TC 4.7 Minutes, Orlando  January 26, 2010

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, NE / Atlanta, GA 30329
404-636-8400

TC/TG/TRG MINUTES COVER SHEET

(Minutes of all meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG No.  TC 4.7  DATE:  February 1, 2010

TC/TG/TRG TITLE:  Energy Calculations

DATE OF MEETING:  January 26, 2010  LOCATION:  Orlando

<table>
<thead>
<tr>
<th>MEMBERS PRESENT</th>
<th>YEAR APPTD</th>
<th>MEMBERS ABSENT</th>
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<tr>
<td>Philip Haves (CHAIR)</td>
<td>2008</td>
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<td>Timothy McDowell (SEC)</td>
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<td>Robert Sonderegger</td>
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EX-OFFICIO MEMBERS & ADDIT'L ATTENDANCE

See attendance list for Additional attendees.

DISTRIBUTION

ALL MEMBERS OF THE TC/TG/TRG

TAC CHAIR:  Donald Brundage
TAC SECTION HEAD:  Suzanne LeViseur
SPECIAL PUBLICATIONS LIAISON:  Stanley Mumma
STANDARDS LIAISON:  Andrew Nolfo
HANDBOOK LIAISON:  Peter Simmonds
RAC RESEARCH LIAISON:  John House
PROF DEV COMM LIAISON:  Fiorentino Mendez
CHAP TECH TRANSFER LIAISON:  Andrew Cochrane
STAFF LIAISON (RESEARCH):  Michael R Vaughn
STAFF LIAISON (TECH SERVICES):  Michael R Vaughn
STAFF LIAISON (STANDARDS):  Stephanie Reiniche

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

ORLANDO MEETING

MOTIONS AND ACTION ITEMS

1. MOTION: “Approval of the minutes from the meeting in Louisville” moved Huang/Krarti (9-0-0 CNV)

2. MOTION: “TC 4.7 recommends a no cost extension of 1456-RP until July 31, 2010” moved Huang/Neymark (8-0-1 CNV, subcontractor abstained)

3. MOTION: “Approve WS-1588 “Representative layer-by-layer descriptions for fenestration systems with specified bulk properties such as U-factor and SHGC” with minor editorial changes” moved Huang/Krarti (7-0-1 CNV, abstention due to no time to review WS)

4. MOTION: “Approval of the TC4.7 Program Plan” moved Haberl/Huang (8-0-0 CNV)

5. MOTION: “TC 4.7 supports the TC4.1 TPS Standard Method of Test for Determining Heat Gain for Office Equipment Used in Buildings” moved Sonderegger/Crawley (7-1-0 CNV, reason for negative vote: I voted against the motion because I thought the monitoring detail was excessive for the needs of TC 4.7, and still would not provide the TC usable guidance on how to model office equipment energy usage and heat gain in building energy simulations. I'm not critical of the SMOT, which may be great in improving the energy efficiency of office equipment, I just don't think the resultant data are that helpful to TC 4.7.)

6. MOTION: “TC 4.7 supports the development of TPS HVAC Equipment Performance Data Formats for Energy Simulation” moved Sonderegger/Neymark (8-0-0 CNV)
TC/TG/TRG MINUTES COVER SHEET

TC/TG/TRG No. TC 4.7 DATE: February 1, 2010

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: January 26, 2010 LOCATION: Orlando

<table>
<thead>
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<th>LOCATION – past 12 months</th>
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TC/TG/TRG SUBCOMMITTEES

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<tr>
<th>Function</th>
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<td>Program</td>
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LONG RANGE RESEARCH PLAN

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<th>Rank</th>
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HANDBOOK RESPONSIBILITIES

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<th>Chapter Title</th>
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STANDARDS ACTIVITIES - List and Describe Subjects

SPC 140 Standard Method of Test for Building Energy Software – Joel Neymark

TECHNICAL PAPERS from Sponsored Research - Title, when presented (past 3 yrs. present & planned)

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<tr>
<th>TC/TG/TRG Sponsored Symposia</th>
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JOURNAL PUBLICATIONS - Title, when published (past 3 yrs. present & planned)

None
Below is a complete listing of attendees at this and the prior three meetings. It includes the voting members of the committee listed on the first page.

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V = Visitor
VM = Voting
CM = corres.
## Appendix 1

### TC 4.7 RESEARCH PROJECTS STATUS

**ASHRAE**  
Technical Committee 4.7 Energy Calculations  
(January 26, 2010)

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**Active projects**

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<th>#</th>
<th>Title</th>
<th>Joint TC</th>
<th>Cog SC/Contractor</th>
<th>PMSC</th>
<th>Dates / status</th>
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<tr>
<td>1197-RP</td>
<td>Update Energy Calculations for Residential HVAC Equipment</td>
<td>Sim/Comp, Univ of Colo</td>
<td>Chip Barnaby</td>
<td>Awaiting submission of final paperwork</td>
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<td>1416-RP</td>
<td>Development of Internal Surface Convection Correlations for Energy and Load Calculations</td>
<td>4.1</td>
<td>Sim/Comp, Univ of Texas</td>
<td>Dan Fisher (Chair), Steve Bruning, Jan Kosny</td>
<td>In Progress</td>
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<td>1456-RP</td>
<td>Assess and Implement Natural and Hybrid Ventilation Models in Whole-building Energy Simulations</td>
<td>4.10</td>
<td>Sim/Comp, Univ of Colo</td>
<td>Joe Huang (Chair), Philip Haves, Jan Hensen, R.Banks, N.Bourassa, S.Szymurski</td>
<td>In Progress</td>
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<td>1404-RP</td>
<td>Modeling, Analysis, and Reporting Protocols for Predicting Annual Energy Performance from Short-Term Building Energy Monitoring</td>
<td>DDM, Milwaukee School of Engineering</td>
<td>R. Sonderegger (Chair), J. Haberl, V. Smith</td>
<td>Contract signed 9/2009</td>
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## Appendix 2
### RESEARCH PLAN

