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 30, 2007

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: January 30, 2007
LOCATION: Dallas

<table>
<thead>
<tr>
<th>MEMBERS PRESENT</th>
<th>YEAR APPTD</th>
<th>MEMBERS ABSENT</th>
<th>YEAR APPTD</th>
<th>EX-OFFICIO MEMBERS &amp; ADDIT'L ATTENDANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dan Fisher (CHM)</td>
<td>2006</td>
<td></td>
<td></td>
<td>Suzanne LeViseur</td>
</tr>
<tr>
<td>Ian Beausoleil-Morrison (VC)</td>
<td>2006</td>
<td></td>
<td></td>
<td>Hugh Henderson</td>
</tr>
<tr>
<td>Joe Huang (RES)</td>
<td>2004</td>
<td></td>
<td></td>
<td>(see below for additional attendees)</td>
</tr>
<tr>
<td>Chip Barnaby (APP)</td>
<td>2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richard Liesen (WEB)</td>
<td>2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simon Rees (INTL)</td>
<td>2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jonathan Wright (INTL)</td>
<td>2003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bass Abushakra</td>
<td>2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michael Brandemuehl</td>
<td>2003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrick Carpenter</td>
<td>2003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larry Degelman</td>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peter Ellis</td>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan Kosny</td>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agami Reddy</td>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|               |             |                | Bill Bahnfleth | 2003 |
|---------------|-------------|----------------|----------------|
| Mingsheng Liu | 2004        |                |                |
| George Walton  | 2003        |                |                |

DISTRIBUTION

ALL MEMBERS OF THE TC/TG/TRG
TAC CHAIR                          Patricia Thomas Graef
TAC SECTION HEAD                   Suzanne LeViseur
SPECIAL PUBLICATIONS LIAISON       Kimball E. Ferguson
STANDARDS LIAISON                  George Reeves
HANDBOOK LIAISON                   Douglas C Hittle
PROGRAM LIAISON                    Joseph S Ferdelman
RAC RESEARCH LIAISON               Hugh Henderson
PROF DEV COMM LIAISON              Julian R. De Bullet
TECH TRANSFER LIAISON              Stephen V Abernathy
STAFF LIAISON (RESEARCH)           Michael R. Vaughn
STAFF LIAISON (TECH SERVICES)      Michael R. Vaughn
STAFF LIAISON (STANDARDS)          Claire Ramspeck
ASHRAE TC 4.7 Energy Calculations

DALLAS MEETING

ACTION ITEMS

1. **MOTION:** That the TC 4.7 Chair write a letter recommending that the previous registration policy be reinstated. (Barnaby/?)  *Motion carried 10-0-0 CNV.*

2. **MOTION:** That TC 4.7 recommend to ASHRAE that the short course on Simplified Energy Calculations be retired (Liesen/Brandemuehl).  *Motion carried 12-0-0 CN.*

3. **MOTION:** That TC 4.7 accept Work Statement 1416 as presented (Huang/Barnaby)  *Motion carried 12-0-0 CNV.*

4. **MOTION:** That TC 4.7 permit fast tracking of Work Statement 1456, with revisions as discussed and a letter ballot (Huang/Brandemuehl)  *Motion carried 12-0-0 CNV.*

5. **MOTION:** That TC 4.7 accept the program plan for Long Beach proposed by Jeff Haberl (Degelman/Rees):
   - 1st priority: Seminar: Solar Decathlon
   - 2nd priority: Seminar: Active/Phase Change
   - 3rd priority: Seminar: what happened to AI?
   *Motion carried 12-0-0 CNV*

6. **MOTION:** TC 4.7 recommends that ASHRAE discontinues the publication of bin data for simplified energy calculations (Degelman/Branaby)  *Motion carried 12-0-0 CNV*
**TC/TG/TRG MINUTES COVER SHEET**

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

TC/TG/TRG No. _______ TC 4.7 ________________________ DATE: ______ January 30, 2007 ______

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: ____ January 30, 2007 ______ LOCATION: ____ Dallas ______

<table>
<thead>
<tr>
<th>LOCATION – past 12 months</th>
<th>DATE</th>
<th>LOCATION - planned next 12 months</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Québec City</td>
<td>June 27, 2006</td>
<td>Long Beach</td>
<td>June 26, 2007</td>
</tr>
<tr>
<td>Dallas</td>
<td>January 30, 2007</td>
<td>June New York City</td>
<td>January 22, 2008</td>
</tr>
</tbody>
</table>

**TC/TG/TRG SUBCOMMITTEES**

<table>
<thead>
<tr>
<th>Function</th>
<th>Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation and Component Models</td>
<td>Tim McDowell</td>
</tr>
<tr>
<td>Applications</td>
<td>Chip Barnaby</td>
</tr>
<tr>
<td>Data-Driven Modeling</td>
<td>Kris Subbarao</td>
</tr>
</tbody>
</table>

