Matt Leach), which is for a transportable modular apartment unit, also with data collection in artificial and natural climate configurations (like ETNA) was shown to have steady-state UA measurement uncertainty substantially less than the difference between applying measured UA versus UA based only on catalog data. So for iUnit, as in ETNA, substantial bias error (about 30%) can be mitigated by making selected conductivity adjustments based on characterization measurements. NREL is making substantial progress towards completion of the iUnit test spec and simulation trials in 2024.
        - For ORNL/FRP (led by Piljae Im), data has been collected for a multi-zone test facility with typically constructed HVAC and air-distribution systems. Simulation trials have been done by ORNL and Argonne Lab with two modeling tools. A preliminary draft spec was developed describing all aspects of the test facility and distributed to McDowell and Neymark for comments. ORNL will address comments and revise their test spec as they proceed toward external simulation trials.
    - Compliance Modeling Tests, led by Jian Zhang of PNNL

        - This addresses building types applied in Standard 90.1 and is a broader software-to-software (no empirical truth standard) comparative testing paradigm than the more diagnostic isolated-physics test suites applied so far for Std 140.
        - Work on feasibility of developing 90.1 medium office building test specs interpretable by multiple programs was completed with three building performance simulation tools. Initial feasibility looks good with good agreement among results.
        - Work is proceeding on developing a test specification intended for external simulation trials (outside of their project team) and eventual inclusion in Standard 140 after completion of simulation trial iterations.
        - SSPC 140 is forming a Working Group for this project. If you are interested in participating, contact Tim McDowell.
    - Airside HVAC BESTEST Volume 2 test suite led by Neymark
        - 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.
        - Test spec development in progress, though delayed this cycle for Empirical Validation work and Standard-140 referencing activities.
    - SSPC 140 voted to recommend IBPSA-International co-sponsorship of Standard 140 at the Atlanta meeting last February
        - ASHRAE will be the lead organization. This promotes use of Standard 140 internationally.
        - Per Connor Barbaree (MoS), ASHRAE has developed a proposed agreement, which PPIS just approved and then it will make its way forward to technology council through standards committee. IBPSA also has the agreement in hand to approve on their end, but needs ASHRAE's fully approved version before they can vote it. Should be done by Fall.
        - IBPSA-World BoD will address ASHRAE's proposal at their meeting in July.
    - 140 Activities Roadmap update: McDowell overhauled the document Feb 2023, which comprises the activities described above along with known test suites for consideration. SSPC 140 will address prioritization of these activities.
        - "Prioritization Roadmap" document posted at: http://data.ashrae.org/standard140/
    - 140 Stakeholder meeting for 2023:
        - DOE seeks to gather feedback from beyond the SSPC 140 membership on how to further improve Standard 140
        - Argonne (Muehleisen) is planning to have a meeting with AHJs (documents and agencies that cite Standard 140) in late July/early Aug to solicit their needs with respect to referencing Standard 140 and its software acceptance critieria.
        - Contact Ralph Muehleisen if you are interested in attending and/or know anyone at AHJs that we should contact.
    - Other items we are working on include Automation of the standard (e.g., processing submitted results) and a User's Manual – both intended to facilitate use of the Standard and led by Jason Glazer; and updating the Standard 140 Roadmap, led by Tim McDowell.
- 205-2023: *Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment* (Barnaby/Kruis) – Barnaby reporting
    - Cosponsorship by IBPSA pending approval by ASHRAE Board.

    - 205 is developing a scheme for adapting machine readable schema information from a common base source; this promotes consistency of data content/format.
    - 205 is recently published as 205-2023 with data models standardized for water-cooled chillers, DX refrigeration, electric, fans, motors and drives, etc (there are 7 equipment types total)
    - Continuing as an SSPC.
    - Prioritized items for future addenda covering new items: air-cooled chillers, fenestration
        - Topics mentioned previously for addendum are: ERV, HRV, boilers
    - Also, working on getting manufacturers to provide more data files
- 209-2018 (ASHRAE/IBPSA): *Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings* (Glazer/Crawley/Kolderup) – Kolderup reporting
    - Cosponsorship by IBPSA approved by ASHRAE Board.
    - PC reformed in 2021 as SSPC: Up to 40+ members (VMs and NVMs)
    - 13 topical Working Groups (e.g., facades, quality assurance, etc)
    - Addenda planned topically, first addendum is modeler qualification
    - Supplemental appendices under way: predictive modeling, greenhouse gas (GHG) calculations, thermal comfort.
- 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.
    - 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 of the standard
    - PNNL is developing a checking tool for 90.1-2019 modeling
        - 229 intended to be updated as needed, as rule bases change
    - Progress:
        - The ruleset is pretty well defined
        - Work is proceeding on output reporting and schema development
        - Test for generating correct descriptions is considering applying a 140 shoebox and/or a simple building
    - Public review planned for 2024.
    - Cosponsorship by IBPSA pending approval by ASHRAE Board.
    - Several working groups currently active.
- 232P (ASHRAE/IBPSA): *Schema-Based Building Data Model Protocols* (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 implies a single method for how to describe data models.
    - Areas of focus include time-series and time-stamp schema
    - Cosponsorship by IBPSA approved by ASHRAE Board.
    - Standard intended to be referenced by other standards.
    - Hope to go out for public review late this year / early next year.