**ASHRAE Technical Committee 4.7 Energy Calculations**  
2010 Research Plan (Jan 29, 2010)

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<tr>
<th>Title</th>
<th>Society status</th>
<th>TC 4.7 Status</th>
<th>Actors or TC 4.7 Prime Contact</th>
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<td><strong>Active projects</strong></td>
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<tr>
<td>1197-RP Update energy calculations for Residential HVAC equipment</td>
<td>awaiting final disposition</td>
<td>Project completed, but forms need to be turned in to ASHRAE</td>
<td>Barnaby (chair)</td>
<td>SCM</td>
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<td>1416-RP Development of Internal Surface Convection Correlations for Energy and Load Calculations</td>
<td>project underway</td>
<td>Third PMS meeting held Orlando Jan ‘10</td>
<td>Contractor: UTexas PMS: DFisher (chair), SBruning, JKosny</td>
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<td>1456-RP Assess and implement natural and hybrid ventilation models in whole-building energy simulations</td>
<td>project underway</td>
<td>Contractor delivered final report Oct ’09; PMS met in Orlando, but could not vote due to lack of quorum, PMS will review final report and do a letter ballot by Mar ’10, 6-mos. NCX to July ‘10</td>
<td>Contractor: UColo PMS YJHuang (chair), PHaves, JHensen, RBanks, CScrutton, XDWang, HDavies</td>
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<td>1404-RP Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring</td>
<td>Project awarded Jul 09, contract signed Sep 09</td>
<td>First PMS held in Orlando Jun10</td>
<td>Contractor: UMilwaukee PMS: RSonderegger (chair), JHaberl, VSmith</td>
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<td><strong>WSs approved by TC</strong></td>
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<td>1588-WS Procedure to create hypothetical layer-by-layer fenestration descriptions when only the bulk properties such as U-factor and SHGC have been defined</td>
<td>RTAR accepted Jan 09</td>
<td>TC 4.5 voted to co-sponsor; WS approved by full committee in Orlando Jan ’10 to be forwarded to RAC</td>
<td>YJHuang (WS author), proposed PES JHaberl (chair), CBarnaby, TMcDowell, + TC4.5 rep to be determined</td>
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<td>WS returned to TC4.2 Jun ’09, TC 4.2 letter ballot of revised WS to be held after Orlando</td>
<td>Co-sponsorship approved by full committee in Salt Lake City Jun 08</td>
<td>YJHuang (TC 4.7 contact)</td>
<td>DDM</td>
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</table>
## Appendix 3

### TECHNICAL PAPERS FROM SPONSORED RESEARCH

<table>
<thead>
<tr>
<th>RP</th>
<th>Title</th>
<th>Contractor</th>
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<td>Institution</td>
<td>Date</td>
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Appendix 4

TC/TG/TRG SPONSORED TRANSACTIONS SESSIONS

Current as of January 2010

PRESENT:

PLANNED:

**Albuquerque, June 26-30, 2010**
  Organized by: TC 4.7
  Chair: Russ Taylor
  Status: Since 1/09. 3 speakers (R. Taylor, R. Brahme, K. Otto)

**Jun 25-29, 2011 - Montreal, Quebec**
Transaction “Use of ‘equation solvers’ for Simulation”
  Organized by: TC 4.7 (Data Driven Models)
  Co-Chair: Jean Lebrun/Michael Wetter
  Status: Have 1 paper (Lebrun), need one more paper.

PAST:

**Louisville, June 20-24, 2009**
Transaction “Improving Load Calculations for Fenestrations with Shading Devices”

**Chicago, January 24-28, 2009**
HVAC&R Research Seminar “Synthesis of Optimum HVAC System Configurations”

**New York City/January 2008**
  How Low Can You Go?

  Recent Advances in Energy Simulation (Chair: Dan Fisher)

  How Low Can You Go? Low-Energy Buildings Through Integrated Design (Chair: Dru Crawley)

  Application of Inverse Models (Chair: Jeff Haberl)
Appendix 5
TC/TG/TRG SPONSORED SEMINARS

Current as of January 2010

PRESENT:

Orlando, January 23-27, 2010

Seminar “Web-based Programs for Calculating Energy Code-Compliance”
Organized by: TC 4.7 (Applications)
Chair: Larry Degelmann
Speakers: Jeff Haberl, Eric Richman, Krishnan Gowri.

Seminar “How to Assess the Performance of Sustainable Buildings”
Organized by: TC 4.7 (Data Driven Models)
Chair: Moncef Krarti
Speakers: William Koran, David Claridge

PLANNED:

Albuquerque, June 26-30, 2010

Priority #1 Seminar “Building Energy Simulation 101”
Track: Energy/Simulation
Organized by: TC 4.7
Chair: Chip Barnaby
Status: New

Priority #3 Seminar “Simulation of HVAC/R equipment and systems using the limited data published by manufacturer”
Track: Systems and Equipment
Organized by: TC 4.7 (Simulation and Component Models)
Chair: Michael Wetter

Priority #4 Seminar “Computer Simulation of Supermarkets”
Organized by: TC 10.7 (co-sponsored by 4.7)
Chair: Van D. Baxter, ORNL
Status: Since 7/09. Has 4 speakers

Jan 29-Feb 2, 2011 - Las Vegas, NV

Seminar “Modeling of High Performance Buildings”
Track: Energy Conservation and Alternative Energy Sources
Organized by: TC 4.7 (Simulation and Component Models)
Chair: Tim McDowell
Status: Since 6/08.
PAST:

**Louisville, June 20-24, 2009**
Seminar “Energy modeling of large buildings systems”

**Salt Lake City, June 21-25, 2008**
Use of Equation Solvers for Simulation (Chair: Michael Wetter)

**New York City, January 2008**
How to model nothing – Energy Modeling for Zero Net Energy Buildings: Parts 1 & 2 (Chair: Jan Kosny)

