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: January 23, 2013

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: June 26, 2012 LOCATION: San Antonio

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS & ADD'L ATTENDANCE
Jeff Haberl (CHAIR)	2010	Jan Hensen	2008	See attendance list for additional attendees.
Tim McDowell (V CHAIR)	2010	Iain Macdonald (SCM SC CHR)	2009	
Joe Huang (SEC, APP SC CHR)	2010			
Chip Barnaby (HDBKSC CHR)	2010	Bass Abushakra (RES & DDM SC CHR)	2011	
Chris Balbach (PRGM SC CHR)	2010			
Joel Neymark (STDS SC CHR)	2011	Robert Sonderegger	2008	
Dan Fisher	2011	Russ Taylor	2010	
		Michael Wetter	2011	

Total attendance of voting members: 7 present, 6 absent.

DISTRIBUTION

ALL MEMBERS OF THE TC/TG/TRG

TAC CHAIR	Michael Bilderbeck , Charles Culp
TAC SECTION HEAD	
SPECIAL PUBLICATIONS LIAISON	William Fleming
STANDARDS LIAISON	James Tauby
HANDBOOK LIAISON	Peter Simmonds
RAC RESEARCH LIAISON	Srinivas Garimella
PROF DEV COMM LIAISON	John Nix
CHAP TECH TRANSFER LIAISON	Harris Sheinman
STAFF LIAISON (RESEARCH)	Michael Vaughn
STAFF LIAISON (TECH SERVICES)	Michael 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
San Antonio Meeting

MOTIONS AND ACTION ITEMS

MOTION: Tim McDowell moved, Chris Balbach seconded, to accept the minutes, Motion passes 6-0-0, Chair not voting.

MOTION: Tim McDowell moved, seconded by C. Barnaby, to approve the program plan as presented with six seminars for Dallas. Motion passes 6-0-0 Chair not voting.

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DATE OF MEETING: June 26, 2012 LOCATION: San Antonio

TC/TG/TRG MEETING SCHEDULE

LOCATION – past 12 months	**DATE**	**LOCATION - planned next 12 months**	**DATE**
Chicago	Jan. 24, 2012	Dallas	January 29, 2013
Montreal	June 28, 2011	Denver	June 25, 2013

TC/TG/TRG SUBCOMMITTEES

Function	**Chair**
Program	Chris Balbach
Research	Bass Abushakra
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**
2009 Fundamentals	Energy Estimating Methods	19	July 2012	Barnaby, /Simmonds

STANDARDS ACTIVITIES - List and Describe Subjects

SPC 140 Standard Method of Test for Building Energy Software – Joel Neymark
SPC 205 Data Exchange Protocols for Energy Simulation of HVAC&R Equipment Performance - Chip Barnaby
SPC 209 Energy Simulation Aided Design for High-Performance Buildings - Jason Glazer

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

Below is a complete listing of attendees at this meetings. It includes the voting members listed on the first page

Last Name	First Name	Affiliation	E-mail	Status 06/12 VM Voting CM Corres. V Visitor
Anderson	JR	Anderson Engineering		V
Balbach	Chris	Perf. Systems Develop.		VM
Barnaby	Chip	Wrightsoft		VM
Bhandari	Mahabir	ORNL		
Clark	Jordan	UT-Austin		
Cockerham	Keith	DLB Associates		CM
Cornick	Steve	NRC Canada		V
Crawley	Dru	Bentley		
Cumali	Zulfi	Energy System		
Degelman	Larry	TAMU		CM
Fallahi	Ali	Fraunhofer CSE		
Fisher	Dan	Oklahoma State Univ		VM
Glazer	Jason	GARD Analytics		
Haberl	Jeff	TAMU		VM
Haves	Philip	LBNL		CM
Hong	Tianzhen	LBNL		
Huang	Joe	White Box Technologies		VM
Huizar	Antonio	KW Engineering		
Judkoff	Ron	NREL		CM
Karava	Panagioton	Purdue		
Kelsey	Jim	KW Engineering		
Kennedy	Mike	Mike Kennedy Inc		
Kennedy	John	Autodesk		
Kinney	Kris	KES		CM
Kolderup	Erik	Kolderup Consulting		V
Kota	Sandeep	Texas A&M University		
Krarti	Moncef	University of Colorado		CM
Liu	Shichao	UT-Austin		
Long	Nicholas	NREL		
McDowell	Tim	TESS		VM
McNeill	James	Affiliated Engineers		
Miura	Mayumi	Azbil Co.		
Neymark	Joel	J. Neymark & Assoc		CM
Ng	Lisa	NIST		
O'Neill	Zheng	UTRC		V
Pruett	John	ZMM, Inc.		V
Reddy	T. Agami	Arizona State Univ		V
Roth	Amir	DOE		V
Sheinman	Harris	CTT Liaison		
Shirey	Don	Bentley		
Snyder	Steven	Johnson Controls		
Sobrevilla	Andres	Munters		
Tabares	Paulo	NREL		
Ullah	Tania	NIST		
Wray	Craig	LBNL		
Zuo	Wangda	LBNL		CM

Appendix 1
TC 4.7 RESEARCH PROJECTS STATUS

ASHRAE
Technical Committee 4.7 Energy Calculations
(June 26, 2012)

Active projects

#	Title	Joint TC	Cog SC/ Contractor	PMSC	Dates / status
1413-RP	Developing standard procedures for filing missing weather data	4.1	APP, Univ of Oklahoma	Didier Thevenard (Chair, TC 4.2), Steve Cornick (TC4.2), Neal Lott, (TC 4.2), Chip Barnaby (TC 4.2/4.7)	Underway, expected completion June 2013
1468-RP	Development of a Reference Building Information Model (BIM) for Thermal Model Compliance Testing	1.5	SCM, Texas A&M	J. Kennedy (Chair, TC 1.5)	Underway, expected completion Aug. 2012

Appendix 2
RESEARCH PLAN

ASHRAE
Technical Committee 4.7 Energy Calculations
2012 Research Plan (June 26, 2012)

Title	Society status	TC 4.7 Status	Actors or TC 4.7 Prime Contact	Subcom-mittee*
Active projects				
1413-RP Developing standard procedures for filing missing weather data (TC 4.2 lead)	project underway	Second PMS meeting held in San Antonio Jun '12	Contractor: U. of Oklahoma, PMS: Didier Thevenard: (chair TC 4.2), Chip Barnaby, Steve Cornick, Neal Lott	APP
1468-RP Development of a Reference Building Information Model (BIM) for Thermal Model Compliance Testing	project nearing completion expected Fall '12	Third PMS meeting held in San Antonio Jun'12.	Contractor: Texas A&M PMS: John Kennedy (chair TC1.5), others ?	SCM
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	Approved by RAC in San Antonio pending minor changes June'12.	Revised WS approved by TC 4.7 Jan '12 and resubmitted to RAC May '12.	Joe Huang (WS author), proposed PES Jeff Haberl (chair), Chip Barnaby, Tim McDowell, + TC4.5 rep to be determined	APP
WS under development				
1456-RP Assess and Implement Natural and Hybrid Ventilation Models in Whole-building Energy Simulations (Phase Two)	Awaiting RTAR for Phase Two	RTAR and WS under development	Wangda Zuo, Joe Huang , Simon Rees, Eric Kolderup, Malcolm Cook, Iain Macdonald	SCM

Appendix 3
TECHNICAL PAPERS FROM SPONSORED RESEARCH

Anything new to add ? What about papers from 1404-RP and 1413-RP ??

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. Ponjapornpon, 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. Ponjapornpon, 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).

Appendix 3 (continued)
TECHNICAL PAPERS FROM SPONSORED RESEARCH

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 June 2012

should we eliminate this appendix because TCs no longer can organize transaction sessions ?

PRESENT:

PLANNED:

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 June 2012

PRESENT:

San Antonio, June 23-27, 2012

"Three perspectives on SPC 205P" (title TBD)
Chair: Chip Barnaby
Three proposed speakers, including a consumer of 205P, a product manufacturer , and a software vender

"Using measured data of various fidelity with simulations"
Chair: Dave Bosworth
Speakers: Eric Bonnema, Jesse Dean, Tim McDowell

"Methods for quantifying water savings using regression models"
Chair: Chris Balbach (may be changed)
Speakers: Chris Balbach, Jerone Gagliano, Jeff Haberl

PLANNED:

Dallas, January 26-30, 2013

need program activities from Chris Balbach. Minutes say there will be six seminars scheduled for Dallas, but I need names and titles.

PAST:

Chicago, January 21-25, 2012

Standard 205P: Hassle-Free Equipment Performance Data for Energy Modeling (Chair: Chris Balbach)
Improving Energy Modeling Consistency (Chair: Joe Huang)

Integrated Multi-domain Simulations for Innovative Building Design and Operation, Part One (Chair: Wangda Zuo)

Integrated Multi-domain Simulations for Innovative Building Design and Operation, Part Two (Chair: Jerone Gagliano)

Las Vegas, Jan 29-Feb 2, 2011

Building Energy Simulation 102 (Chair: Keith Cockerham)
Energy Modeling of Existing Buildings (Chair: Sue Reilly)

Albuquerque, June 26-30, 2010

Building Energy Simulation 101 (Chair: Tim McDowell)
Simulation of HVAC/R equipment and systems using the limited data published by manufacturer (Chair: Michael Wetter)

Appendix 5 (continued)
TC/TG/TRG SPONSORED SEMINARS

Orlando, January 23-27, 2010

Web-based Programs for Calculating Energy Code-Compliance (Chair: Larry Degelman)
How to Assess the Performance of Sustainable Buildings (Chair: Moncef Krarti)

Louisville, June 20-24, 2009

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 June 2012

PRESENT:

Jun 26-30, 2012 – San Antonio

None

PLANNED (w/priorities):

None

PAST:

Chicago, January 24-28, 2009

"Limitation of Energy Simulations for NZEB" (Chair: Tim McDowell)

Chicago/January 2006

"What Controls Modeling Capabilities are Needed for Energy Simulations?" (Chair: Philip Haves)

ASHRAE TC 4.7 Energy Calculations
Tuesday,June 26, 2012, 6:00-8:30 p.m.
San Antonio

Minutes of TC 4.7 full meeting

6:05 Meeting called to order by Chair Jeff Haberl

6:10 Roll call and introductions

6:12 Jeff Haberl asked for Liaisons

6:17 **Liaisons**

Technical Liaison Mike Bilderbeck spoke to remind everyone that speakers can... (rest lost).,

- If a TC knows ahead of time there's not a quorum at a meeting, members can be brought in electronically. This doesn't mean a meeting can be of 2 people, and the rest all joining remotely. Procedure will be determined by tomorrow, and better-defined by Dallas. TC members are encouraged to get more involved in their local chapters. The president-elect will award points to chapters that get TC members involved
- new TC : CCTV - Chapter b (?) Transfer Committee (meaning unclear)
- Jeff expressed his concern that a number of simulation programs were mentioned at this conference that were proprietary did and not come out of ASHRAE.

6:21 ***Delayed roll call*** - the attendance barely reached quorum , with 6 attending and 5 absent.

MOTION: Tim McDowell moved, Chris Balback seconded, to accept the minutes, Motion passes 6-0-0, Chair not voting.