**RESEARCH PROJECTS – Current**

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Contractor</th>
<th>Comm.Chm.</th>
<th>Report Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix 1</td>
<td></td>
<td></td>
<td>At Meeting</td>
</tr>
</tbody>
</table>

**LONG RANGE RESEARCH PLAN**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Title</th>
<th>W/S Written</th>
<th>Approved</th>
<th>To R &amp; T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**HANDBOOK RESPONSIBILITIES**

<table>
<thead>
<tr>
<th>Year &amp; Volume</th>
<th>Chapter Title</th>
<th>No.</th>
<th>Deadline</th>
<th>Handbook Subcom. Chair/Liaison</th>
</tr>
</thead>
</table>

**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)**
<table>
<thead>
<tr>
<th>Appendix 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TC/TC/TRG Sponsored Symposia - Title, when presented (past 3 yrs. present &amp; planned)</strong></td>
</tr>
<tr>
<td>Appendix 4</td>
</tr>
<tr>
<td><strong>TC/TG/TRG Sponsored Seminars - Title, when presented (past 3 yrs. present &amp; planned)</strong></td>
</tr>
<tr>
<td>Appendix 5</td>
</tr>
<tr>
<td><strong>TC/TG/TRG Sponsored Forums - Title, when presented (past 3 yrs. present &amp; planned)</strong></td>
</tr>
<tr>
<td>Appendix 6</td>
</tr>
<tr>
<td><strong>JOURNAL PUBLICATIONS - Title, when published (past 3 yrs. present &amp; planned)</strong></td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>
### Attendance

This 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. Email addresses are listed for those who have explicitly authorized their inclusion in the minutes, which are posted on the TC’s web site.

