

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: June 24, 2008

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: January-June 24, 2008 LOCATION: Salt Lake City

| MEMBERS PRESENT | YEAR APPTD | MEMBERS ABSENT | YEAR APPTD | EX-OFFICIO MEMBERS & ADDIT'L ATTENDANCE |
|--------------------------|------------|-------------------------|------------|---|
| Dru Crawley (HND) | 2007 | Dan Fisher (CHAIR) | 2007 | Suzanne LeViseur (TAC) |
| Joe Huang (RES) | 2004 | Ian Bea.-Morr (V.CHAIR) | 2006 | Craig Wray (TAC) |
| Joel Neymark (STDS S.C.) | 2007 | Simon Rees (INT'L) | 2005 | |
| Chip Barnaby (APP S.C.) | 2005 | Jan Kosny | 2006 | |
| Klaus Sommer (INT'L) | 2007 | Moncef Krarti | 2007 | |
| Rich Liesen (WEB) | 2005 | | | See attendance list for Additional attendees. |
| Bass Abushakra | 2005 | | | |
| Larry Degelman | 2006 | | | |
| Peter Ellis | 2006 | | | |
| Agami Reddy | 2006 | | | |

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 |
| CHAP 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

SALT LAKE CITY MEETING

MOTIONS AND ACTION ITEMS

1. MOTION for RTAR #1413 change title from “Developing Standard Procedures for Filling Weather Data Gaps During Analysis of Measured Building Energy use” to be “Developing Standard Procedures for Filling Weather Data Gaps During Analysis”, (Huang/Reddy), Vote: 10 in favor, 0 against, 0 extensions. Motion passed.
2. MOTION to approve TC 4.7’s Handbook Draft for submission to the Handbook Committee (Crawley/Liesen), Vote: 10 in favor, 0 against, 0 extensions. Motion Passed.
3. MOTION to approved TC 4.7’s Program, (Barnaby/Leisen), Vote: 10 in favor, 0 against, 0 extensions. Motion passed.
4. ACTION item, K.Gowri agreed to post a copy of TC 1.5’s WS on BIM to energy simulation WS on a secure site and notify the members of TC 4.7.
5. ACTION item, J.Haberl agreed to write an RTAR to combine the software from RP1050 and RP1093 into one toolkit, and expand the capabilities to include water modeling, demand modeling.
6. ACTION item, (all TC 4.7 committee member and interested others) to email all their new research ideas to J.Haberl who will merge and assemble into a list for distribution prior to the Chicago meeting.

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TC/TG/TRG No. TC 4.7 DATE: June 24, 2008

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: January-June 24, 2008 LOCATION: Salt Lake City

| TC/TG/TRG MEETING SCHEDULE | | | | |
|--|---------------------------|------------------|---|--------------------------------|
| LOCATION – past 12 months | | DATE | LOCATION - planned next 12 months | |
| New York City | | January 22, 2008 | Chicago, ILL | |
| Long Beach | | June 22, 2007 | Louisville, KY | |
| June 20-24, 2009 | | | June 20-24, 2009 | |
| TC/TG/TRG SUBCOMMITTEES | | | | |
| Function | | | Chair | |
| Simulation and Component Models Applications Data-Driven Modeling | | | Phil Hayes Tim McDowell Chip Barnaby 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/IC/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 and the prior three meetings. It includes the voting members of the committee listed on the first page.

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

| Present at Meeting | | | | Last name | First name | Membership |
|--------------------------|-------------------|----------------------|-----------------|--------------|-------------|---|
| Salt Lake City June 2008 | New York Jan 2008 | Long Beach June 2007 | Dallas Jan 2007 | | | V= Visitor VM = Voting CM = corres. |
| X | X | X | | Lemort | Vincent | V |
| X | X | X | X | Liesen | Richard | VM |
| | X | X | X | Lisenbee | Larry | |
| X | X | X | X | MacDonald | Iain | V |
| | X | | | Malhotra | Mini | V |
| X | X | X | X | McDowell | Tim | CM |
| X | X | X | X | Neymark | Joel | VM |
| | | X | X | Norford | Les | |
| | X | | X | O'NEILL | Zheng | |
| | | X | | Parekh | Anil | |
| X | X | X | X | Pedersen | Curt | CM |
| X | | X | X | Reddy | T. Agami | VM |
| | X | | X | Rees | Simon | |
| | X | | | Sonderegger | Robert | |
| X | X | | | Sommer | Klaus | INT'L M |
| | X | X | X | Spitler | Jeffrey | |
| | X | X | X | Subbarao | Kris | |
| | X | | | Szymurski | Steven | |
| | X | | | Tabanes | Paulo Cesar | |
| X | X | X | | Taylor | Russell | V |
| | X | | | Vukovic | Vladimir | |
| | X | | | Wang | Xudong | |
| X | X | X | X | Wetter | Michael | CM |
| | | X | X | Wray | Craig | TAC Chair |
| | | | X | Wright | Jonathan | |
| | | | X | Xiao | Dongyi | |
| X | | X | X | Xiaobing | Liu | V |
| | | | | Mukhopadhyay | Jaya | V |
| | | | | Bertagnolio | Stephane | V |
| | | | | Kolacki | Elizabeth | V |
| | | | | Hintz | Scott | V |
| | | | | Ladaudi | Kris | V |
| | | | | Schaefer | Larry | V |
| | | | | Gowri | Krishnan | V |
| | | | | Roth | Stephen | V |
| | | | | Brook | Martha | V |
| | | | | Smith | Vern | V |
| | | | | Susan | LeViseur | TAC Sec Head |

Appendix 1**TC 4.7 RESEARCH PROJECTS STATUS****ASHRAE
Technical Committee 4.7 Energy Calculations
(June 24, 2008)****Active projects**

| # | Title | Joint TC | Cog SC/ Contractor | PMSC | Dates / status |
|---------|---|-------------------------|----------------------------------|--|---|
| 1311-RP | Improving Load Calculations for Fenestration with Shading Devices | 4.1 (cognizant 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 |
| 1416-RP | Development of Internal Surface Convection Correlations for Energy and Load Calculations | 4.1 | Sim/Comp, Univ of Texas | Dan Fisher (Chair), Steve Bruning, Jan Kosny | Contractor selected 6-2008, expected to start 8/2008, conf call prior to SLC. |
| 1456-RP | Assess and Implement Natural and Hybrid Ventilation Models in Whole-building Energy Simulations | 4.10 | Sim/Comp, Univ of Colo | Joe Huang (Chair) Philip Haves, Jan Hensen, R.Banks, N.Bourassa, S.Szymurski | Contractor selected 6-2008, First task is lit search. |

Appendix 2RESEARCH PLAN

**ASHRAE
Technical Committee 4.7 Energy Calculations
2007-2008 Research Plan
(June 24, 2008)**

| Title | Society status | TC 4.7 Status | Authors or TC 4.7 Prime Contact | Sub committee* |
|--|-----------------------------------|--|---------------------------------|----------------|
| Active Projects | | | | |
| None | | | | |
| Approved RTARs | | | | |
| None | | | | |
| 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 | RTAR has been approved and being devel into WS by 1.5. RTAR discussed at SLC | YJHuang | A |
| RTARs under development in subcommittee (prioitized) | | | | |
| Assessment of the potential for application of moisture absorption/desorption models in whole bldg energy simulations 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 |
| Procedure to create hypothetical fenestration model when only bulk properties are avail (Ufactor, SHGC). | None | J.Huang presented draft of RTAR at subcommittee meeting. Discussion | J.Huang | A |
| Modeling, Analysis and Reporting Protocols for Predicting Annual Energy Perf. From Short Term Monitoring | RTAR #1404 | Was approved at N.Y.C. by full committee. Needed revisions. Revisions not yet made. Will have revisions by Chicago | A.Reddy, L.Norford, V.Smith | DDM |
| Performance metrics for HVAC secondary systems | None | No progress since Jun 07 | JWright, JHaberl, and CBarnaby | SCM |
| Develop a radiant system module for the simulation and analysis of spaces and systems | None | Original RTAR fom TC 6.5 rejected in Long | Kosny, Haves | SCM |