Announcements

Jeff asked for other liaisons or announcements. There being none, Jeff moved on to other announcements.

Jeff described what he heard from the Section Chair's breakfast

- A number of MTGs (Multi-Disciplinary Task Groups) have been formed, several of which are relevant to this TC, in particular one on Energy Efficient Air-Handling Systems
- there will now be a speakers registration fee
- will review accelerations and calendars (don't know what this is =- YJH)
- research going forward starting the Denver conference, 25% will go to research and research items.

Upcoming conferences

- Oct 2012 - ASHRAE Energy Modeling Conference
- Oct. 2012 Joint ASHRAE/NIST conference on refrigerants
- Nov 12-14 Calgary (name of conference ? YJH)

Other items

- There are changes to way things will be updated on the Web site. Concerns should be forwarded to Webmaster Kris Kinney In addition, there will be a rebranding of ASHRAE - including .a new logo, "Shaping tomorrow's environment today".
- Advanced Energy Design Guide

- In addition to the sign-up sheet, Jeff is circulating another sheet for TC members wanting letters to their employers.

Minutes of TC 4.7 full meeting (continued, page 2 of 7)

- Conference calls are being be set up for meetings, but not entirely
- Defers to Chris about tracks for future AHSRAE conferences.`
- Related workshops are on the ASHRAE web site.
- There is an offer for a TC master calendar to be available through Google, may be used for future meetings.
- ASHRAE thinking of a ASHRAE terminology Wiki It's already up and is a supervised Wiki; people should check it out.
- Jeff asks for announcements for members or liaisons from other TCs.
- Someone from TC 7.9 said that in his TC someone participated in the meeting remotely and was able to cast his vote.
- Jeff announced the new officers to be rolling on after this meeting (see agenda).

6:32 - please contact secretary if anyone wants to join TC 4.7.

- Tim McDowell says that it's better for those wanting to be new members to go through the ASHRAE website

Subcommittee reports

Data-Driven Models (Chris Balbach substituting for Bass Abushakra)

Did not generate any new Work Statements

Applications (Joe Huang)

The Applications Subcommittee meeting was held from 3:30 to 5:00 just prior to this meeting. There were four main topics that came up during the meeting: COMNet, Standard 209, WS-1588 on window modeling, and whether TC 4.7 should develop a set of prototypical building models.

- Ellen Franconi introduced the BEM work and the BEM library on which she was working. The topic evolved to a long discussion about the current status of COMNet and what ASHRAE and specifically TC 4.7 should do in response. There were suggestions as well as concerns raised about the TC sponsoring a forum or seminar on COMNet, so in the end no action was proposed.
- Jason Glazer said that a new Standard 209 "Energy Simulation Aided Design for High-Performance Buildings" has been established and met for the first time at this conference.
- WS-1588 "Procedure to create hypothetical layer-by-layer fenestration descriptions when only the bulk properties such as U-Factor and SHGC have been defined" was finally approved by RAC at this conference.
- DOE has developed a set of prototypical commercial building models that exist only as EnergyPlus input files and are currently not being supported. Should TC 4.7 adopt or expand on these models as a reference set for use by ASHRAE?

Simulations and Component Models (Tim McDowell substituting for Iain Macdonald)

Because Iain was not able to attend this conference, Tim McDowell chaired the SC meeting last evening. Since we're not sure of Iain's position going forward, so anyone of interest should let us know. During the SC meeting, the following topics were discussed:

- RTAR-1456 (Natural Ventilation Phase Two). Although the Phase One work was widely considered a successful project, scoping out Phase Two has been stalled for more than a year. Joe Huang has

Minutes of TC 4.7 full meeting (continued, page 3 of 7)

asked for volunteers interested in moving this task along. Wangda Zuo has agreed to take a look at the Phase One WS and project report.

- Is there a way to automatically zone a building, possibly by also looking into the building geometry? It's unclear whether that would be a computer program or research.
- Variable Refrigerant Flow (VRF) systems. Similar to above, not enough is known to tell whether modeling VRF systems requires more research or developing a computer program. Chris Baker agreed to do some investigation on this topic and then report back to the TC.
- Discussion on uncertainty of inputs and outputs in simulations - The new test cells at ORNL and LBNL are just coming on-line and hopefully will generate high quality data that can be used to determine some of the uncertainty in the inputs and test the outputs from software. So it might make the most sense to wait until this data starts becoming available.

6:41 **Research** (Jeff Haberl substituting for Bass Abushakra)

Chair Jeff Haberl asked the PMSC chairs to update the meeting on the status of current active projects:

RP-1404 "Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring". PMSC member Agami Reddy summarized the status of the project as follows: The contractor (Bass Abushakra) has replied to PMSC comments in the Fall of 2011, but the PMSC has yet to respond. Perhaps the TC should contact the PMSC Chair Robert Sonderegger to clarify the project status. The project is basically complete, with four papers having been submitted , and the final report underway.

RP-1413 "Developing standard procedures for filing missing weather data" (co-sponsored project with TC 4.2 as the lead). Dru Crawley reported that the project about half done, and slated to be finished by next year.

RP-1468 "Development of a Reference Building Information Model (BIM) for Thermal Model Compliance Testing". John Kennedy reported that the PMSC met with the contractor (Jeff Haberl) Sunday morning . Final comments on the project will be sent to the contractor in the next couple of weeks. The project is planned for completion, also within the next few weeks.

RP-1588 "Procedure to create hypothetical layer-by-layer fenestration descriptions when only the bulk properties such as U-Factor and SHGC have been defined". Work Statement author Joe Huang reported that the WS has been approved by RAC, on the condition that a few remaining RAC comments are addressed. In addition, there is a need to contact the proposed PESC members to confirm their interest and availability to serve on the PESC and eventual PMSC. Agami , who is a current RAC member, said that this must be done by August 15th .

RTARs under discussion

- RTAR on "Modelica models for the evaluation of supervisory control strategies in the ASHRAE Handbook" (Wangda Zuo and Michael Wetter authors)
- RTAR on "Data-driven building models for smart meters" (Robert Sonderegger author) has been sent in to Mike Vaughn. Agami says that RAC has discussed it and will be returning it to the TC
- RTAR on actual performance of buildings (proposed by Phil Haves) Jeff Haberl summarized the work as getting a little sidetracked, but that Phil would get it back on track.
-

Minutes of TC 4.7 full meeting (continued, page 4 of 7)

- RTAR on 1456 natural ventilation Phase II - no progress since Chicago. Joe Huang has asked for volunteers interested in moving this task along. Wangda Zuo has agreed to do this.
- RTAR on uncertainty of inputs and outputs in simulations - situation unclear.
- RTAR on adapting DOE's Commercial Reference Building models for ASHRAE use (proposed by Joe Huang) - Dru mentioned the ongoing work for 1651-RP. Jeff described the interests for using the prototypes may not be the same as 1in 1651-RP, and suggested that Dru and Joe coordinate to see how to proceed.

Handbook (Chip Barnaby)

The new chapter is improved, but somewhat late according to ASHRAE timelines. It will need to submit by July. (Chip will supply the exact dates for those interested). Chip Barnaby moved that the TC approve the handbook chapter, which was seconded by Tim McDowell. Agami asked what has been changed from the previous version. Chip said there was a pass through all the text by Joel Neymark and himself to clean up the text, while Jeff Haberl's students went through the references. The section on ground heat loss has been replaced by a new section describing several ground heat transfer models. The validation section has been reworked by Joel and Ron, and there are improved cross-references to Climatic Information on Degree-Days, etc.

MOTION passed 6-0-0 Chair voting.

Program (Chris Balbach)

Chris Balbach and Keith Cockerham went over the program plan.

Chip Barnaby suggested that Seminar 7 with Chip and Neal Kruis be moved from Dallas to Denver.

Keith described the deadlines for submitting program items and paper for future conferences.

MOTION: Tim McDowell moved, seconded by C. Barnaby, to approve the program plan as presented with six seminars for Dallas. Motion passes 6-0-0 Chair not voting.

Standards (Joel Neymark)

Standard 140 (Ron Judkoff)

Joel first asks Ron Judkoff to talk about Standard 140. Ron says that Standard 140 is ranked seventh of ASHRAE's 130 standards in popularity. Over the past six months, they have added HERS BestTest, and modeler reports. Although SP 140 is just a SMOT (Standard Method of Test) with no pass-fail, but other groups will use these tests to define pass-fail for programs. What's in the future are a BestTest for ground heat transfer being done with the IEA, and another on multi-zone air flow also being done with the IEA.There are also needs to add one more test for VAV, tighten up language, and more field tests.

Many people wanted Section 5.2, which is the "heart and soul" of SP 140, to be upgraded. Some resources have finally been found to do this and to bring it up to date with modern software. There are many citations to SP 140, including ASHRAE-90.1, COMNet, RESNET, IRS building credits, IRS residential building credits, etc. Good examples are the CEC and Bruce Wilcox in creating a new residential program for California, and ReSNET are both citing SP 140.

There are about a page and a half of potential test suites identified around the world (which may get incoporated into SP 140 ?)

Minutes of TC 4.7 full meeting (continued, page 5 of 7)

SPC 205 "Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment" (Chip Barnaby)

SPC205 aims at developing standard representation of performance data for HVAC & R equipment and other facility equipment. A meeting was held today, and produced a rough draft. The attendees went down a list of issues and came to consensus on them. They will have a more solid draft in Dallas, and would love to get more involvement from people at their meetings which take place Tuesday morning 8-10.

GPC 20 "Documenting HVAC&R Work Processes and Data Exchange Requirements " (Barnaby)

The aim of GPC20 is to document HVAC&R work process and data exchange requirements. They have generated some use cases, and how to use social media to do that.

SPC 209 "Energy Simulation Aided Design for High-Performance Buildings" (Jason Glazer)

SPC 209 was voted out of TC 7.6 in Montreal. There was a call for members in the Spring, with 49 who have expressed interest, and 29 selected by Jason as voting members. The first organizational meeting was held earlier this morning, with 25-30 people attending. The meeting discussed how the standard should be organized, which essentially followed the design process, and four subcommittees were established - Master Planning, Design Construction & Construction (I seemed to have missed one or two- YJH) .

The goal is to have draft ready in 18 months, and a publication on the street in three years. The plan is to hold monthly conference calls.

BPI-2400-2-2011 (Chris Balbach)

Chris Balbach announced that this residential standard has now been published, and is available on the Web. The intention of the Standard is to set up a repeatable protocol to produce conservative estimates of building energy savings.

Jeff Haberl commented that Standards have been doing amazing things recently.

7:31 **TC 4.7 Web site**

Jeff Haberl asked Webmaster Kris Kinney to give an update about the TC 4.7 web site. Kris said that the Web site is going through rebranding, some of which has already happened, and some of which will be coming in July. Kris equests that the TC 4.7 officers check out their respective SC sections.

7:32 **Related Activities**

New Water Standard 191P - Chip Barnaby mentioned that the committee is in a bit of hot water (pun intended) because they've been in existence for eight years and have yet to come out with a draft standard.

MTG EAS Energy Efficient Air-Handling Unit (AHU) Systems - Jeff has circulated the MTG minutes and made the following report: Herman Behls is the Chair, and Craig Wray is the Vice-chair. The aim of the MTG is on air handling systems in non-residential buildings. The MTG has chosen not to meet at AHSRAE, and instead to do work through conference calls. The first conference call was on June 14th, and got everyone on board, but little else was done. Jeff encourages those who are interested to contact him. The next conference call will be in two months.

