

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

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS & ADDIT'L ATTENDANCE
Philip Haves (CHAIR)	2008	Jan Hensen	2008	See attendance list for Additional attendees.
Jeff Haberl (V CHAIR)	2009	Peter Ellis	2006	
Joel Neymark (STDS S.C.)	2007	Russ Taylor	2009	
Joe Huang	2009	Iain MacDonald	2009	
Klaus Sommer (INT'L)	2007			
Dru Crawley	2008			
Moncef Krarti	2007			
Jan Kosny	2006			
Timothy McDowell (SEC)	2008			
Robert Sonderegger	2008			

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 Cochran
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)

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TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: January 26, 2010 LOCATION: Orlando

TC/TG/TRG MEETING SCHEDULE				
LOCATION – past 12 months		DATE	LOCATION - planned next 12 months	
Louisville		June 23, 2009	Albuquerque, NM	
Chicago		January 27, 2009	Las Vegas, NV	
			June 26-20, 2010	
			January, 2011	
TC/TG/TRG SUBCOMMITTEES				
Function			Chair	
Program			Michael Wetter	
Research			Joe Huang	
Handbook			Chip Barnaby	
RESEARCH PROJECTS – Current			Monitoring	Report Mode
Project Title	Contractor		Comm.Chm.	At Meeting
Appendix 1				
LONG RANGE RESEARCH PLAN				
Rank	Title	W/S Written	Approved	To R & T
	Appendix 2			
HANDBOOK RESPONSIBILITIES				
Year & Volume	Chapter Title	No.	Deadline	Handbook Subcom. Chair/Liaison
2005 Fundamentals	Energy Estimating Methods	31	June 2011	Barnaby/Simmonds
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)				
Appendix 3				
TC/TC/TRG Sponsored Symposia - Title, when presented (past 3 yrs. present & planned)				
Appendix 4				
TC/TG/TRG Sponsored Seminars - Title, when presented (past 3 yrs. present & planned)				
Appendix 5				
TC/TG/TRG Sponsored Forums - Title, when presented (past 3 yrs. present & planned)				
Appendix 6				
JOURNAL PUBLICATIONS - Title, when published (past 3 yrs. present & planned)				
None				

Attendance
Attendance

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.

Present at Meeting				Last name	First name	Membership
Orlando January 2010	Louisville June 2009	Chicago January 2009	Salt Lake City June 2008			V= Visitor VM = Voting CM = corres.
X	X	X	X	Abushakra	Bass	CM
X		X	X	Anderson	J.R.	V
		X		Armstrong	Peter	
X	X	X		Balbach	Chris	V
		X	X	Baltazar	Juan-Carlos	V
X	X	X	X	Barnaby	Chip	CM
	X			Bobker	Michael	V
		X		Bourassa	Norm	CM
X				Brantley	John	V
X	X	X		Carpenter	J Patrick	CM
		X		Chaisuparasmikul	Pongsak	V
X		X		Cho	Soolyeon	V
X	X	X	X	Claridge	David	CM
		X		Coffey	Brian	V
X	X	X	X	Cornick	Steve	V
X	X	X	X	Crawley	Dru	VM
X	X	X	X	Degelman	Larry	CM
X				Eldridge	David	V
		X	X	Ellis	Peter	VM
X				Fang	Xia	V
	X			Field	Kristin	V
X				Firraniello	Joseph	V
	X	X		Fisher	Dan	CM
		X		Gardner	Carol	
X	X	X	X	Haberl	Jeff	VM
X	X	X		Haddad	Kamel	CM
X	X	X	X	Haves	Philip	VM
				Hensen	Jan	INT'L M
X				Hermesen	Austin	V
	X			Hittle	Doug	CM
	X	X	X	Hong	Tianzhen	V
X				Brooks	Hooper	V
	X			Horton	Travis	V
X				House	John	V
X	X	X	X	Huang	Joe	VM
X	X	X	X	Judkoff	Ron	CM
X				Kennedy	Mike	V