<table>
<thead>
<tr>
<th>Present at TC 4.7 meeting?</th>
<th>Last name</th>
<th>First name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abushakra</td>
<td>Bass</td>
</tr>
<tr>
<td>X</td>
<td>Anderson</td>
<td>J.R.</td>
</tr>
<tr>
<td>X</td>
<td>Ahmad</td>
<td>Mushtaq</td>
</tr>
<tr>
<td>X</td>
<td>Armstrong</td>
<td>Peter</td>
</tr>
<tr>
<td>X</td>
<td>Bahnfleth</td>
<td>Bill</td>
</tr>
<tr>
<td>X</td>
<td>Balaras</td>
<td>Costas</td>
</tr>
<tr>
<td>X</td>
<td>Barnaby</td>
<td>Chip</td>
</tr>
<tr>
<td>X</td>
<td>Beausoleil-Morrison</td>
<td>Ian</td>
</tr>
<tr>
<td>X</td>
<td>Bernier</td>
<td>Michel</td>
</tr>
<tr>
<td>X</td>
<td>Black</td>
<td>Al</td>
</tr>
<tr>
<td>X</td>
<td>Bojic</td>
<td>Milorad</td>
</tr>
<tr>
<td>X</td>
<td>Bourassa</td>
<td>Norman</td>
</tr>
<tr>
<td>X</td>
<td>Brandemuehl</td>
<td>Mike</td>
</tr>
<tr>
<td>X</td>
<td>Brown</td>
<td>Rob</td>
</tr>
<tr>
<td>X</td>
<td>Carpenter</td>
<td>J Patrick</td>
</tr>
<tr>
<td>X</td>
<td>Chantrasrisalai</td>
<td>Chanvit</td>
</tr>
<tr>
<td>X</td>
<td>Claridge</td>
<td>David</td>
</tr>
<tr>
<td>X</td>
<td>Cornick</td>
<td>Steve</td>
</tr>
<tr>
<td>X</td>
<td>Crawley</td>
<td>Dru</td>
</tr>
<tr>
<td>X</td>
<td>Culp</td>
<td>Charles</td>
</tr>
<tr>
<td>X</td>
<td>Degelman</td>
<td>Larry</td>
</tr>
<tr>
<td>X</td>
<td>Ellis</td>
<td>Peter</td>
</tr>
<tr>
<td>X</td>
<td>Filler</td>
<td>Mike</td>
</tr>
<tr>
<td>X</td>
<td>Fisher</td>
<td>Dan</td>
</tr>
<tr>
<td>X</td>
<td>Firrantello</td>
<td>Joseph</td>
</tr>
<tr>
<td>X</td>
<td>Goldman</td>
<td>Milton</td>
</tr>
<tr>
<td>X</td>
<td>Gowri</td>
<td>Krishnan</td>
</tr>
<tr>
<td>X</td>
<td>Gueymard</td>
<td>Chris</td>
</tr>
<tr>
<td>X</td>
<td>Haberl</td>
<td>Jeff</td>
</tr>
<tr>
<td>X</td>
<td>Haddad</td>
<td>Kamel</td>
</tr>
<tr>
<td>X</td>
<td>Hayes</td>
<td>Philip</td>
</tr>
<tr>
<td>X</td>
<td>Hensen</td>
<td>Jan</td>
</tr>
<tr>
<td>X</td>
<td>Huang</td>
<td>Joe</td>
</tr>
<tr>
<td>X</td>
<td>Judkoff</td>
<td>Ron</td>
</tr>
<tr>
<td>X</td>
<td>Kootin-Sanwu</td>
<td>Victor</td>
</tr>
<tr>
<td>X</td>
<td>Kosny</td>
<td>Jan</td>
</tr>
<tr>
<td>Present at TC 4.7 meeting?</td>
<td>Last name</td>
<td>First name</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>Add to email list</td>
<td>Dallas Jan 2007</td>
<td>Québec City June 2006</td>
</tr>
<tr>
<td>X</td>
<td>Krarti</td>
<td>Moncef</td>
</tr>
<tr>
<td>X</td>
<td>Kummert</td>
<td>Michaël</td>
</tr>
<tr>
<td>X</td>
<td>Laouadi</td>
<td>Aziz</td>
</tr>
<tr>
<td>X</td>
<td>Lemort</td>
<td>Vincent</td>
</tr>
<tr>
<td>X</td>
<td>Levermore</td>
<td>Geoff</td>
</tr>
<tr>
<td>X</td>
<td>Leviseur</td>
<td>Suzanne</td>
</tr>
<tr>
<td>X</td>
<td>Liesen</td>
<td>Richard</td>
</tr>
<tr>
<td>X</td>
<td>Lisenbee</td>
<td>Larry</td>
</tr>
<tr>
<td>X</td>
<td>Ljungquist</td>
<td>Damian</td>
</tr>
<tr>
<td>X</td>
<td>Malone</td>
<td>brian</td>
</tr>
<tr>
<td>X</td>
<td>McDowell</td>
<td>Tim</td>
</tr>
<tr>
<td>X</td>
<td>Neymark</td>
<td>Joel</td>
</tr>
<tr>
<td>X</td>
<td>Nigusse</td>
<td>Bereket</td>
</tr>
<tr>
<td>X</td>
<td>Norford</td>
<td>Les</td>
</tr>
<tr>
<td>X</td>
<td>Pinel</td>
<td>Patrice</td>
</tr>
<tr>
<td>X</td>
<td>Pedersen</td>
<td>Curt</td>
</tr>
<tr>
<td>X</td>
<td>Radosevic</td>
<td>Marija</td>
</tr>
<tr>
<td>X</td>
<td>Reddy</td>
<td>T. Agami</td>
</tr>
<tr>
<td>X</td>
<td>Rees</td>
<td>Simon</td>
</tr>
<tr>
<td>X</td>
<td>Roth</td>
<td>Stephen</td>
</tr>
<tr>
<td>X</td>
<td>Shirey</td>
<td>Don</td>
</tr>
<tr>
<td>X</td>
<td>Smith</td>
<td>Vernon</td>
</tr>
<tr>
<td>X</td>
<td>Sonderegger</td>
<td>Robert</td>
</tr>
<tr>
<td>X</td>
<td>Spitler</td>
<td>Jeffrey</td>
</tr>
<tr>
<td>X</td>
<td>Strachan</td>
<td>Paul</td>
</tr>
<tr>
<td>X</td>
<td>Strand</td>
<td>Rick</td>
</tr>
<tr>
<td>X</td>
<td>Subbarao</td>
<td>Kris</td>
</tr>
<tr>
<td>X</td>
<td>Theios</td>
<td>Jason</td>
</tr>
<tr>
<td>X</td>
<td>Thomaston</td>
<td>Bill</td>
</tr>
<tr>
<td>X</td>
<td>Walton</td>
<td>George</td>
</tr>
<tr>
<td>X</td>
<td>Weaver</td>
<td>Kevin</td>
</tr>
<tr>
<td>X</td>
<td>Wetter</td>
<td>Michael</td>
</tr>
<tr>
<td>X</td>
<td>Wray</td>
<td>Craig</td>
</tr>
<tr>
<td>X</td>
<td>Wright</td>
<td>Jonathan</td>
</tr>
<tr>
<td>X</td>
<td>Xiaobing</td>
<td>Liu</td>
</tr>
<tr>
<td>X</td>
<td>Lebrun</td>
<td>Jean</td>
</tr>
<tr>
<td>X</td>
<td>Bou-Saada</td>
<td>Tarek.</td>
</tr>
<tr>
<td>X</td>
<td>Henderson</td>
<td>Hugh</td>
</tr>
<tr>
<td>X</td>
<td>MacDonald</td>
<td>Ian</td>
</tr>
<tr>
<td>X</td>
<td>Gardner</td>
<td>Carol</td>
</tr>
<tr>
<td>X</td>
<td>O’NEILL</td>
<td>Zheng</td>
</tr>
<tr>
<td>X</td>
<td>XIAO</td>
<td>Dongyi</td>
</tr>
</tbody>
</table>
### TC 4.7 RESEARCH PROJECTS STATUS

