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 22, 2008 _____

TC/TG/TRG TITLE:___ Energy Calculations _____

DATE OF MEETING: January 22, 2008 _____ LOCATION:__ New York City _____

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS & ADDIT'L ATTENDANCE
Dan Fisher (CHM)	2006	Ian Beausoleil-Morrison	2006	Suzanne LeViseur (TAC)
Joe Huang (RES)	2004	Peter Ellis	2006	Hakim Elmahdy (RAC)
Richard Liesen (WEB)	2005	Agami Reddy	2006	Craig Wray (TAC)
Chip Barnaby (APP)	2005			
Simon Rees (INTL)	2005			
Larry Degelman	2006			
Jan Kosny	2006			
Moncef Krarti	2007			(see below for
Joel Neymark	2007			additional attendees)
Klaus Sommer (INTL)	2007			
Michael Wetter	2007			

DISTRIBUTION

ALL MEMBERS OF THE TC/TG/TRG
TAC CHAIR   Craig Wray
TAC SECTION HEAD   Suzanne LeViseur
SPECIAL PUBLICATIONS LIAISON   Mark Fly
STANDARDS LIAISON   Jerry White
HANDBOOK LIAISON   Douglas C Hittle
PROGRAM LIAISON   Carol Lomonaco
RAC RESEARCH LIAISON   Hakim Elmahdy
PROF DEV COMM LIAISON   Kenneth Fulk
TECH TRANSFER LIAISON   Stephen V Abernathy
STAFF LIAISON (RESEARCH)   Michael R Vaughn
STAFF LIAISON (TECH SERVICES)   Michael R Vaughn
STAFF LIAISON (STANDARDS)   Claire Ramspeck

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

NEW YORK CITY MEETING

ACTION ITEMS

1. MOTION to accept the RTAR *"Measurement, modeling, analysis and reporting protocols for short-term M&V of whole-building energy performance"* for submission to RAC: (Huang/Krarti) 11-0-0-0-CNV. Motion passes.
2. ACTION: Kris Kenney, NAESCO volunteered to take over as webmaster
3. ACTION: Sonderegger agreed to be the liaison to TC7.6.

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TC/TG/TRG TITLE: ____Energy Calculations____

DATE OF MEETING: January 22, 2008   LOCATION: New York City

TC/TG/TRG MEETING SCHEDULE			
LOCATION – past 12 months	**DATE**	**LOCATION - planned next 12 months**	**DATE**
Dallas	January 30, 2007	Salt Lake City	June 24, 2008
Long Beach	June 22, 2007	Chicago	January 27, 2009
TC/TG/TRG SUBCOMMITTEES			
Function		**Chair**	
Simulation and Component Models		Tim McDowell	
Applications		Chip Barnaby	
Data-Driven Modeling		Kris Subbarao	

RESEARCH PROJECTS – Current		Monitoring	Report Mode
Project Title	**Contractor**	**Comm.Chm.**	**At Meeting**
Appendix 1			

LONG RANGE RESEARCH PLAN				
Rank	Title	W/S Written	Approved	To R & T
	Appendix 2			

HANDBOOK RESPONSIBILITIES				
Year & Volume	Chapter Title	**No.**	Deadline	**Handbook Subcom. Chair/Liaison**
2005 Fundamentals	Energy Estimating Methods	31	June 2008	Crawley/Hittle

STANDARDS ACTIVITIES - List and Describe Subjects
SPC 140 Standard Method of Test for Building Energy Software – Joel Neymark
TECHNICAL PAPERS from Sponsored Research - Title, when presented (past 3 yrs. present & planned)

Appendix 3
TC/TC/TRG Sponsored Symposia - Title, when presented (past 3 yrs. present & planned)
Appendix 4
TC/TG/TRG Sponsored Seminars - Title, when presented (past 3 yrs. present & planned)
Appendix 5
TC/TG/TRG Sponsored Forums - Title, when presented (past 3 yrs. present & planned)
Appendix 6
JOURNAL PUBLICATIONS - Title, when published (past 3 yrs. present & planned)
None

<u>Attendance</u>

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

Present at Meeting				Last name	First name
New York Jan 2008	Long Beach June 2007	Dallas Jan 2007	Québec City June 2006		
X		X	X	Abushakra	Bass
	X	X	X	Anderson	J.R.
X				Arias	Diego
				Armstrong	Peter
				Balbach	Chris
X				Baltazar	Juan-Carlos
X		X	X	Barnaby	Chip
		X	X	Beausoleil-Morrison	Ian
X				Benitez	Jose
		X	X	Bernier	Michel
		X	X	Bou-Saada	Tarek.
		X	X	Brandemuehl	Mike
X	X	X	X	Carpenter	J Patrick
	X			Claridge	David
X	X	X	X	Cornick	Steve
	X	X	X	Crawley	Dru
	X			Culp	Charles
X	X	X	X	Degelman	Larry
X				Eldrige	David
	X	X	X	Ellis	Peter
X	X	X	X	Fisher	Dan
				Firrantello	Joseph
	X	X	X	Gardner	Carol
	X			Graves	
	X			Gray	
X	X	X	X	Haberl	Jeff
				Haddad	Kamel
X	X	X	X	Haves	Philip
		X	X	Henderson	Hugh
X				Hensen	Jan
	X			Hittle	Doug
X	X	X	X	Huang	Joe
X		X	X	Judkoff	Ron
X				Kinney	Kris
X	X	X	X	Kosny	Jan
X	X	X	X	Krarti	Moncef
		X	X	Lebrun	Jean

Present at Meeting				Last name	First name
New York Jan 2008	Long Beach June 2007	Dallas Jan 2007	Québec City June 2006		
X	X		X	Lemort	Vincent
X	X	X	X	Liesen	Richard
X	X	X	X	Lisenbee	Larry
X	X	X	X	MacDonald	Iain
X				Malhotra	Mini
X	X	X	X	McDowell	Tim
X	X	X	X	Neymark	Joel
	X	X	X	Norford	Les
X		X	X	O'NEILL	Zheng
	X			Parekh	Anil
X	X	X	X	Pedersen	Curt
	X	X	X	Reddy	T. Agami
X		X	X	Rees	Simon
X				Sonderegger	Robert
X				Sommer	Klaus
X	X	X	X	Spitler	Jeffrey
X	X	X	X	Subbarao	Kris
X				Szymurski	Steven
X				Tabanes	Paulo Cesar
X	X			Taylor	Russell
X				Vukovic	Vladimir
X				Wang	Xudong
X	X	X	X	Wetter	Michael
	X	X	X	Wray	Craig
		X	X	Wright	Jonathan
		X	X	Xiao	Dongyi
	X	X	X	Xiaobing	Liu

Appendix 1

RESEARCH PROJECTS

TC 4.7 RESEARCH PROJECTS STATUS

Active projects

#	Title	Joint TC	Cog SC/ Contractor	PMSC	Dates / status
1311-RP	Improving Load Calculations for Fenestration with Shading Devices	4.1 (cogni-zant TC), 4.5	Sim/Comp, University of Waterloo	Robert Hopper (chair/4.1); Ross McCluney (4.1); Chris Wilkins (4.1); Dru Crawley (4.7)	Contractor selected 6-2004 Start: 02-2005

Appendix 2

RESEARCH PLAN

ASHRAE
Technical Committee 4.7 Energy Calculations
2006-2007 Research Plan
(June 30, 2007)