**Long Beach, June 2007**
Simulation Support for the 2007 Solar Decathlon (Chair: Kamel Haddad)

**Dallas, January 2007**
Use of ‘equation solvers’ for Simulation (Chairs: Jean Lebrun/Mike Wetter)

Applications of Computer Simulation in High Performance Buildings (Chair: Martha Brook)

**Québec City, June 2006**
None

**Chicago, January 2006**
How and Why to Calibrate a Simulation to Measured Data (Chair: Robert Sonderegger)

Application and Experiences with the New Simulation Software (Chair: Dan Fisher)

**Denver, June 2005**
Neglected Topics in Building Simulation (Chair: Ian Beausoleil-Morrison).

**Orlando, January 2005**
What to do When Data Misbehave (Chair: Agami Reddy)
PRESENT:

**Orlando, January 23-27, 2010**
None

PLANNED (w/priorities):

**Albuquerque, June 26-30, 2010**
Priority #2 Forum “Should ASHRAE Develop a Standard for Simulation Aided Design of High Performance Buildings”
  Track: Sustainability/LEED
  Organized by: TC 4.7 (Applications)
  Chair: Jason Glazer
  Status: Since 6/08

PAST:

**Chicago, January 24-28, 2009**
“Limitation of Energy Simulations for NZEB”

**Chicago/January 2006**
What Controls Modeling Capabilities are Needed for Energy Simulations? (Chair: Philip Haves)
1. Roll call and introductions (McDowell)
   - The meeting convened at 6:05 PM.
   - 10 voting members were present, excluding the chair, out of 14 non-international members, constituting a quorum.
   - Those present introduced themselves.

2. Accept agenda & approve minutes of Louisville meeting (Haves) (Agenda: Attachment A)
   
   MOTION: “Approval of the minutes from the meeting in Louisville” moved Huang/Krarti (9-0-0 CNV)

3. Announcements/Liaisons (Haves)
   - Update on Research Strategic Plan – a link was sent out with the agenda, society is inviting members to review and make comments. The TC subcommittees have reviewed the plan and will report later. Comments by Feb 22nd
   - The International Member position on committees has been replaced with a non-quorum voting position.
   - New category of provisional corresponding member – can become a CM partly through the roster cycle.
   - CEC Liaison, Monte Troutman,
     - Conferences have tracks with one track un-assigned, potential program should be assigned to a track and the track chair will determine how it fits in the track, but priority does not matter.
   - Research Liaison, John House,
     - Research budget is very tight and there might not be a call for proposals this Spring.
   - President-elect, Lynn Bellinger
     - Theme for next year is modeling a sustainable world
     - Wants a specialty conference on simulation - Looking for members on a steering committee for the conference from TC4.7 and IBPSA. Monty Troutman is chair of the specialty conference subcommittee and this is their number one priority. The planning should start in the next week or two. They asked the TC to provide 2-3 people to serve on the steering committee for the conference.
   - CLIMA 2010 in Turkey May 9-12.
   - System Simulation in Buildings Conference Dec in Liege
   - ASES/ASME Solar Conference in Phoenix

4. Membership (Haves)
   - Rolling off Haves, Ellis, and Kosny
   - Rolling on not finalized
   - Process is to sign up as Corresponding Member, volunteer your time, and then the Chair might invite to put come Member

5. Subcommittee reports

5.1 Research Joe Huang (chair) reporting:
   - In workstatements, the intended placement of the paper must be explicit e.g., HVAC&R Journal or ASHRAE Transactions.
   - 1416-RP – presentation by the PI, progress in testing procedure, several experiments have been performed with different diffusers and aspect ratios and placements. The PMS is satisfied with the progress shown and maybe a little ahead of schedule.
   - 1456-RP – natural and hybrid ventilation – the contractor has submitted the final report, but still waiting for review from the PMS. Recommendations on future work especially the need for more and better data sets
– improving the thermal and air network models. PMS will send comments to contractor, and hold letter ballot on final report by March 2010. Should be ready for full TC consideration by Albuquerque.

MOTION: “TC 4.7 recommends a no cost extension of 1456-RP until July 31, 2010” moved Huang/Neymark (8-0-1 CNV, subcontractor abstained)

- 1404-RP – modeling analysis short-term data – teleconference and meeting here – will continue to have meetings between conferences – have seen literature search and project plan.
- WS-1413 (filling missing weather data) TC4.2 lead, went out for bid. Only two bids received, of which one was disqualified. TC 4.2 will hold letter ballot to approve revised WS immediately after Orlando.
- WS-1588 “Representative layer-by-layer descriptions for fenestration systems with specified bulk properties such as U-factor and SHGC” TC 4.7 is responsible, TC 4.5 decided to co-sponsor.

MOTION: “Approve WS-1588 “Representative layer-by-layer descriptions for fenestration systems with specified bulk properties such as U-factor and SHGC” with minor editorial changes” moved Huang/Krarti (7-0-1 CNV, abstention due to no time to review WS)

5.2 Handbook, Chip Barnaby (chair) reporting:
- Starting next meeting the chapter will undergo review and revision.

5.3 Program, Michael Wetter (chair) reporting:
- TC prioritization is no longer needed.
- 2 seminars at this conference (150-200 participants for seminar chaired by Krarti, 200 participants for seminar chaired by Degelmann.)

MOTION: “Approval of the TC4.7 Program Plan” moved Haberl/Huang (8-0-0 CNV)

5.4 Standards, Ron Judkoff (chair) reporting
- SSPC 140 – addendum b HERS BESTEST passed public review includes informative annex with acceptance criteria, addendum c ground coupling should be voted in Feb, multi-zone cases are review draft by Feb, RP865 air-side mechanical equipment tests should be ready in 2011 – posting rules for results have been submitted to Dru Crawley for inclusion on the DOE tools website. Will communicate to 90.1 that future references to SMOT 140 should refer to specific sections of the standard rather than the entire standard.