#### Active projects

<table>
<thead>
<tr>
<th>#</th>
<th>Title</th>
<th>Joint TC</th>
<th>Cog SC/Contractor</th>
<th>PMSC</th>
<th>Dates / status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1311-TRP</td>
<td>Improving Load Calculations for Fenestration with Shading Devices</td>
<td>4.1 (cognizant TC), 4.5</td>
<td>Sim/Comp, University of Waterloo</td>
<td>Robert Hopper (chair/4.1); Ross McCluney (4.1); Chris Wilkins (4.1); Dru Crawley (4.7)</td>
<td>Contractor selected 6-2004 Start: 02-2005</td>
</tr>
</tbody>
</table>
## RESEARCH PLAN

**Appendix 2**

**RESEARCH PLAN**

**January 29, 2007**

<table>
<thead>
<tr>
<th>Title</th>
<th>TC Priority 2005-2006</th>
<th>Prior TC Priority</th>
<th>Society status</th>
<th>TC Status</th>
<th>Authors or Prime Contact</th>
<th>Sub com.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prioritized</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1416-RTAR Developing internal surface convection correlations for energy and load calculations</td>
<td>1</td>
<td>1 (2005-2006)</td>
<td>RTAR accepted 05, WS due before Aug 07</td>
<td>WS draft being revised</td>
<td>DFisher, IBeausoleil-Morrison</td>
<td>SCM</td>
</tr>
<tr>
<td>1404-RTAR Development of protocol for accurate prediction of building annual energy use based on minimum short-term monitoring</td>
<td>2</td>
<td>2 (2005-2006)</td>
<td>RTAR accepted 05, WS due before Aug 07</td>
<td>WS draft being revised</td>
<td>AReddy</td>
<td>DDM</td>
</tr>
<tr>
<td>1456-RTAR Models for Natural and Hybrid Ventilation</td>
<td>3</td>
<td>0 (2005-2006)</td>
<td>RTAR accepted Jun 06, WS due before Jun 08</td>
<td>WS under development</td>
<td>YJHuang, PHaves, GWalton, SRees</td>
<td>SCM</td>
</tr>
<tr>
<td><strong>Unprioritized</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 enclosure and furnishings</td>
<td></td>
<td></td>
<td>RTAR draft under revision, no progress since Quebec City, awaiting completion of related IEA work</td>
<td></td>
<td>JKosny</td>
<td>SCM</td>
</tr>
<tr>
<td>Development of reference Building Information Model (BIM) for thermal model compliance testing</td>
<td></td>
<td></td>
<td>Expression of interest to work with TC 1.5</td>
<td></td>
<td>LNorford</td>
<td>A</td>
</tr>
</tbody>
</table>

SCM = Simulations and Component Models  
DDM = Data Driven Modeling (formerly Inverse Methods)  
A = Applications
## Appendix 3

**TECHNICAL PAPERS FROM SPONSORED RESEARCH**

<table>
<thead>
<tr>
<th>RP</th>
<th>Title</th>
<th>Contractor</th>
<th>Approved</th>
<th>Paper</th>
</tr>
</thead>
</table>
Appendix 4

TC/TG/TRG SPONSORED SYMPOSIA

Current as of January 2007

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

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

PAST:
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.

Orlando/February 2005
  None.

Nashville/June 2004
  Modeling Moisture Sorption/Desorption by Building Materials (Chair Jan Kosny)

Anaheim/January 2004
  Applications and Knowledge-based Tools for Enhanced Building Energy Simulation (Chair, Vern Smith)
Appendix 5

TC/TG/TRG SPONSORED SEMINARS

Current as of January 2007

PRESENT:

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)

PLANNED:

Long Beach/June 2007
Genetic Algorithms for Energy Calculations (Chair: Bass Abushakra)

Web-based Programs for Calculating Code-Compliance (Chair: Norm Bourassa)

PAST:

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)

Nashville/June 2004
Co-sponsored with TC 7.5. Models for Automated Building/HVAC Fault Detection and Diagnostics (Chair: Michael Brandemuehl)

Anaheim / January 2004
Energy Use Calculations and Evaluations for Laboratories (co-sponsored with TC. 9.10, Chair Patrick Carpenter)
Appendix 6

TC/TG/TRG SPONSORED FORUMS

Current as of June 2006

PRESENT:
None.

PLANNED:
None.

PAST:
Chicago/January 2006
What Controls Modelling Capabilities are Needed for Energy Simulations (Chair: Phil Haves)
1. Roll call and introductions (Haves)
   - The meeting convened at 18h05.
   - Fisher chair, Haves secretary.
   - Quorum with 10 voting members present (8 + 2 international) out of 15 non-international.
   - Introductions.