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| | | | | |
|--|------|--|----------------|-----|
| | | Beach, to be replaced by a new RTAR. No progress since Jun 07. | | |
| 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 |
| Modeling of Multi-split variable refrigerant volume systems | None | Discussed in SCM | Jon Wright | SCM |
| Variable R-value insulation | None | Discussed in SCM | Haberl, Fisher | SCM |
| Modeling direct ground coupled heat exchanger | None | Discussed in SCM | Chris Balbach | SCM |
| Combined modeling of daylighting and energy calculations | None | Discussed in SCM | Haberl | SCM |
| Energy calculations and water use | None | Discussed in SCM | Haberl | SCM |
| Natural ventilation controls | None | Discussed in SCM | Haberl | SCM |
| Infiltration rates in crawspaces and attice | None | Discussed in SCM | Haberl | 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. |
| 865 | Accuracy Tests for Simulations of VAV Dual Duct, Single Zone, Four Pipe Fan Coil and Four Pipe Induction Air Handling Systems (4796) | Univ Nebraska, Texas A&M | July 2002 | Yuill, G., Haberl, J. 2006. "Accuracy Tests for Simulations of VAV Dual Duct, Single Zone, Four Pipe Fan Coil and Four Pipe Induction Air Handling Systems (4796)," ASHRAE Transactions-Research, Vol. 112, Pt. 1 (January). |
| 865 | Accuracy Tests for Simulations of Constant Volume, Dual Duct and Variable Volume Air Handling Systems (4796). | Univ. Nebraska, Texas A&M | July 2002 | Yuill, G., Haberl, J., Caldwell, J. S. 2005. "Accuracy Tests for Simulations of Constant Volume, Dual Duct and Variable Volume Air Handling Systems (4796, RP-865)," ASHRAE Transactions-Research, Vol. 111, Pt. 2, No. 4796, pp. 137 – 153 (June). |

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

Appendix 4
TC/TG/TRG SPONSORED TRANSACTIONS SESSIONS

Current as of June 2008

PRESENT:

Salt Lake City June 21-25, 2008

None.

PLANNED (w/priorities):

Chicago, January 24-28, 2009

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 "Fenestration performance" [8 papers in review from RP-1311. Contact: John Wright]

Organized by: TC 4.1/4.5/4.7

Chaired by: Glenn Friedman (maybe 2 sessions)

Status: Moved from NYC.

Louisville, June 20-24, 2009

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

PAST:

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 2008

PRESENT:

Salt Lake City June 21-25, 2008

Seminar "Use of Equation Solvers for Simulation"
Organized by: TC 4.7 (Data Driven Models)
Chaired by: Michael Wetter
Status: Stephane Bertagnolio, Michael Wetter.

PLANNED (w/priorities):

Chicago, January 24-28, 2009

- 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: Moved from Salt Lake City. Joel Neymark, Vincent Lemort, Stephane Bertagnolio & Jean Lebrun, Craig Wray.
- 4) Seminar "Web-based Programs for Calculating Energy Code-Compliance"
Organized by: TC 4.7 (Applications)
Chaired by: Larry Degelmann
Status: Moved from Dallas, Jeff Haberl, Eric Richmond and possibly one more speaker. Put forward to committee.
- 5) Seminar "How to Assess the Performance of Sustainable Buildings through Measured Data"
Organized by: TC 4.7 (Data Driven Models)
Chaired by: Moncef Krarti
Status: New. 4 speakers (David Jump, B. Koran, Bass Abushakra, David Claridge)
- 6) 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. Has two speakers. Put forward to committee.

Louisville, June 20-24, 2009

- 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 "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 "Shoot-out of Code Compliance Simulation for Residential Buildings"
Organized by TC 4.7 (Applications)
Chaired by: Jeff Haberl
Status: New (6/08)
- Seminar "Applying Performance Assessment Tools to mitigate Climate Change"

Organized by TC 4.7 (Applications)

Chaired by: Carol Gardner

Status: Moved from NYC. May get 4 speakers, but none confirmed.

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 “Advanced Inverse Modeling Techniques using Interval Data”

Organized by: TC 4.7 (Data Driven Models)

Chaired by: Jeff Haberl

Status: Moved from NYC.

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 “Modeling of High Performance Buildings”

Organized by: TC 4.7 (Simulation and Component Models)

Chaired by: Tim McDowell

Status: New (6/08).

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 2008

PRESENT:

Salt Lake City June 21-25, 2008

None.

PLANNED (w/priorities):

Chicago, January 24-28, 2009

- 1) Forum "Limitation of Energy Simulations for NZEB"
Organized by: TC 4.7 (Simulation and Component Models)
Chaired by: Tim McDowell
Status: Moved from Salt Lake City
- 3) Forum "Should ASHRAE Develop a Standard for Simulation Aided Design of High Performance Buildings"
Organized by: TC 4.7 (Applications)
Chaired by: Jason Glazer
Status: Moved from Salt Lake City. Put forward to committee.

Louisville, June 20-24, 2009

None.

PAST:

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)

PAST:

New York City/January 2008

None.

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, 6:00 PM to 9:00 PM
Salt Lake City, Utah

1. Roll call and introductions (Haves)

- The meeting convened at 6:05 PM, with Haves as acting chair and Haberl as secretary.
- 10 voting members were present, excluding the chair, out of 14 non-international members, constituting a quorum.
- Those present introduced themselves.

2. Accept agenda & approve minutes of Long Beach meeting (Haves) (Agenda: Attachment A)

- MOTION to accept the agenda (Barnaby/Leisen) Approved by voice vote.
- MOTION to accept the minutes of the New York meeting (Barnaby/Leisen) Approved by voice vote.

3. Announcements/Liaisons (Haves)

- The ASHRAE BOD has asked for TC inputs to the Strategic Plan, to be discussed later.
- 3 new steering committees:
 - AEDG
 - Building Performance and metrics
 - BIM
- Rosters and membership information can be found on-line, C.Wray said that this was link dependent.
- Option to request a thank you letter now uses a form
- Research Advisory panel has been reformed. J.Spittler chair.
- 2 new AEDGs: lodging, health care. ASHRAE is calling for more input.
- ASHRAE has shifted list servers and web servers. In the last 6 months ASHRAE has also had to restore their server, hence some information was lost. Members are asked to check their data.
- Nominations for the Hightower award are being sought. Nominations can go to P.Haves.
- ASHRAE HQ is undergoing renovation. It is anticipated that it will get LEED Gold. It is also intended ~~the~~ to be a living laboratory.
- Links to RIVA are being further developed. There is also a EU conference in May 2010 in Turkey.
- ASHRAE Certification committee is looking for new ideas for certification. Ideas can come to P.Haves.
- It was also announced that the Program Committee is being replaced Conferences and Exposition Committee. It has been proposed that there will no longer be program liaisons. This will be assigned to section heads. The overall goal is to improve the communication to the TCs. Curt Messimer is the incoming chair.
- Society is encouraging more intersociety liaisons and liaisons with other societies. TCs should list the liaisons. Suggestions about how to improve this can be forwarded to P.Haves.
- Society is now looking to appoint more Fellows. Their goal is to have 1% of membership. Process is described on the ASHRAE web site. Fellowship is awarded according to technical achievement, not for service for society.

4. Membership (Haves)

- Haves read the new members for 2008/2009, including: Haves (Chair), McDowell (Secretary), Liesen (Simulations Chair), Crawley.
- Continuing on: Huang (Research), Neymark (Standards), Barnaby (Applications Chair), Taylor (Handbook), Fisher (Awards, non-voting), Haberl (Vice Chair, non-voting), Wetter (Program, non-voting).

5. Subcommittee reports

5.1 Applications: Chip Barnaby (chair) reporting: (Attachment B)

- Barnaby reported that there was discussion of the Carbon Toolkit that ASHRAE is developing.

- This was followed by discussion about the 90.1 ECB liaison.
- Barnaby reported discussion about a TC 4.7 wikipedia. IBPSA USA wanted to start this but IBPSA Germany got this started first, so IBPSA USA decided to join this. The committee was encouraged to visit the site and contribute.
- This was followed by long discussion about 1468 WS was discussed, Rules for extraction thermal models from BIM models. The WS needs help from 4.7. Applications will work closely with 1.5 to complete this.
- There was also an RTAR about developing an automatic multilayer glazing interface to Window 5 that would allow code compliant simulation. Currently this cannot be done with 90.1 or 90.2 or IECC. There is a need for this in the simulation world.
- Finally, there was also a discussion of how the subcommittee has been supporting the strategic plan. Results are included in the TC 4.7 strategic plan.

