

Agenda: ASHRAE TC 4.7 Energy Calculations – Main Meeting

OMNI Hotel, DOGWOOD A ROOM, ATLANTA, GA

Tuesday, January 14 2019, 6:00 pm – 8:30 pm

MOTIONS:

- Approve agenda and Houston minutes: Haberl moves. Pruettt seconds. 7-0-0 CNV. Passes.
- Request for no cost extension for RP1661. Recommendation to approve from all PMS committee members present. Motion for TC to Approve by Ralph, Second by Joshua New, Committee voted 8-0-0 CNV
- Motion to accept program by Pruettt seconded by Muehleisen. Committee voted 8-0-0 CNV

ACTION ITEMS:

- Balbach to convene meeting to discuss TC reorganization.
- Balbach to ask ASHRAE about Basecamp best practices.

“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. Roll call and introductions (5 minutes) **6:00 Muehleisen**

Malcom Cook and Tony Fontanini absent. Crawley arrived late.

2. Accept agenda & approve minutes of previous meeting (5 minutes) **6:05 Balbach**

Haberl moves. Pruettt seconds. 7-0-0 CNV. Passes.

3. Announcements/Liaisons (5 minutes) **6:10 Balbach**

- Dennis Wessel (Section 4 Liaison)

TAC has updated MOP (available online). Proposal to revise the technical committees to ~30. ASHRAE is trying to make things more efficient and enable attendees to attend more than just technical committee meeting. Finding fewer and fewer hotels that can accommodate the number of meetings. Need to improve the efficiency of operation at ASHRAE.

Haberl: Feedback form is insufficient.

Chris: Plan is to have a web call to collect feedback more formally.

Wessel: Feedback by tomorrow's TAC meeting at 7:00am would be good.

- Mike Pouchak (Research Liaison)
- Bass Abushakra (Handbook Liaison)

Fundamentals 2021. Everything needs to be in by July 2020.

2019 ASHRAE Annual Conference in Kansas City: All the following are due by Feb 8, 2019

- Technical / Conference Final Papers
- Extended Abstracts for Research Summit Track Presentations
- Seminar, Forum, Debate, Panel and Workshop proposals

Balbach: Brian Kastl agreed to be program chair for TC 4.7.

- Nominating ASHRAE Fellows:

Haberl

Haberl: Current Fellows should work with me to help nominate others.

Balbach: says he will help Haberl

4. Membership (5 minutes) **6:15 Balbach**

- <https://www.ashrae.org/technical-resources/technical-committees/applying-for-membership-on-a-technical-committee> (11 new members since Houston)
- By the MOP, the maximum number of voting members on a committee is 18. However, the drawback of a high number of VM would be the quorum in meetings. (We currently have 11 Voting Members.)
 - Jeff Haberl and Dru Crawley to roll off Jun 30
 - Neal Kruis and Alamelu Brooks to roll on July 1
- A new Program Chair has been identified: Brian Kastl.
- We are moving from using the Onebuilding.org mailing list over to the **TC 4.7 Basecamp3** for all official business (posting of minutes, RTAR, WS, etc) and email. We will transition over the next year. All Provision Corresponding Members should get an existing TC 4.7 member on Basecamp to add them as a TC 4.7 Project Team Member, e.g.. Chris Balbach, Ralph Muehleisen, Neal Kruis

Balbach: Anyone on the basecamp site can add new members.

New: Some TCs suggest only inviting PCMS since there may be sensitive information.

Muehleisen: We are encouraged to be as inclusive as possible.

Haberl: The TC website is public facing. Basecamp is for internal use for document distribution. Are we going to make the webmaster in charge of managing Basecamp?

Muehleisen: Executive committee will organize the website.

Balbach: We need best practices, but ASHRAE doesn't have anything yet. Will ask at the next TC chairs meeting.

5. TC/TG/MTG/TRG Reorganization (5 minutes)

6:20 Balbach

- Proposal: Reduce current **110 Functional Group Meetings and 180 Subcommittee Meetings** to **~ 30 synergistic Technical Working Groups (TWG) consisting of 75 - 125 members.**
 - A TC 4.7 web meeting will be scheduled (target Mid/late February) discuss further and generate feedback
 - Individual feedback can be provided to Section 4 Head (Dennis Wessel)
- Balbach: Already discussed with Section 4 Liaison.