2. Accept agenda & approve minutes of Chicago meeting (Fisher) (Attachment A)
   - Agenda accepted (Barnaby/Kosny). Approved by voice vote.
   - Minutes accepted (Kosny/Reddy). Approved by voice vote.

3. Announcements/Liaisons (Fisher)
   - New registration policy for authors – authors and session chairs will no longer get free registration for the whole of the meeting
     - **MOTION:** That the TC 4.7 Chair write a letter recommending that the previous registration policy be reinstated. (Barnaby/?) **Motion carried 10-0-0 CNV**
     - All presentations (Powerpoint slides) for New York City will be due one month early - a one time change to accommodate NY ‘professional development hours’ (pdh) requirements.
     - New Section Head Suzanne LeViseur introduced herself. She announced that the criteria for the George B. Hightower Award have been modified to recognize contributions over a number of years. The award is for service to the TC in all areas except research and standards: program, handbook, officers, technical inquiries and special assignments.
     - David Meredith (Professional Development Committee) reminded the committee that the short course on Simplified Energy Calculations is still ‘on the books’.
     - **MOTION:** That TC4.7 recommend to ASHRAE that the short course on Simplified Energy Calculations be retired (Liesen/Brandemuehl). **Motion carried 12-0-0 CNV**
     - Professional Development Coordinator sought to substitute for Fisher
     - Craig Wray (Vice Chair of TAC) announced that TC members, including corresponding members, will be allocated to subcommittees by the TC Chair if there are insufficient volunteers

4. Membership (Fisher)
   - Bill Bahnfleth, Michael Brandemuehl, Patrick Carpenter, George Walton and Jonathon Wright will roll off after the Long Beach meeting and Moncef Krarti, Joe Neymark, Klaus Sommer and Michael Wetter will roll on.

5. Subcommittee reports
   5.1 Applications: Chip Barnaby (chair) reporting: (Attachment B)
      - Norford has discussed with SSPC 90.1 Energy Cost Budget (ECB) subcommittee chair Jason Glazer how TC4.7 might work with ECB. ECB is receptive to the possibility of joint work, the most promising area being research.
      - IBPSA-USA is exploring establishing a building simulation wiki
      - The subcommittee is interested in the TC 1.5 RTAR Development of Reference Building Information Model (BIM) for Thermal Model Compliance Testing, which has been submitted to RAC and returned with comments.
      - The problem of simulation of fenestration when only ratings data is available was discussed. A short 'issue paper' will be prepared NFRC.

   5.2 Data-Driven Modeling Kris Subbarao (chair) reporting: (Attachment C)
      - RTAR’s on “Use of chiller/fan data to infer building loads” and a follow-up to RP-1051: “Automated calibration of detailed building energy simulation programs” were discussed
• Discussion on other RTAR’s, primarily concerned with baselining, was deferred due to lack of time (1 hr rather 1.5 hour meeting time due to miscommunication)

5.3 Simulation & Component Models Tim McDowell (chair) reporting: (Attachment D)
• Draft Work Statements on internal convection (1416) and natural ventilation (1456) were discussed and approved for submission to the full TC
• The RTAR on the assessment of moisture absorption/desorption models was put on hold pending completion of relevant IEA work.
• 10 ideas for new RTARS were generated. The topic of metrics for HVAC secondary system performance was discussed

5.4 Research, Joe Huang (chair) reporting (Attachment E)
• There is higher visibility for ASHRAE Research, due in part to interest from USGBC and co-funding from CEC
• There is a new conflict of interest policy for bidders who are also work statement authors – details on the ASHRAE web site
• 1311-RP Load calculations with shading devices (report by Barnaby):
  o TC4.1 is the lead, TC4.7 and TC4.5 are co-sponsoring.
  o work on multilayer glazings is progressing well.
  o tables on shading by blinds and drapes has been updated
  o draft report is due in 12 months.
• Research plan:
  o 3 prioritized items 1456-WS, 1416-WS, 1404-WS
  o 1 new unprioritized co-sponsored item: Development of reference Building Information Model (BIM) for thermal model compliance testing – TC1.5 is lead
• Beausoleil-Morrison described Work Statement 1416. TC4.1 will co-sponsor following clarifications of the scope.
  MOTION: That TC4.7 accept Work Statement 1416 as presented (Huang/Barnaby) Motion carried 12-0-0 CNV
  1416-PES: Kosny, Beausoleil-Morrison (chair), Bruning (TC4.1)
• Huang described Work Statement 1456. TC4.10 will co-sponsor, CEC will co-fund 50% up to $50k, ARTI will co-fund 20% up to $20k. Huang and Rees will revise further and submit for letter ballot. Craig Wray recommended involving TC4.3.
  MOTION: That TC4.7 permit fast tracking of Work Statement 1456, with revisions as discussed and a letter ballot (Huang/Brandemuehl) Motion carried 12-0-0 CNV