Title	Society status	TC 4.7 Status	Authors or TC 4.7 Prime Contact	Sub committee*
Active Projects				
TRP-1456 Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulations	Opened for Bid Nov 07	PES met and forwarded recommended bidder to full committee NY meeting.	PES JHuang (chair), PHaves, JHensen, RBanks, NBourassa, SSzymurski	SCM
TRP-1416 Development of Internal Surface Convection Correlations for Energy and Load Calculations	Opened for Bid Nov 07	PES met and forwarded recommended bidder to full committee NY meeting.	PES: DFisher (chair), SBruning, JKosny	SCM
Approved RTARs				
None				
RTARs recommended by SC for approval				
Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring	None	RTAR accepted by SC and forwarded to full committee; approved by full committee NY meeting	AReddy, LNorford, VSmith, BAbushakra	DDM
CFD boundary conditions for natural ventilation	TC 4.10 lead, None	Discussed in full committee NY, co-sponsorship rejected but liaison with TC 4.10 to continue	YJHuang	SCM
RTARs to be reviewed				
RTAR-1468 Development of reference Building Information Model (BIM) for thermal model compliance testing	TC 1.5 lead, RTAR approved Jun 07	YJH to obtain copy of RTAR from TC 1.5 and circulate in SC	YJHuang	A
RTARs under development in subcommittee (prioitized)				
Assessment of the potential for application of moisture absorption/desorption models in whole bldg energy simul-ations to evaluate possible energy savings caused by moisture buffering effects in bldg enclosure and furnishings	None	Highest priority in SC; draft RTAR still under discussion in SC, no progress since June 06	JKosny	SCM

* SCM = Simulations and Component Models
  DDM = Data Driven Modeling (formerly Inverse Methods)
  A = Applications

ASHRAE
Technical Committee 4.7 Energy Calculations
2006-2007 Research Plan (continued)
(June 30, 2007)

Title	Society status	TC 4.7 Status	Authors or TC 4.7 Prime Contact	Sub committee*
RTARs under development in subcommittee (prioitized. continued)				
Development of Enhanced Window Simulation Capability for Standard 90.1 Prescriptive Simulation	None	RTAR under development, no progress since Jan 07	JHaberl, JDeringer,	A
Performance metrics for HVAC secondary systems	None	No progress since Jun 07	JWright, JHaberl, and CBarnaby	SCM
Research topics under discussion in subcommittee (unprioritized)				
Develop a radiant system module for the simulation and analysis of spaces and systems	None	Original RTAR fom TC 6.5 rejected in Long Beach, to be replaced by a new RTAR. No progress since Jun 07.	Kosny, Haves	SCM
Use of evolutionary compu-tation for inverse problems	None	Under discussion in SC	RNelson	DDM
Toolkit of Energy Conser-vation Measures, Prototypical Buildings, Sensitivity Analysis, and ECMs for use in ASHRAE Standard 90.1 Energy Cost Budget Method	None	Under discussion in SC	JGlazer, LNorford	A
Development of integrated models for liquid desiccant dehumidification driven by heat recovery or renewable energy	None	No progress since Jun 07	Haberl	SCM
Thermal mass toolkit: optimization of the calculation of the thermal mass energy benefits for residential and commercial buildings	None	No progress since Jun 07	Kosny	SCM
Modeling of humidity controlled equipment	None	No progress since Jun 07	Haberl	SCM
Modeling of the ground heat exchanger in foundation systems	None	No progress since Jun 07	Kosny	SCM

* SCM = Simulations and Component Models
  DDM = Data Driven Modeling (formerly Inverse Methods)
  A = Applications

Appendix 3
TECHNICAL PAPERS FROM SPONSORED RESEARCH

RP	Title	Contractor	Approved	Paper
1051	Procedures for Reconciling Computer-calculated Results with Measured Energy Data	Drexel	Chicago January 2006	*Reddy, T.A., 2006. "Literature Review on Calibration of Building Energy Simulation Programs: Uses, Problems, Procedures, Uncertainty and Tools", ASHRAE Transactions, vol 112(1).*
1051	Procedures for Reconciling Computer-calculated Results with Measured Energy Data	Drexel	Chicago January 2006	*Sun J. and Reddy T.A., 2006, "Calibration of Building Energy Simulation Programs Using the Analytic Optimization Approach (RP-1051)", Int. J HVAC&R Research 12(1) 177-196.*
1051	Procedures for Reconciling Computer-calculated Results with Measured Energy Data	Drexel	Chicago January 2006	*Reddy, T.A., I. Maor and C. 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.*

Appendix 4
TC/TG/TRG SPONSORED TRANSACTIONS SESSIONS

Current as of January 2008

PRESENT:
New York City/January 2008
> *How Low Can You Go? Low-Energy Buildings Through Integrated Design* (Co-sponsored by TC 4.7) (Chair: Dru Crawley)

PLANNED:
Salt Lake City/June 2008
> *How Low Can You Go? Low-Energy Buildings Through Integrated Design* (Co-sponsored by TC 4.7) (Chair: Dru Crawley)

> *How and Why to Calibrate a Simulation to Measured Data* (Chair: Bass Abushakra)

PAST:
Long Beach/June 2007
> *How Low Can You Go? Low-Energy Buildings Through Integrated Design* (Co-sponsored by TC 4.7) (Chair: Dru Crawley)

Dallas/January 2007
> *How Low Can You Go? Low-Energy Buildings Through Integrated Design* (Co-sponsored by TC 4.7) (Chair: Dru Crawley)

Québec City/June 2006
> *Validation of Building Simulation Programs Through ASHRAE Standard 140* (Chair: Chip Barnaby)

> *How Low Can You Go? Low-Energy Buildings Through Integrated Design* (Co-sponsored by TC 4.7) (Chair: Dru Crawley)

Chicago/January 2006
> *Thermal Modeling of Phase Change Materials in Building Envelopes: Old Problem, New Developments* (Chair: Jan Kosny)

> *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)

Denver/June 2005
> *None.*

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Appendix 5
TC/TG/TRG SPONSORED SEMINARS

Current as of January 2008

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

PLANNED:

Salt Lake City/June 2008
Use of 'Equation Solvers' for Simulation (Chair: Michael Wetter)

Simulation of HVAC/R Components based on published Manufacturer Data (Chair: Michael Wetter)

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

Dallas/January 2007
Use of 'equation solvers' for Simulation (Chairs: Jean Lebrun/Mike Wetter)

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

Québec City/June 2006
None

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

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

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

Orlando/January 2005
What to do When Data Misbehave (Chair: Agami Reddy)

Appendix 6
TC/TG/TRG SPONSORED FORUMS

Current as of January 2008

PRESENT:
New York City/January 2008

   None.

PLANNED:

Salt Lake City/June 2008

Should ASHRAE Develop Standards or Guidelines for Simulation Aided Design of High Performance Buildings? (Chair: Jason Glazer)

Limitation of Energy Simulations for ZEB (Chair: Tim McDowell)

PAST:
Chicago/January 2006

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

ASHRAE TC 4.7 Energy Calculations
Tuesday, January 22, 2008, 18h00 to 20h30
Regent 2, Hilton Hotel
New York City, NY

1. Roll call and introductions (Fisher)
- The meeting convened at 18h00, with Fisher as chair and Haberl as secretary.
- 10 voting members were present, including the Chair, out of 15 non-international members, constituting a quorum.
- Those present introduced themselves.