Section 4.0 Liaison (not on agenda).

- Susan reviewed the items in the TC chair breakfast. She reminded the committee that the precast concrete institute was developing a design guide and was looking for ASHRAE input.
- Susan asked about program. She mentioned that if the TC does not put something into the priority

Comment [m1]: incomplete

5.2 Data-Driven Modeling Kris Subbarao (chair) reported by Reddy: (Attachment C)

- Reddy reported that there was discussion of research, beginning on the RTAR about long term performance form short term measurements. There was a long discussion and the subcommittee decided that the RTAR needed work before going forward as a WS. Reddy will be working on this.
- New research ideas were then discussed, including combining 1050, 1093, etc into a combined tool, water modeling, energy demand modeling.
- ACTION: These will be developed into an RTAR by J.Haberl.

5.3 Simulation & Component Models Tim McDowell (chair) reporting: (Attachment D)

- McDowell reported there a short discussion of program, followed by a long discussion about research.
- The subcommittee received a WS from another committee for co-sponsor. There was concern that the other committee did not address the comments from the subcommittee.
- There was also a long discussion of the strategic plan by P.Haves.

5.4 Research, Joe Huang (chair) reporting (Attachment E)

- J.Huang reported on the research chairs breakfast. At the breakfast there was discussion of the “nuts and bolts”. First, there was a discussion on conflicts of interest. Research has rules for doing this, including how to do this. (See the rules page about this).
- The research budget was \$2.3 million for the next year. 68 active projects after New York, now 85 active projects.
- Dates: RTARs due Aug 15, Dec 15, Mar 15.
- 1311 RP is a project by TC 4.1, 4.5 and 4.7. C.Barnaby gave an update on the project. It is a project to develop better calculations for windows. Waterloo is the prime and Wrightsoft is the subcontractor. It includes blinds, roller blinds, etc. Models are very sophisticated. Currently, the models are done, and work is proceeding to finish this by September. J.Wright has already published papers on this work.
- 1416 RP develop of internal convection coefficients. Contractor is the Univ of Texas at Austin. Project is expected to start in August. They had planned to have a PMSC meeting at SLC but the PMSC could not be here. Contractor had a conf call before SLC. Contractor will get the toolkit from C.Barnaby to get start.
- 1466 RP, natural ventilation, also just getting started. CEC and CIBSE are cofunding. Unfortunately, several members could not attend. Contractor is the Univ of Colo, John Zhai is the PI. The first task is to do a lit search. The contractor had a 40 page report on the literature search. Contractor is very experienced on multimode models.
- J.Huang expressed that not enough concern was being placed on the coupling of the air flow modeling with the thermal modeling and that this needed more effort. A.Reddy asked about the implementing. J.Huang

said that this was a 2 phase model. First phase was literature search and gathering data. Second phase was modeling.

- J.Huang then mentioned that there were RTARs under consideration. WS 1413 needed action by TC 4.7. This RTAR was started in 4.7 then moved to 4.2. Since 4.7 was a cosponsor it needed consideration. L.Degelman said that TC 4.2 was looking for comments as well as cosponsor. Status of 4.2 was that there would be a letter ballot. July 4th was the deadline for comments. Haves asked if 4.2 could summarize the comments. L.Degelman said that there was some cleaning needed, deliverables needed adding, etc. C.Barnaby said that the title needed changing to remove the use only for energy use, which would broaden the application.
- MOTION for RTAR #1413 change title from “Developing Standard Procedures for Filling Weather Data Gaps During Analysis of Measured Building Energy use” to be “Developing Standard Procedures for Filling Weather Data Gaps During Analysis”, (Huang/Reddy) Discussion, why the “apx \$100k”, this needed to be more firm. J.Huang that these were the sorts of comments that were being asked to clarify. Vote, 10 in favor, 0 against, 0 extensions. Motion passes.
- T.McDowell mentioned that TC 4.7 needed to vote on the Cosponsorship for the as-yet-to-be-seen WS from TC 6.5. No motion was made to cosponsor.
- J.Huang then moved on to discuss the remainder of the Research Plan. He mentioned that there were a host of “ideas” that had been developed, but that very few RTARs were being written.
- J.Huang mentioned that perhaps the TC was being too tough on RTARs.
- C.Barnaby felt this was a needed exercise and that the RTARs need to be -well written to survive when they go forward to RAC.
- D.Crawley reminded the committee that each subcommittee had a scope that helped directed their research ideas, and that it might help to reinstate this.

5.5 Handbook, Dru Crawley (chair) reporting (Attachment F)

- D.Crawley told the committee that the update to the TC 4.7 Handbook chapter was circulated on the list server by D.Fisher and S.Reese. Changes were updates, references, examples for 1050 and 1093, etc.
- P.Haves asked for comments on the Handbook. J.Neymark asked about due dates.
- MOTION (Crawley, Liesen) to approve the draft for submission to handbook committee, 10 voted in favor, 0 against, 0 extensions. Motion passed.

5.6 Program, Michael Wetter (chair) reporting (Attachment G)

- M.Wetter reviewed the program from the 3 subcommittees.
- Chicago: Priority #1: Net Zero energy simulations, McDowell, Priority #2: Published manf data, Wetter, Priority #3: High perf simulation, Glazer, Priority #4: Web-based simulation, Degelman, Priority #5: Assess the performance of a building through meas-~~ured Data~~red ~~Data~~data, Krarti, Priority #6: QC in energy analysis, Taylor
- Transactions sessions need no prioritization.
- Discussion, D.Crawley said that items beyond the 4th item would most likely not get approved.
- Reddy asked about a rumor that he had heard about signing the form. Some authors had objected to this. ASHRAE will soon require the form to be signed or the talk will be rejected.
- P.Haves said that some authors were unhappy about seminars that the quality had dropped significantly, but that they were getting published anyway.
- P.Haves asked that the Seminar chairs check the presentations (informally)
- MOTION to approve program (Barnaby, Liesen), 10 in favor 0 against, 0 extensions. Motion passed.

5.7 Standards, Ron Judkoff reporting for Joel Neymark (chair) (Attachment H)

- SSPC 140 SMOT for Eval Building Energy Analysis Computer Programs
 - J.Neymark told the committee about the IRS notice that had been published. Also, Addendum A had been approved. Publication expected by August. Committee working on adaptation of HERS BESTEST suite.

- J.Neymark looking to have the document for vote by November. Committee also approved an informative annex to include BESTEST cases, including HERS BESTEST. The committee also had their first errata regarding the weather data.
- The data format subcommittee was formulating the format to be posted on the DOE tools web site.
- M.Witte on the committee was developing new tables to go in the annex. The committee also discussed new IEA efforts. Also, IBPSA has asked Standard 140 to give a presentation at the SIMBUILD conference.

5.8 Web Site, Rich Liesen (chair) reporting (no attachment)

- New webmaster is Kris Kenney, NAESCO.
- The website will need updating, links are broken and need to have minutes posted. The new webmaster needs to check the template to make sure the web site is current.