MOTION: “To instruct the chair of TC 4.7 to write an appropriate letter to tech council to express our concern about the proliferation of non-vetted, non-ASHRAE simulation standards that are counter-productive to simulation” (Haberl/Neymark) There is concern that the TC does not have full information to know if this is the correct action, as well as concern that COMNET has proceeded without a public, open process. Another suggestion is to form a subcommittee to review the current situation. Motion was withdrawn. The chair will form a subcommittee to review the situation with COMNET.

- SSPC 140 is looking into how to update the example results include in the informative part of the standard. Will need to develop rules for updating example results. The chair has asked the SSPC to develop future test suites that could be included in the SMOT. These will be included in a written report. The inclusion of new content is difficult and time-consuming.
- TC4.1 – Proposal for forming standard method of test for determining heat gain from equipment – asking for support from TC4.7

MOTION: “TC 4.7 supports the TC4.1 TPS Standard Method of Test for Determining Heat Gain for Office Equipment Used in Buildings” moved Sonderegger/Crawley (7-1-0 CNV, reason for negative vote: I voted against the motion because I thought the monitoring detail was excessive for the needs of TC 4.7, and still would not provide the TC usable guidance on how to model office equipment energy usage and heat gain in building energy
simulations. I'm not critical of the SMOT, which may be great in improving the energy efficiency of office equipment, I just don't think the resultant data are that helpful to TC 4.7.)

- Proposal to form a standard for the HVAC equipment performance data for energy simulation. There is support outside of the TC. Barnaby will work on the TPS and bring to the TC for action.

MOTION: “TC 4.7 supports the development of TPS HVAC Equipment Performance Data Formats for Energy Simulation” moved Sonderegger/Neymark (8-0-0 CNV)

5.5 Website, chair not in attendance,
- Contact the chair (Kris Kinney) with any changes or updates to the website.

6. Reports on related activities (Various persons)
- GPC 20, XML definitions – updated, should be voted for public review soon
- TC 2.8 no report.
- TC 4.1, possible seminar on the effect of global warming on load calcs.
- TC 4.2, new weather data and many different elements added in the handbook; specing the data to be included in 2013; IWEC2s are being finished up.
- TC 4.5, interested in the convection coefficients on windows.
- TC 6.5, project on comfort calculations in radiant systems.
- TC 7.5, 5 possible research projects
- TC 7.6, discussing name and scope change.
- Building Smart, no report.
- IBPSA-USA, SimBuild 2010 New York City in August 9-13, 100 accepted abstracts, Lynn Bellinger will be the invited speaker and co-sponsorship by ASHRAE. Workshops on simulation training. BEMBOOK being developed. Copyright/left provisions are left to be worked out with ASHRAE on continuing with training.
- IBPSA Canada, eSim Winnipeg May 19/20 – 75 abstracts, papers being reviewed, keynotes are Ian Beausoleil-Morrison and Thomas Auer.
- IBPSA World, Building Simulation 2011 conference will be Wellington, New Zealand in November
- New working group 1 on Optimization meeting at ASHRAE
- There was a previous push for collaboration within Group 4 – thoughts to Phil

7. Old Business
   (none)

8. Committee Structure
- Subcommittees met with the new structure with one meeting with brainstorming and then breaking out into groups. Met and discussed ideas and the ASHRAE Research Strategic Plan
- Haves summarizes that for the third time, the structure was changed. Seven items from ASHRAE strategic plan were put on a short list. One idea moved into a TPS.
- Consensus is to keep new structure.

9. New Business
- Simulation Conference Organizing Committee – Haves will get recommendations.

10. Adjourn
- Meeting adjourns at 9:10.

Attachments
A. Agenda
B. Subcommittee Minutes
C. Research Subcommittee Minutes
D. Program
E. SSPC 140 Minutes
Agenda
ASHRAE TC 4.7 Energy Calculations
Tuesday, January 26, 2010, 6:00-8:30 p.m.
Panzacola Room, Rosen Shingle Creek Hotel
Orlando

1. Roll call and introductions  McDowell

2. Accept agenda & approve minutes of Louisville meeting  Haves

3. Announcements/Liaisons  Haves

4. Membership  Haves

5. Subcommittee reports
   5.1 Research  Huang
      • Status: 1404-RP Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring (Milwaukee School of Engineering)
      • Status: 1416-RP Development of Internal Surface Convection Correlations for Energy and Load Calculations (TC 4.1/4.7 Univ. of Texas at Austin)
      • Status: 1456-RP Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulations (TC 4.10/4.7 Univ. of Colorado)
      • RTARs and Work statements for consideration
   5.2 Handbook  Barnaby
   5.3 Program  Wetter
   5.4 Standards  Neymark
      • SSPC 140 SMOT for Eval Bldg Energy Analysis Computer Programs
      • IEA Annex 34/43 Test and Validation of Bldg Energy Sim Tools
   5.5 Web Site  Kinney

6. Related activities reports
   GPC 20 XML Definitions for HVAC&R  Barnaby
   TC 2.8 Building Environmental Impacts and Sustainability  ?
   TC 4.1 Load Calculation Data and Procedures  Petersen
   TC 4.2 Climate Information  Degelman
   TC 4.5 Fenestration  Barnaby
   TC 6.5 Radiant Heating and Cooling  Sommer
   TC 7.5 Smart Building Systems (now includes TC 7.4)  Wetter
   TC 7.6 Systems Energy Utilization  Abushakra
   BuildingSMART (formerly IAI International Alliance for Interoperability)  Haves
   IBPSA: USA, SimBuild 2008; Canada, eSim 2006; IBPSA, BS 2009  Haberl, Hensen

7. Old Business  (Haves)

8. Committee Structure  Haves

9. New business  (Haves)

10. Adjourn
Call to order at 6:37 pm

Still trying new format of half hour of brainstorming for new topics, then dividing into groups to conduct work on the actual topics. We will discuss at the main meeting whether this format will continue or change.

Introductions

Suggestions for changing how the meeting should be run. Older items should be revisited before proceeding with just new business.

Old Business:

Draft workstatement from Joe Huang on crafting window assemblies. Should be discussed and possibly worked on as one of the break out groups.