2. Accept agenda & approve minutes of Long Beach meeting (Fisher) (Agenda: Attachment A)
- Motion to accept the agenda (Degelman / Neymark) **Approved by voice vote.**
- Motion to accept the minutes of the Long Beach meeting (Degelman / Krarti) **Approved by voice vote.**

3. Announcements/Liaisons (Fisher)
- TC 4.7 needs a webmaster
- The Research Liaison reported the on the research items from RAC. All items must be turned in on time. RAC needs all final items for RP 1197 (University of Colorado.) Barnaby reported that this needed to be sent by the contractor. The Research Liaison asked the committee to please forward all research material to him to take forward to RAC.
- The Section Head had nothing to report.
- Fisher stated that starting at Salt Lake City, no program presentations would be reviewed at the meeting. All presentations will have to be approved before the meeting. Also, all seminars would be recorded. If someone does not want their presentation recorded, then they will not get their registration waived

4. Membership (Fisher)
- Beausoliel-Morrison, Rees, Huang and Fisher will roll off after the Salt Lake City meeting and Haves, Taylor, MacDonald, McDowell, Sonderegger will roll on.

5. Subcommittee reports
5.1 Applications: Chip Barnaby (chair) reporting: (**Attachment B**)
Program and research were discussed at the subcommittee meeting.
- There was some discussion of carbon accounting. Haberl agreed to be the TC 4.7 liaison for carbon accounting.
- There was a discussion about "simulation methods for high performance buildings". The subcommittee agreed that this was a good topic for a forum.
- There was also discussion about a "simulation Wikipedia". Wetter reported on work in Germany.
- The subcommittee discussed work on an RTAR for a method of test for BIM translators.
- There was also a long discussion about an RTAR for "parallelization of building simulation algorithms". The focus on the discussion was whether or not this was a TC 4.7 area of concern of not. There is a lot of work going on in the computer science world and perhaps it would be best to wait.
- The topic of modern methods for use in simulation was then discussed. Wetter and Taylor volunteered to write a 1-pager about this and circulate it to the subcommittee.

5.2 Data-Driven Modeling Kris Subbarao (chair) reporting: (**Attachment C**)
- Subbarao reported on the DDM subcommittee. He requested that the 90 minute slot be restored. Fisher agreed to send this in. Discussion on program was deferred to program.
- Subbarao reported on other program ideas, simulation for policy.
- Abushakra suggested a topic on simulation for commissioning. Reddy suggested a topic of simulation for risk analysis.
- Subbarao reported on other ideas, for example, water modeling and other adaptations to the IMT, standardized M&V for VAV reset, certification of codes such as LEED, standardization of deliverables from an ASHRAE research project, and wavelet classification schemes used for inverse analysis.

5.3 Simulation & Component Models Tim McDowell (chair) reporting: **(Attachment D)**
- McDowell asked the chair to make sure to get a bigger room for meetings, as the room was too small.
- Research topics discussed included modeling moisture adsorbtion/desorption, modeling multi-split VRV systems, modeling variable R-value insulation and modeling direct contact ground heat exchangers
- The remaining of the meeting was spent looking at the wish list. It is planned to continue the reassessment using email between meetings.

5.4 Research, Joe Huang (chair) reporting **(Attachment E)**
Huang reported on the research chair's breakfast.
- The budget and number of projects were discussed. He reported that there will be a new research manual for use by TCs. This is to be ready at the end of January. WS must include three potential bidders, the PESC and PMSC must have at least three members and WS can not require special equipment. Also, USGBC has committed $1 million for research into green buildings; USGBC is now asking for pre-proposals.
- TC 4.7 research plan status: 2 active projects – 1456-TRP Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulations and 1416-TRP Development of Internal Surface Convection Correlations for Energy and Load Calculations Both have gone out to bid and contractor selection will be discussed in executive session.
- TC 4.7 does not have RTARs that have been approved, only 2 recommended to the committee for approval, "*"Measurement, modeling, analysis and reporting protocols for short-term M&V of whole-building energy performance"* from Data-driven Models and *"Boundary conditions for computer modeling of natural ventilation through large openings"* from TC 4.10.
- There is also an RTAR on BIM for which TC 1.5 is expected to request co-sponsorship.
- Rees asked about the 90% rule for WS authors. Wray stated that it still in effect, i.e., the WS authors bid must be no less than 90% of the WS. The project can be awarded to non-low bidders if there is sufficient justification.
- Sonderegger asked about the three bidders rule. This was clarified to be that three bids must be received for the project to be awarded to a WS author.
- The committee was reminded that the new Research Manual would cover these details.
RTAR *"measurement, modeling, analysis and reporting protocols for short-term M&V of whole-building energy performance"* was discussed.
- Abushakra gave an example of a building that was going for LEED rating - is it possible to do this with less than 1 year's data? He also reviewed the history of the RTAR and assured the committee that it was ready for approval.
- Motion to accept: (Huang/Krarti); discussion followed.
- Fisher reminded the committee that it was appropriate to approve the RTAR, then the WS…and not to reject the WS after the RTAR was approved.
- Fisher asked that all acronyms be explained.
- Wray asked some of the ESCO representatives in the room if they would ever use this. Also, how is this different from Guideline 14 and Standard 140? He noted a need for editorial clarification regarding "software code developers…". Also, he asked that the discussion of "value" be strengthen. Abushakra agreed to respond to these requests
- Degelman asked that the use of the word "modeling" be clarified, and perhaps dropped as this implied new "models". Abushakra said this was in reference to "inverse models". He agreed to edit this.
- There was also a question about what the "time" was to collect data?..., how fine an interval or over one month…, time interval vs time period. Abushakra agreed to clarify this. He felt this was the "length of data to drive the model".
- **MOTION to accept the RTAR *"Measurement, modeling, analysis and reporting protocols for short-term M&V of whole-building energy performance"* for submission to RAC: (Huang/Krarti) 11-0-0-0-CNV. Motion passed.**
Discussion of RTAR *"boundary conditions for computer modeling of natural ventilation through large openings"* from TC 4.10.
- The RTAR is concerned with pressure conditions, depth of area surrounding the building, etc.
- Motion to approve co-sponsorship subject to the condition that it be revised to meet the editorial comments at this meeting (Huang/Rees).

- Wray reminded the committee that TC 4.3 objected to this. This WS has been to RAC before and was rejected. CFD models were not developed to do this because of their lack of an ability to handle boundary conditions.
- The RTAR author clarified that this was a comparison of two methods for determining pressure coefficients: wind tunnel vs CFD.
- Huang said that this was appropriately explained.
- Wray said that there already was old data on this…and that TC 4.10 needs to get TC 4.3 to sign off on this.
- Haves asked about if this would address single sided ventilation or just two sided.
- Haves recommended this because there have been large advances in CFD since the last time RAC looked at this.
- Huang stated that the TC 4.7 natural ventilation project (1456-TRP) is different and that the project proposed by TC4.10 would benefit it.
- Haberl offered a friendly amendment that it be contingent on TC4.3 approval.
- McDowell suggested that it needed editing to make sure that the RTAR clarify what need work meets that cannot be met by a multi-nodal model. The author agreed to this.
- Wray stated that RP 903 has done multi-nodal modeling and that it did not work, and that this should not be part of this research. He stated that the work that needed to be done was to generate pressure coefficients.
- Rees asked about what he meant by "large openings". The author said "doors" and "garage doors". He felt the research question was how to get the pressure coefficients of large openings.
- Degelman asked Wray if he had told 4.10 about the need for 4.3 to sign-off on this. Wray said he had not.
- Degelman said that the RTAR needed to just say CFD modeling…that the title and body of the RTAR do not agree.
- Huang asked if TC 4.10 had approved. The RTAR author said they had not approved this. He was just here to get support from TC 4.7.
- Fisher said that the number of questions at this meeting made this seem like it needed to be pushed to Salt Lake City.
- Wray said that the duct folks have also had the same problem with CFD modeling for ductwork. They were proposing a "shootout" just like the "predictor shootout".
- Liesen suggested that it be rejected.
- 3 in-favor, 7 opposed, 1 abstention, chair not voting. Motion fails.
- **MOTION: "TC 4.7 approves co-sponsorship of the RTAR "B*oundary conditions for computer modeling of natural ventilation through large openings"* subject to the conditions that it be revised to meet the editorial comments at this meeting and that TC 4.3 also approve this" (Huang/Rees). 3-7-1-0-CNV. Motion failed.**
- Rees volunteered to work with the author on the RTAR.