6. Reports on related activities (Various persons)

- GPC 20 (Meets Mon 10:15 am), C.Barnaby said that 1345 RP examines 3 schemes for XML. TC 1.5 has learned much about these schemas. In addition to this the CEC is funding R.Hitchcock to get the Guidelines in better shape.
- TC 2.8 (Crawley) finished 2 chapters for the Handbook. Work is underway to update the Green Guide. New liaison needed for TC 2.8.
- TC 4.1 (Barnaby) Loads calc chapter has been revised. Changes in the clear sky model, this will influence the load calculations. Several projects underway, including measured heat gain.
- TC 4.2 (Barnaby) Main product of the current research project, weather data for the 2009 Handbook, CD of weather files will allow for the create bin tables for all locations on the CD. First update in the clear sky model, based on turbidity data by satellite. Results are less diffuse, and little less beam.
- TC 4.5 (who?) no report.
- TC 6.5 (Sommer) will have symposiums in Chicago, radiant systems. Another seminar for Chicago on snow melt, and another short course for low temperature cooling and high temperature heating.
- TC 7.4/7.5 (Reddy) the two committees wanted to merge. Motion passed starting in Chicago pending approval by TAC. Change name to "supervisory control".
- TC 7.6 (Abushakra) committee discussed research ideas, 3 of the ideas were toolkits for demand savings, water savings and merging 1050, 1093, 827, etc., Committee also had idea for RTAR to develop air flow for save indoor environment. SSPC 90.1 and 90.2 were also discussed. There was some discussion about 90.1 and 189, regarding whether adopting authorities would adopt 189 versus 90.1 GPC 14 was also discussed, the guideline needs to be more useful, proposed published in 12 to 18 months.
- IAI (Haves) reported that they are in the process of sponsoring interoperability of energy tools and 3D CAD programs. Holding a kickoff meeting on several projects.
- IBPSA USA (Haves) elections will soon be coming forward for officers. L.Degelman will be managing the ballot.
- IBPSA Journal (Wetter) "building performance simulation" Ian B-M is the editor.
- SIMBUILD (Wetter) conf brochures were passed out. The best 7 to 9 papers will be recommended for publication also in the IBPSA Journal. Conf is cosponsored by ASHRAE. Conf will have reviewed papers, poster sessions, a session on LEED, lighting, education. Student scholarships have been extended to 6/26 and are encouraged to attend. Poster deadline has also been extended.
- IBPSA Canada (McDonald) ESIM conf recently held, good attendance.
- IBPSA World (Barnaby) is wrapping up the final follow-up of the China conference. 2009 conf will be in Glasgow in July. Abstracts due in September. Papers from China have been loaded to the website.

7. Old Business

(none)

8. New business

- P.Haves discussed the coordination of activities in the TC. Currently, there was little coordination ~~in~~ between the subcommittees. P.Haves proposed to setup an Exe Com to better coordinate between subcommittees. A teleconference would be planned 45 days before the next meeting to better coordinate the agendas.
- P.Haves also asked-opined that 4.7 needed more interaction with 90.1.
- C.Wray suggested that TCs 4.2, 4.1, 4.5, and 4.7 could have a meeting to help coordinate activities.
- D.Crawley said that several years ago there was a breakfast meeting for the research chairs for 4.1, 4.2, 4.5 and 4.7 to meeting and coordinate research.
- P.Haves discussed the need ~~to~~ for an improved structure for the subcommittees. Perhaps there was a need for a “tools” subcommittee. One idea was to expand the name of “applications” to be “tools and applications”. Another suggestion was to merge Data Driven Models and Simulation and Component ~~Simulatin~~ Models.
- Reddy expressed concern that there might not be an overlap between Data Driven and Component Models. He was concerned that the scopes were different. One starts with data and forms a model from the data. The other creates data from the models.
- P.Haves suggested that “tools” may still not be covered by one of the subcommittees, or coverage spanned across committees and needed coordinating. Perhaps this could be accomplished by combining the committee.
- J.Huang expressed concern that there may not be any benefit in combining them. Just because there were many folks who attended both meetings did not mean ~~they~~ there is a need to ~~be~~ combining them.
- P.Haves reminded the committee that a new chair was needed for the Data Driven subcommittee if K.Subbarao was dropping out.
- Wray reminded the committee what was needed was a TC 4.7 strategic plan that matches the ASHRAE strategic plan.
- Reddy suggested having one session in Chicago that would be committee to the strategic plan across the committee.
- J.Huang asked if there were any other TCs in ASHRAE that used the same approach as TC 4.7?
- Wray reviewed the scopes for 4.2, 4.5, 4.6...most were working on calculations.
- P.Haves then moved the discussion to the strategic plan. ASHRAE was asking the TCs to map their work onto the Society Strategic plan. TC 4.7 has been specifically asked say how activities are supporting the items on the plan, for example #14, “...research will support user interface tools...”.
- Wray informed the committee that there were activities that were taking place outside the TCs, and that this was an opportunity for the TCs to help shape the strategic plan.
- J.Haberl reviewed some of the discussion, that there was a need for ASHRAE to seek out 10 to 100x more resources to accomplish the items on the strategic plan and to make these resources more available to TCs if they felt that more work needed to be done faster. Also, that ASHRAE needs a business plan and improvements in the management of research and the distribution and maintenance of research products before they consider developing new software that competes with commercially available software.
- Wray ~~informed-opined~~ that the TCs should not be too concerned about resources, but rather work on the issues.
- Reddy suggested another mechanism for making resources available to TCs to help develop RTARs, handbook chapters, and work statements.
- P.Haves reminded the committee that there were Special Publications that sometimes made resources available.
- Claridge proposed that the subcommittees needed time to brainstorm more. That this was helpful in generating new ideas.
- P.Haves agreed with this idea and added that the list server could be used for this.
- Wray suggested using the SIMBUILD conference to have a brainstorm session for TC 4.7. P.Haves agreed with this.
- ACTION ITEM committee members with new research ideas should email those ideas to J.Haberl. J.Haberl will receive these ideas and assemble into a brainstorming list for discussion at SIMBUILD.

9. Executive Session
(none)

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, June 24, 2008, 6:00-8:30 p.m.

Grand Ballroom C, Hilton
Salt Lake City

| | |
|--|---------------------|
| 1. Roll call and introductions | Haves |
| 2. Accept agenda & approve minutes of New York meeting | Haves |
| 3. Announcements/Liaisons | Haves |
| 4. Membership | Haves |
| 5. Subcommittee reports | |
| 5.1 Applications | Barnaby |
| 5.2 Data-Driven Modeling | Subbarao |
| 5.3 Simulation & Component Models | McDowell |
| 5.4 Research | Huang |
| • <u>Status:</u> 1311-RP Improving Load Calculations for Fenestration with Shading Devices (TC 4.1/4.5/4.7; Univ. of Waterloo) | |
| • <u>Status:</u> 1416-RP Development of Internal Surface Convection Correlations for Energy and Load Calculations (TC 4.1/4.7 Univ. of Texas at Austin) | |
| • <u>Status:</u> 1456-RP Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulations (TC 4.10/4.7 Univ. of Colorado) | |
| • RTARs and Work statements for consideration | |
| 5.5 Handbook | Crawley |
| 5.6 Program | Wetter |
| 5.7 Standards | Neymark |
| • SSPC 140 SMOT for Eval Bldg Energy Analysis Computer Programs | |
| • IEA Annex 34/43 Test and Validation of Bldg Energy Sim Tools | |
| 5.8 Web Site | Liesen |
| 6. Related activities reports | |
| 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 | |
| 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. Adjourn

Attachment B

ASHRAE TC 4.7 Energy Calculations
Applications Subcommittee
Tuesday, June 24, 2008, 3:30 – 5 PM
Salt Lake City, UT

Minutes

Present. Chip Barnaby, Michael Wetter, Joel Neymark, Tim McDowell, Larry Degelman, Klaus Sommer, Joe Huang, Rich Liesen, Jeff Haberl, Iain MacDonald, Kamel Haddad, Tianzhen Hong, Ryan Hammond, Nadia Sabeh, Ted Tiffany, Stuart Malkin, Juan-Carlos Baltazar, Jaya Mukhopadhyay, Kris Kinney, Martha Brook, Peter Armstrong, Phil Haves

Meeting called to order at 3:40 PM. Introductions. Agenda approved.
Reviewed New York action items.

Carbon accounting. J. Haberl reported on ASHRAE's carbon accounting effort under leadership of Hal Levin and the Building Performance Metrics Steering Committee. J. Haberl is a member of that committee and will keep the subcommittee informed.

PROGRAM. SEVERAL PROGRAM ITEMS DISCUSSED. CONSENSUS ON RECOMMENDATIONS

- Forum: *Should ASHRAE Develop a Standard for Simulation Aided Design of High Performance Buildings.* Moderator is Jason Glazer.
- Seminar: *Web-based Programs for Calculating Energy Code-Compliance.* Chair is Larry Degelman; he has several possible speakers.

Standard 90.1 ECB Coordination. No additional interaction, but hope for the future.

IBPSA Simupedia status. M. Wetter reported on IBPSA-Germany effort. See <http://129.187.44.165/index.php/Simupedia/en>.