6. Subcommittee reports (70 minutes)

6:25 Various

6.1 Multiscale Building Energy Modeling (10 minutes)

Judkoff

Program:

- Multi-scale modeling 11 to be chaired/organized by Dan Macumber, Daniel Villa, and Wangda Zou
- Ralph to chair V&U session

See subcommittee minutes for details.

6.2 Data-Driven Modeling (10 minutes)

Muehleisen / Balbach

Miller: described kaggle competition concept.

See subcommittee minutes for details.

6.3 Simulation and Component Models (10 minutes)

Huang

Two current RP. See minutes for detail

Request for no cost extension for RP1661. Recommendation to approve from all PMS committee members present. Motion for TC to Approve by Ralph, Second by Joshua New, Committee voted 8-0-0 CNV

Discussion of existing and new potential RTARS in the SCM minutes.
No program suggestions.

6.4 Research (15 minutes) (move up above subcommittees to avoid subcommittee update redundancy)

Haberl

Haberl: RAC is asking TCs to nominate for ASHRAE research awards. RAC does not have enough nominations. Executive committee will discuss nominations.

Haberl: Those interested in doing research should consider being on PESs and PMSs.

Haberl: PTAR (Publication Topic Application Request) to turn research into special publications to better highlight ASHRAE research.

6.5 Handbook (10 minutes)

Pruett

Met 5-6pm at this meeting. We now have reviewers/readers for all sections of our chapter in the fundamentals.

Deadlines for content/updates are in minutes for meeting.

One new section to be added on multiscale modeling

There is a basecamp folder set up. John will have the master copy on his computer but contributors can edit.

6.6 Program (15 minutes)

Abushakra

- Program Submittals:
 - Talk to the Track Chair before submitting
 - Conform to one of the Tracks
 - Emphasize New Technology - Audiences more interested in technology than physics
 - Don't be afraid to propose a Track to CEC
- ASHRAE BPAC
 - Balbach: Occuring in Denver, CO Sept. 26-27. Presentation only (call coming soon).

Program for KC

- Multi-scale modeling XI to be chaired/organized by Dan Macumber, Daniel Villa, and Wangda Zou
- Empirical Validation and Uncertainty of Building Energy Simulation Software - Ralph to chair V&U session and invite team members from LBNL, ORNL, ANL, and NREL DOE project
- Identifying and Removing Outliers for DDMS, Organize by Agami (if he agrees)
- Data Driven Modeling - Unlimited Opportunities (Brooks to organize)
- VRF Systems Modeling (Brooks to organize)

Motion to accept program by Pruettt seconded by Muehleisen

Committee voted 8-0-0 CNV

5.7 Historical (5 minutes)

7:30 Haberl

- Historical Committee - 125 Anniversary.
 - Anniversary events at next two meetings.
 - Video interview with Robert Heninger accepted.
 - Two articles on historical topics and six articles proposed for orlando.

5.8 Standards (15 minutes)

7:45 Neymark

- SSPC 140 SMOT for Evaluation of Building Energy Analysis Computer Programs **Neymark**
 - Currently updating thermal fabric test cases. Final report published by the end of this year.
 - ECB encouraged 140 to explore an acceptance criteria.
 - Test case topic prioritization exercise. Going to focus on updating the BESTEST HVAC Volume 1 cases with empirically derived performance map.
 - Validation and uncertainty project shows that there are possibly some data sets that can be used for test cases.
 - Muehleisen: Stakeholder meeting for feedback on 140. Solicits interest in participating.
- SPC 205 Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment **Barnaby**

About to go out for public review with draft following response to comments from APR.
Current draft has water-cooled chillers, unitary AC, and fans.
Worked on roadmap for additional equipment. AC extended to do heat pumps, chiller to include air-cooled, pumps will follow pattern of fans.
Several other components on the back burner.
Will develop an open-source toolkit to allow ability to convert between formats.

5.9 Web Site (5 minutes) (<https://tc0407.ashraetcs.org/>)

7:50 New

Interwebs are still working.

Minutes go back to 1995.