5.5 Handbook, Dru Crawley (chair) reporting **(Attachment F)**
- The following RPs needed to be better explained: 865, 1049, 1050, 1051, 1093, 1311, 1197.
- The revisions need to be done in time to get them to the full TC by May, for review and vote in Salt Lake City.

5.6 Program, Michael Wetter (chair) reporting **(Attachment G)**
- Wetter discussed program from the 3 subcommittees (see attached).
- Fisher reminded the committee about the TC 4.7 program, which were well attended.
- Wetter then reviewed the proposed program:
- Two transactions sessions: one on calibrated simulation (chair: Abushakra) and one on low energy buildings and integrated design (chair: Crawley, sponsored by TC2.8, co-sponsored by TC4.7)
- Ranked sessions:
  1. Seminar: Use of 'Equation Solvers' for Simulation (chair: Wetter, 3 speakers).
  2. Seminar: Simulation of HVAC/R Components based on Published Manufacturers' Data (chair: Wetter, 3 speakers, 1 maybe)
  3. Forum: Should ASHRAE Develop Standards or Guidelines for Simulation Aided Design of High Performance Buildings (chair: Glazer)
  4. Forum: Limitation of Energy Simulations for ZEB (chair: McDowell)

- **MOTION:** That TC 4.7 accepts the program plan for Salt Lake City (Barnaby/Degelman). **Motion carried on a voice vote.**

5.7 *Standards,* Ron Judkoff reporting for Joel Neymark (chair) **(Attachment H)**
SSPC 140 SMOT for Eval Building Energy Analysis Computer Programs
- Judkoff reviewed the work by SSPC 140, including web-based hosting of Standard 140 tests for tax compliance, and results of compliance. The committee felt that this was useful for setting the state of the art by statistics.
- HERS BESTEST was also discussed at length. It was considered important for this residential standard to get into Standard 140. This is set up for hourly software, but could accommodate seasonal software.
- Judkoff reported between 60 and 70 bugs fixed by using Standard 140, which emphasizes the usefulness of this standard. All these will be on the IEA Solar Heating and Cooling web site. Daylighting is already up, double skin façade is up, other will appear in April or May.

IEA Annex 34/43 Test and Validation of Building Energy Simulation Tools
- Judkoff reported on IEA Solar Heating and Cooling 34/43 on validation testing. This has wrapped up. Reports are being written. Test suites exist, including a ground coupling suite (NREL), multizone air flow test (Japan). He said the set of analytical solutions on these tests were very useful. These tests were set up to accommodate several levels of tests, including (perhaps) CFD.
- Exhaustive double skin façade literature review by Lund has been published. Test facility in Denmark for double skin tests used to generate data. All should be available in April time-frame.
- Finally, a university in Dresden has developed an empirical test suite on hydronic data, and this will be available through the IEA, "Task 34, publications outcomes".

5.8 *Web Site,* Rich Liesen (chair) reporting **(no attachment)**
- Liesen suggested putting the SCM "wish list" on the TC web site.
- Rees noted that this had been up there before.
- Fisher suggested that it be put back up on the web site.
- ACTION: Kris Kenney, NAESCO volunteered to take over as webmaster

6. Reports on related activities
Carbon Counting Program (Haberl) Haberl reported on the work by Hal Levin on the Carbon Emissions Toolkit.

GPC 20 XML Definitions for HVAC&R (**Barnaby**)
- There is a research project underway to look at domain overlap with other efforts.
- A BIM interoperability group has just been formed to jump activity in ASHRAE with respect to BIM and Interoperability. There is not a good set of standard definitions across the whole ASHRAE field. There is talk of developing a society-wide glossary. This is needed to identify multiple definitions; this would be a pre-cursor for work addressing semantics.
- Huang reported on the Seminar on BIM in new construction. He said that BIM was revolutionizing the construction industry, so how could ASHRAE play a leadership role?
- Barnaby said that this is why ASHRAE has to do this.

TC 2.8 Sustainability (Crawley)
(Not much to report)

TC 4.1 Load Calculations (Barnaby)
- Jeff Spitler has been updating the LOADS manual for the Radiant Time Series. There will be extensive modifications to the 2009 handbook chapter, including kitchen heat gains

TC 4.2 Climatic Information (Barnaby)
- Degelman requested to the committee to attend the TC 4.2 Seminar on more accurate tool
- TC 4.2 has several research projects, 1325-RP – hygrothermal data analysis weather data, 1363-RP – design day weather data, 1453-RP – climate data for design standards, 1477-RP – typical year weather data.
- Barnaby said that after 40 years the ASHRAE clear sky data will be updated, driven by a database of aerosol data

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TC 4.5 Fenestration (no report)

TC 6.5 Radiant Heating and Cooling (no report)
>   Sommer agreed to be the new liaison

TC 7.4 Building Operation Dynamics (Haves)
- TC 7.4 is interested in collaborating with TC 4.7 on energy use impact on the electric grid.

6.8 TC 7.5 Smart Building Systems (Haves)
- TC7.5 and TC7.4 are considering merging.

6.9 TC 7.6 Systems Energy Utilization ()
>   ACTION: Sonderegger agreed to be the liaison.

6.10 IAI International Alliance for Interoperability (no report)

6.11 Standard 90.1 (no report**)**

6.12 IBPSA (USA, Canada, World, BS 2007)
- IBPSA-USA (Brandemuehl):
  - SimBuild 2008 will be held in Berkeley July 29 – August 1. It will feature seminars and forums in addition to technical paper presentations
- IBPSA-Canada (no report)
  - eSim2008 will be held in Quebec City in May
- IBPSA-World (Spitler):
  - Hansen reported that IBPSA has 1500 papers on the IBPSA web site. IBPSA is now 20 years old. It has 2,500 members in 17 regional organizations.
  - The first edition of the IBPSA Journal of Building Performance Simulation is expected to be published in March
  - Building Simulation 2009 will be held in Glasgow, Scotland

7. Old Business
>   (none)

8. New business
>   (none)

9. Executive Session
1. RP 1416 Development of Internal Surface Convection Correlations for Energy and Load Calculations: Contractor Selection (PES: Fisher (chair) , Kosny, Bruning-TC4.1)
2. RP 1456 Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulations: Contractor Selection (PES: Huang (chair), Haves, Hensen, Szymurski-ARI, Sutton-CEC,Banks-TC4.10)

Committee voted on recommendations to RAC regarding the contractor for each project. Chairman will communicate votes to Mike Vaughn.