Research

1468-RTAR (from TC 1.5), *Development of Reference Building Model (BIM) for Thermal Model Compliance Testing.*

RTAR has been approved and is under development into a WS in TC 1.5. Barnaby summarizes WS. Barnaby said TC 4.1 has definite interest in this research. Huang sent comments to Hitchcock. Huang's difficulty with WS is that WS does not address problem of how to extract and simplify geometry. Very dangerous to come up with rules how to simplify BIM extraction based on parametric analysis because it can depend very much on problem. For us, we need to decide if we want to continue co-sponsorship. Haberl thinks topic is so broad that it may be just a work statement to figure out how to deduce rules. Barnaby would not rely on parametrics, but rather approach it more formally. Hong said that PG&E sponsored a few years ago testing of geometry extraction; this report should be referenced. Haberl points out of lack of references in this work statement. WS needs to specify that methods need to be tested by contractor. Haberl points out that there is no mention of Standard 140 as a test case. There is no description of the testing that should be done. Barnaby recommends to get more engaged with this WS. Rather than writing a few comments, Barnaby and Huang should contact Hitchcock to make serious rewrite. Haberl suggest limiting scope to just building fabrics & exclude HVAC system. Haves suggest we recommend to TC 1.5 that WS will be phased: (i) building fabrics, (ii) HVAC system. Huang points out that this WS just defines rules how to do extraction, not the development of tool. Missing is how to simplify geometry, say building with 2000 zones.

Correct extraction of zone is tricky because it depends on tool, whether simulator can do e.g. thermal bridges with 2D/3D modeling. How to standardize this is not clear in view of different modeling capabilities.
 Hong, Haberl, Malkin, Huang, Haberl and Barnaby volunteered to work with TC 1.5.

Draft RTAR, *Procedure to create hypothetical layer-by-layer fenestration description when only the bulk properties such as U-factor and SHGC have been defined.*

Joe Huang presented draft RTAR. Input in procedure should be U-factor and SHGC from 90.1. Problem is that code compliance is based on 2 values only, but most energy simulation need layer-by-layer construction. Picking an arbitrary window may create a loop-hole that we need to avoid. Hong says that one can make up a one layer window with these properties in EnergyPlus. Another opportunity is how to address window frame. Sommer says alternative could be to come up with library of existing windows and frames; this would possibly allow a more accurate window simulation. Haberl thinks implications of not having this research can be profound. Barnaby summarizes that consensus is that the topic is interesting. Comments should be sent to Huang soon.

STRATEGIC PLAN

Haves said that Technical Activities Committee wants to hear how TC 4.7 activities relate to ASHRAE Strategic Plan. Each subcommittee need to write how current and future activities support plan in general and items related to simulation in particular.

- 1) Decided how to answer how activities relate to plan.
- 2) With regard to user-friendly energy analysis tools and interfaces: Reality that ASHRAE goes directly into simulation support business was questioned in this morning discussion among TC 4.7 subcommittee chairs. Task of this committee is to figure out position of TC for simulation support and report to Activities Committee.

Barnaby says that ASHRAE should freely distribute ASHRAE programs and code to speed up adoption. Huang agrees and says this committee should discuss having a software support center. Users need to have point-of-contact for questions. It would be working with vendors who want to do this. Barnaby says this TC should focus on speeding up adoption of ASHRAE funded code as opposed to working on interfaces. Haves said ASHRAE needs input on how software should be used in future for widespread use of simulation. How should TC respond to this? Do we need a brainstorming session? This is a complementary effort to the program distribution. Haddad said ASHRAE funds could go to private sector to make software user-friendly. Haves said increase in ASHRAE budget is unlikely at the level needed. ASHRAE should use its position to work with organizations that are in a better position to fund significant software effort. How could ASHRAE do that? Neymark says that building performance requirements will create the needed pull. Barnaby says we are not the committee that can change how the industry should design buildings. Pulls are LEED, code compliance, tax credits, utility programs. Barnaby asserts the limitations is not the lack of tools. McDonalds says that TC could do interface specification as we know how tools should be used. Haberl says there need to be business plan from ASHRAE for interface development. Haves says this need to be an interaction to develop business plan; upper level of society is probably open to this. Wetter says ASHRAE could fund interface development under the condition that contractor open-sources the code so that private companies can integrate into their tools. Current software licensing is not conducive to integrate models into other tools. Barnaby says current copyright is problem; ASHRAE locks down software, it is hard to get to code and integrate into other products.
 Meeting adjourned 5:20 PM.

Salt Lake City Action Items

| Who | When | What |
|---|------|---|
| Wetter / Barnaby | Soon | Circulate info about Simupedia |
| Hong, Haberl, Malkin, Huang, Haberl and Barnaby | ASAP | Comments to Joe Huang on 1468-WS (BIM extraction) |
| All | Soon | Comments to Joe Huang on fenestration "bulk properties" RTAR draft. |

Attachment C

TC4.7 Data-Driven Modeling Subcommittee
TC 4.7 Data-Driven Modeling (40)
June 23, 2008, Monday 6:00–7:30p
Salt Lake City
Interim Chair: Agami Reddy
(Chair: Kris Subbarao)

AGENDA

1. Introductions
2. Approval of the minutes from the New York meeting, June 21, 2008
3. Discussion of Program
 - Winter 2009
 - Transaction: “How and Why to Calibrate a Simulation”, Chair: Sonderegger; Subbarao to contact Sonderegger; 2 papers by Claridge and Liu from RP-1092; coordinate with TC9.6 which sponsored RP-1092
 - Seminar: “Methods of Certification of Savings from Energy Efficiency Measures: White Tags for Carbon Credits”, Chair: Kris Subbarao
 - Enhanced Value of Calibrated Simulations in Energy Policy Making
4. Discussion of WS and RTARs
 - a. WS- “Modeling, Analysis, and Reporting Protocols for Predicting Annual Energy Performance from Short-term Building Energy Monitoring” Reddy, Norford and Smith
 - b. Follow-up of RP-1051: “Automated calibration of detailed building energy simulation programs”
 - c. Baselineing
 1. adjusting M&V projects due to creep and other causes
 2. electricity demand savings
 3. water use in a facility
 4. in-situ procedures for energy savings from renewable projects
 - d. Standardized M&V for savings from operational changes: SAT reset, static pressure reset, ...”
 - e. Certification of built buildings against code such as LEED
 - 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.
 - g. New ideas
5. Discussion on:
 - a. better ways to digest past research
 - b. how best to disseminate research results
 - c. how best to coordinate research and results with allied TC and SC
 - d. maintain expertise within SC even when membership changes
6. Old Business
7. New Business
8. Adjourn

Some Background Information:

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%,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

Minutes

Meeting started at 6:30 pm. Chair called session to order followed by introductions and approval of New York meeting minutes. Attendance sheet was circulated (Appendix 1).

Programs

There was some discussion on programs- removal of old ones and suggestions of new ones. This will be reported by Mike Witter, the TC Program Chair.

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 RTAR (# 1404) was approved at New York by the full TC pending some minor revisions. Reddy reported that he was unable to flesh this out into a full Work statement given the short notice. There was some discussion as to whether the SC could discuss some of the outstanding issues and modify the RTAR into a full WS to be discussed in the main TC. It was decided not to do so. Reddy volunteered to get this done by Chicago meeting.

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. - Nothing done in this regard.

c. Haberl suggested three new RTAR ideas:

1. An Interoperable tool which would combine the various software tools developed in TC 4.7 and other pertinent TCs. This was identified by ASHRAE as being one of the pressing strategic needs.
2. Determination of savings from water conservation measures
3. Determination of energy demand

A few volunteered to help Haberl write RTARs for discussion at Chicago.

ASHRAE Strategic Plan

Haves informed the attendees that ASHRAE had developed a new strategic plan and that TC were asked to identify ways in which they contributed to this plan. Here are the items that the Data Driven subcommittee has done or is working on regarding the Strategic Plan:

1. DDM is developing a WS from an RTAR to deliver method to measure long term performance from short term tests. This is needed to measure building performance, which complies with the Strategic Plan.
2. Data Driven has several research topics that will be developed into RTARs for Chicago, namely:
 - + Consolidating existing ASHRAE Toolkits in-situ tools (RP865, RP1050, RP1093, RP1092, RP1051, RP827) into a unified, easy-to-use toolkit, which complies with the Strategic plan objective of making research more easy to use.
 - + Development of Toolkit for analyzing insitu performance of building water use.
 - + Development of Toolkit for analyzing insitu demand performance.
3. Data Driven also has a number of other research topics, to be developed into RTARs:
 - + Development of Inverse Toolkit to take manufacturer's data and envelope inputs for the most common simulation programs.
 - + Development of Inverse Toolkit for measuring the performance of a group of buildings with a central plant.