7:45 **Reports from other TCs**

TC 2.8 (Building Environmental Impacts and Sustainability) - no report

Minutes of TC 4.7 full meeting (continued, page 6 of 7)

TC 4.1 (Loads Calculation) - Chip Barnaby mentioned work on Standard 203 on how to measure the heat gain of office equipment, and what is the split between convective and radiative heat gains. They found that all of the heat gain is convective if the equipment has a fan, and that otherwise there would be a 50/50 convective/radiative split

TC 4.2 (Climatic Information) - Dru Crawley reported that the climatic data in the Handbook are being done, with another 1,200 locations being added. Standard 169 approved that all the data be replotted, resulting in all the ASHRAE climate zone moving slightly north.

TC 4.3 (Infiltration & Ventilation) - no report

TC 4.5 (Fenestration) - no report

TC 6.5 (Radiant Heating and Cooling) - no report

TC 7.5 (Smart Building Systems) - no report. P. Haves later mentioned there was ongoing work on building optimization. At a SC meeting there was a lot of discussion of different applications in implementing optimal controls, either using simulation models or embedding simulation models in the controls.

TC 7.6 (Building Energy Performance) - Chair J. Haberl mentioned there are several efforts under way, with a fast track in support of ASHRAE's Building Energy Label, work on the ASHRAE Green Book on auditing (not the ASHRAE Green Guide). There are also associated Standards 100 for energy efficiency in existing buildings, Standard 105 , etc.

TC 1.5 (Computer Applications) - P. Haves said TC 1.5 is the cognizant TC for SPC 207 SMOT for fault detection of roof-top units (RTUs).

buildingSmart - P. Haves said that LBNL will be preparing to take building bldg geometry from 3-D files and getting that into building energy simulations.

IBPSA-USA Chip Barnaby reported that IBPSA-USA met on Saturday and had business meeting to talk about how to keep the organization growing. The number of local chapters is growing around the country. For example, Boston will be holding a meeting soon. At the IBPSA dinner Saturday night, Jeff Haberl gave a talk on the history of loads calculations. The next *SimBuild 2012* conference will be held in Madison in Fall 2013, please see Tim McDowell for details. The next IBPSA International conference will be August 2013 in Paris, and the call for abstracts has just gone out.

Open source DOE-2 - no report, but Chair Jeff Haberl mentioned some continuing intention by Joe Huang and others to maintain DOE-2.1E as open-source software.

COMNet - Chair Jeff Haberl reported on the continuing discussions between TC 4.7 members and COMNet, and suggested that those interested get in touch with Ellen Franconi or Charles Eley.

8:25 Old Business -

T. McDowell explained that the TC 4.7 listserve is currently being hosted by Jason Glazer at GARD Analytics. To get there on the Web, go to onebuilding.org, and then to TC47.L. If anyone has difficulties, please send an e-mail to Jason.

8:30 Meeting adjourned exactly on time at 8:30

Minutes of TC 4.7 full meeting (continued, page 7 of 7)

Attachments

A. Agenda
B. Simulations and Component Models Subcommittee Agenda and Minutes
C. Data-Driven Models Subcommittee Agenda and Minutes
D. Applications Agenda and Minutes
E. Handbook Subcommittee Minutes
F. Program Plan
G. SSPC 140 Agenda and Minutes

Attachment A

Agenda
ASHRAE TC 4.7 Energy Calculations – Main Meeting
Tuesday 6:00-8:30 pm

1. Roll call and introductions — Huang

2. Accept agenda & approve minutes of previous meeting — Haberl

3. Announcements/Liaisons — Haberl
   How to get on email list.

4. Membership — Haberl
   New Officers (after June 2012 meeting)
   - Tim McDowell – Chair
   - Joe Huang – Vice Chair & Applications
   - Bass Abushakra – Secretary & DDM
   - Jeff Haberl – Research
   - Chris Balbach – Program
   - Chip Barnaby – Handbook
   - Iain Macdonald – SCM
   - Joel Neymark - Standards

5. Subcommittee reports

   5.1 Applications — Huang

   5.2 Data-Driven Modeling — Abushakra/Balbach

   5.3 Simulation and Component Models — Macdonald

   5.4 Research — Abushakra/Haberl

   Research Projects/Work Statements

   - Status: 1413-RP Missing weather data (co-sponsored with TC 4.2) – underway (underway Univ. of Okla).
   - Status: 1468-RP BIM to thermal modeling (co-sponsored with TC 1.5) – should be finishing at S.A.
   - Status: 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 (resubmitted to RAC).

   RTARs, Requests for Co-sponsorship

   - Status: RTAR of Modelica Models for the Evaluation of Supervisory Control Strategies in the ASHRAE Handbook (sent back to Authors) - SCM
   - Status: RTAR of Smart Meters (sent to Mike Vaughn after vote) - DDM
   - Status: RTAR of Actual Performance of Buildings (Haves) – APP
   - Status: 1456 RTAR Natural Ventilation Phase II – SCM
   - Status: RTAR Uncertainty – SCM
   - Status: RTAR Adapt DOE Reference Buildings for ASHRAE Use – APP
   - Requests for co-sponsorship

   5.2 Handbook — Barnaby

   5.3 Program — Balbach

Attachment A (continued page 2 of 2)

Agenda
ASHRAE TC 4.7 Energy Calculations – Main Meeting
Tuesday 6:00-8:30 pm

5.4 Standards	Neymark
• SSPC 140 SMOT for Eval Bldg Energy Analysis Computer Programs (Judkoff) • SPC 205 – Std. Repr. of Perf. Data for HVAC&R Eq. & Other Fac'l Eq.(Barnaby) • SGPC 20 Documenting HVAC&R Work Process and Data Exchange Requirements (Barnaby) • New Standard 209P "Energy Simulation Aided Design for High Performance Buildings" (Glazer)	
5.5 Web Site	Kinney
6. Related activities reports	
• Water Standard 191P	Haberl
• MTG.EAS Energy Eff AHU Systems	Crawley
• TC 2.8 Building Environmental Impacts and Sustainability	
• TC 4.1 Load Calculation Data and Procedures	Pedersen
• TC 4.2 Climate Information	Degelman
• TC 4.3 Infiltration & Ventilation Requirements	MacDonald
• 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 Building Energy Performance	Abushakra
• BuildingSMART (formerly IAI International Alliance for Interoperability)	Haves
• IBPSA: USA, SimBuild ; Canada, eSim IBPSA	Wetter, Hensen
• BPI-2400-2-2011 Standardization Qualification of Whole-house Energy Savings Est.	Balbach
• Potential for open source simulation (DOE-2)	Huang
• Guideline 14	Haberl
• COMNet	Eley
7. Old Business	Haberl
8. New business	Haberl
9. Executive Session	Haberl
10. Adjourn	Haberl

Attachment B

TC 4.07: Simulation and Component Models Subcommittee

Agenda

1) Introductions and Agenda Review (5 minutes)
2) Approval of minutes (5 minutes)
3) Program (20 minutes)
    1. 2012 Annual/Summer (San Antonio)
        i. Can I Determine My loads with My Energy Modeling Program?
        ii. Effective Calibration of Building Energy Modeling Using Measured Data
    2. Held over:
        i. Determining Energy and Water Savings Related to Retrofits
        ii. Using Measured Data of Various Fidelity with Simulations
        iii. Calibration Case Studies, Fleets of Buildings, Individual Building and Algorithm
        iv. Uncertainty and Shortcomings in Using Building Energy Simulations
    3. 2013 Winter (Dallas)
4) Research (50 minutes)
    1. Active Research (5 minutes)
       RP-1416 *Development of Internal Surface Convection Correlations for Energy and Load Calculations* (Contractor: UTexas; PMS Chair: Fisher)
    2. Work Statements (20 minutes)
       WS-xxxx *Develop comprehensive performance rating procedure for unitary equipment* (co-sponsor request from TC 8.1; Barnaby)
       WS/RTAR-xxxx *Assess and Implement Natural and Hybrid Ventilation Models in Whole-building Energy Simulations* (Phase Two) (Huang, Cook, Kolderup, Macdonald, Rees)
    3. RTARS (20 minutes)
       RTAR-1629 *Testing and Modeling Energy Performance of Active Chilled Beam Systems* (co-sponsor request from TC 5.3; Macdonald)
       RTAR-1661 *Development of Modelica Models for the Evaluation of Supervisory Control Strategies in the ASHRAE Handbook* (Wetter)
       RTAR-xxxx Air-to-air heat exchange (co-sponsor request from TC 5.5; Macdonald)
    4. Research Plan/New ideas (15 minutes)
       Validation Issues (Haves, Macdonald)
       Uncertainty (Haves, Macdonald)
5) AOCB (10 minutes)

Attachment B (continued page 2 of 5)
(TC 4.7 Simulation and Component Models Subcommittee)

Attendance

Name	Affiliation	E-mail (deleted)
Tim McDowell	TESS	
Jeff Haberl	TAMU	
Payam Delgoshaei	PSU	
Madhu Iyengar	TC9.9	
Kirby Nelson		
T. Agami Reddy	ASU	
Dane Bosworth	BuildLab	
Eric Studer	TNZ Energy Consulting	
Amir Roth	DOE/EERE	
Michael Wetter	LBNL	
Hyojin Kim	TAMU	
Nuri Bae	University of Michigan	
Antonio Huizar	kW Engineering	
Sean Harleman	kW Engineering	
Li Zhang	Carrier Corp	
Dan Fisher	OSU	
Berekel Nigusse	FSEC	
Chandan Sharma	FSEC	
Ery Djunaedy	University of Idaho	
Malcolm Cook	Loughborough University	
Iam Beausoleil-Morrison	Carleton University	
Robert Sonderegger	Itron, Inc	
Chris Baker	The Weidt Group	
Wangda Zuo	LBNL	
Chris Balbach	Performance Systems Development	
Keith Cockerham	DLB Associates	
Mitch Paulus	MSOE	
Kelsey Van Tassel	Sustainable Engineering Group	
Bass Abushakra	MSOE	
Peter Armstrong	MASDAR Institute	
Juan-Carlos Baltazar	TAMU	
Tom Webster	UC Berkeley	
Wilmer Pasut	US Berkeley	
Fred Bauman	UC Berkeley	
Joe Huang	White Box Technologies	
Therese Stovall	ORNL	
Som Shrestha	ORNL	
Erik Kolderup	Kolderup Consulting	
Joe Simmons	HVAC Solution	
Agami Reddy	ASU	

Minutes

- T.McDowell started the meeting at 6:00
- T.McDowell informed the group that the minutes from the last meeting were included in the main minutes from the main TC 4.7 meeting and asked to comments. No comments were made.
- Minutes were approved.