Present at Meeting				Last name	First name	Membership
Orlando January 2010	Louisville June 2009	Chicago January 2009	Salt Lake City June 2008			V= Visitor VM = Voting CM = corres.
			X	Kinney	Kris	V
X				Kolderup	Erik	V
X				Koran	Bill	V
X	X	X		Kosny	Jan	VM
X	X	X		Krarti	Moncef	VM
X				Kummert	Michael	V
		X		Laughman	Christopher	V
X			X	Lemort	Vincent	V
	X	X	X	LeViseur	Susan	TAC Sec Head
	X	X	X	Liesen	Richard	CM
		X		Logee	Terry	V
		X	X	MacDonald	Iain	VM
X				Malherek	Elyse	V
X	X	X	X	McDowell	Tim	VM
X	X	X	X	Mukhopadhyay	Jaya	V
X	X	X	X	Neymark	Joel	VM
X		X		O'NEILL	Zheng	
X	X	X	X	Pedersen	Curt	CM
X				Pegues	Jim	V
			X	Reddy	T. Agami	CM
	X			Rees	Simon	CM
X		X		Schaefer	Larry	V
X				Schertz	Paul	V
		X	X	Selkowitz	Steve	V
X				Shirey	Don	CM
	X			Shrestha	Som	V
X		X		Smith	Vern	V
		X		Sloat	Cara	V
X	X	X		Sonderegger	Robert	VM
X	X	X	X	Sommer	Klaus	INT'L M
		X		Spitler	Jeffrey	
	X	X		Stovall	Therese	V
	X		X	Taylor	Russell	VM
	X			Thevenard	Didier	V
X				Tseng	Paul	V
X				Verba	Roman	V
X	X	X	X	Wetter	Michael	CM
X				Winkler	Jon	V
	X	X	X	Wray	Craig	CM
	X			Wright	John	V
			X	Xiaobing	Liu	V
X				Yuill	Gren	V
		X		Zhou	Liang	V

Present at Meeting				Last name	First name	Membership
Orlando January 2010	Louisville June 2009	Chicago January 2009	Salt Lake City June 2008			V= Visitor VM = Voting CM = corres.
		X		Zmeureanu	Radu	V

Appendix 1**TC 4.7 RESEARCH PROJECTS STATUS**

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

Active projects

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

Appendix 2
RESEARCH PLAN

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

Title	Society status	TC 4.7 Status	Actors or TC 4.7 Prime Contact	Subcommittee*
Active projects				
1197-RP Update energy calculations for Residential HVAC equipment	awaiting final disposition	Project completed, but forms need to be turned in to ASHRAE	Barnaby (chair)	SCM
1416-RP Development of Internal Surface Convection Correlations for Energy and Load Calculations	project underway	Third PMS meeting held Orlando Jan '10	Contractor: UTexas PMS: DFisher (chair), SBruning, JKosny	SCM
1456-RP Assess and implement natural and hybrid ventilation models in whole-building energy simulations	project underway	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.	Contractor: UColo PMS YJHuang (chair), PHaves, JHensen, RBanks, CScrutton, XDWang, HDavies	SCM
1404-RP Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring	Project awarded Jul 09, contract signed Sep 09	First PMS held in Orlando Jun10	Contractor: UMilwaukee PMS: RSonderegger (chair), JHaberl, VSmith	DDM
WSs approved by TC				
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	RTAR accepted Jan 09	TC 4.5 voted to co-sponsor; WS approved by full committee in Orlando Jan '10 to be forwarded to RAC.	YJHuang (WS author), proposed PES JHaberl (chair), CBarnaby, TMcDowell, + TC4.5 rep to be determined	A
co-sponsored WSs under development				
WS-1413 Developing standard procedures for filing missing weather data (TC 4.2 lead)	WS returned to TC4.2 Jun '09, TC 4.2 letter ballot of revised WS to be held after Orlando	Co-sponsorship approved by full committee in Salt Lake City Jun 08	YJHuang (TC 4.7 contact)	DDM