Been asked to consider the ASHRAE strategic research plan – specifically the goal 7.

Topics from last meeting:

1) Generation of curve-fit coefficients for Equipment Simulation
2) Better match of simulation to existing buildings
3) Equip/Misc loads schedules
4) Window properties from bulk properties workstatement

TC4-1 has asked for support of SMOT for determining heat gain of office equipment in buildings – the idea is that TC4.1 has sponsored many research projects for determining this data, but by the time it gets to the handbook it is out-of-date. So a SMOT would allow manufacturer’s to calculate these values themselves and not wait for another research project. The mismatch between nameplate and actual power draw and the many different service modes of the equipment makes this important for both load and energy calculations. (This will be added to the main meeting agenda.)

TC4.4 – idea evaluating the accuracy of whole building simulation with comparison to field measured data.

Window property workstatement – with only the bulk characteristics (U and SHGC) and any other data such as number of panes, can you derive a layer-by-layer description of the window. TC4.5 is interested enough in co-sponsorship. Joe feels the workstatement is ready to go to full committee for approval.

Other ideas: need for component model for direct exchange ground loop performance (should this stay in TC6.8)
Extending RP865 – need more analytical tests and other support for SMOT 140

Research Strategic Plan Topics:
1 – create templates for UI – don’t think we should or could solve such a long term issue – maybe this would only be a specification of requirements – guideline 20 has developed use cases for data exchange – maybe a similar task is needed – without knowing the engine it would be have to be so basic it would be useless
2 – create guidelines for the minimum building inputs – 1468 – RP TC1.5 – develop BIM to thermal test suite
3 – natural and hybrid ventilation – RP1456 is addressing the current robustness of whole building to network models – will recommend further experimental work to produce good data sets
4 – simultaneous thermal and other comfort with energy consumption – methods are available just not integrated
5 – integration of renewable and energy storage with whole-building - new methods are needed for passive solar components – need a target software platform
6 – rapid prototyping of component models – are our current models set-up the correct methods – ASHRAE vs IEA vs IBPSA – framework for toolkits and intellectual property – so some form of open-source site might be useful – use of Modelica may makes this possible
7 – perimeter heat – procedure for making decisions rather than just using the software – could fall back into a user manual
8 – dynamically operated shading devices – passive heating and cooling – NFRC is looking into rating shading systems and their performance
9 – simple rating tool for shading+glazing

Our tools and design methodologies have started to lag behind other industries and uncertainty analysis.

Design tools are not mentioned rather than just design procedures. Should we just talk about analysis? (discuss at the beginning or ABQ)

Windows Workstatement:

Visitors from TC4.5 – approval was voted from TC4.5 – wanted to make sure that the final outcome would be useful to industry and users – there is some conflict with current work done at LBNL – but that is an equivalent single-layer approach

This approach will develop more realistic window descriptions that will include the number of panes and optical properties.

Straw Poll – overwhelming for moving it forward at the main committee

Shortlist has 9 items:
RTAR Idea #1 (Chip, Jim): “Generation of curve fit coefficients for equipment simulation”
RTAR Idea #2 (B.Koran, Mangash): “Better match of Simulation to measured building energy and environmental data”
Idea #3 (0 votes): “Equipment and other misc. loads”
Idea #4 (WS already written) “Specific window simulation properties (i.e., WINDOW 5 properties) from ‘bulk’ window properties (i.e., SHGC, U-value, frame assumptions).”
Idea #5 (0 votes) (From TC 4.1, asking for co-sponsor): “SMOT for determining the heat gain of office equipment used in buildings”
RTAR Idea #6 (Kris): “Development of a simulation component model representing 2-phase refrigerant flow in vertical bore-holes serving geothermal heat pumps”
RTAR Idea #7 (Michael W, Tim M): “Development of a rapid prototyping capability that will allow ‘power users’ of whole building simulation tools to add custom models quickly and easily.”
RTAR Idea #8 (Klaus, Jeff): “Develop whole building simulation tools and design procedures that can evaluate the time dependent value of passive solar renewable energy sources, and the effectiveness of energy storage technologies in resolving the conflicts of availability and use.”
Idea #9 (Standard 140 Support): “Next level of “RP865-like” models for Standard 140.”

Idea #10 (Vern, Bill): Support development of tools, procedures, and methods suitable for designing low energy buildings.

There was overwhelming indifference for the topics and any further work this evening.

Feelings on meeting structure – 3rd rotation and shelf life is limited on the ideas and do not seem to last – we lose momentum between the meetings – the discussion of the strategic plan took more time away from the discussions – the brainstorming was supposed to bring out new ideas, but we have never had a problem bringing out the ideas, but we do not follow through on the ideas.

Need reminders and time to work on these outside of the meeting structure – focus on what will be worked on before the meeting so solid drafts can be developed and brought to the meeting for editing.

ASHRAE TC 4.7 Energy Calculations
Subcommittee
Tuesday, January 26, 2010, 3:30-5 pm
Orlando, Florida

Attendance: Tim McDowell, Jeff Haberl, Michael Wetter, Klaus Sommer, Mike Kennedy, Keith Cockerham, Bill Koran, Larry Degelman, Ron Judkoff, Joel Neymark, Liangzhu Wang, Gang Tan, Xia Fang, Jon Winkler, Joseph Firrantello, Philip Haves, Chip Barnaby

Agenda – proposal for standards group, program, window workstatement

Introductions

Proposal for standard for equipment data format – the software would have to read in the data, but it would be complete and in a common format for each piece of equipment. Lots of interest outside of the TC – we should talk about and work on the wording but not act at this point. Continue the politicking and work via email. While the standard would not be mandatory, it might be adopted into code. This should be data and not coefficients. Capture the data, but not make the model to represent the equipment. Is there enough data from the manufacturer for the maps? Getting the equipment manufacturers and the model developers at the same table and hammer out the format. The data format would be equipment specific. TC7.6 systems energy utilization is also moving forward with this type of project as well. Will get a sense of the main TC but will continue to get the words correct before officially proceeding.