Attachments
- A. Agenda
- B. Applications Subcommittee Minutes
- C. Data Driven Modelling Subcommittee Minutes
- D. Simulation and Component Models Subcommittee Minutes
- E. Research Subcommittee Minutes
- F. Handbook Subcommittee Minutes
- G. Program
- H. SSPC 140 Minutes

Attachment A

Agenda
ASHRAE TC 4.7 Energy Calculations
Tuesday, Jan 22, 2008, 6:00-8:30 p.m.
Regent 2, Hilton
NYC

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1. Roll call and introductions	Haves
2. Accept agenda & approve minutes of Long Beach meeting	Fisher
3. Announcements/Liaisons	Fisher
4. Membership:	Fisher
5. Subcommittee reports	
5.1 Applications	Barnaby
5.2 Data-Driven Modeling	Subbarao
5.3 Simulation & Component Models	McDowell
5.4 Research	Huang
• Status: 1311-RP Improving Load Calculations for Fenestration with Shading Devices (TC 4.1/4.5/4.7; Univ. of Waterloo)	Crawley
• RTARs and Work statements for consideration	Huang
1. Measurement, Modeling, Analysis and Reporting Protocol for short-term Measurement & Verification (M&V) of Whole Building Energy Performance.	
2. CFD Boundary Conditions for Natural Ventilation	
5.5 Handbook	Crawley
5.6 Program	Wetter
5.7 Standards	Neymark
• SSPC 140 SMOT for Eval Building Energy Analysis Computer Programs	Judkoff
• IEA Annex 34/43 Test and Validation of Building Energy Simulation Tools	Judkoff
5.8 Web Site	Liesen
6. Related activities reports	
Carbon Counting Program	Haberl
GPC 20 XML Definitions for HVAC&R	Barnaby
TC 2.8 Building Environmental Impacts and Sustainability	Crawley
TC 4.1 Load Calculation Data and Procedures	Fisher
TC 4.2 Climate Information	Barnaby
TC 4.5 Fenestration	---
TC 6.5 Radiant Heating and Cooling	Wetter
TC 7.4 Building Operation Dynamics	Brandemuehl
TC 7.5 Smart Building Systems	Reddy
TC 7.6 Systems Energy Utilization	Abushakra
IAI International Alliance for Interoperability	---
IBPSA: USA, SimBuild 2006; Canada, eSim 2006; IBPSA, BS 2007	Brandemuehl, Hensen
7. Old Business	
8. New business	
9. Executive Session:	Fisher
3. RP 1416 Contractor Selection (PES: Fisher (chair) , Kosny, Bruning-TC4.1)	
4. RP 1456 Contractor Selection (PES: Huang (chair), Haves, Hensen, Szymurski-ARI, Sutton-CEC,Banks-TC4.10)	
10. Adjourn	

Attachment B

ASHRAE TC 4.7 Energy Calculations
Applications Subcommittee
Tuesday, January 22, 3:30 – 5 PM
New York City, CA

Minutes

Meeting called to order at 3:35 PM. Introductions. Agenda approved.

Haberl reported on ASHRAE's carbon accounting effort. Judkoff added information about NREL's Site/source effort.

Program

Discussion then moved on to the *"…fenestration data needs for loads calculations…"* Barnaby mentioned that the problem is that all that ever gets mentioned is SHGC and U-value, and that there is more needed such as number of layers, frame type, etc. Haberl mentioned that there was also the problem with using SHGC and U-value, and that this was not enough to use the Window-5 program. Also, when using programs such as DOE-2 one is forced to use the SC method and not the more accurate multilayer subroutines that are triggered with Window-5. Barnaby asked the group to table the discussion until research.

Discussion then went on to *"web-based programs for calculating code compliance"*. Degelman said he has spoken with Haberl and needed more speakers. ACTION: Degelman said he would get the seminar ready by 2/8.

Barnaby asked about the possible program for the *"..solar decathlon simulation…"*. Haddad was supposed to chair this. This was followed by more discussion on the issue of who would speak, and the need for someone from NREL to speak.

Barnaby then asked the subcommittee to prioritize the selections. He suggested that *"…solar decathlon…"* be first, followed by *"…web-based programs…"*. This will then be reported at the main committee

Carbon accounting.

Barnaby asked that this be moved to the full committee for reporting by Haberl, who is on the Performance Metrics Steering Committee.

Standard idea:

Discussion then moved to *"…simulation aided design for high performance buildings…"*. Neymark asked that the subcommittee briefly read the RTAR (see attached). Barnaby suggested that this RTAR needed a possible Forum for Salt Lake City. J.Huang told the committee that this may be the wrong organization for this, that this would be better received by the architecture design community. ACTION: The subcommittee agreed to add: FORUM: "Should ASHRAE develop simulation standards for high performance buildings".

Standard 90.1 ECB Coordination.

Barnaby tabled this discussion since.Norford was not present.

IBPSA Simupedia.

Wetter informed the committee that IBPSA had investigated this and found that there was a German site that could be "added-on to". ACTION: Barnaby asked that there be a link on the IBPSA web site for others to use, and to report back at the Salt Lake City meeting.

Research.

Barnaby then moved discussion on to the RTAR about BIM under discussion at TC 1.5 Someone from TC 4.7 Applications is needed to contact TC 1.5. ACTION: Huang said that he would contact Gowri, and Kennedy at Green Building Studio.

Discussion then moved on to *"..parallelization of building simulation algorithms.."* .Barnaby said that this might be more of a roll for Intel/Microsoft. Leisen said that this was under investigation by JFK at Green Building Studio, but they were having trouble getting through this. The committee agreed that there was room for doing this with a simulation. However, there was not agreement about who or how to do this. There were some calculations that needed to communicate with other calculations. Wetter said that there were compilers that could "decompose" a simulation and optimize it for running, but that there was still a need to rewrite the code to make it run faster. Haberl mentioned that there was also an issue for web-based simulation, where multiple users were using one page at one time and the work farmed-out to a cluster of computers. The committee agreed that the issue was how to make (1) building run faster, versus making multiple runs. Barnaby then asked for volunteers to work with Glazer and flesh this out. Nobody volunteered.

Discussion then moved to *"...modern methods for use in simulation..."*. Wetter talked about the need for this. ACTION: Wetter/Taylor agreed to write a 1-pager about this and circulate it back to the subcommittee.

ACTION: J.Huang will send around his 2-pager on the fenestration.

Meeting adjourned 5:00 PM.

Attachment C

TC4.7 Data-Driven Modeling Subcommittee
Monday, January 21, 2008
6:00 to 7:30 p.m.
New York City, NY
Chair: Kris Subbarao

Minutes

Meeting started at 6:30 pm. Chair called session to order followed by introductions and approval of Long Beach meeting minutes. Attendance sheet was circulated.

We request restoration of 90 minutes (had been 90 minutes but apparently accidentally reduced to 60 minutes in Dallas but restored for Long Beach, but somehow went back to 60 minutes)

Programs
    Salt Lake City
- **Transaction: "Use of Equation Solver for Building Simulation", Chair: Mike Wetter**
- **Transaction: "How and Why to Calibrate a Simulation", Chair: Abushakara; 2 papers by Haberl et al have been reviewed and accepted by ASHRAE**
- **Seminar: "Methods for Carbon Credit Certification from Energy Efficiency and Renewable Energy", Chair: Kris Subbarao. 3 speakers expected to be lined up.**

    Beyond:
- "Enhanced Value of Calibrated Simulations in Energy Policy Making" David Jump suggested a speaker from LA county. LA county is performing retrofits on some 100 court houses and using eQuest (any calibration is not meant to be robust)

- Abushakara suggested a topic on simulations for determining energy efficiency retrofits through simulations (possibly calibrated) versus perform "continuous commissioning" to identify and install the measures.

- Agami Reddy suggested a topic on the link between risk and uncertainty analysis

- Attendees were encouraged to suggest through e-mail additional program topics.