Appendix 3
TECHNICAL PAPERS FROM SPONSORED RESEARCH

RP	Title	Contractor	Approved	Paper
1051	Procedures for Reconciling Computer-calculated Results with Measured Energy Data	Drexel	Chicago January 2006	Reddy, T.A., 2006. "Literature Review on Calibration of Building Energy Simulation Programs: Uses, Problems, Procedures, Uncertainty and Tools", ASHRAE Transactions, vol 112(1).
1051	Procedures for Reconciling Computer-calculated Results with Measured Energy Data	Drexel	Chicago January 2006	Sun J. and Reddy T.A., 2006, "Calibration of Building Energy Simulation Programs Using the Analytic Optimization Approach (RP-1051)", Int. J HVAC&R Research 12(1) 177-196.
1051	Procedures for Reconciling Computer-calculated Results with Measured Energy Data	Drexel	Chicago January 2006	Reddy, T.A., I. Maor and C. Pongjapornpon, 2006, "Calibrating Detailed Building Energy Simulation Programs with Measured Data- Part I: General Methodology", accepted for publication in Int. J HVAC&R Research.
1051	Procedures for Reconciling Computer-calculated Results with Measured Energy Data	Drexel	Chicago January 2006	Reddy, T.A., I. Maor and C. Pongjapornpon, 2006, "Calibrating Detailed Building Energy Simulation Programs with Measured Data- Part II: Application to Three Case Study Office Buildings", accepted for publication in Int. J HVAC&R Research.
865	Accuracy Tests for Simulations of VAV Dual Duct, Single Zone, Four Pipe Fan Coil and Four Pipe Induction Air Handling Systems (4796)	Univ Nebraska, Texas A&M	July 2002	Yuill, G., Haberl, J. 2006. "Accuracy Tests for Simulations of VAV Dual Duct, Single Zone, Four Pipe Fan Coil and Four Pipe Induction Air Handling Systems (4796)," ASHRAE Transactions-Research, Vol. 112, Pt. 1 (January).
865	Accuracy Tests for Simulations of Constant Volume, Dual Duct and Variable Volume Air Handling Systems (4796).	Univ. Nebraska, Texas A&M	July 2002	Yuill, G., Haberl, J., Caldwell, J. S. 2005. "Accuracy Tests for Simulations of Constant Volume, Dual Duct and Variable Volume Air Handling Systems (4796, RP-865)," ASHRAE Transactions-Research, Vol. 111, Pt. 2, No. 4796, pp. 137 – 153 (June).

1050	Development of an Inverse Model Toolkit	Univ. of Dayton, Texas A&M	December 2001	Kissock, K., Haberl, J., Claridge, D. 2003. "Inverse Model Toolkit (1050-RP): Numerical Algorithms for Best-Fit Variable-Base Degree-Day and Change-Point Models," ASHRAE Transactions-Research, Vol. 109, Pt. 2, pp. 425 – 434.
1050	Development of an Inverse Model Toolkit	Univ. of Dayton, Texas A&M	December 2001	Haberl, J., Claridge, D., Kissock, K. 2003. "Inverse Model Toolkit (1050-RP): Application and Testing," ASHRAE Transactions-Research, Vol. 109, Pt. 2, pp. 435 – 448.
1093	Diversity Factors and Schedules for Energy and Cooling Load Calculations	Texas A&M	June 2000	Abushakra, B., Haberl, J., Claridge, D. 2004. "Overview of Literature on Diversity Factors and Schedules for Energy and Cooling Load Calculations (1093-RP)," ASHRAE Transactions-Research, Vol. 110, Pt. 1 (February), pp. 164 – 176.
1093	Diversity Factors and Schedules for Energy and Cooling Load Calculations	Texas A&M	June 2000	Claridge, D., Abushakra, B., Haberl, J. 2003. "Electricity Diversity Profiles for Energy Simulation of Office Buildings (1093-RP)," ASHRAE Transactions-Research, Vol. 110, Pt. 1, pp. 365 – 377 (February).

Appendix 4

TC/TG/TRG SPONSORED TRANSACTIONS SESSIONS

Current as of January 2010

PRESENT:

PLANNED:

Albuquerque, June 26-30, 2010

Conference Paper "Use of Building Energy Simulation in Energy Code and Policy Analysis"

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

Status: Since 6/08. Joel Neymark, Vincent Lemort, Craig Wray.

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)

Appendix 6
TC/TG/TRG SPONSORED FORUMS

Current as of January 2010

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)

ASHRAE TC 4.7 Energy Calculations
Tuesday, June 23, 2009, 6:00 PM to 9:00 PM
Louisville, KY

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.
 Panzicola 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
• <u>Status:</u> 1404-RP Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring (Milwaukee School of Engineering)	
• <u>Status:</u> 1416-RP Development of Internal Surface Convection Correlations for Energy and Load Calculations (TC 4.1/4.7 Univ. of Texas at Austin)	
• <u>Status:</u> 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	

Attachment B

ASHRAE TC 4.7 Energy Calculations
Subcommittee
Monday, January 25, 2010, 6-9 pm
Orlando, Florida

Attendance: Tim McDowell, Jeff Haberl, Michael Wetter, Piljae Im, Soolyeon Cho, Larry Degelman, Hofu Wu, Kwang Ho Lee, Austin Hermsen, Chip Barnaby, Vern Smith, Don Shirey, Joe Huang, Moncef Krarti, John House, Mangesh Basarkar, Chris Balbach, Bill Koran, Michael Kummert, Michel Bernier, Jim Pegues, Dan Fisher, Aleka Pappas, Paul Schertz, Bass Abushakra, Klaus Sommer, Norm Bourassa, William Dupont, Bipin Shah, Brian Crooks, Phil Haves

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 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 make 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 be 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

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.