Attachment B (continued page 3 of 5)
(TC 4.7 Simulation and Component Models Subcommittee)

Minutes (continued)

- Introductions were then made.
- Agendas were passed around and discussed.
- Discussion the moved to Program
- C.Balbach informed the subcommittee about the program that TC 4.7 had submitted at this meeting and at the next meeting.
- T.McDowell asked for program items
- W.Zhou volunteered to do a seminar on natural ventilation with TC 4.10. He is looking for speakers.
- J.Huang said that 1456 was involved with coupling air flow models with thermal models and that this might be a good topic.
- J.Haberl mentioned that RP1468 would be finishing and could have one or more talks for Dallas.
- Discussion then moved on to Research.
- T.McDowell asked about progress with 1416. J.Haberl said it appears to be completed.
- J.Huang then mentioned about 1456 had made some progress, but that it might need a new champion to move this forward. He said he did get some comments from J.Hensen, but needed more. He also said that it could move right to a WS. However, he is looking for someone else to take this and move ahead with this. This would be Phase II
- T.McDowell asked if 4.10 would help with this.
- W.Zhou said he would help with this.
- J.Huang reviewed Phase I. He said they looked at air flow modeling vs measured data. On the coupled part using energyplus with air net.
- T.McDowell asked for other to help.
- E.Koldrup also said he would help
- J.Hensen, Eric, Malcolm Cook were possible volunteers.
- T.McDowell then moved the discussion about RTAR 1629 modeling active beams. No volunteers came forward.
- W.Zhou then talked about RTAR 1661, modeling using Modelica. He said they had comments back and was hoping to get another draft by mid July.
- T.McDowell then moved the discussion to the RTAR on modeling air to air heat exchange. No updates were available on this.
- T.McDowell then mentioned the two topics from the previous meeting by P.Haves: Validation issues and Uncertainty.
- T.McDowell then asked about other ideas:
- C.Balbach mentioned that what might useful to use some sort of Biot number to tell if a simple or complex model was needed. A tool would need to do this…how many zones? When to use 1, 2, 5 zones, have some sort of metric to say…was it worth it? Just looking at loads.
- One comment on this concept was in favor of this idea.
- One question was asked about what this was after? What level of zoning was needed?
- Question was whether or not this was some sort of wizard or AI.
- J.Haberl mentioned work done by Kaplan in the 1980s about recs for doing this, but that more work was needed.
- T.McDowell suggested a seminar to lay out some of the issues…maybe then follow up with a

Attachment B (continued page 4 of 5)
(TC 4.7 Simulation and Component Models Subcommittee)

Minutes (continued)

SOW from the seminar.

- Z.Cumali asked if he was talking about the 'effective' number of zones in an analysis, 1,2,5,10. He informed the committee that the impact is reduced as the number of zones is decreased. There are more general things about zoning large spaces, exterior, interior. All these issues need to be looked at.
- C.Balbach said that most practitioners learn this over time…but don't have a ready reference with examples to see what the difference is.
- T.McDowell was wondering if it was possible to get this into a useful tool.
- Z.Cumali said that part of this was educational, but that important none the less.
- T.McDowell again asked if this would be a good seminar.
- Question was about how this was one thing for office buildings vs hospitals?
- C.Balbach said that there was advice in Appendix G…but more was needed.
- E.Baldrup said that any program item would need significant work to produce a useful presentation.
- Z.Cumali reminded the committee that using multipliers was one useful way of shrinking the number of zones…
- Question was asked about where one goes to get this information?
- Z.Cumali said that most programs do not do more than 5 zones per floor.
- Question was asked about if this information was coming from a BIM file, then what to do? When are interior partitions needed?
- Question was asked about cosponsorship with TC 1.5?
- C.Balbach said he would be willing to chair this.
- The discussion then moved on to water cooled variable cooled refrigerant systems. What is this? How does it operate?
- Comment about a model that was developed. For energyplus there is a plan to add VRS modeling capabilities.
- Comment was made about the current model being for DOE-2.1e. How this would work for other programs was not known.
- Question about what method was used for the model: steady state performance curve? Or First principle model? How to get these curves are a headache for any modeler.
- Z.Cumali said that the representation of any varying refrigerant model needs to have something more than curves…needs a compressor, evaporator, put in the manf. Data for the parameter.
- T.McDowell said that he knows of models that estimate the different components and how they would work at different conditions.
- Question was also about how the model transfers heat from a zone in heating to a zone in cooling. He suggested that it would be a good thing to learn more about this.
- E.Koldrup asked if the EP work could be presented in January…
- Tangzen said that FSEC was working a system that could do this and had done a demo about this.
- Comment was that there were issues with how this system gets rated by manfs.
- T.McDowell said that there seems to be a lot of interest in this…and he volunteered Kris to get some help with an RTAR.
- J.Huang thought this might be a good program item.
- Chris agreed that more research was needed.

Attachment B (continued page 5 of 5)
(TC 4.7 Simulation and Component Models Subcommittee)

Minutes (continued)

- J.Huang thought this might be a good program item.
- Chris agreed that more research was needed.
- P.Haves asked about 140. What was it doing?
- T.McDowell said that 865 was being incorporated. As well as new updates for BESTEST.
- P.Haves encouraged some sort of strategic plan for validation. What are the major causes of uncertain in algorithms. What are the causes in uncertainty on modeling in general. What do people question the most? Can those considerations be used to prioritize future validation efforts.
- T.McDowell said that the issue from 140 point of view was to move forward on what has been written and tested. How to write meaningful test specs. However, if 140 does not know what the answer is then how does one do the test.
- P.Haves said that the first thing needed is a list of the broader need of simulation, and then prioritize it.
- J.Haberl mentioned that he supported both ideas of a need for more work on validation and for getting a better hand on uncertainty.
- C.Wrey said that TC 4.7 may need to look to an MTG to get more help.
- One comment mentioned the discussion about the need for empirical data for validating the simulations vs just comparing one model against the other…for practitioners…there is still a need if a model actually work.
- P.Haves said that there was a major effort on uncertainty at Georgia Tech about this, perhaps this TC could invite Dr. Augenbrau to come and talk about this. It was much broader than just 140 but certainly good material for a seminar.
- Z.Cumali said that instrument error was also an issue.
- T.McDowell said that TC 4.7 did submit a program on uncertainty for San Antonio but it did not get on the agenda.
- C.Balbach said that there was a very large lab in Penn that was being instrumented but that this may not be ready.
- ORNL said that they were doing the same for residential, but did not know that this may be ready, it included heat flux transducers in the walls.
- C.Balbach asked if he could get in contact with the people doing this work
- P.Haves said that 25% of the tracks in Denver would be devoted to Research.
- T.McDowell said that someone should contact Georgia Tech.
- Question came up on what efforts were being used to help BIM modelers to create HVAC systems.
- J.Haberl informed the committee about the progress with 1468.
- Comment was also made about a GBXML committee meeting Tues AM.
- Question about how may buildings had had a high level of modeling done on them as part of the design process…..project at McMasters university.
- P.Haves said that LBNL was building a building to do this…might have some results.
- Question about need for seminar to show how to model different scenario.
- J.Haberl said that he was at a session this morning where DOE-2 was spoken about in depth for almost an hour…very good…but maybe gives this TC some ideas about how to get more program out to practitioners.
- Meeting adjourned.

Attachment C
TC 4.07 Data Driven Models Subcommittee
Monday, 25 June 2012
7:30-9:00pm
Chair: Chris Balbach "(standing in for Chair: Bass Abushakra)

Agenda

1. Introductions (5 minutes)
2. Approval of the minutes of the meeting in Chicago, January 2012 ((5 minutes)
3. Discussion of Program (10 minutes)
    a. Winter Meeting 2013 (Dallas)
        - Technical Paper Session: *RP1404: New Approach in Data-Driven Modeling using Short-term Monitored Data for Long-term Predictions of Building Energy Performance.*
    b. Annual Meeting 2013 (Denver)
    c. Beyond.
4. Discussion of WS and RTAR's (50 minutes)
    d. Existing WS and RTAR's
    e. Ideas for new RTAR's
    RTAR's need to be aligned with the ASHRAE Research Strategic plan for 2010-2015 (attached, below).
        - Ideas previously discussed:
            1. Al for data-driven modeling
            2. In-situ procedures for energy savings from renewable projects
            3. In-situ procedures for actual energy performance of LEED-Certified buildings **(Draft RTAR)**
            4. Electricity demand savings
            5. Water use in a facility
            6. Data-driven Building Models for Smart Meters **(Draft RTAR)**
            7. Standardized M&V for savings from operational changes
        - New ideas.
5. Current RP's (5 minutes)
    - RP-1404 *"Measurement, Modeling, Analysis and Reporting Protocols for Short-term M&V of Whole Building Energy Performance":* PMSC Meeting: Sunday, 1:00pm, Fairmont, Burnham 1.
6. Discussion on: (15)
    - Better ways to digest past research
    - Disseminate research results
    - Coordinate research and results with allied TC and SC (co-sponsoring RTAR's)
    - Participate in newly-formed "Multi-disciplinary Task Groups (MTG's)
    - Maintain expertise within SC even when membership changes.
7. Old Business
8. New Business
9. Adjourn

Some Background Information:

Attachment C (page 2 of 3)
TC 4.07 Data Driven Models Subcommittee

Agenda (continued)

Review of ASHRAE Strategic Plan for Research:

- Research themes include:

  1) Energy and Resources,
  2) Indoor Air Quality,
  3) Tools and Applications, and
  4) Equipment, Components and Materials

- Weighted criteria:

  1) Supports strategic plan 45%,
  2) co-funding support 10%,
  3) anticipated application 10%,
  5) RAC vote 20%, and
  6) Tech Council Preview Feedback 5%

- RAC will review RTARs at all meetings: 3/yr -need 45 days advance - May 15, Aug 15, Dec 15
- Limited time for RTARs in Implementation Plan (4 meeting shelf life); intended to minimize delays in initiating research projects

ASHRAE Research Strategic Plan - 2010-2015

Goal 1 Maximize the actual operational energy performance of buildings and facilities.

Goal 2 Progress toward Advanced Energy Design Guides (AEDG) and cost-effective net-zero-energy (NZE) buildings.

Goal 3 To reduce significantly the energy consumption for HVAC&R, water heating and lighting in existing homes.

Goal 4 Significantly advance our understanding of the impact of indoor environmental quality (IEQ) on work performance, health symptoms and perceived environmental quality in offices, providing a basis for improvements in ASHRAE standards, guidelines, HVAC&R designs and operation practices.

Goal 5 Support the development of ASHRAE energy standards and reduce effort required to demonstrate compliance.

Goal 6 Building Information Modeling of energy efficient, high performing buildings. BIM is a rapidly developing field of knowledge which stretches beyond the traditional boundaries of the HVAC&R industry to the wider construction sector.

Goal 7 Support development of tools, procedures and methods suitable for designing low-energy buildings.

Goal 8 Facilitate the use of natural and low global warming potential (GWP) synthetic refrigerants and seek methods to reduce their Goal 8 Facilitate the use of charge.

Goal 9 Support the development of improved HVAC&R components ranging from residential through commercial to provide improved system efficiency, affordability, reliability and safety.

Goal 10 Significantly increase the understanding of energy efficiency, environmental quality and the design of buildings in engineering and architectural education.

Goal 11 Understand influences of HVAC&R on airborne pathogen transmission in public spaces and develop effective control strategies.