Discussion of WS and RTARs

   a. **RTAR- "Modeling, Analysis, and Reporting Protocols for Predicting Annual Energy Performance from Short-term Building Energy Monitoring" Reddy, Norford and Smith This draft RTAR was discussed and unanimously voted to be forwarded to the full TC for approval and submission to RAC**
   b. Follow-up of RP-1051: "Automated calibration of detailed building energy simulation programs". Agami Reddy and Kris Subbarao assigned to develop a draft RTAR for discussion in Salt Lake City.
   c. Baselining water use in a facility – Jeff Haberl will develop, for discussion in Salt Lake City, an RTAR possibly to adapt and enhance the inverse model toolkit.

Other baselining issues raised were:
- adjusting M&V projects due to creep and other causes
- electricity demand savings
- in-situ procedures for energy savings from renewable projects

If draft RTARs are preparedby as yet unidentified volunteers, they will be discussed in Salt Lake City

d. Standardized M&V for savings from operational changes: SAT reset, static pressure reset, …". Sonderegger suggested that small improvements may not be identifiable from data in an individual building, but possibly in a sufficiently large group of buildings.

e. Certification of built buildings against code such as LEED – Joe Huang assigned to prepare a draft RTAR for discussion in Salt Lake City.

f. Standardization (ActiveX DLL, …) of software component of deliverables of ASHRAE projects sponsored by the subcommittee, so that users can imbed them directly in their software. Jeff Haberl said he will look into this in the context of inverse tool kit for water use. Joe Huang felt that the two are too dissimilar to be combined into one RTAR

g. New ideas: Jeff Haberl suggested that the ongoing Ph.D work at A&M should be used to develop an RTAR. The topic is "Wavelet based classification schemes for day type analysis". Kris Subbarao assigned to write a draft RTAR for discussion in Salt Lake City.

There was a very brief discussion of the following item due to time constraints.

1. better ways to digest past research
2. how best to disseminate research results
3. how best to coordinate research and results with allied TC and SC
4. maintain expertise within SC even when membership changes

The meeting was adjourned at 7:40 pm.

Attachment D

TC4.7 Simulation and Component Models Subcommittee
Minutes: Monday, January 25, 2007, 7:30-9:00pm
Sheraton – Park 3(5)

Called to Order: 7:40 pm

Attendance:

Tim McDowell	TESS	mcdowell@tess-inc.com
Joel Neymark	J. Neymark & Assoc	neymarkj@msn.com
Kris Kinney	NORESCO	kkinney@noresco.com
Joe Huang	White Box Technologies	joe@drawdbl.com
Larry Degelman	TAMU	ldegelman@suddenlink.net
Diego Arias	Gamma Technologies	d.arias@gtisoft.com
Philip Haves	LBNL	phaves@lbl.gov
Richard Liesen	Owens Corning S&T	Richard.J.Liesen@owenscorning.com
Russell Taylor	UTRC	taylorrd@utrc.utc.com
Timothy Moore	UC Berkeley CBE	tmoore@whole-systems-design.com
Moncef Krarti	University of Colorado	krarti@colorado.edu
Iain MacDonald	NRC	iain.macdonald@nrc.gc.ca
Dan Fisher	Oklahoma State	dfisher@okstate.edu
Dan Macumber	NREL	daniel@macumber@nrel.gov
Peter Armstrong	MIST	parmstr@mit.edu
Steve Cornick	NRC/IRC	steve.cornick@nrc.ca
Michael Wetter	LBNL	mwetter@lbl.gov
Jeff Haberl	TAMU	jhaberl@tamu.gov
Anna Zhou	Taylor Engineering	azhou@taylor-engineering.com
Yiqun Pan	Tongji University	yiqunpan@mail.tongkji.edu.cn
David Eldridge	Grumman/Butkus Associates	dse@grummanbutkus.com
Chris Balbach	Performance Systems Development	cbalbach@psdconsulting.com
Kris Subbarao	Texas A&M	KSubbarao@tamu.edu
Steven Hespoler	Roger Williams University	Shespeler195@Hawks.rwu.edu

Program

New York (January 2008)
- **Seminar** *How to Model Nothing – Energy Modeling of ZNE Buildings* (Chaired by Jan Kosny) (Part 1 and 2)

Thanks to Jan Kosny for chairing the seminars.

Salt Lake City (June 2008)
- **Transactions** on *Modeling and Experimental Validation of Active Building Components* (Chaired by: Jan Kosny) – unsure of the status of the papers
- **Seminar** on *Simulation of HVAC/R Components based on published Manufacturer Data (Chaired by Mike Wetter)* – has 1 speaker for sure and 3 maybe speakers
- **Seminar** on *Modeling of Double Envelope Facades and Active Windows (Chaired by Mike Brandemuehl)* – slipped from New York – need to talk to Brandemeuhl concerning the status
- **Seminar on** *Quality Assurance of Software Programs* (Chaired by Russ Taylor)
- **Forum** on Limitations on Modeling of High Performance Buildings (*Chaired by Tim McDowell*)

Chicago (January 2009)

- **Transactions** on *Evolution Design of HVAC Systems* for RP 1049 – will be a HVAC&R seminar and not through TC 4.7

RTARS

- *Assessment of the Potential for Application of Moisture Absorption/Desorption Models in Whole Building Energy Simulations to Evaluate Possible Energy Savings Caused by Moisture Buffering Effects in Building Enclosures and Furnishing* (Jan Kosny, Andre Desjarlais, Rich Liesen). – The IEA task has completed their work and this topic can be picked back up. Rich which coordinate with Jan.
- *Modeling of Multi-Split Variable Refrigerant Volume Systems* (Carol Gardner, Russ Taylor) Russ will communicate with Carol and work on the RTAR for Salt Lake City
- *Variable R-value Insulation* (Jeff Haberl, Dan Fisher) Jeff and Dan will work on this topic after the Salt Lake City meeting
- *Modeling of Direct Contact Ground Heat Exchange* (Chris Balbach) Chris volunteered to start the process and will look for advice and input once first draft is complete

RTAR from 4.10 on Natural Ventilation – Joe Huang will review RTAR for possible overlap with the approved workstatement and advise the full TC.

Other possible topics needing champions:

- *Performance Metrics for HVAC Secondary Systems* (Jonathon Wright) A new idea for a RTAR for a metric of evaluating HVAC secondary systems. Jeff Haberl and Chip Barnaby raised concerns and will work with Jon on this RTAR.
- *Development of Integrated Models for Liquid Desiccant Dehumidification Driven by Heat Recovery or Renewable Energy* (Jeff Haberl).
- *Thermal Mass Toolkit: Optimization of the Calculation of the Thermal Mass Energy Benefits for Residential and Commercial Buildings* (Jan Kosny).
- *Modeling of Humidity Controlled Equipment* (Jeff Haberl).
- *Modeling of the ground heat exchanger in foundation systems (Jan Kosny)*
- *Combined Modeling of Daylighting and Energy Calculations* (Jeff Haberl)
- *Energy Calculations and Water Usage* (Jeff Haberl)
- *Natural Ventilation Controls* (Jeff Haberl)
- *Infiltration of Crawlspace and Attics* (Jeff Haberl)

A brainstorming session was held to come up with topics for "green" building technologies that cannot be simulated with readily available simulation tools:

Thermal Bridging in 2-D and 3-D
Heuristic Controls
Dewpoint Modeling
Simulating Capabilities Modeling on Contaminant
Airflow UFAD Modeling
Thermally Stratified Room Airflow
Microclimate Modeling
Integrating PV-Thermo with Electric Storage
Standardized Manufacturing Data for Simulation
Stack Effect in Tall Building
Greenroofs
Evaporative/Radiative Cooling from Roof Surfaces
Fabric Diffusers

These topics will be added to the existing SCM research wishlist and be posted on the 4.7 website.