Attachment C

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

Title	Society status	TC 4.7 Status	Actors or TC 4.7 Prime Contact	Subcommittee*
Active projects				
1197-RP Update energy calculations for Residential HVAC equipment	awaiting final disposition	Project completed, but forms need to be turned in to ASHRAE	Barnaby (chair)	SCM
1416-RP Development of Internal Surface Convection Correlations for Energy and Load Calculations	project underway	Third PMS meeting held Orlando Jan '10	Contractor: UTexas PMS: DFisher (chair), SBruning, JKosny	SCM
1456-RP Assess and implement natural and hybrid ventilation models in whole-building energy simulations	project underway	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.	Contractor: UColo PMS YJHuang (chair), PHaves, JHensen, RBanks, CScrutton, XDWang, HDavies	SCM
1404-RP Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring	Project awarded Jul 09, contract signed Sep 09	First PMS held in Orlando Jun10	Contractor: UMilwaukee PMS: RSonderregger (chair), JHaberl, VSmith	DDM
WSs approved by TC				
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	RTAR accepted Jan 09	TC 4.5 voted to co-sponsor; WS approved by full committee in Orlando Jan '10 to be forwarded to RAC.	YJHuang (WS author), proposed PES JHaberl (chair), CBarnaby, TMcDowell, + TC4.5 rep to be determined	A
co-sponsored WSs under development				
WS-1413 Developing standard procedures for filing missing weather data (TC 4.2 lead)	WS returned to TC4.2 Jun '09, TC 4.2 letter ballot of revised WS to be held after Orlando	Co-sponsorship approved by full committee in Salt Lake City Jun 08	YJHuang (TC 4.7 contact)	DDM

Attachment D

TC 4.7 Program Plan
ASHRAE Meeting
1/24/10

January 23-27, 2010, Orlando, FL**Theme: Humidity and Sustainable Indoor Environment**

2/15/2009 Transactions Session proposals due; 3/2/2009 Notification of acceptance of Transactions Sessions; 5/1/2009 Papers Due ***
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.
Within Track *Energy Conservation and Alternative Energy*: Global Energy Use Trends - Geothermal Applications- High Performance Office Buildings - *Energy Modeling Experiences* - Net Zero Energy Residential Buildings - Alternative Energy: Solar Applications - Combined Heat and Power Systems - *Energy Calculation Models*

- Seminar "Web-based Programs for Calculating Energy Code-Compliance" Scheduled
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" Scheduled
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" Not
scheduled
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" Not
scheduled
Organized by: TC 10.7 (co-sponsored by 4.7)
Chair: Van D. Baxter, ORNL
Status: Since 7/09. Has 4 speakers

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

Tracks: What Is Sustainable Anyway? - **Energy Facts and Simulation** - Ventilation Systems - Refrigeration for the Future - Central Plant Systems - BIM/CAD/Paper and Pencils - Energy Conservation vs. New Generation - Living with HVAC&R Systems - High Efficiency HVAC Systems - Professional Skills - Data Center and High Density Cooling

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

Status: Since 6/08. Joel Neymark, Vincent Lemort, Craig Wray.

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

Conference Paper "Use of Building Energy Simulation in Energy Code and Policy Analysis"

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 'till 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).

Attachment E

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 EPA Act (DOE/Crawley) “qualified tools” listing;

- The newly developing COMNet (BPI, Energy Foundation et al) User's Manual.
- RESNET plans to reference Section 7 tests (140-2007 Addendum B) after they are published.

BESTEST-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 BESTEST-EX to address furnace and space cooling system retrofits, duct leakage, and domestic hot water modeling. Additionally, other building physics test cases for BESTEST-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 Validaiton Tests (empirical and comparative, TUD, Germany)
- IEA-34/43 “Double-Skin Façade Empirical Validation Tests” (Aalborg U., Denmark).
- IEA 22 “Daylighting/HVAC Interaction Tests for the Empirical Validation of Building Energy Analysis Tools (Iowa ERS, US)
- 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)
- IEA ECBCS Annex 42: Comparative Testing and Empirical Validation of Annex 42 Models for Residential Cogeneration Devices (NRCan)
 - http://cogen-sim.net/index.php?pg=&download=Annex_42_ST_B_Final_report_on_comparative_testing_and_empirical_validation.pdf
- 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.