5.5 Handbook, Dru Crawley (chair) reporting (Attachment F)
• Updating of Chapter 31 of Fundamentals will focus on:
  o Results from research sponsored by TC4.7
  o Ground heat transfer
  o Information on toolkits
  o Incorporation of room airflow models to energy calculations
  o Window modeling
  o Validation
  o Comparison of simulation tools
  o Simulation for code compliance
  o New areas of simulation: water, onsite power, green roofs, natural ventilation, duct modeling …
• Volunteer writers are sought.
• Reviewers are sought
• The new chapter needs to be reviewed and voted out in 18 months

5.6 Program, Jeff Haberl reporting for Rick Strand (chair), who has resigned and will be replaced by Michael Wetter (Attachment G)
• One Symposium (“How Low Can You Go? Low-Energy Buildings Through Integrated Design, chaired by Dru Crawley) and two Seminars (“Applications of Computer Simulation in High Performance Buildings”, chaired by Martha Brook, and “Use of ‘Equation Solvers’ for Simulation”, co-chaired by Jean LeBrun and Mike Wetter) were presented at the Dallas meeting
Proposed plan for Long Beach consists of one Symposium (“How Low Can You Go? Low-Energy Buildings Through Integrated Design, chaired by Dru Crawley) and three Seminars

**MOTION:** That TC 4.7 accept the program plan for Long Beach proposed by Jeff Haberl (Degelman/Rees):
- 1st priority: Seminar: Solar Decathlon
- 2nd priority: Seminar: Active/Phase Change
- 3rd priority: Seminar: what happened to AI?

Motion carried 12-0-0 CNV.

**5.7 Standards,** Joel Neymark (chair) reporting (Attachment H)
- SPC 140 (Judkoff reporting).
  - Addendum "b" passed public review in September.
  - IEA Newsletter lauded S140 as a good example of research to practice
  - Data format s/com very active – put results from S140 assessments on a website.

**5.8 Web Site,** Liesen (chair) reporting (no attachment)
- Rules for rosters – phone numbers and emails – were clarified by Craig Wray
- Sanitized version of minutes needed – remove email addressed

**6. Reports on related activities**

**6.1 GPC 20 XML Definitions for HVAC&R (Barnaby)**
- Draft guideline in moderate shape.
- 4 use cases well developed – design, system sizing, commissioning, operations
- 1354-RP (TC1.5) 95 data groups commonly exchanged

**6.2 TC 2.8 Sustainability (Crawley)**
- TC2.8 is sponsoring Standard 189 (Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings) and Standard 191, which deals with water conservation

**6.3 TC 4.1 Load Calculations (Spitler)**
- TC 4.1 will co-sponsor 1416-WS
- More heat gain measurements work, including development of a method of measurement, is being pursued.

**6.4 TC 4.2 Climatic Information (Barnaby)**
- Data for 2009 printed handbook is currently being considered.
  - **MOTION:** TC4.7 recommends that ASHRAE discontinues the publication of bin data for simplified energy calculations (Degelman/Branaby) **Motion carried 12-0-0 CNV**

**6.5 TC 4.5 Fenestration** (no report)
- Performance path approach: interest in method of assessing windows in-situ
- Need for best simulation methods to be used in support of Standard 90.1

**6.6 TC 6.5 Radiant Heating and Cooling** (no report)

**6.7 TC 7.4 Building Operation Dynamics (Brandemuehl)**
- Current topics include utility operations, load curtailment, short term building response and the effect on the utility of CHP and building integrated PV

**6.8 TC 7.5 Smart Building Systems (Reddy)**
- Current topics include fault detection and diagnosis, wireless communications for monitoring and control

**6.9 TC 7.6 Systems Energy Utilization** (no report)

**6.10 IAI International Alliance for Interoperability** (no report)
6.11 Standard 90.1 (Liesen)
- Public comments have been received challenging the technical calculation methods.

6.12 IBPSA (USA, Canada, World, BS 2007)
- IBPSA-USA (Brandemuehl):
  - 50 people at meeting.
  - Interaction with US GBC on training for simulation, Wiki-like database for simulation topics.
  - Bill Sisson (UTRC/World Business Council for Sustainable Development) will be dinner speaker in Long Beach.
- IBPSA-Canada (Beausoleil-Morrison):
  - Scholarships for students.
  - eSim 2008 will be in Montreal
- IBPSA-World (Beausoleil-Morrison):
  - Excellent facilities at Tsinghua University for BS’07
  - ~600 abstracts, 300 papers expected, due March 1.