The discussion of the topics will continue on the TC4.7 mailing list before the Salt Lake City meeting. At Salt Lake City the topics will be prioritized.

Adjourned at 9:00 pm

Attachment E

ASHRAE
Technical Committee 4.7 Energy Calculations
2007-2008 Research Plan
(January 22, 2008)

Title	Society status	TC 4.7 Status	Authors or TC 4.7 Prime Contact	Sub committee*
Active Projects				
TRP-1456 Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulations	Opened for Bid Nov 07	PES met and forwarded recommended bidder to full committee NY meeting.	PES JHuang (chair), PHaves, JHensen, RBanks, NBourassa, SSzymurski	SCM
TRP-1416 Development of Internal Surface Convection Correlations for Energy and Load Calculations	Opened for Bid Nov 07	PES met and forwarded recommended bidder to full committee NY meeting.	PES: DFisher (chair), SBruning, JKosny	SCM
Approved RTARs				
None				
RTARs recommended by SC for approval				
Modeling, analysis, and reporting protocols for predicting annual energy performance from short-term building energy monitoring	None	RTAR accepted by SC and forwarded to full committee; approved by full committee NY meeting	AReddy, LNorford, VSmith, BAbushakra	DDM
CFD boundary conditions for natural ventilation	TC 4.10 lead, None	Discussed in full committee NY, co-sponsorship rejected but liaison with TC 4.10 to continue	YJHuang	SCM
RTARs to be reviewed				
RTAR-1468 Development of reference Building Information Model (BIM) for thermal model compliance testing	TC 1.5 lead, RTAR approved Jun 07	YJH to obtain copy of RTAR from TC 1.5 and circulate in SC	YJHuang	A
RTARs under development in subcommittee (prioitized)				
Assessment of the potential for application of moisture absorption/desorption models in whole bldg energy simul-ations to evaluate possible energy savings caused by	None	Highest priority in SC; draft RTAR still under discussion in SC, no progress since June 06	JKosny	SCM

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moisture buffering effects in bldg enclosure and furnishings				

ASHRAE
Technical Committee 4.7 Energy Calculations
2007-2008 Research Plan (continued, page 2)
(January 22, 2008)

Title	Society status	TC 4.7 Status	Authors or TC 4.7 Prime Contact	Sub committee*
RTARs under development in subcommittee (prioitized. continued)				
Development of Enhanced Window Simulation Capability for Standard 90.1 Prescriptive Simulation	None	RTAR under development, no progress since Jan 07	JHaberl, JDeringer,	A
Performance metrics for HVAC secondary systems	None	No progress since Jun 07	JWright, JHaberl, and CBarnaby	SCM
Research topics under discussion in subcommittee (unprioritized)				
Develop a radiant system module for the simulation and analysis of spaces and systems	None	Original RTAR fom TC 6.5 rejected in Long Beach, to be replaced by a new RTAR. No progress since Jun 07.	Kosny, Haves	SCM
Use of evolutionary compu-tation for inverse problems	None	Under discussion in SC	RNelson	DDM
Toolkit of Energy Conser-vation Measures, Prototypical Buildings, Sensitivity Analysis, and ECMs for use in ASHRAE Standard 90.1 Energy Cost Budget Method	None	Under discussion in SC	JGlazer, LNorford	A
Development of integrated models for liquid desiccant dehumidification driven by heat recovery or renewable energy	None	No progress since Jun 07	Haberl	SCM
Thermal mass toolkit: optimization of the calculation of the thermal mass energy benefits for residential and commercial buildings	None	No progress since Jun 07	Kosny	SCM
Modeling of humidity controlled equipment	None	No progress since Jun 07	Haberl	SCM
Modeling of the ground heat exchanger in foundation systems	None	No progress since Jun 07	Kosny	SCM

* SCM = Simulations and Component Models

  DDM = Data Driven Modeling (formerly Inverse Methods)

  A = Applications

Attachment F

Meeting Minutes
Handbook Subcommittee
ASHRAE TC 4.7 Energy Calculations
5:00-6:00 pm, Tuesday, January 22, 2008
Regent, Hilton New York
New York, New York

Present:
> Dru Crawley (Subc Chair)
> David Eldridge
> Dan Fisher
> Jeff Haberl
> Ron Judkoff
> Joel Neymark
> Russ Taylor

Chair Crawley called the meeting to order at 5:05 pm. Those present introduced themselves.

Crawley indicated that electronic copies of the 2005 Fundamentals Chapter 32 were available for review. The schedule for the update of the chapter has TC 4.7 voting to approve the updated chapter by the Annual Meeting in 2008.

The group quickly reviewed the existing chapter material and suggested that work be focused on the following areas:

- Updates for recent TC 4.7 research projects including 865-RP, 1049-RP, 1050-RP, 1051-RP, 1052-RP, 1092-RP, 1093-RP, 1197-RP, 1311-RP, etc
- Ground heat transfer needs substantial updating including Beausoleil-Morrison, Bahnfleth and Deru. Need revisions to Krarti…
- Table 1, Haberl students to update
- Need discussion of toolkits and updates—Loads, HVAC1, HVAC2.
  - Brandemuehl agreed to update information on HVAC2 toolkit.
  - LeBrun agreed to update information on HVAC1 toolkit
- Couple airflow models plus displacement, UFAD (Haves/Hensen)
- Genetic algorithms/1049-RP (Wright/Nelson)
- Window blinds/shades/screens modeling/1311-RP (Barnaby)
- Bringing the validation/testing methods discussion up to date (Neymark/Judkoff)
- Comparison of simulation tools (Crawley)
- Look at ASHRAE-HQ as possible example-- (1093 example?) (Haberl)
- Simulation for code compliance
- New areas of simulation: water, onsite power, green roofs, CFD applications linking, natural ventilation, duct model,

It was agreed to again solicit authors/reviewers at the TC 4.7 meeting.

Crawley will email those present to ask if they want a copy of the current chapter in electronic form to those present.

A review of Chapter 32 (2005 F) received from the Handbook Committee in January 2006 shows a number of minor typographical changes needed.

Meeting ended at 5:25 PM.

Attachment G

TC 4.7 Program Plan
New York City ASHRAE Meeting
January 2008

Salt Lake City June 21-25, 2008   * Deadlines: Manuscripts 9/28/07; Package 2/8/08, PPT 4/1/08 for NY PE credits.**
Theme: Benchmarking: The Current Standard of Care

Transactions "How Low Can You Go? Low-Energy Buildings Through Integrated Design"
        Organized by: TC 2.8 (Co-sponsor)
        Chaired by: Dru Crawley
        Status: 2 papers in review, 4th transaction session

Transactions "How and why to calibrate building energy simulation programs"
        Organized by: TC 4.7 (Data Driven Models)
        Chaired by: Bass Abushakra
        Status: Jeff Haberl has 2 papers

1) Seminar "Use of 'Equation Solvers' for Simulation"
        Organized by: TC 4.7 (Data Driven Models)
        Chaired by: Michael Wetter
        Status: V. Lemort/S. Bertagnolio, Xia Jianjun(?), Yi Jiang (UTRC)(?).

2) Seminar "Simulation of HVAC/R Components based on published Manufacturer Data"
        Organized by: TC 4.7 (Simulation and Component Models)
        Chaired by: Michael Wetter
        Status: Presenter: Joel Neymark, Vincent Lemort, Kamel Haddad(?), Russ Taylor.