Honors, Awards, and History (5 min, Haberl) 5:00

2 previous considerations fell through.
Will reconvene with committee to determine additional considerations.

Website (2 min, J. Kim) 5:05

- https://tc0407.ashraetcs.org/
  Home page is up to date. Additional tabs not updated yet.
  [Action 1]: Jeannie and Neal to follow up with TAC on website requirements.

Handbook (5 min, Baltazar) 5:07

Changes requested by end of year so changes can be made prior to Chicago meeting.
June 21 2024 revisions due to ASHRAE.
Baltazar will be updating basecamp lists of deliverables
Any RTARs originating in TC4.7 should have a deliverable be verbiage for inclusion in Handbook.

Program (10 min, Kastl) 5:12

2 sessions submitted and accepted for Tampa: Seminar 14 and Seminar 26.
1 cosponsored session not accepted.
1 proposed submission for Chicago on empirical validation.
Tracks for Chicago are posted on the ASHRAE website.
Fontanini requesting cosponsorship with TC6.8 on a program for Chicago on geothermal modeling.
[Motion 3] Motion to approve cosponsorship of program for Chicago with TC6.8 by Pruett. Second by Crawley. Approved 4-0-1 CNV.

Research (10 min, McDowell) 5:22

0 RTARs reviewed by RAC, 6 Work Statements reviewed
1 approved work statement with comments.
5 returned work statements.
Funding for $5.5 million.
$350,000 budget for 2 year project / $450,000 budget for 3 year project is RAC's guideline.
Training for project monitors in July/August
RP1661: waiting for final paper to close project out.
RP1815: Haberl is TC4.7 representative. Work is underway
RP1816: Haberl is TC4.7 representative. Progress is slow due to restricted access to hospital equipment
RP1857: Contract awarded but work has not started.
WS1921: returned. Comments to be addressed.
WS1947: 3 informal comments received.
[Motion 4] Request to cosponsor WS1947 with TC2.5, 2.10, 4.2. Crawley moved, second by Fontanini

Approved 5-0-0 CNV.
[Action 2] Kruis to add discussion of content for website at next meeting.
Crawley noted that decarbonization is high on President's agenda - will aid associated RTARs

Simulation and Component Models (5 min, Ball) 5:32

Recommended expanding descriptions of work statements from 1 sentence to short paragraph

Data-Driven Modeling (5 min, McNeill) 5:37

Several ideas for work statements from Haberl that need additional time and personnel support to fully develop.
Seminar 26 was very well attended on Monday.
~3 program ideas discussed but no timeline set.
Recommendation to form a mentoring list to help train people on the RTAR process.
[Action 3] Start a Mentor / Mentee program for TC4.7. Ralph will help coordinate. Add to agenda for Chicago.

Multiscale Building Energy Modeling (5 min, Judkoff) 5:42

Huang has written an RTAR. Would like feedback from TC4.7 by the end of July. Version 2 on Basecamp under MBEM folder.
Future program items: Ralph to submit one for Chicago.
Discussion on survey of MBEM practitioner needs.Survey results recently released. Potential research topics and/or program topics can come from these results.
How can we attract new members - may help to describe our items more thoroughly, watch talking 'in code'.

Merger of SCM/MBEM Subcommittees (15 min, Kruis) 5:47

A lot of overlap between the two groups, ambiguity in assigning some responsibilities. Propose shifting to one physics-based modeling group and one data-driven modeling group. 2 hours for combined group to start with. What to name the combined group?
[Motion 5] Crawley moves to combine SCM and MBEM. Seconded by Fontanini. H. Kim recommends determining scope of each subcommittee before deciding to combine them. Many of the same members contribute to both. Approved 6-0-0 CNV.
[Action 4] New subcommittee name to be determined at Chicago if not before.

Related Activities Reports (15 min) 6:02

- Standard 90.1
- TC 4.1

Working on F25 revisions.
May undergo major revision of residential section for 2029.

- TC 4.2
  Working on F25 revisions.
- TC 4.4
- TC 4.10
- TC 7.6
- Guideline 14
  2023 version complete but not published yet.
- MTGs (need new liaison to MTG.BIM)
  Haberl volunteered to be new liaison to MTG.BIM
  MTG.BIM may be disbanded.
- IBPSA-USA
- IBPSA-World
- Modelica
- CalBEM
- Others?
  [Action 5] Add names of TC's to Related Activities Reports list.

New Business (5 min) 6:17

Adjourn 6:22

[Motion 6] Pruett moves to adjourn. Fontanini seconds. Approved 6-0-0 CNV

Appendix A: Upcoming Meetings

- Jan 20, 2024 - Chicago, IL
- June 22, 2024 - Indianapolis, IN
- Feb 8, 2025 - Orlando, FL
- June 21, 2025 - Phoenix, AZ
- Jan 31 - Feb 4, 2026 - Las Vegas, NV

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