Attachment C (page 3 of 3)
TC 4.07 Data Driven Models Subcommittee

Attendance

First Name	Last Name	Affiliation	E-mail
Chris	Baker	The Weidt Group	
Chris	Balbach	Performance Systems Development	
Juan-Carlos	Baltazar	Texas A&M	
Keith	Cockerham	DLB Associates	
David	Ellis	HDR Architecture	
Ali	Fallahi	Fraunhofer CSE	
Dan	Fisher	Oklahoma State Univ	
Kelton	Friedrich	McMaster University	
Joe	Huang	White Box Technologies	
Antonio	Huizar	KW Engineering	
Piljae	Im	ORNL	
David	Jump	QUEST	
Kris	Kinney	KES	
Erik	Kolderup	Kolderup Consulting	
Tim	McDowell	TESS	
Lisa	Ng	NIST	
Agami	Reddy	Arizona State University	
Amir	Roth	DOE	
Steven	Snyder	Johnson Controls	
Theresa	Stovall	ORNL	
Marija	Todorovic	University of Belgrade	
Marija	Trcka	UTRC	

Minutes (none supplied)

Attachment D
TC 4.7 Applications Subcommittee
Tuesday, 26 June 2012
3:30-5:00pm Texas C

Agenda

1) Introductions and Agenda Review (5 minutes)
2) Program (15 minutes) (Chris Balbach)
    a. 2012 Summer (San Antonio)
    b. 2013 Winter (Dallas)
    c. 2013 Summer (Denver)
    d. Beyond
3) Research (65 minutes)
    a. Existing Work Statements (5 minutes)
        - 1588-WS Representative Layer-by-Layer Descriptions for Fenestration Systems with Specified Bulk Properties such as U-Factor and SHGC (co-sponsored by TC 4.5) (Joe Huang) Approved !
    b. Ideas for new RTARS or other research activities (15 minutes each)
        - Update on TC 4.7 involvement in the review of COMNET and other COMNET-related activities (Ellen Franconi if available, others).
        - Update on Hi-Performance Buildings TPS (Jason Glazer, if available)
        - Actual Performance of Buildings (Phil Haves) (original topic "reconciling differences in computer simulation results to actual energy usage of LEED-certified buildings").
        - Should TC 4.7 maintain a set of prototypical building models and input files, possibly building on DOE's "Reference Building Models"? (Joe Huang)
        - Using building energy simulations for HVAC design calculations (Joe)
4) Any other ideas and burning issues (time permitting) (5 minutes)

Attachment D (continued)
(TC 4.7 Applications Subcommittee)

Attendance List

First Name	Last Name	Affiliation	E-mail
José Luis Bermúdez	Alcocer	Texas A&M	
Chris	Balbach	Performance Systems Development	
Juan-Carlos	Baltazar	Texas A&M	
Mahabir	Bhandari	ORNL	
Keith	Cockerham	DLB Associates	
Clark	Denson	SSRCx	
Sebastian J.	Eluvathingal	Texas A&M ESL	
Jeff	Haberl	Texas A&M	
Phil	Haves	LBNL	
Tianzhen	Hong	LBNL	
Joe	Huang	White Box Technologies	
Antonio	Huizar	KW Engineering	
Hyojin	Kim	Texas A&M	
Kee Han	Kim	Texas A&M	
Erik	Kolderup	Kolderup Consulting	
Sandeep	Kota	Texas A&M	
Tim	McDowell	TESS	
Ron	Nelson	Institute for Market Transformation	
Lisa	Ng	NIST	
Sukjoon	Oh	Texas A&M	
John	Pruett	ZMM, Inc.	
Andres	Sobrevilla	Munters Corporation	
Wangda	Zuo	LBNL	

Minutes

- J. Huang started the meeting at 3:35 PM.
- Copies of the agenda were passed out.
- Introductions were then made.
- E.Franconi asked for time to introduce the BEM work and BEM library she is working on.
- J.Huang then moved on to program.
- K.Cochran then reviewed the program for San Antonio, Dallas, Denver and beyond, including dates for submission.
- Program was also reviewed from SCE and DDM, including the modeling seminar that W.Zhou had recommended, the data visualization seminar from DDM.
- E.Franconi suggested a forum on COMNet
- There are several states that want to automate the baseline calculation. IBPSA has reviewed COMNet…and found that there are issues with it being used for baseline generation. Therefore, there is a need for a more rigorous review of COMNet.
- It was also suggested that Standard 209 may be a topic for a forum in Dallas.

Attachment D (continued)
(TC 4.7 Applications Subcommittee)

Minutes (continued)

- Discussion then moved on to Research.
- WS 1588 was then reviewed.
- J.Huang said that this was recently approved.
- P.Haves gave the subcommittee an update on RAC. The general issue is that there are lots of different people on RAC with varying backgrounds. Therefore, they don't always understand what's being presented in the RTAR. Therefore, there need to be a clear justification as to why the RTAR is needed.
- J.Huang reviewed the history of the WS.
- Discussion then moved on to COMNet. E.Franconi and R.Nelson presented a brief presentation for the subcommittee.
- Initially COMNet was created to automate the modeling for different baseline techniques: federal tax, green building, energy rating, code compliance.
- ECB has now picked-up some of the modeling procedures from COMNet.
- COMNet has also proposed a standard file output for simulation for XML.
- COMNet now has a "portal" for submitting simulation files.
- CEC is also working on a "rules base" for use with simulation.
- E.Franconi reminded the subcommittee that IBPSA had reviewed COMNet when it first came out. To accomplish this C.Eley created a presentation, that was recorded, and reviewed COMNet.
- IBPSA reviewed COMNet and noted their concerns in a letter to C.Eley.
- E.Franconi mentioned that the CEC was very much interested in COMNet for review.
- J.Haberl expressed concern about the use of another "layer" when simulating code compliance. Who was going to maintain this? What's the business model for COMNet? Will there be a fee over time for using it?
- R.Nelson said that COMNet was not supposed to be another "layer", but rather an automated platform.
- Questions were raised about what a forum could do to help get the word out.
- J.Glazier mentioned that COMNet has too much detail to allow it to become part of 90.1…there is already 14 pages in the ECB guideline and going to 100s of pages seems to be quite a task.
- J.Haberl spoke in favor of a forum for discussing COMNet.
- P.Haves was concerned that he has now heard this several times, but was still trying to understand the issue…therefore there's more needed than just a Forum…probably something on the order of a Seminar/Forum.
- T.McDowell said that Forums are usually there for people to come and learn something. Therefore, he was concerned that any such forum would just be folks coming in to complain about COMNet. Therefore, he suggested a Seminar presentation. The issue is that nobody has implemented COMNet's rules in software yet.
- P.Haves said that someone needs to demonstrate how it works, why it works, and how it is intended to be adopted.
- E.Franconi expressed concern that this needs to be discussed. If someone like USGBC adopts it, then what. Hence the need for the public vetting.
- P.Haves said the point of presenting it was, can it be presented in ½ hour or 1 hour…in such a way that everyone can see what's in it.

Attachment D (continued)
(TC 4.7 Applications Subcommittee)

Minutes (continued)

- E.Holderup said that he was concerned that 4.7 does not have a way to go forward with this if it can't be a seminar, forum or RTAR.
- J.Haberl reminded the committee that ASHRAE should not be supporting a private effort and therefore, TC 4.7 should not be supporting a forum or seminar on COMnet.
- J.Huang said that he needed to close the discussion on COMNet.
- Discussion then moved on to Standard 209
- J.Glazier reviewed Standard 209 with the subcommittee.
- A call for members went out before Chicago. 49 applications were made and a recommendation for 29 members and the rest to be non-voting members.
- At the meeting today, things were treated as an informal meeting.
- First draft is for January 2014. Publication for June 2015.
- A framework for the document has been created. 5 subcommittees have been created, with one on resources, definitions, references, etc.
- There is a need for liaisons, including TC 4.7.
- Standard 209 is considering having a meeting at the IBPSA meeting, in addition to conference calls, etc.
- Discussion then moved to the previous items from Chicago.
- P.Haves spoke to the issue on reconciling differences in computer simulation results to actual usage of LEED certified buildings.
- P.Haves said that there was a call, but not much progress made since then.
- He anticipated that there would be progress in the near future.
- Discussion the moved to the idea of TC 4.7 having prototypical building files for use by anyone.
- J.Huang reviewed the idea to use the reference buildings that DOE has created through NREL, LBNL and PNNL.
- The idea would be for ASHRAE to get involved in this through TC 4.7.
- J.Huang did show this to C.Wray on the MTG.EAS and he thought this would be a good idea.
- J.Glazier said that this sounded like a good idea. He reminded the committee that the 2010 User's manual included some sample files, although they had not been completely vetted. The challenge is what software do you want to support with this…since one definition does not fit all software.
- J.Huang said that the current reference buildings are in EnergyPlus, but that this needed to be opened up to other platforms.
- P.Haves was still wondering what the purpose for this was? There was already some confusion of the difference between the PNNL and LBNL versions of the sample files, and was wondering how that would be resolved.
- J.Huang said that the main purpose was to have agree-upon prototypical buildings. That there would be multiple uses for this.
- Z.Cumali said what was necessary was a standard way of describing a building energy input file.
- Meeting was adjourned at 5:05 PM

Attachment E
ASHRAE TC 4.7 Energy Calculations
Handbook Subcommittee
Tuesday, June 26, 2012, 5 – 6 PM
Grand Hyatt, San Antonio, TX]
Minutes

Attendance

Who	Affiliation	eMail
Ron Judkoff	NREL	
Tim McDowell	TESS	
Jeff Haberl	TAMU	
Joel Neymark	JNA	
John Pruett	ZMM	
Erik Kolderup	Kolderup Consulting	
Chip Barnaby	Wrightsoft	
Therese Stovall	ORNL	

Discussion and review of draft 2013 HOF Chapter 19. Assembled proposed schedule for finalization as shown below.

Action Items

Who	*What*	*When*
All	Submit final editorial comments to Chip Barnaby	July 6, 2012
Chip Barnaby	Prepare submittal version of chapter and circulate to TC	July 13, 2012
Chip Barnaby	Submit chapter	July 20, 2012 (ish)
Chip Barnaby	Coordinate publication with staff	As needed

Attachment F
TC 4.7 Program Plan

January 21- 25, 2012, Chicago IL Theme: N/A!