7. Old Business
- none.

8. New business
- none.

9. Adjourn
- Meeting adjourned at 20h15.

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
# ASHRAE TC 4.7 Energy Calculations

**Tuesday, January 30, 2006, 6:00-8:30 p.m.**  
**Houston Ballroom A**  
**Convention Center, Third floor**  
**Dallas, Texas**

## 1. Roll call and introductions  
Haves

## 2. Accept agenda & approve minutes of Chicago 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  
#### 1311-RP Improving Load Calculations for Fenestration with Shading Devices (TC 4.1/4.5/4.7; Univ. of Waterloo)  
Crawley  
#### Work statements for consideration  
Huang

### 5.5 Handbook  
Crawley

### 5.6 Program  
Haberl

### 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  
### 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  
Strand

### 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, Beausoleil-Morrison, Hensen

## 7. Old Business

## 8. New business

## 9. Executive Session

## 10. Adjourn
Chip Barnaby started the meeting at 3:35 PM with introductions and approval of agenda.

**PROGRAM**

*Simulation Support for the 2007 Solar Decathlon* (chair: Kamel Haddad). Submitted for Dallas but was not accepted. Applications recommends that the session be resubmitted for Long Beach.

Ideas for New York or future meetings.
- *Fenestration Data Needs for Energy and Loads Calculations* (with TC 4.1). Session not submitted for Dallas as was planned.
- *Web-Based Programs for Calculating Code Compliance*.
- *Appliance Performance Compliance Tools to Mitigate Climate Change*. Carol Gardner knows of potential speakers.

**STANDARD 90.1 COORDINATION**
Norford reported on how TC 4.7 might work with SSPC 90.1 Energy Cost Budget (ECB) subcommittee. He reported on his meeting with the subcommittee and conversations with Jason Glazer, ECB chair. ECB is receptive to the possibility of joint work.

In the discussion that followed, the consensus was that research is the most promising area for cooperation. Norford agreed to continue discussion with Jason Glazer and the ECB subcommittee to identify research topics of mutual interest.

**IBPSA-USA BUILDING SIMULATION WIKI**

Barnaby reported that IBPSA-USA is exploring establishing a building simulation wiki. Michael Wetter, Vern Smith, and Chip Barnaby are looking into technical and intellectual property issues. Comments or additional participation are welcome.

**RESEARCH**

**BIM data translation.** The TC 1.5 RTAR Development of Reference Building Information Model (BIM) for Thermal Model Compliance Testing is under development. It has been submitted to RAC and was returned with comments. This RTAR proposes research to define procedures for automated generation of simulation thermal models from CAD applications and to develop tests to verify correctness of such generation.

The subcommittee remains interested in being involved in this project.

Ian Beausoleil-Morrison, Michael Wetter, and Joel Neymark have reviewed the RTAR. Michael Wetter will assemble their comments and transmit them to TC 1.5 chair Rob Hitchcock.

**Simulation of fenestration when only ratings data is available.** This problem was discussed in relation to design modeling and also generic parametric modeling for standards development. The difficulty is that a given SHGC / U-factor combination can correspond to many actual window assemblies, so those inputs are not sufficient to define detailed simulation input. Joe Huang has developed a proposed input preparation procedure for the CEC; he will circulate a description of the method.

After some discussion, Chip Barnaby and Joe Huang agreed to write a one-page issue paper that Steve Selkowitz can bring forward at the upcoming NFRC board meeting. This analysis may lead to identification of research topics as well.

**Representative Data for Residential Energy and Load Calculations.** The Building America residential assumptions are complete and obviate the need for this project. Drop.
OTHER RESEARCH TOPICS. BARNABY REVIEWED THE REMAINING RESEARCH TOPICS AND URGED THEIR CHAMPIONS TO MAKE PROGRESS.

OTHER BUSINESS. NONE.

Meeting adjourned 5:10 PM.

ACTION ITEMS

<table>
<thead>
<tr>
<th>Who</th>
<th>When</th>
<th>What</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnaby</td>
<td>Immediately</td>
<td>Request that TC 4.7 Chair (Fisher) transmit to RAC support for Std. 90.1 RTAR</td>
</tr>
<tr>
<td></td>
<td>(done at TC 4.7 meeting)</td>
<td></td>
</tr>
<tr>
<td>Wetter</td>
<td>Early Feb.</td>
<td>Integrate comments on TC 1.5 BIM RTAR and transmit to Rob Hitchcock</td>
</tr>
<tr>
<td>Huang</td>
<td>Immediately</td>
<td>Distribute CEC write-up on modeling fenestration given standard ratings</td>
</tr>
<tr>
<td>Huang, Barnaby</td>
<td>Mid February</td>
<td>Write one-page briefing paper on fenestration rating issues for Steve Selkowitz to present to NFRC board.</td>
</tr>
</tbody>
</table>
Summary
TC4.7 Data-Driven Modeling Subcommittee
Monday, January 29, 2007
6:30 to 7:30 p.m.
Dallas, TX
Chair: Kris Subbarao

Meeting started at 6:35 pm with 17 in attendance. Chair called session to order followed by introductions and approval of Quebec City meeting minutes.