The meeting was adjourned at 7:30 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 | |
| Joel Neymark | J. Neymark & Assoc | |
| Kris Kinney | NORESO | |
| Joe Huang | White Box Technologies | |
| Larry Degelman | TAMU | |
| Diego Arias | Gamma Technologies | |
| Philip Haves | LBNL | |
| Richard Liesen | Owens Corning S&T | |
| Russell Taylor | UTRC | |
| Timothy Moore | UC Berkeley CBE | |
| Moncef Krarti | University of Colorado | |
| Iain MacDonald | NRC | |
| Dan Fisher | Oklahoma State | |
| Dan Macumber | NREL | |
| Peter Armstrong | MIST | |
| Steve Cornick | NRC/IRC | |
| Michael Wetter | LBNL | |
| Jeff Haberl | TAMU | |
| Anna Zhou | Taylor Engineering | |
| Yiqun Pan | Tongji University | |
| David Eldridge | Grumman/Butkus Associates | |
| Chris Balbach | Performance Systems Development | |
| Kris Subbarao | Texas A&M | |
| Steven Hespeler | Roger Williams University | |

ProgramNew 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 Brandemuehl 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 Dessicant 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 (repeated from New York City)

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 (prioritized) | | | | |
| Assessment of the potential for application of moisture absorption/desorption models in whole bldg energy simulations 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 |

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 computation 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**

No minutes from the Salt Lake City meeting since chapter was submitted..

Attachment G

TC 4.7 Program Plan
ASHRAE Meeting
06/24/08

Salt Lake City June 21-25, 2008 Theme: Benchmarking: The Current Standard of Care

Seminar "Use of Equation Solvers for Simulation"
Organized by: TC 4.7 (Data Driven Models)
Chaired by: Michael Wetter
Status: Stephane Bertagnolio, Michael Wetter.

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 "Fenestration performance" [8 papers in review from RP-1311. Contact: John Wright]
Organized by: TC 4.1/4.5/4.7
Chaired by: Glenn Friedman (maybe 2 sessions)
Status: Moved from NYC.

1) Forum "Limitation of Energy Simulations for NZEB"
Organized by: TC 4.7 (Simulation and Component Models)
Chaired by: Tim McDowell
Status: Moved from Salt Lake City

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: Moved from Salt Lake City. Joel Neymark, Vincent Lemort, Stephane Bertagnolio & Jean Lebrun, Craig Wray.

3) Forum "Should ASHRAE Develop a Standard for Simulation Aided Design of High Performance Buildings"
Organized by: TC 4.7 (Applications)
Chaired by: Jason Glazer
Status: Moved from Salt Lake City. Put forward to committee.

4) Seminar "Web-based Programs for Calculating Energy Code-Compliance"
Organized by: TC 4.7 (Applications)
Chaired by: Larry Degelmann
Status: Moved from Dallas, Jeff Haberl, Eric Richmond and possibly one more speaker. Put forward to committee.

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

6) 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. Has two speakers. Put forward to committee.

Louisville, June 20-24, 2009 * Deadlines: Manuscripts 9/26/08; Package -/-/. Theme: Optimal Air Quality**

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

----- APPLICATIONS

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 "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 "Shoot-out of Code Compliance Simulation for Residential Buildings"

Organized by: TC 4.7 (Applications)

Chaired by: Jeff Haberl

Status: New (6/08)

Seminar "Applying Performance Assessment Tools to mitigate Climate Change"

Organized by: TC 4.7 (Applications)

Chaired by: Carol Gardner

Status: Moved from NYC. May get 4 speakers, but none confirmed.

Seminar "Fenestration Data Needs for Energy and Loads Calculations"

Organized by: TC 4.7 (Applications)

Chaired by: -

Status: Moved from Dallas. Keep as maybe.

----- DATA DRIVEN MODELS

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 "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.

----- SIMULATION AND COMPONENT MODELS

Seminar "Modeling of High Performance Buildings"

Organized by: TC 4.7 (Simulation and Component Models)

Chaired by: Tim McDowell

Status: New (6/08).

MINUTES
SSPC-140 SMOT FOR BUILDING ENERGY SOFTWARE
Salt Lake City, June 23, 2008 (submitted to ASHRAE MOS Jan 24, 2008)
Chair: R. Judkoff
Vice Chair: J. Neymark

ATTACHMENTS

- A. Agenda for the meeting
- B. SSPC 140 Address List
- C. Data Format SubC Chair report
 - C1. Data Format SubC Address list
- D. Handout for Adaptation of HERS BESTEST to SSPC 140-2007 Addendum B

ATTENDANCE

| VOTING MEMBERS / OFFICERS PRESENT | YEAR APPTD | VOTING MEMBERS / OFFICERS ABSENT | YEAR APPTD |
|---|-----------------------|---|-----------------------|
| Ron Judkoff (CHM) | 2005 | | |
| Joel Neymark (VC) [NVM] (Liaison to SSPC 90.1) | 2005 | | |
| | | Ian Beausoleil-Morrison | 2006 |
| | | Dru Crawley | 2005 |
| Philip Fairey | 2001 | | |
| | | David Knebel | 2006 |
| | | Sean Kolling | 2007 |
| Tim McDowell | 2004 | | |
| Jim Pegues | 2004 | | |
| | | Simon Rees | 2004 |
| Michael Witte | 2005 | | |

CORRESPONDANCE SINCE LAST MEETING

See chair announcements below, and Data Format Subcommittee Chair report included in Attachment C.

Attendance

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

| Present at SSPC 140 meeting? | | | | | Last name | First name | Email |
|------------------------------|---------------------|-------------------------|---------------------|--------------------------|---------------------|------------|-------|
| SLC Jun. 2008 | NYC Jan. 2008 | Long Beach Jun. 2007 | Dallas Jan. 2007 | Quebec City Jun. 2006 | | | |
| X | | | | | Bailey | Pat | |
| | | | X | X | Beausoleil-Morrison | Ian | |
| | | | | | Crawley | Dru | |
| | | | | | Doerr | Robert | |
| X | X | X | X | X | Fairey | Philip | |
| | | X | | | Gardner | Carol | |
| | | X | | X | Gowri | Krishnan | |
| X | X | X | X | X | Haberl | Jeff | |
| X | | | | | Haves | Phil | |
| | | | | X | Huang | Joe | |
| X | X | X | X | X | Judkoff | Ron | |
| | X | | X | X | Knebel | David | |
| | | X | X | X | Kolling | Sean | |
| | | X | | | Lemort | Vincent | |
| | | | | X | Loutzenhiser | Peter | |
| | X | | | | Lutz | Jim | |
| X | X | X | X | X | McDowell | Tim | |
| X | X | X | | | Mukhopadhyay | Jaya | |
| X | X | X | X | X | Neymark | Joel | |
| X | X | X | X | X | Pegues | Jim | |
| | X | | X | X | Rees | Simon | |
| | | | | X | Ribberink | Hajo | |
| | | | X | | Shirey | Don | |
| | | | | X | Spreeman | Jonathan | |
| | | | | X | Strachan | Paul | |
| | | X | | | Taber | Christian | |
| X | | | | | Wiggins | Carl | |
| X | X | | X | X | Witte | Mike | |
| | | | X | | Xiao | Dongyi | |

MEETING SUMMARY

The primary purposes of the meeting were to:

- Report on progress of proposed Addendum *a* to Std 140-2007 that includes updates to standard output reports developed for the DOE Tools site.
- Report on progress of proposed Addendum *b* to Std 140-2007 that adapts HERS BESTEST for Std 140
- Discuss errata necessary to make informative material for furnace cases consistent with the test spec
- Data Format Subcommittee progress report (regarding posting Standard 140-results data on the DOE Tools web site)

Chair Announcements

- IRS notice 2008-40, published Apr 7, 2008, updates the previous IRS requirements relating to the deduction for energy efficient commercial buildings by changing testing requirements for software developers from Standard 140-2004 to Standard 140-2007.
- ANSI/ASHRAE Standard 140-2007 Addendum A passed through public review ending May 5, 2008 with no comments. The addendum 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. Publication of the addendum is expected in July/August.
- SSPC 140 approved (8-0 via letter ballot closed Mar 17, 2008) to include example procedures for developing acceptance range criteria for proposed new Section 7 test cases (HERS BESTEST) as an *informative* annex. Editorial comments were submitted along with one of the approval votes (Crawley) recommending changes related to use of equivalent S-I units.
- Omari Fuller of Autodesk/Green Building Studio reported an inconsistency for furnace Case HE100 results when using included DOE-2 input files in conjunction with normally included weather data. Further review by Kamel Haddad of NRCan indicates that the DOE-2 processed weather data files provided with the input files utilize a windspeed > 0, such that DOE-2 calculated exterior surface coefficients match the specified surface coefficients. However, this is inconsistent with test spec, where Section 5.4.1.7 indicates, “If the software being tested does not allow for the definition of convection coefficients, follow the approach described in Section 5.4.1.9” [infiltration used to generate heating load].