TC 4.7 SPONSORED PROGRAMS PRESENTED AT CHICAGO:

MONDAY: SEMINAR 18: Standard 205P: Hassle-Free Equipment Performance Data for Energy Modeling
Chair: Chris Balbach, P.E. Speakers: Charles S. Barnaby, Mark Hydeman, P.E., Neal Kruis,
Attendance:

MONDAY - SEMINAR 28: Improving Energy Modeling Consistency
Chair: Joe Huang, Speakers: Erik Kolderup, P.E., Thomas White, P.E., Ellen Franconi,
Attendance:

WEDNESDAY - SEMINAR 44: I Integrated Multi-Domain Simulations for Innovative Building Design and Operation, Part 1
Chair: Wangda Zuo, Ph.D., Speakers: Jan Hensen, Ph.D., John Zhai, Ph.D., Ian Beausoleil-Morrison, Ph.D
Attendance:

WEDNESDAY SEMINAR 53: Integrated Multi-Domain Simulations for Innovative Building Design and Operation, Part 2
Chair: Jerone Matthew Gagliano, P.E. Speakers: Michael Wetter, Ph.D., Wangda Zuo, Ph.D., Yao-Jung Wen, Christophe Von Treeck/Sebastian Stratbucker
Attendance:

ASHRAE High Performance Buildings Conference - A Focus on Deep Energy Savings
March 12-13, 2012, San Diego, CA
Call for Posters due February 3rd

Energy Modeling Conference: Tools for Designing High Performance Buildings
October 01 - 03, 2012 Atlanta, GA, USA
Abstracts due: 2/15/12, **Decisions**: 3/15/12 **Accepted speaker forms due**: 4/15/12 **Presentations due**: 9/1/12
Conference: 10/12

Next ASHRAE Meeting: June 23 - 27 2012 / San Antonio TX WEBSITE (http://ashraem.confex.com/ashraem/s12/cfp.cgi) OPEN

Track 1 HVAC&R Systems & Equipment
Track 2 HVAC&R Fundamentals and Applications
Track 3 Integrated Energy Systems
Track 4 Building Modeling Applications
Track Chair: Pam Androff Email: pamela.androff@gmail.com
In our modern times, building design almost always demands some version of modeling, but the debate continues as to what is the most effective method to simulate various building systems. The stakes are especially high for building designs that require validation in effectiveness prior to installation. This track seeks papers and programs that focus on understanding, manipulating, and optimizing building design choices via modeling.
The programs will cover modeling fundamentals, building component contributions, system right-sizing, 3-D computer simulation advantages, and advanced energy modeling techniques

Attachment F
TC 4.7 Program Plan (continued, page 2 of 4)

Track 5 Refrigeration Applications
Track 6 Indoor Environmental Applications
Track 7 Integrated Building Controls

SAN ANTONIO PROGRAMS SCHEDULE:

February 13	Seminar, Forum, TPS and CPS Program Proposals Due
February 13	Technical Papers Final Reviews
March 7	Final Technical Papers Due
March 9	Revised Conference Papers Due
March 16	Notifications of Seminar and Forum Accept/Reject Distributed
March 30	Conference Papers Accept/Reject Notifications
April 5	Final Conference Papers Due
May 4	Upload of PPTs Begin
June 4	All PPTs Due Online
June 23	Speaker's Lounge Opens

POTENTIAL SEMINAR SUBMISSIONS FOR SAN ANTONIO

SEMINAR # 1 CHAIR: (Chip Barnaby / Neal Kruis) TITLE – 3 perspectives on SPC 205P (Chip)

3 speakers who would be a consumer of 205P, and product manufacturer complying w/ 205P and a software vendor working w/ 205P data

SEMINAR #2 CHAIR Keith Cockerman –"Calibration 102" – follow-up to seminar 28

Joe Huang- Fred Bauman (Simulation calibration of New York Times) New case studies of calibration

SEMINAR #3 CHAIR – CHRIS BAKER (WEIDT GROUP) –Topic - Calibration? Follow up on

White Box (Joe Huang) RE: differences between different programs for same process AtticSim coupling w/ DOE-2 vs EnergyPlus;
Weidt Group on 10 school model calibrations;
Speaker from Group 14 (Sue Reilly) RE: Informed energy audits for MF;
Speaker from NREL (Ron Judkoff?) RE: BESTEST-EX

SEMINAR #4 CHAIR – DAVE BOSWORTH TITLE: Using measured data of various fidelity with simulations

Speaker from NREL (Eric Bonnema) RE: AEDG – use of building profiles (schedules, to inform modeling;
Speaker from NREL (Jesse Dean) RE: NREL RSF - Generating fully articulated models from building sub-metered data);
Speaker TES (Tim McDowell) RE: How to calibrate and what can be learned when very detailed measured data of system output of a collection of components (flow rate, temp, pressure) are available (how to we take that data and match it to a theoretical model and extract value).

SEMINAR #5 CHAIR – CHRIS BALBACH TITLE: "Method for Quantifying Water savings using Regression Models"

Speaker 1 (Chris Balbach) - Can reliable baseline regressions be determined (across different geography) using monthly bills and average monthly dry bulb (or another variable) across the country? (need 5 - 7 different locations and a decent 12month data set for each bldg). Quantifying CV-RMSE-> Uncertainty to say whether or not (2) is valuable;
Speaker 2 (Jerone) - Determining Water Savings associated w/ a specific project Pick one building where a prediction of savings was made. Determine pre, post and predicted and evaluate uncertainty, etc. Do we have a property where Can we get it for ONE bldg;

Attachment F
TC 4.7 Program Plan (continued, page 3 of 4)

Speaker 3 – (Jeff Haberl) - "How to convert predicted savings to societal energy savings" (JEFF HABERL will present this). This is going to be dependent on details for each muni water system, etc)

Other ideas from prior TC 4.7 subcommittee meetings?

1) TC4.7 (Simulation and Component Models) Seminar Chair: Joe Huang:
Topic Reasons or Causes for Uncertainty in Building Energy Simulation
Speakers: Ian, NREL, Jan Hansen

2) TC4.7 (Applications) Seminar Chair: Chair Needed (Tim McDowell) EK – submit & Fail…
Topic Building Simulation 104 Analysis of uncertainty….Uncertainty validation and calibration input uncertainty, output uncertainty of the result…
Speakers Phil Haves, Nick Long, Ron Judkoff

3) TC4.7 (Data Driven Models) Seminar Chair: Bill Koran
Topic UNCERTAINTY Technical
Speakers TBD

Code-Compliance Scheduled
Organized by: TC 4.7 (Applications)
Chair: Larry Degelmann
Status: Moved from Dallas. (Jeff Haberl, Eric Richmond, Paul Mathew).

Seminar "How to Assess the Performance of Sustainable Buildings" Scheduled
Organized by: TC 4.7 (Data Driven Models)
Chair: Moncef Krarti
Status: 4 speakers (B. Koran, Bass Abushakra, David Claridge)

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

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.

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

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)

Attachment F
TC 4.7 Program Plan (continued, page 4 of 4)

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 "Shoot-out of Code Compliance Simulation for Residential Buildings"
Organized by TC 4.7 (Applications)
Chair: Jeff Haberl

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, Stephane Bertagnolio & Jean Lebrun, Craig Wray.

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 G
SSPC 140
Standard MOT for the Evaluation of Building Energy Analysis Computer Programs
Monday, June 25, 2012 2:15-6:15
Presidio C (Hyatt, 3rd level), San Antonio
Chair: Ron Judkoff

Agenda

1. Introductions

2. Chair Announcements/Communications since last meeting *[Judkoff, 10 min.]*
- **ANSI/ASHRAE Standard 140-2011 listed with ASHRAE's 10 Most Popular Standards and Guidelines.** It is 7th on the list of approximately 130 Standards and Guidelines. See http://www.techstreet.com/lists/ashrae_standards.tmpl
- **Standard 140-2011 continuous maintenance rev published in January 2012,** primarily integrating: 140-2007, HERS BESTEST, ICC mandatory language requirements, expanded modeler reports, and errata to furnace tests.
- **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 **11 programs are qualified**; since June 2011, **one** was added; **four** programs qualified updated versions. **New submittals brent.griffith@nrel.gov**

Qualified programs listed at www1.eere.energy.gov/buildings/qualified_software.html
- **Current IRS rules (**IRS notice 2008-35, published Mar 2008) for evaluating **residential building** energy efficiency tax credits; **5 tools are qualified** for this purpose so far. Required tests include NREL's HERS BESTEST (recently included in Std 140-2011), along with equipment modeling and other modeling tests developed by RESNET. **New submittals to RESNET** (http://www.resnet.us/professional/standards/tax_credits). **Qualified programs listed at: http://www.irs.gov/businesses/small/industries/article/0,,id=155445,00.html**
- **Latest versions of IECC and IGCC to cite 140-2011, planned during 2013** (will update from current reference of 140-2007 + addenda).
- **Airside HVAC Equipment simulation trials:** Updated test spec distributed May 15; simulation trial results received from 5 participants; further discussion per agenda item below.
- **Thank You letters to employers**

3. Membership *[Judkoff, 2 min.]*
- Re-up thru June 30, 2016: Haddad, McDowell, Pegues, Rees
- New Voting Members: Hong (thru June 30, 2014); Sturm (thru June 30, 2015).
  - Staggered so > ½ the PC doesn't roll off 6/30/16

4. Acceptance of Previous Minutes *[Judkoff, 5 min.]*

5. Adjustments to Agenda *[Judkoff, 5 min.]*

6. 140-2011-A: Adaptation of NREL/IEA-34/43 Ground Coupling (GC) Tests *[Neymark, 5 min]*
- Status Report, and Action Items

7. 140-2011-B: Adaptation of NREL/IEA 34/43 Multi-Zone (MZ) Tests *[Neymark, 5 min.]*
- Status Report, and Action Items

8. 140-2011-C: Adaptation of ASHRAE/RP-865 (air-side mechanical equipment): Modifications and Simulation Trials *[Neymark 15 min, defer in-depth discussion (if needed) for after Item 15]*
- Meeting summary, Air-Side HVAC Equipment Modeling Tests Working Group:

Attachment G (continued page 2 of 6)
SSPC 140 SMOT for the Evaluation of Bldg Energy Analysis Computer Programs

Agenda (continued)

- Status Report, and Action Items

9. 140-2011-D: Adaptation of BESTEST-EX Physics cases for Section 7 *[Neymark, 10 minutes]*

10. 140-2014-A: Update Section 5.2 (IEA BESTEST envelope, 1995) test spec/example results *[Judkoff/Neymark, 20 min.]*
- PC approval to proceed
- Develop a separate Working Group, and meeting slot, for future meetings.

11. California Energy Commission Application of HERS BESTEST *[Brook/Wilcox, 30 minutes, finish by 4:30P]*

12. Proposed Work Schedule (2012/13) for Above Addenda *[Neymark, 10 minutes]*

13. Residential empirical-data based tests (fyi) *[Neymark, 5 minutes]*

14. BESTEST-EX residential calibrated energy savings cases (fyi) *[Judkoff, 5 minutes]*
- Go through RESNET

15. References to Standard 140 in Standard 90.1 *[Pegues, 10 min – hold until 4:15P for JP]*
- After publication of 140-2011, recommend to SSPC 90.1 to specifically cite the Class I test procedures (Section 5 of Std 140) for 90.1-2013. *Keep on agenda as reminder.*
- If GC and MZ addenda to 140-2011 are part of Section 5.2 (as 5.2.4 and 5.2.5), is that ok for future referencing by 90.1 and others?

16. COMNET and ASHRAE Building Energy Quotient (EQ) Referencing of Standard 140 *[Haberl/Fairey 10 min]*

17. Residential Incentives Programs *[Fairey 10 min.]*
- RESNET, Tax Credits/Supplemental Cases, IECC Section 404, Homestar Gold

8a. Further discussion, Adaptation of ASHRAE/RP-865 (air-side mechanical equipment), Modifications and Simulation Trials *[Chair's discretion]*

18. Comments by P. Sahlin on Case CE410 (Economizer with non-integrated compressor – i.e., economizer only operates when it satisfies all cooling load by itself). *[Neymark 2 minutes]*
- Consideration delayed pending progress on Airside Sim Trials – informs economizer model testing.