Program:

All second hand information – no response on the new conference papers. Not sure if the program needs to ranked again, so we will just in case.

Contacted chairpersons about moving off the list if they have been around longer than 2006.

For ABQ – forum by Jason Glazer; seminar on modeling high performance buildings will move down if no speakers; Seminar on simulation HVAC equipment using limited manufacturer’s data

Proposed ranking – forum, seminar on equipment, seminar of simulation of refrigeration

Ideas for Las Vegas to Michael Vetter

-- Page 22 --
Should we give a basic seminar on simulation – what to do, what to expect? Seminar on basic calibration/accuracy as well? This would be the beginning or a series of seminar dealing with simulation.

Handbook – huge revision not needed for the next version. In ABQ, specific people should be lined up to review the chapter. Changes are due mid 2012.
### Title Society status TC 4.7 Status Actors or TC 4.7 Prime Contact Subcommittee

#### Active projects

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<th>TC 4.7 Status</th>
<th>Actors or TC 4.7 Prime Contact</th>
<th>Subcommittee</th>
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<tr>
<td>1197-RP Update energy calculations for Residential HVAC equipment</td>
<td>awaiting final disposition</td>
<td>Project completed, but forms need to be turned in to ASHRAE</td>
<td>Barnaby (chair)</td>
<td>SCM</td>
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<tr>
<td>1416-RP Development of Internal Surface Convection Correlations for Energy and Load Calculations</td>
<td>project underway</td>
<td>Third PMS meeting held Orlando Jan ‘10</td>
<td>Contractor: UTexas PMS: D Fisher (chair), S Bruning, J Kosny</td>
<td>SCM</td>
</tr>
<tr>
<td>1456-RP Assess and implement natural and hybrid ventilation models in whole-building energy simulations</td>
<td>project underway</td>
<td>Contractor delivered final report Oct ’09; PMS met in Orlando, but could not vote due to lack of quorum, PMS will review final report and do a letter ballot by Mar ‘10, 6-mos. NCX to July ‘10.</td>
<td>Contractor: UColo PMS: YJ Huang (chair), PHaves, JHensen, RBanks, C Scrutton, XD Wang, HDavies</td>
<td>SCM</td>
</tr>
<tr>
<td>1404-RP Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring</td>
<td>Project awarded Jul 09, contract signed Sep 09</td>
<td>First PMS held in Orlando Jun10</td>
<td>Contractor: UMilwaukee PMS: RSonderegger (chair), J Haberl, V Smith</td>
<td>DDM</td>
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#### WSs approved by TC

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<td>1588-WS Procedure to create hypothetical layer-by-layer fenestration descriptions when only the bulk properties such as U-factor and SHGC have been defined</td>
<td>RTAR accepted Jan 09</td>
<td>TC 4.5 voted to co-sponsor; WS approved by full committee in Orlando Jan ‘10 to be forwarded to RAC.</td>
<td>YJ Huang (WS author), proposed PES J Haberl (chair), CB Barnaby, T McDowell, + TC4.5 rep to be determined</td>
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#### Co-sponsored WSs under development

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<td>YJ Huang (TC 4.7 contact)</td>
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January 23-27, 2010, Orlando, FL

Theme: Humidity and Sustainable Indoor Environment


**7/10/2009 Session proposals due; 7/15/2009 Notification of selection; 8/14/2009 Final Program Submissions with speakers due**

Theme: Humidity and Sustainable Indoor Environment

Tracks: Energy Conservation and Alternative Energy Sources *** Sustainability *** IAQ/Comfort *** Load Calculations ***

Commissioning *** Refrigeration *** Building Information Modeling.


Seminar “Web-based Programs for Calculating Energy Code-Compliance”
Organized by: TC 4.7 (Applications)
Chair: Larry Degelmann
Speakers: Jeff Haberl, Eric Richman, Krishnan Gowri.

Seminar “How to Assess the Performance of Sustainable Buildings”
Organized by: TC 4.7 (Data Driven Models)
Chair: Moncef Krarti
Speakers: William Koran, David Claridge

Seminar “Supporting Performance Feedback Via Community Energy Benchmarking - Lessons learned”
Organized by: TC 4.7 (Data Driven Models)
Chair: Chris Balbach
Status: Since 1/09. (Candace Damon, Kim Lenihan, Chris Balbach)

Seminar “Computer Simulation of Supermarkets”
Organized by: TC 10.7 (co-sponsored by 4.7)
Chair: Van D. Baxter, ORNL
Status: Since 7/09. Has 4 speakers

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Jun 26-30, 2010 - Albuquerque, NM

Theme: Energy Efficient System Design for High Elevations and Dry Climates

9/25/2009 Transactions Papers and abstract of Conference Papers due;
12/15/2006 to 2/12/2010 Seminars/Forums submission period;
1/9/2010 Conference Papers Due


Priority #1 Seminar “Building Energy Simulation 101”
Track: Energy/Simulation
Organized by: TC 4.7
Chair: Chip Barnaby
Status: New

Priority #2 Forum “Should ASHRAE Develop a Standard for Simulation Aided Design of High Performance Buildings”
Track: Sustainability/LEED
Organized by: TC 4.7 (Applications)
Chair: Jason Glazer
Status: Since 6/08

Priority #3 Seminar “Simulation of HVAC/R equipment and systems using the limited data published by manufacturer”
Track: Systems and Equipment
Organized by: TC 4.7 (Simulation and Component Models)
Chair: Michael Wetter

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-- Page 25 --
Priority #4 Seminar “Computer Simulation of Supermarkets”
Organized by: TC 10.7 (co-sponsored by 4.7)
Chair: Van D. Baxter, ORNL
Status: Since 7/09. Has 4 speakers

Organized by: TC 4.7
Chair: Russ Taylor
Status: Since 1/09. 3 speakers (R. Taylor, R. Brahme, K. Otto)

Jan 29-Feb 2, 2011 - Las Vegas, NV
Theme: Zero Energy Design
4/9/10 Technical Papers and abstract of Conference Papers due;
6/4/10 to 8/6/10 Seminars/Forums submission period;
8/6/10 Conference Papers Due
Seminar “Modeling of High Performance Buildings”
Track: Energy Conservation and Alternative Energy Sources
Organized by: TC 4.7 (Simulation and Component Models)
Chair: Tim McDowell
Status: Since 6/08. 1/10: Tim suggests to drop unless there is significant interest in Orlando.