Membership

- McDowell, Pegues, and Rees (scheduled to roll off June 30, 2008) are all re-upped for additional 4 year terms (July 1, 2008 – June 30, 2012)
- Beausoleil-Morrison is dropped June 30, 2008 (per his resignation request)
- Haddad is added for July 1, 2008 – June 30, 2012 to replace Beausoleil-Morrison.

Committee Discussion

Approval of Prior Minutes

Note: We did not have quorum; previous meeting minutes are letter balloted

Motion (): Accept Minutes of January 2008 NYC meeting, [see SSPC140min0108c.doc, available upon request].

2nd ():

Vote:

Yes = ; No =

Abstain:

Absent:

Motion:

SIMULATION REQUIREMENTS, FEDERAL TAX DEDUCTIONS IN ENERGY-EFFICIENT COMMERCIAL BUILDINGS

- IRS notice 2008-40, published Apr 7, 2008, updates the previous IRS requirements relating to the deduction for energy efficient commercial buildings by changing testing requirements for software developers from Standard 140-2004 to Standard 140-2007.

Errata to furnace test case informative accompanying files and results (relating to Annex B16, Section B16.6)

The following action items were agreed to:

Action Item (Haddad, Sep 15, 2008): revise DOE-2 input files to be consistent with spec (5.4.1.9 as referred to by 5.4.1.7)

Action Item (Haddad, Sep 15, 2008): revise Annex B16.6 results as needed (for expected minor changes to DOE-2 results)

Action Item (Haddad, Sep 15, 2008): check that ESP-r input files are consistent with spec (see 5.4.1.7)

EnergyPlus allows user defined exterior surface coefficients; current input files are ok.

Additional discussion led to the following action items.

Action Item (Witte, Dec 1, 2008): Update the furnace spreadsheets for the DOE Tools site to identify organizations performing simulations.

Action Item (Neymark, Dec 1, 2008): For inclusion with either an upcoming addendum, or 2010 CM revision, develop the equivalent of 140-2007, Table B17-2 for the furnace cases – data needed for this table is included with the modeler reports in the original IEA SHC 22 furnace cases final report. Include the specific version numbers in the tables.

Action Item (Neymark, Dec 1, 2008): Look into possibility of adding one more level to table of contents for Section 5 [Witte requested this to help with navigation]

Action Item (Neymark, Next meeting [Chicago Jan 2008]): Reorganize accompanying files CD as follows:

- Normative data
- Informative data
 - Within informative data include a “README-BEFORE-USING.DOC” **indicating something like “Included input files and processed weather data files were used to generate example results shown in the informative annex. Do not use these files for developing new results. For**

purposes of performing the test cases, files must be developed according to the normative portions of the standard.”

- Revise text as needed to consistently reference accompanying files.
- Submit proposed new CD for PC approval at Chicago meeting.

Adaptation of HERS BESTEST for Std 140

Neymark and Fairey presented on proposed Addendum B for integrating HERS BESTEST into Std 140; see Attachment D. FSEC is making progress on updating HERS BESTEST results charts into electronic spreadsheet format. The spreadsheet will allow automated update of user results to charts for comparison with example results, including automated comparison of seasonal results versus monthly results including linear interpolation of monthly results where needed. PC consensus in NYC (Jan 2008) is to leave HERS BESTEST case numbering as is.

Discussion led to the following **Action Items**

- **Fairey, Aug 1, 2008: Revise Section Headers in Table of Contents and text as**
 - Section 5: Class I Test Procedures [*Also add intro paragraph describing usage*]
 - Section 6: Class I Output Requirements
 - Section 7: Class II Test Procedures [*Also add intro paragraph describing usage*]
 - Section 8: Class II Output Requirements
 - Regarding introductory paragraph language, consider following PC comments ...
 - Witte noted:
 - hourly or subhourly programs can run either and/or both the Class I and Class II test cases
 - Annual/seasonal programs only appropriate for the Class II test cases
 - Judkoff noted Class II cases are realistic for residential applications, Class I test cases are more for diagnostics
- **Fairey, Aug 1, 2008: Revise Section 4.2 to be consistent with revised introductory language of Sections 5 and 7, [and search on “seasonal” to find other portions of the addendum that may need revision for consistency].**
- **Fairey, Aug 1, 2008: Update Titles of Annexes B8, B11, B16 and B17 to include relevant section numbers.** Contact Neymark if help is needed for that.
- **Fairey, Aug 1, 2008: In Section 7 replace the term “vented crawl space” with something else.** Comments included to consider use of “floor exposed to air”. **Whatever the new term, formally define it in Section 3.**
- **Fairey, Aug 1, 2008: Update language for Section 7.1.8 as: [7.1.8 Example Acceptance Criteria. For certifying or accrediting agencies that may wish to consider adopting acceptance ranges, example criteria are provided in informative Annex B22tk. For users applying these criteria for determining agreement between results, and Where application of the criteria leads to identification of a disagreement\(s\) that a software developer may wish to correct, the rules of Section 4.4.3 for modifying simulation programs or inputs shall be applied.](#)**
- **Fairey, Aug 1, 2008: For Class II tests Replace term “Reference Results” with “Example Results” to be consistent with usage for Class I tests**
- **Fairey, Aug 1, 2008: Delete the following from the introduction to 7.2:** “A summary of the various parametric cases is provided in Section 7.2.2 and in greater detail in Annex B1, Table B1-5. Table B1-5 is recommended for preliminary review, but do not use it for defining the test cases.” [so as not to distract users]
- **Neymark, Aug 15, 2008: During review, check Class II presented slab and basement results versus as-presented in HERS BESTEST.**

Fairey presented on 140-2007, Section 7.2 Spreadsheet. Consensus (4-1) among voting members present is that “For simulation results data included in normative and informative portions of Standard 140, acceptance range criteria

will not be included.” For the statement: Judkoff, McDowell, Pegues, Witte. Against the statement: Fairey. This leads to **Action Item:**

- **Fairey, Aug 1, 2008: Produce Bar Charts to only show the 3 simulation results bars.** Class II Informative results presentation to be consistent with existing informative results for other sections.
- **Fairey, Aug 1, 2008: For tabulated results statistics include only “Min”, “Max” and “Mean.”**

Related discussion regarding presentation of statistics for current 140-2007 informative results led to the following **Action Item:**

- **Witte, Dec 1, 2008: For DOE Tools Site Spreadsheets (developed in conjunction with the Data Format SubC), for statistics include only “Min”, “Max” and “Mean.”** The eventual goal will be to only include these in future CM revisions of Standard 140.
- **Witte, Dec 1, 2008: Add a note regarding the statistics to capture the gist that there is no substantial importance to changing the presented statistics; the statistics are not to be interpreted as acceptance criteria.**

The PC agreed that the HERS BESTEST adaptation only requires a 4-week review period for PC internal approval/review. Current schedule indicates 140-2007 Addendum B to be submitted to SSPC 140 for publication/public review approval in September. If there are no negative votes, anticipated submittal of public review draft to ASHRAE is Nov/Dec 2008.