19. Additional Future Test Suites that could be adopted *[Judkoff, 5 min.]*
- RESNET mechanical equipment test cases (RESNET now qualified for ANSI process)
- Other IEA-34/43: Shading/Daylighting/Load Interaction by Switz. (empirical), Hydronic Equipment by Germany, Airflow by Japan (final report still in progress), Double-Skin Façade empirical by Denmark.
- IEA ECBCS Annex 42: Testing/Validation of Models for Resl. Cogeneration Devices
- Other Existing Test Suites and new research

20. Multidisciplinary Task Group on Energy Eff. Air-Handling Systems (MTG.EAS) *[Haberl 5 min.]*

21. New business

22. Adjourn

Attachment G (continued page 2 of 12)
SSPC 140 SMOT for the Evaluation of Bldg Energy Analysis Computer Programs

Attendance

VOTING MEMBERS / OFFICERS PRESENT	YEAR APPTD	VOTING MEMBERS / OFFICERS ABSENT	YEAR APPTD
Ron Judkoff (CHM)	2009		
Joel Neymark (VC) [NVM] (Liaison to SSPC 90.1)	2009		
Dru Crawley	2009		
Philip Fairey	2011		
		Kamel Haddad	2008
David Knebel	2010		
Tim McDowell	2008		
Jim Pegues	2008		
		Simon Rees	2008
Michael Witte	2009		

A complete listing of attendees at this and the prior four meetings is shown on the next page. It includes the voting members of the committee listed on the first page of the minutes.

Meeting Summary

The primary purposes of the meeting were to report on the following activities:

- Adaptation of IEA 34/43 Ground Coupled Slab tests to Standard 140
- Adaptation of IEA 34/43 Multi-Zone Non-Airflow tests to Standard 140
- Adaptation of ASHRAE/RP-865 airside equipment tests to Standard 140.
- Adaptation of BESTEST-EX Physics test cases into Standard 140
- Plan for update of Section 5.2 results and specification
- Hear California Energy Commission (M. Brook, B. Wilcox) comments on application of HERS BESTEST to California software

Chair Announcements

- **ANSI/ASHRAE Standard 140-2011 listed with ASHRAE's 10 Most Popular Standards and Guidelines.** It is 7th on the list of approximately 130 Standards and Guidelines. See http://www.techstreet.com/lists/ashrae_standards.tmpl
- **Standard 140-2011 continuous maintenance rev published in January 2012,** primarily integrating: 140-2007, HERS BESTEST, ICC mandatory language requirements, expanded modeler reports, and errata to furnace tests.
- **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 **11 programs are qualified**; since June 2011, **one** was added; **four** programs qualified updated versions. **New submittals brent.griffith@nrel.gov**
  Qualified programs listed at www1.eere.energy.gov/buildings/qualified_software.html
  Current IRS rules (IRS notice 2008-35, published Mar 2008) for evaluating **residential building** energy efficiency tax credits; **5 tools are qualified** for this purpose so far. Required

Attachment G (continued page 3 of 12)
SSPC 140 SMOT for the Evaluation of Bldg Energy Analysis Computer Programs

Complete listing of attendees at this and the prior four meetings

Present at SSPC 140 meeting?					Last name	First name	Email
Chicago Jan 2012	Chicago Jan 2012	Montreal June 2011	Las Vegas January 2011	Albuquerque June 2010			
	X				Antretter	Florian	
			X		Balbach	Chris	
X					Bourassa	Norm	
X					Brook	Martha	
X	X				Cumali	Zulfi	
X	X	X	X	X	Crawley	Dru	
X	X	X			Ellis	David	
X	X	X	X	X	Fairey	Philip	
				X	Ferguson	Steve	
			X		Gardner	Carol	
	X				Gagliagno	Jerone	
X	X	X	X	X	Haberl	Jeff	
	X	X	X	X	Haddad	Kamel	
	X				Haves	Phil	
	X				Hinge	Adam	
X	X	X			Hong	Tianzhen	
			X		Jayaraman	Nadar	
X	X	X	X	X	Judkoff	Ron	
			X		Kim	Hyojin	
X		X	X	X	Kennedy	Mike	
X	X	X	X		Knebel	David	
		X			Kulankara	Satheesh	
			X	X	Marriott	Carol	
X	X	X	X	X	McDowell	Tim	
				X	Mukhopadhyay	Jaya	
			X		New	Joshua	
X	X	X	X	X	Neymark	Joel	
X	X	X	X	X	Pegues	Jim	
			X	X	Rees	Simon	
X	X				Roth	Amir	
		X	X	X	Shirey	Don	
X	X	X	X		Sturm	Eric	
			X		Tayiku	Fitsum	
X					Wang	Weimin	
X	X				Wilcox	Bruce	
X	X	X		X	Witte	Mike	
		X			Yuill	Gren	
			X		Zhang	Li	

Attachment G (continued page 4 of 12)
SSPC 140 SMOT for the Evaluation of Bldg Energy Analysis Computer Programs

Meeting Summary (continued)

tests include NREL's HERS BESTEST (recently included in Std 140-2011), along with equipment modeling and other modeling tests developed by RESNET. **New submittals to RESNET** (http://www.resnet.us/professional/standards/tax_credits). **Qualified programs listed at: http://www.irs.gov/businesses/small/industries/article/0,,id=155445,00.html**

- **Latest versions of IECC and IGCC to cite 140-2011, planned during 2013** (will update from current reference of 140-2007 + addenda).
- **Airside HVAC Equipment simulation trials:** Updated test spec distributed May 15; simulation trial results received from 5 participants; further discussion per agenda item below.
- **Thank You letters to employers**

3. Membership

- Re-up thru June 30, 2016: Haddad, McDowell, Pegues, Rees
- New Voting Members: Hong (thru June 30, 2014); Sturm (thru June 30, 2015).
  - Staggered so > ½ the PC doesn't roll off 6/30/16

4. Acceptance of Previous Minutes

Motion (Knebel): Accept Minutes of January 2012 Chicago meeting, [see Attachment B, sspc140min24Jan2012.docx , available upon request].
2nd (McDowell):
Vote:
Yes = 5; No = 0; Abstain: 0
Absent: Crawley, Haddad, Pegues, Rees,

5. Adjustments to Agenda

None

6. 140-2011-A: Adaptation of NREL/IEA-34/43 Ground Coupling Tests *[Neymark, 10 minutes]*

- PC approved for Public Review April 2010; Public Review with no comments Fall 2010.
- Public reviewed version did not have ICC mandatory language improvements – comments re language requirements came after the 2010 public review submittal.
- PC voted (Jan 2011) to hold publication to integrate ICC language improvements in the addenda

Action Items*:*

- **Update addendum with mandatory language changes *[Neymark/Kennedy]***
  - Begin with 1/18/11 draft marked up by Mike Kennedy containing preliminary language updates
  - Submit to SSPC 140 for 2nd P/PR approval in next few months
    - Include reviewers note that language improvements do not affect basic content of previously reviewed tests and there were no comments on the previous public review.
    - SSPC 140 letter ballot *[SSPC 140]*
- **Resubmit for public review – 2nd review of full draft *[Judkoff]***
  - Include reviewers note that language improvements do affect basic content of previously reviewed tests and there were no comments on the previous public review.
- **Finish publication process *[ASHRAE Staff, Neymark]***

Attachment G (continued page 5 of 12)
SSPC 140 SMOT for the Evaluation of Bldg Energy Analysis Computer Programs

Meeting Summary (continued)

7. 140-2011-B: Adaptation of NREL/IEA 34/43 Multi-Zone Tests *[Neymark,10 min.]*

- PC approved for adaptation, June 2009
- GARD comments on xls results files addressed

Action Items*:*

- Create pdf of results file
- Update electronic file structure to match 140-2011 (normative informative files separation, etc.)
- Update text for ICC language improvements
- Distribute to PC for comments in October 2012 time frame
- PC comments *[SSPC 140]*
- Address PC comments, and distribute for PC letter ballot
- Submit to ASHRAE for Public Review
- Address public review comments, if any
- Final publication process *[ASHRAE Staff, Neymark]*

8. 140-2011-C: Adaptation of ASHRAE/RP-865 (air-side HVAC equipment): Modifications and Simulation Trials

Separate Working Group meeting discussion details are included with Attachment D.

Meeting summary, Air-Side HVAC Equipment Modeling Tests Working Group:
Progress

- 1st round sim trial results presented, Jun 2011
  - 5 simulation results sets submitted
  - Modelers thought tests were useful
- One new results set received Jan 2012
- Round 2 Spec distributed (updated/clarified FC and SZ systems, and new CV and VAV systems), May 2012
- 6 simulation results sets submitted: 2 new participants
  - 1 participant requested late submittal; one (by NREL) not updated
- 2 (or more?) other developers may submit results.

Action Items

- Revise spec for Jun 2012 comments (Summer 2012)
  - Iterative participant comments/spec revisions on terms definitions, etc.
- Send reminders to potential additional participants
- Complete 2nd round sim trial Aug/Sept*[All Sim Trial Participants]*
- Expand spec and 3rd/4th round sim trials (2012/2013)
- PC P/PR Letter Ballot (after completion of sim trials)
- Public Review and Publication

9. 140-2011-D: Adaptation of BESTEST-EX Physics cases for Section 7 [Neymark, 10 minutes]

Attachment G (continued page 6 of 12)
SSPC 140 SMOT for the Evaluation of Bldg Energy Analysis Computer Programs

Meeting Summary (continued)

As this item relates to CEC comments (see Item 10), Neymark re-presented details from the January 2012 (Chicago) meeting. See slides 5 thru 12 of Attachment C, and especially note physics test features of HERS BESTEST that have been updated in BESTEST-EX (B-EX) in slides 8 thru 10 there.

Discussion

Fairey: Expressed concerned about implication that the B-EX Physics test cases may replace the existing HERS BESTEST cases.

Others: The committee agreed to add new results in a separate subsection of Section 7; this allows referencing organizations to select from the menu of tests provided by 140, as they are already doing.

Additional concern expressed about differences between HERS BESTEST and the BESTEST-EX Physics tests. This needs to be discussed further as the adaptation of the B-EX Physics tests proceeds.

Progress:

- PC approved for adaptation, Jan 2012

Action Items:

- Update results xls for Std 140
  - Create pdf of results file
- Update electronic file structure to match 140-2011
- Update text for mandatory language compliance
- Distribute to PC for comments
- Address PC comments, and distribute for PC letter ballot
- Submit to ASHRAE for Public Review

11 (moved up before 10). California Energy Commission (CEC) Application of HERS BESTEST *[Brook/Wilcox]*

See Attachment E summarizing comments as presented by CEC.

Background

- CEC is producing major update to their residential energy code development, compliance and HERS Software. Goal is to have open source software that is useful nationally and complies with national standards and requirements, therefore must comply with 140 [esp, Sec 7 (HERS BESTEST), and RESNET's application of that method of test].

CEC's primary comments:

- CEC has no problem running the HERS BESTEST cases and meeting the established pass/fail criteria [the pass/fail criteria are developed as normative by other agencies using a calculation procedure described in an *informative* annex of Std 140]. However, HERS BESTEST [original published in 1995] usefulness is limited because of out of date algorithms and assumptions used, for example:
  - Constant infiltration and ventilation rates
  - Unusable for CEC's cooling slab on grade algorithm [HERS BESTEST slab cases are only in heating mode]

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Meeting Summary (continued)

  - Unrealistic [idealized] treatment of buffer spaces (attic, etc).
  - House is located at the wind anemometer (10 meters in the air in an open field)
  - There is no data provided for the house leakage characteristics [usable by weather driven infiltration algorithms] and the [constant] infiltration assumption is not consistent with current data
  - Slab insulation specification is incomplete and results are not consistent with modern algorithms
- Certifying agencies would like certification runs to reflect how the programs will be operated. Programs that pass the idealized test cases may not necessarily be good in realistic conditions. Certifying agencies are not generally capable of evaluating modeler's reports to determine whether program adjustments are reasonable.