Jun 25-29, 2011 - Montreal, Quebec
Theme: Net-Zero Buildings
Transaction “Use of ‘equation solvers’ for Simulation”
Organized by: TC 4.7 (Data Driven Models)
Co-Chair: Jean Lebrun/Michael Wetter
Status: Have 1 paper (Lebrun), need one more paper.

Dropped:
Seminar “Shoot-out of Code Compliance Simulation for Residential Buildings”
Organized by TC 4.7 (Applications)
Chair: Jeff Haberl
Status: Since 1/07

Seminar “Experience with Simulation of Standard 90.1 Code-compliant Buildings”
Organized by TC 4.7 (Applications)
Chair: Carol Gardner
Status: Since 1/07

Seminar “Methods of Carbon Credit Certification from Energy Efficiency and Renewable Energy”
Organized by TC 4.7 (Data Driven Models)
Chair: Kris Subbarao
Status: Since 6/07. Confident to get 3 speakers.

Seminar “Simulation Support for the Solar Decathlon”
Track: Applications
Organized by TC 4.7 (Applications)
Chair: Kamel Haddad
Status: Since 6/07. Has speakers.

Seminar “Applying Performance Assessment Tools to mitigate Climate Change”
Organized by TC 4.7 (Applications)
Chair: Carol Gardner
Status: Since 1/08. May get 4 speakers, but none confirmed.

Seminar “Advanced Inverse Modeling Techniques using Interval Data”
Organized by TC 4.7 (Data Driven Models)
Chair: Jeff Haberl
Status: Since 1/08.

Seminar “You don’t know what you’ve got ‘til it’s checked! The importance of QA in benchmarking energy analysis results”
Organized by: TC 4.7 (Simulation and Component Models)
Chair: Russ Taylor
Status: Since 1/08. Had two speakers (summer 09).

-- Page 26 --
SSPC 140 Orlando Meeting Summary – 1/25/10 (submitted 1/26/10)

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

Current IRS rules (IRS notice 2008-40, published Apr 2008) relating to the deduction for energy efficient commercial buildings require software used for assessing tax credits be tested to Standard 140-2007. Currently 9 programs have satisfied the new requirements (up from 4 programs last June and 1 program last January). (10 programs satisfied the previous requirement (issued June 2006) to submit test results for Standard 140-2004.)

ANSI/ASHRAE Standard 140-2007 Addendum B (HERS BESTEST adaptation by FSEC/JNA) passed Sep/Oct 2009 public review with no comments. The addendum will be published in early 2010, pending completion of final editorial changes by ASHRAE Staff. The addendum proposes a separate new section in Standard 140 (to facilitate reference by others) for test cases for more simplified building energy analysis tools commonly used for residential modeling. The addendum also includes an informative (non-mandatory) annex containing example procedures for developing acceptance range criteria adapted from HERS BESTEST.

ANSI/ASHRAE Standard 140-2007, Proposed Addendum C (BESTEST In-Depth Ground-Coupling adaptation by NREL/JNA) was submitted to SSPC 140 for initial review Nov 30, 2009. (The tests – developed by NREL in collaboration with IEA 34/43 -- include analytical verification tests, and the methodological advancement of developing a secondary mathematical truth standard using an analytical solution benchmark and verified numerical-model results for other test cases included within the test suite. During PC review and simulation trials, S. Rees of De Montfort University ran their newly developed detailed 3-d numerical model for conduction and diffusion through the test cases and report finding/fixing 2 bugs – one of which had a 40% effect on results. The PC will proceed with letter-ballot for publication/public review approval in the near future.

SSPC 140 unanimously agreed with NREL’s plans to adapt and field-test for incorporation into Standard 140 ASHRAE RP 865 (by Yuill and Haberl) – air-side mechanical equipment analytical verification test cases. RP 865 includes 78 test cases over 7 air-distribution systems with similarly varied loads, set points and economizer controls. The tested systems are: constant volume terminal reheat, VAV, single fan constant volume dual duct, dual fan VAV dual duct, single-zone air conditioner, four pipe fan coil, four pipe induction. The adaptation will include full NREL/IEA-type simulation trials with SSPC 140 (and others invited to participate). The spec will be revised as indicated by the simulation trials. Distribution of an initial test specification adaptation (with all the trimmings required for use within Std 140) is planned for Fall 2010. 3 rounds of simulation trials are expected (more if needed), concluding Summer/Fall of 2011. After that the test suite will be submitted to SSPC 140 for publication/public review recommendation.

In Louisville, SSPC 140 unanimously agreed with NREL’s plans to adapt for incorporation into Standard 140 NREL’s recently completed IEA 34/43 Multi-Zone test suite. Content of the test suites is:

- Multi-zone envelope test cases (developed by NREL in collaboration with IEA 34/43) including:
Analytical verification conduction test

Comparative tests of

- The effect of shading on a window, where a shading device is affixed to the window of a neighboring zone
- The effect of shading on a window by a neighboring zone of the building
- Internal windows.

An initial review draft will be submitted to SSPC 140 in February.

SSPC 140 also plans to develop a new erratum for the Furnace cases developed by NRCan. This is to correct a minor discrepancy with developing equivalent base case furnace loads for programs that cannot directly input specified surface coefficients.

Development of a format for 140 results data to be posted on the DOE Tools web site.
The Data Format SubC continues to develop data format, submittal, and posting recommendations; much of this can also be applied for tax-deductions related software approvals.