Data Format Subcommittee Report

As time was running out, Neymark very quickly (it appeared on the screen) summarized SubC meeting minutes of June 22 (see Attachment C).

- **140-2007 Addendum A** completed public review on May 5, 2008 with no comments. The addendum 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. Publication is expected Aug/Sep 2008. [as noted in Chair announcements]
- **Spreadsheets, automating entry of other user results for comparison with current example results for envelope:**
 - Witte/GARD made progress on envelope and HVAC spreadsheets, and has begun this work for the furnace spreadsheet; the HVAC BESTEST Vol 2 spreadsheet work remains.
 - A number of action items were identified with respect to reviews and spreadsheet development for the next work cycle (thru Jan 2009).
- **Web site Cover Page and Rule Base document:**
 - Pegues made minor revisions in February with additional minor revs in June to make materials for use on DOE Tools site consistent with editorial revisions by ASHRAE Staff to 140-2007 Addendum A.
 - As Witte has begun work on the spreadsheets recently added for 140-2007, the SubC agreed that the cover page and rule-base documented should be updated to make everything consistent with 140-2007. Pegues agreed to address this.
- **Adding updated automated results-comparison spreadsheets to Std 140 informative sections:** The SubC reiterated its intent to do this. Also, completion of new electronic .xls charts for the envelope cases would allow removal of hardcopy printouts in Std 140, in favor of electronic only (with hardcopy reference to chart tabs within accompanying files). When all this is ready to go, a related approval motion will be put forth to the PC, as discussed in NYC (Jan 2008).
- **How to establish newly submitted results (e.g., via DOE tools site) as updated example results:** Consensus seemed to be that some process must be defined before we can do this. The SubC recommended this discussion for the full PC [The PC didn't have time to discuss; try again next meeting]

Investigate Possibility of ASHRAE Funding Research Projects for Standard 140

McDowell reported no progress.

Residential Test Cases Update/RESNET

Ran out of time on previous agenda items. No report given.

Future Test Suites that could be adopted

Ran out of time on previous agenda items. No report given.

IEA Related Research Activities Updates

Ran out of time on previous agenda items. No report given.

Meeting Adjourned.**References**

ANSI/ASHRAE Standard 140-2007, *Method of Test for the Evaluation of Building Energy Analysis Computer Programs*. ASHRAE, Atlanta, GA.

ANSI/ASHRAE/IESNA Addendum p to ANSI/ASHRAE/IESNA Standard 90.1-2001, *Energy Standard for Buildings Except Low-Rise Residential Buildings*. ASHRAE, Atlanta, GA.

ANSI/ASHRAE/IESNA Addendum L to ANSI/ASHRAE/IESNA Standard 90.1-2004, *Energy Standard for Buildings Except Low-Rise Residential Buildings*. ASHRAE, Atlanta, GA.

Judkoff, R., and J. Neymark. (1995a). *International Energy Agency Building Energy Simulation Test and Diagnostic Method (IEA BESTEST)*. NREL/TP-472-6231. Golden, CO: National Renewable Energy Laboratory.

Judkoff, R., and J. Neymark. (1995b). *Home Energy Rating System Building Energy Simulation Test (HERS BESTEST)*. NREL/TP-472-7332. Golden, CO: National Renewable Energy Laboratory.

J. Purdy, and I. Beausoleil-Morrison. (2003). *Building Energy Simulation Test and Diagnostic Method for Heating, Ventilation, and Air-Conditioning Equipment Models (HVAC BESTEST): Fuel-Fired Furnace Test Cases*. Ottawa, Canada: Natural Resources Canada, CANMET Energy Technology Centre.

Neymark, J. and R. Judkoff. (2002). *International Energy Agency Building Energy Simulation Test and Diagnostic Method for Heating, Ventilating, and Air-Conditioning Equipment Models (HVAC BESTEST), Volume 1: Cases E300–E545*. NREL/TP-550-30152. Golden, CO: National Renewable Energy Laboratory.

Neymark, J. and R. Judkoff. (2004). *International Energy Agency Building Energy Simulation Test and Diagnostic Method for Heating, Ventilating, and Air-Conditioning Equipment Models (HVAC BESTEST), Volume 2: Cases E300–E545*. NREL/TP-550-36754. Golden, CO: National Renewable Energy Laboratory.

RESNET. (2007). *Procedures for Verification of International Energy Conservation Code Performance Path Calculation Tools*. RESNET Publication No. 07-003. Oceanside, CA: Residential Energy Services Network.

ATTACHMENT A.**AGENDA – SSPC 140****STANDARD MOT FOR THE EVALUATION OF BUILDING ENERGY ANALYSIS COMPUTER PROGRAMS****Monday, June 23, 2008; Salt Lake City****Time: 2:15P –6:15P****Location: Hilton Meeting Salon III (Lobby Level)****Chair: Ron Judkoff**

1. Introductions
2. Chair Announcements/Communications since last meeting [*Judkoff, 5 min.*]
 - IRS notice 2008-40, published Apr 7, 2008, updates the previous IRS requirements relating to the deduction for energy efficient commercial buildings by changing testing requirements for software developers from Standard 140-2004 to Standard 140-2007.
 - ANSI/ASHRAE Standard 140-2007 Addendum A passed through public review ending May 5, 2008 with no comments. The addendum 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. Publication of the addendum is expected in July/August.
 - SSPC 140 approved (8-0 via letter ballot closed Mar 17, 2008) to include example procedures for developing acceptance range criteria for proposed new Section 7 test cases (HERS BESTEST). Editorial comments were submitted along with one of the approval votes (Crawley) recommending changes related to use of equivalent S-I units.
 - Omari Fuller of Autodesk/Green Building Studio reported an inconsistency for furnace Case HE100 results when using included DOE-2 input files in conjunction with normally included weather data. Further review by Kamel Haddad of NRCan indicates that the DOE-2 processed weather data files provided with the input files utilize a windspeed > 0, such that DOE-2 calculated exterior surface coefficients match the specified surface coefficients. However, this is inconsistent with test spec, where Section 5.4.1.7 indicates, “If the software being tested does not allow for the definition of convection coefficients, follow the approach described in Section 5.4.1.9” [infiltration used to generate heating load].
3. Membership [*Judkoff, 5 min.*]
4. Acceptance of Previous Minutes [*Judkoff, 5 min.*]
5. Adjustments to Agenda
6. Simulation Requirements, Federal Tax Deductions in Energy-Efficient Commercial Buildings [*Crawley, 10 min.*]
7. Errata to furnace test case informative accompanying files and results (relating to Annex B16, Section B16.6) [*Judkoff/Neymark/Haddad, 30 min*]
8. Adaptation of HERS BESTEST for Std 140, Progress Report [*Fairey/Neymark, 60 min.*]
 - Progress overview
 - 140-2007, Section 7.2 Spreadsheet
 - SSPC 140, Jun 23: Consider including range-setting criteria in the informative reference results for Section

7 (HERS BESTEST adaptation)

- Other discussion items.

9. Ad-Hoc Data Format Subcommittee Report [*Neymark/Witte, 30 min.*]

- Progress on developing format for posting 140 results data on DOE web site
- Consider adding new automated results comparison spreadsheets (if ready) to Std 140 informative sections (changes to informative material doesn't require addendum).
- How to establish newly submitted results (e.g. via DOE tools site) as updated example results.

10. Residential Update [*10 min.*]

- RESNET [*Fairey*]
- Tax Credits/Supplemental Cases [*Fairey*]
- IECC Section 404 [*Fairey*]

11. Investigate possibility of ASHRAE funding research projects for Std 140 [*McDowell, 5min.*].

- Has anyone written RTARs?

12. Future Test Suites that could be adopted [*Judkoff, 30 min.*]

- IEA ECBCS Annex 42: Comparative Testing and Empirical Validation of Annex 42 Models for Residential Cogeneration Devices
 - http://cogen-sim.net/index.php?pg=&download=Annex_42_ST_B_Final_report_on_comparative_testing_and_empirical_validation.pdf
- Other Existing Test Suites
- New Research

13. New business

14. Adjourn

15. IEA Related Research Activities Updates [*45 min.*]

- IEA Task 34/43 update [*Judkoff*]
- Ground Coupling Tests [*Neymark/Judkoff*]
- Multi-Zone Tests [*Neymark/Judkoff*]