6. Related activities reports (10 minutes)

8:00 Various

NOTE: We have removed any committees/groups that closed or had no updates in last 4 meetings

- SPC 191 Standard for the Efficient Use of Water in Building and Mechanical Systems
Water equivalent of 90.1. Water balance for buildings. Going out for second public review in a few months.
- MTG.IAST, Impact of ASHRAE Standards And Technology On Energy Savings/ Performance
None
- MTG.OBB Occupant Behavior in Buildings
Proposing a new chapter for HoF.
- MTG.BIM Building Information Modeling
United States rep on a number of ISO projects, but cannot participate effectively.
- MTG.ACR Air Change Rates
None
- TC 4.1 Load Calculation Data and Procedures
Between handbook chapters. A lot of discussion about radiant system.
- TC 4.2 Climatic Information
New is going to be new chair.
Research on reanalysis model for getting weather data for anywhere in the world (use with care).
Recommending contractor to update climatic information in the handbook.
RTAR for climatic data for rooftop units.
- TC 4.5 Fenestration
Interest in participating in Standard 205.
- TC 6.5 Radiant Heating and Cooling
None
- TC 6.6 Service Water Heating Systems
RTAR for collecting empirical data for ASHRAE 140 test suite
SPC Method of Test to generate parameters for simplified simulation (potentially relevant to Standard 205).
- TC 7.5 Smart Building Systems
None
- TC 7.6 Building Energy Performance
Energy audit group interested in developing schema to use BuildingSync
Potentially extending a standard to pursue issues related to water. Modeling of water use may need more attention.
- TC 9.12 Tall Buildings
None
- 90.1
Joint 140/ECB working group
- Guideline 14
Prioritizing efforts for work on the guideline
- BuildingSMART (formerly IAI International Alliance for Interoperability)
None
- IBPSA: USA, Canada, World
USA: New board, endorsed BPAC conference. World: Building Simulation conference in Rome in 2019.
- IEA Annex 66 Occupant Patterns
Dru: thinks it's closed.

7. Awards Nomination (5 Minutes)

8:05 Balbach

Executive committee is going to identify nominees. Deadline for submissions is Dec. 1.

8. Old Business

Balbach

9. New business

Balbach

Informal discussion of TC reorganization.

10. Adjourn

Balbach

Pruett moved, Neymark second

7-0-0 CNV

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SSPC 140 Meeting Summary – 14Jan2019 (submitted to TC4.7 1/15/19)

Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs.

- **140-2017 CM revision is current; integrates airside HVAC cases with 140-2014 test suites.**
 - **IRS rules** re the deduction for energy efficient **commercial buildings** require software used for assessing tax credits be tested as follows for projects placed in service:
 - o On/after Jan 1,2016: test to 140-2014 (except Secs. 5.2.4, 7, 8) **11 progs (26 vers.) qualified; up from 9/16 progs/vers last June**
 - o On or before Dec 31, 2015: test to 140-2007, **13 programs qualified.**
- New submittals to ron.judkoff@nrel.gov.
Qualified programs listed at <http://energy.gov/eere/buildings/qualified-software-calculating-commercial-building-tax-deductions> (Last check 09Jan2019).
- **RESNET or DOE list 3** (last check 09Jan2019) tools as either accredited for HERS ratings, “45L” tax credit compliance (DOE). Required tests are NREL’s HERS BESTEST (included in Std 140-2011,-2014), along with equipment modeling and other modeling tests developed by RESNET. “45L” submit to DOE (45Lsoftware@ee.doe.gov) **Other submittals to RESNET (<http://www.resnet.us/professional/programs/software>).**
 - **ASHRAE 90.1 and 189.1 reference Standard 140;**
 - 90.1-2016, published Fall 2016, references 140-2014 (except Sections 7, 8).
 - **2018 IECC cites 140-2014;** IGCC citation accords with IECC.
 - **ASHRAE 90.2-2018 is published,** references Standard 140, Section 7

Building Thermal Fabric Tests Update (140, Section 5.2)

- **Address advances in modeling state of the art since 1995**
- **Revisions to existing test cases and inclusion of additional excursion (parametric sensitivity) test cases is nearing completion in collaboration with SSPC 140.**

Test suite progress:

- **Final round test spec distributed to sim trial participants (Sep 2018)**
 - o 8 programs submitted results. In-progress results are treated as sensitive data, for internal use only.
 - o **Range of disagreement among simulation results is improving (getting narrower) since 1995; this is attributable to improvements in the test specifications and the state of the art in modeling since 1995.**
- **Next steps (plan):**
 - o **Final report publication (Nov 2019)**
 - o **Addendum (Spring/Summer 2020)**
 - o **Continuous maintenance revision (Autumn 2020).**

Referencing of 140-2017 in 90.1-2019:

- o **SSPC 90.1 is in progress with updating their reference of 140 for 90.1-2019 to 140-2017; the addendum for this has passed through recent public review**
- o **90.1 ECB/140 collab. working group met for first time Sunday afternoon**
 - **Primary objective is to develop acceptance criteria for 140 test results; the acceptance criteria would be published in 90.1**
 - **All participants agreed that this working group should continue**
 - **Let me know if you are interested in this working group.**

Prioritization of Possible Test Suites to Develop after Completion of Building Thermal Fabric Tests Update:

- **We are doing a roadmap for future activities**
- **This includes prioritization of next test suites to develop**
- **Initial voting indicates strongest interest in updating the HVAC BESTEST working-fluid-side test cases (essentially performance map interpretation tests) with empirically derived performance maps (and other improvements)**

The following test suites were under consideration at this meeting (after eliminating test suites at previous meeting):

Empirical Validation Tests

- New DOE “Validation and Uncertainty” project tests
 - LBNL/Flexlab test cases
 - ORNL test cases
- “ETNA BESTEST Empirical Validation Test Specification (NREL and Electricite de France)
- NREL indoor/outdoor apartment module tests

Other Analytical Verification and Comparative Tests

- Update of HVAC BESTEST cases applying empirically determined performance maps.
- Airside HVAC BESTEST Volume 2
- Weather-Drivers
- Weather-Driven Infiltration and Natural Ventilation
- IEA-34/43 Multi-Zone Test Suite
- More Ground-Coupled Heat Transfer Cases
- 2/3-D conduction cases (e.g., window frames and thermal bridges)
- ASHRAE RP-1052 “Development of an Analytical Verification Test Suite for Whole Building Energy Simulation Programs – Building Thermal Fabric
- Domestic Hot Water
- Standard 205 Performance Map Tests

Empirical Validation: Work sponsored by DOE is in progress. Experimental data is being developed along with simulation results for comparison with empirical data. The participating labs are LBNL (Haves, Kohler), ORNL (Im, New), NREL (Judkoff) and ANL (Muehleisen)

- One year extension of original 3 year project
- Uncertainty analysis:
 - We are using ANL’s analysis to differentiate test case quality (ability to simulate)
- A new project in this is NREL’s indoor/outdoor apartment module that allows empirical determination of exterior wall conductance related inputs, which is difficult to determine without the highly controllable environment that is possible by initially running experiments indoors.

Empirical validation (where program results are compared to empirical data) is much more difficult than comparative testing (comparing software to each other) or analytical verification testing (comparing program results to analytical solution results developed outside of whole building energy sim progs). This is because test specifications are more complex (real experimental facility versus idealized analytical verification or comparative tests for simplicity of input) and inputs must be empirically determined (in addition to the target output results).

Standard 140 Stakeholder Meeting (Muehleisen): Agenda: Possibility of acceptance criteria, user guide, roadmap – web-meeting in Spring; invited attendees at this 4.7 meeting or to tell Ralph if you know someone who may be interested.

References to Standard 140. Standard 140 is referenced by:

- IRS, Standard 90.1
- Standard 189 (High Performance Green Building Design) Appendix D
- Standard 90.2-2018 (new) references Section 7 tests (adapted from HERS BESTEST 1995)
- IECC, IGCC
- The newly developing COMNet (BPI, Energy Foundation et al) User's Manual.
- Implicitly referenced for ASHRAE Building Energy Quotient IF that is based on the COMNet User's Manual;
- RESNET references Section 7 tests.
- Florida Building Commission
- Various international references.

Listing of test suites included in ANSI/ASHRAE Standard 140, Analytical Verification Tests and Comparative Tests (year added to Standard 140 in parenthesis below.)

- NREL/IEA 12/21 "IEA BESTEST", building thermal fabric comparative tests (2001)
- NREL/IEA 22 "HVAC BESTEST Volume 1", working-fluid side analytical verification tests (2004)
- NREL/IEA 22 "HVAC BESTEST Volume 2", working-fluid side comparative (2007)
- NRCan/IEA 22 "Furnace BESTEST", analytical verification and comparative (2007)
- NREL/HERS Council "HERS BESTEST", comparative tests, simplified residential analysis tools (2011)
- NREL/IEA-34/43 "Ground-Coupled Slab-On-Grade In-Depth Tests", analytical verification (2014)
- ASHRAE RP-865 "Air-Side HVAC BESTEST, air-side mechanical equipment analytical verification tests based on ASHRAE 865 RP (2017)

Full SSPC 140 meeting notes are available at <http://sspc140.ashraepcs.org/index.html>.