Progress:

- Web Cover Page content and layout, and rules for submitting results are completed and will be submitted to DOE in the near future; this portion was led by Jim Pegues. This work involves improvements to the standard output reports of Std 140, also included in recently approved Standard 140-2007, Addendum A.
- Mike Witte is developing automation and format improvements to the four results spreadsheets currently in 140-2007 for automating inclusion of new results into formatted charts and tables, for comparing submitted results with the current Std-140 example results set.
- The SubC is also planning to begin work to develop guidelines for vetting newly submitted results that could be used as updated example results. The guidelines may be applied where a repeat of NREL/IEA-type simulation trials (see resolution below) cannot be executed in a timely manner.

Note just below for historical reference

How to establish newly submitted results (e.g., via DOE tools site) as updated example results (i.e., how do we vet new results submittals)

Unanimous Resolution (from Chicago, Jan 2009): “The PC has identified a critical need for updated example results to support Standard 140 and directs the Chair to communicate that need to ASHRAE and DOE.”

At the Louisville meeting the PC agreed that for updating example results there must be a fully funded task to generate updated Section 5.2 and 7.2 results using the process and methodology similar to that used by NREL for the IEA work in Tasks 34/43, 22, 12.

REFERENCES TO STANDARD 140 IN STANDARD 90.1. JIM PEGUES WILL WORK WITH JASON GLAZER (90.1 ECB SUBC CHAIR) TO INDICATE THAT WITH RESPECT TO 140-2010 (FORTHCOMING CM REVISION), FUTURE REFERENCES BY 90.1 SHOULD BE SPECIFIC TO SECTION 5 (CLASS I) TEST PROCEDURES, WHICH ARE MORE APPROPRIATE FOR TESTING DETAILED MODELS USED WITH 90.1 MODELING. THE NEWLY ADDED SECTION 7 (CLASS II) TEST PROCEDURES ARE MORE APPROPRIATE FOR TESTING SIMPLIFIED MODELS COMMONLY USED FOR LOW-RISE RESIDENTIAL MODELING.

Other references to Standard 140. Standard 140 is also referenced by

- Standard 189 (High Performance Green Building Design) Appendix D
- Implicitly referenced for ASHRAE Building Energy Quotient IF that uses the EPAct (DOE/Crawley) “qualified tools” listing;

-- Page 28 --
BATEST-EX UPDATE

This is a new comparative test suite being developed for testing the ability of software used for modeling residential retrofits to predict energy savings. Part of the test process also tests the ability to initially calibrate the model of the existing building (pre-retrofit). The recently completed Interim Test Procedure includes a set of building physics tests with calibrated energy savings test versions of the physics tests. The test cases are based on HERS BESTEST, but with improvements including to equivalent constant surface coefficients (lower values based on recent advancements in the modeling state of the art) and Sherman-Grimsrud infiltration modeling. Test case parametric variations include the following retrofits: air sealing, attic insulation (blown cellulose), wall insulation (blown cellulose), thermostat setback, low-e windows, exterior shading, cool roof, and all retrofits combined. There are also a number of targeted calibration scenarios including targeted high and low space heating energy consumption base case scenarios, and fully random selection base case scenarios. Future test cases would be developed for BATEST-EX to address furnace and space cooling system retrofits, duct leakage, and domestic hot water modeling. Additionally, other building physics test cases for BATEST-EX could be cross-referenced from HERS BESTEST.

P. Haves (TC 4.7 Chair) requested a listing of validation test suites be presented at the meeting (for discussion relating to models that address advanced energy design). A comprehensive listing requires a literature survey. A quick listing of test suites either included in Std 140 or listed in Annex B18 (of Std 140) for future reference include:

Analytical Verification Tests and Comparative Tests already in Standard 140 (or with addenda in progress)
- NREL/IEA 12/21 “IEA BESTEST” (building thermal envelope fabric load tests)
- NREL/IEA 22 “HVAC BESTEST Volume 1” (analytical verification tests)
- NREL/IEA 22 “HVAC BESTEST Volume 2” (comparative tests)
- NRCan/IEA 22 “Furnace BESTEST” (analytical verification and comparative)
- NREL/HERS Council “HERS BESTEST” (comparative tests, simplified residential)
- NREL/IEA-34/43 “Ground-Coupled Slab-On-Grade In-Depth Tests” (analytical verification)
- NREL/IEA-34/43 “Multi-Zone Non-Airflow” (analytical verification and comparative)
- ASHRAE RP-865 “Air-Side Mechanical Equipment Analytical Verification Tests”

Other Analytical Verification and Comparative Tests
- NREL “BESTEST-EX” (comparative physics and calibration tests, existing homes)
- ASHRAE RP-1052 “Development of an Analytical Verification Test Suite for Whole Building Energy Simulation Programs – Building Thermal Fabric
- “RADTEST Radiant Heating and Cooling Test Cases”
- IEA-34/43 Airflow Tests by Japan (final report still in progress)
Empirical Validation Tests

- IEA-34/43: “Empirical Validations of Shading/Daylighting/Load Interactions in Building Energy Simulation Tools (EMPA, Switzerland)
- IEA-34/43 “Chilled Water and Hot Water Mechanical Equipment and Control Comparative and Empirical Validation Tests (empirical and comparative, TUD, Germany)
- IEA-34/43 “Double-Skin Façade Empirical Validation Tests” (Aalborg U., Denmark).
- IEA 22 Economizer Control Tests for the Empirical Validation of Building Energy Analysis Tools (Iowa ERS, US and Spain)
- “ETNA BESTEST Empirical Validation Test Specification (NREL and Electricite de France)
- New Research: There is a possibility of developing a test facility for empirical validation of software used to model retrofits of existing building (i.e., software that is currently the subject of the BESTEST-EX test suite). Such a test facility would be expensive relative to developing comparative and analytical verification tests, but such expense would be well justified if U.S. energy policy moves towards supporting energy efficiency retrofits of energy-inefficient houses that comprise a large portion of the current U.S. housing stock.

Full SSPC 140 meeting notes are available from the Chair on request.