3) Forum "Should ASHRAE Develop Standards or Guidelines for Simulation Aided Design of High Performance Buildings"
         Organized by: TC 4.7 (Applications)
         Chaired by: Jason Glaser
         Status: New

4) Forum "Limitation of Energy Simulations for ZEB"
        Organized by: TC 4.7 (Simulation and Component Models)
        Chaired by: Tim McDowell
        Status: New

Chicago, January 24-28, 2009   * Deadlines: Manuscripts 4/4/08; Package 8/8/08.**
Theme: Sustainable Urban Design

HVAC&R Research Seminar "Synthesis of Optimum HVAC System Configurations"
        Organized by: HVAC&R Research (co-sponsor)
        Chaired by: TBD
        Status: Jonathan Wright to present 2 papers from RP1049, confirmed by R. Radermacher.

Transaction "Use of 'equation solvers' for Simulation"
        Organized by: TC 4.7 (Data Driven Models)

Co-chaired by: Jean Lebrun/Michael Wetter
Jonas Eborn, Jean Lebrun
Status: New
======
Seminar "Simulation Support for the 2007 Solar Decathlon"
Organized by: TC 4.7 (Applications)
Chaired by: Kamel Haddad
Status: Continuing series from Long Beach. Has speakers.

Seminar "Web-based Programs for Calculating Energy Code-Compliance"
Organized by: TC 4.7 (Applications)
Chaired by: Larry Degelmann
Status: Moved from Dallas, Larry Degelmann & Jeff Haberl have three speakers in mind.
Put forward to committee

Seminar "Experience with Simulation of Standard 90.1 Code-compliant Buildings"
Organized by TC 4.7 (Applications)
Chaired by: Carol Gardner
Status: Moved from Dallas

Seminar "Applying Performance Assessment Tools to mitigate Climate Change"
Organized by TC 4.7 (Applications)
Chaired by: Carol Gardner
Status: Moved from NYC. 4 speakers

Seminar "Fenestration Data Needs for Energy and Loads Calculations"
Organized by: TC 4.7 (Applications)
Chaired by: -
Status: Moved from Dallas. Keep as maybe.

Seminar "Methods of Carbon Credit Certification from Energy Efficiency and Renewable Energy"
Organized by: TC 4.7 (Data Driven Models)
Chaired by: Kris Subbarao
Status: Moved from Long Beach. Confident to get 3 speakers.

Seminar "Use of uncertainty analysis and risk analysis for building energy simulation"
Organized by: TC 4.7 (Data Driven Models)
Chaired by: Agami Reddy
Status: Moved from NYC.

Seminar "Advanced Inverse Modeling Techniques using Interval Data"
Organized by: TC 4.7 (Data Driven Models)
Chaired by: Jeff Haberl
Status: Moved from NYC.

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)
Chaired by: Russ Taylor
Status: Moved from NYC.

Attachment H

SSPC 140 New York City Meeting Summary
January 21, 2008

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

Chair Announcements

Chair Announcements/Communications since last meeting *[Judkoff]*

- ANSI/ASHRAE Standard 140-2007 has been published, it includes adaptations of:
  - IEA Building Energy Simulation Test and Diagnostic Method (BESTEST) – building thermal fabric comparative tests, by NREL in collaboration with IEA SHC Task 12/ECBCS Annex 21
  - HVAC BESTEST Volume 1 – unitary cooling equipment analytical verification tests, by NREL in collaboration with IEA SHC Task 22
  - Fuel-Fired Furnace BESTEST – analytical verification tests, by NRCan in collaboration with IEA SHC Task 22
  - HVAC BESTEST Volume 2 – unitary cooling equipment comparative tests, by NREL in collaboration with IEA SHC Task 22.
- 140-2007 Addendum A letter ballot publication/public review approval passed (10-0, unanimous): includes updates to modeling notes and related examples for alternative modeling methods, anomalous results, and software/platform requirements – to be consistent with materials for posting Std 140 results on DOE web site. Goes out for 45-day public review March 21.

Development of a format for 140 results data to be posted on the DOE Tools web site.

The ad-hoc SSPC 140 Data Format Subcommittee, chaired by Neymark, met Sunday (1/20) evening. Meeting objective: Continue with developing a format for Std-140 results data to be posted on the DOE Tools web site. The Subcommittee is developing data format, submittal, and posting recommendations; much of this can also be applied for tax-deductions related software approvals.

Progress:

- Jim Pegues has completed the initial design work to develop Web Cover Page content and layout, and rules for submitting results, including how submitted material will be posted or otherwise be available from vendors.
  - This work involves improvements to the standard output reports of Std 140.
  - This work was the feedstock for proposed 140-2007 Addendum A (see above), which begins 45-day public review on March 21.
- Mike Witte is working on improving two results spreadsheets currently in 140-2004 for automating inclusion of new results into formatted charts and tables, for comparing submitted results with the current Std-140 example results set.
  - The spreadsheet and xls-to-pdf conversion process is complete for the HVAC spreadsheet (Sec 5.3 results)
  - Work is in progress for the Envelope spreadsheet (Sec 5.2 results)
- DOE is requesting that we have a format available for their use in the next couple of months.

Adaptation of HERS BESTEST for Std 140
DOE's Builder Challenge Program desires that software certifications they use (e.g., HERS BESTEST) be under the umbrella of Std 140, which raised the prioritization for 140-adaptation of HERS BESTEST. SSPC 140 has begun developing 140-2007 Addendum B. The work is being done by Philip Fairey/FSEC; with guidance/reviews provided by Neymark. Objective is to have an addendum ready for a PC publication/public review approval vote as soon as possible. The addendum will propose a new section in Standard 140 for test cases for more simplified building energy analysis tools commonly used for residential modeling; example applications of such tools are for residential energy code compliance using performance-based compliance paths, and for home energy rating applications. The PC is also considering including example pass/fail criteria in an *informative* annex as part of the adaptation.

UPDATE FOR IEA TASK/ANNEX 34/43

This IEA research effort focuses on validation and testing of building simulation tools. The Task finished December 2007, with not-already-finished final reports due for completion in April 2008. Some of this work could be included with Standard 140 in the future. **So far the final reports have reported about 65 bugs found in computer programs as a result of the field trials**, with three task leaders not yet reporting on found bugs. Completed final reports are posted at http://www.iea-shc.org/task34/publications/index.html. The following projects are included:
- Comparative Tests (Software-to-software comparisons)
    - Ground coupled heat transfer related to floor slabs (NREL, US)
        - This includes analytical verification tests, and the methodological advancement of developing a secondary mathematical truth standard using an analytical solution benchmark and verified numerical-model results for other test cases included within the test suite.
    - Multi-zone envelope test cases (NREL, US) including:
        - Analytical verification conduction test
        - Comparative tests of
            - The effect of shading on a window, where a shading device is affixed to the window of a neighboring zone
            - The effect of shading on a window by a neighboring zone of the building
            - Internal windows.
    - Airflow test cases including single- and multi-zone (INCT, Japan)
- Empirical Validation Tests (Compare software to empirical data)
    - Daylighting/shading/load interaction – EMPA (Switz.); ERS (Iowa)
        - Final report is posted.
    - Double-Skin Façade (DSF) building – Lund U. (Sweden); Aalborg U. (Denmark)
        - DSF literature review by Lund U. is published/posted.
        - Aalborg U. work includes empirical validation and comparative test cases
    - Mechanical equipment test cases - Dresden University of Technology (Germany):
        - Focusing on water-side components/systems: chillers, boilers, pumps, piping, valves, etc
        - Includes empirical validation and comparative test cases.