CEC recommends the following updates to HERS BESTEST:

- Use typical values and current descriptors, e.g.:
  - ACH 50 as the leakage criteria
  - Typical roof solar absorptivity (0.9), radiant barriers and cool roofs
  - HVAC ducts with varying insulation and leakage in attics, basements and crawl spaces
  - Mechanical ventilation for indoor air quality

  [JN note: BESTEST-EX addresses the first and second sub-bullets here, except radiant barriers]
- Include results for state of the art software (such as EnergyPlus and/or CSE) with:
  - Separate radiant and variable convective heat transfer
  - Explicitly modeled unconditioned zones (attic, etc.)
  - Duct losses and interactions modeled
  - Pressure flow network for combined infiltration and ventilation
  - State of the art ground loss model for heating and cooling

  [JN note: BESTEST-EX uses EnergyPlus as one of program for developing example results.]

CEC preliminarily suggested the following update scenarios:

- Short term:
  - Patch slab insulation results?

    [Brief discussion notes follow in sub-sub bullets]
    - Fairey: RESNET slab acceptance criteria were adjusted to resolve this issue
      - Wilcox: maybe slab should be dropped [better modeling algorithms have been developed since 1995].
      - Judkoff: maybe acceptance criteria could be widened [where logically justified].
  - Clarify wind specification?
    - *[JN note: This is addressed in BESTEST-EX]*
- Longer term:
  - Replace/expand some results with recent std140 work
  - Update prototype descriptions and cases
  - Add modern software results

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Meeting Summary (continued)

- Support from California (CEC & utilities?) and others?

Discussion

Judkoff: Current results have been used since 1995; it makes sense to update the test cases and results. The bottom line is where the resources come from.

Fairey: Another example of weak area is duct system modeling

Witte/McDowell: Two issues here. One is updating cases/results, and the other is adding new cases.

General observation: 140's *informative* process for calculating "example" acceptance criteria are being adapted by others to develop normative acceptance criteria elsewhere.

RJ: To resolve near term issues, recommends CEC contact RESNET regarding acceptance criteria related to areas of concern [such as slab on grade modeling].

CEC: To address longer term issues, perhaps SSPC 140 should pursue via ASHRAE Research. There is precedent for PCs getting research funding.

10 (moved after 11). 140-2014-A: Update Section 5.2 (IEA BESTEST envelope, 1995) test spec/example results *[Judkoff/Neymark, 20 min.]*

- Address advances in modeling state of the art since 1995
- Consider including version of the spec in OpenStudio (GBXML compatible) format for automated input. NREL will take a look at this in addition to standard specification.

Action Items:

- Solicit working group (WG) participants
  - SSPC 140
  - Early "heads up" to prospective international participants
- Find an ASHRAE meeting time for the WG *[when we have discussion items prepared]*
- Iterate spec revisions and simulations
- Draft NREL final report (2015)
- Adapt for Standard 140 (2016)

12. Proposed Work Schedule (2012/13) for Above Addenda *[Neymark, 10 minutes]*
JN presented schedule for all activities over next 12 months. Five tasks in parallel (adaptations of 3 vetted test suites, and test spec development and sim trials for two test suites.

(see figure on next page)

Action Item *[Neymark]*: Send work sched diagram by separate email to the Voting Members per request by McDowell.

13. Residential empirical-data based tests (fyi) *[Neymark, 5 minutes]*

- NREL has Building America Field Data Repository data
  - Building description and utility bill data

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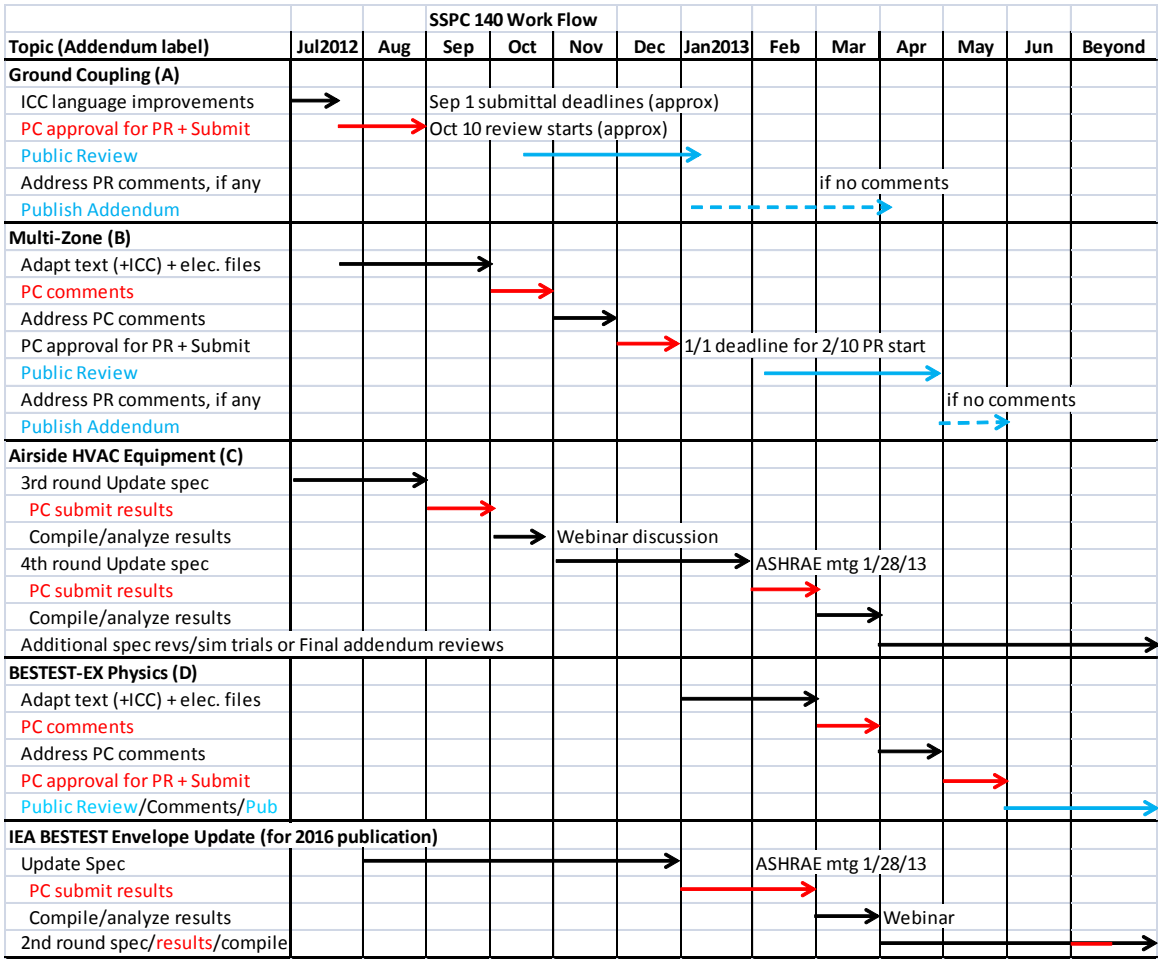
Meeting Summary (continued)



- Aiming for > 30 houses to begin with (hundreds or thousands is better)

- BPI's Home Performance (HP) XML data transfer standard for the building description data format

- Simulation trials in collaboration with Residential Software Accuracy Working Group/RESNET.

Informal discussion on this topic from Item 11 tangential discussion, related to what the committee knows about empirical data

- Neymark: NREL repository data does not have precisely defined inputs as in BESTEST; there is uncertainty in the building descriptions – the data can be used to estimate how well a given large-enough group of houses can be modeled on average.

- Roth: Some test cell data becoming available from LBNL and ORNL

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Meeting Summary (continued)

- Fairey: Models have the physics down pretty well. The real issue is occupant uncertainty.

14. BESTEST-EX residential calibrated energy savings cases (fyi) *[Judkoff, 5 minutes]*

- Judkoff noted that this will go through RESNET.

15. References to Standard 140 in Standard 90.1 *[Pegues, 10 min – hold until 4:15P for JP]*

- After publication of 140-2011, recommend to SSPC 90.1 to specifically cite the Class I test procedures (Section 5 of Std 140) for 90.1-2013. *Keep on agenda as reminder.*
- If GC and MZ addenda to 140-2011 are part of Section 5.2 (as 5.2.4 and 5.2.5), is that ok for future referencing by 90.1 and others?

Jim Peques: 90.1 will be referencing 140-2011 with addendum aw. Modified reference to specify which tests must be met (section 5 [sections 7 and 8 excluded])

16. COMNET and ASHRAE Building Energy Quotient (EQ) Referencing of Standard 140 *[Haberl/Fairey 10 min]*

Fairey: ASHRAE EQ is in early development.

Pegues: COMNET specifies every test specifically in 140.

Fairey: COMNET has developed its own pass/fail criteria for the Std 140 tests.

18. Residential Incentives Programs *[Fairey 10 min.]*

- RESNET, Tax Credits/Supplemental Cases, IECC Section 404, Homestar Gold

19. Additional Future Test Suites that could be adopted *[Judkoff, 5 min.]*

- RESNET mechanical equipment test cases (RESNET now qualified for ANSI process)
- Other IEA-34/43: Shading/Daylighting/Load Interaction by Switz. (empirical), Hydronic Equipment by Germany, Airflow by Japan (final report still in progress), Double-Skin Façade empirical by Denmark.
- IEA ECBCS Annex 42: Testing/Validation of Models for Resl. Cogeneration Devices
- Other Existing Test Suites and new research

RESNET mechanical equipment test cases discussion *[Fairey]*

- RESNET is making an ANSI/RESNET standard out of this
- Title will be "Standard for the Calculation and Labeling of the Energy Performance of Low Rise Residential Buildings Using the HERS Index"
- References 140 Section 7 Class Two, Tier 1 tests.
  - Adds a Case L125a with combined windows and insulation, and has 6 new reference program results for that test case
- Adds HVAC system, ducted air distribution, and DHW tests.
- Public review in 60 days
- Would committee be interested in joining RESNET in promulgating standards adopted by RESNET?

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Meeting Summary (continued)

Straw Poll:

How would committee like to be involved with this process?
Informed at semi-annual meeting: Witte, McDowell, Pegues
Informed as process develops: Haberl, Neymark
Co-sponsor or endorse: None

Action Item: None

20. Multidisciplinary Task Group on Energy Efficient Air-Handling Systems (MTG.EAS)

Haberl: MTG had first conference call; main action items were schedule, additional meetings
Action Item:

- Haberl to see if any MTG participants are interested in participating in the 865 trials.

21. New business

Add to next meeting (Dallas) agenda for Hong to report on IEA ECBCS Annex 58 related to whole building empirical validation work that fits in with new facilities at LBNL.

22. Adjourn