Program:

Seminar for Long Beach: “Whatever happened to AI?” A. Reddy, Chair. Three speakers lined up and this session was bumped from Dallas. Information about topics and speakers uploaded to web site a few months ago. The speakers have confirmed participation for Long Beach.

Symposium for Long Beach: "Survival of the least Square Fittest: Genetic Algorithms for Buildings", possible speakers - Jonathan_Wright/Loughborough from RP-1049 - 2 papers have been submitted to HVAC&R, one accepted and one being reviewed, agreed to present them again in a symposium, but wanted a new title; new working title: "HVAC system design optimization". L. Norford to follow up.

Technical Session for New York: “Use of Equation Solver for Building Simulation” Mike Wetter, Chair. Follow up of Seminar with the same title and Chair held in Dallas

Seminar for Long Beach: R. Sonderegger chair - 2 papers by Claridge and Liu from RP-1092, 2 papers by A. Reddy from RP-1051. Sonderegger told A. Reddy that he was not coming to Long Beach. Also, A. Reddy said his 2 papers have already been presented. Dropped for now.

Work statement:
“Modeling, Analysis, and Reporting Protocols for Predicting Annual Energy Performance from Short-term Building Energy Monitoring” nearly ready, but with suggested changes will be voted on in Long Beach. Reddy with Joe Huang, Les Norford, and Vern Smith will work on this.

RTAR:
1. "Procedure for baselining energy use at large central plants”. Given to A. Reddy, recommendation: drop
2. "Use of chiller/fan data to infer building loads” will be developed further for discussion in Long Beach, assigned to A. Reddy with A. Abushakara. J. LeBrun asked if much work is needed on this topic.
3. Follow-up of RP-1051: “Automated calibration of detailed building energy simulation programs” will be developed further for discussion in Long Beach, assigned to K. Subbarao

Not discussed due to lack of time (meeting allocated 1 hour instead of the usual 1.5 hours due to miscommunication):

4. Procedures for adjusting baseline models for M&V projects due to creep and other causes
5. Development of procedures for baselining electricity demand savings
6. Development of procedures for baselining water use in a facility
7. Development of in-situ procedures for baselining energy savings from renewable projects
8. Procedures to develop performance modes of HVAC&R equipment from published manufacturer data
9. Use of evolutionary computation for inverse problem

New Ideas:

1. Standardized M&V for savings from operational changes: SAT reset, static pressure reset, ...
2. Certification of built buildings against code such as LEED
3. 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.

Dan Fisher will try to restore 1.5 hours for the meeting in Long Beach and beyond. (Reduced to 1 hour in Quebec City and beyond due to miscommunication; the meeting do need the full hour and a half.)

Meeting was adjourned at 7:35 pm.

Attendees:

<table>
<thead>
<tr>
<th>Last Name</th>
<th>First Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abushakra</td>
<td>Bass</td>
<td>MSOE</td>
</tr>
<tr>
<td>Bou-Saeda</td>
<td>Tarek</td>
<td>Oklahoma State U.</td>
</tr>
<tr>
<td>Chervil</td>
<td>Rudy</td>
<td>Johnson Controls Inc</td>
</tr>
<tr>
<td>Fisher</td>
<td>Dan</td>
<td>Oklahoma State U.</td>
</tr>
<tr>
<td>Haberl</td>
<td>Jeff</td>
<td>TAMU</td>
</tr>
<tr>
<td>Huang</td>
<td>Joe</td>
<td>LBNL</td>
</tr>
<tr>
<td>Judkoff</td>
<td>Ron</td>
<td>NREL</td>
</tr>
<tr>
<td>Kamel</td>
<td>Haddad</td>
<td>Natural Resources, Canada</td>
</tr>
<tr>
<td>Kauffman</td>
<td>Justin</td>
<td>York/JCI</td>
</tr>
<tr>
<td>Krarti</td>
<td>Moncef</td>
<td>Univ. of Colorado</td>
</tr>
<tr>
<td>Norford</td>
<td>Les</td>
<td>MIT</td>
</tr>
<tr>
<td>Padmanabhan</td>
<td>Sankar</td>
<td>Oklahoma State U.</td>
</tr>
<tr>
<td>Reddy</td>
<td>Agami</td>
<td>Drexel Univ</td>
</tr>
<tr>
<td>Smith</td>
<td>Vern</td>
<td>AEC</td>
</tr>
<tr>
<td>Subbarao</td>
<td>Kris</td>
<td>TAMU</td>
</tr>
<tr>
<td>Wetter</td>
<td>Michael</td>
<td>United Technologies</td>
</tr>
<tr>
<td>Wright</td>
<td>Jon</td>
<td>Loughborough U.</td>
</tr>
</tbody>
</table>
Called to Order 7:40 pm

Attendance

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tim McDowell</td>
<td>TESS</td>
</tr>
<tr>
<td>Philip Haves</td>
<td>LBNL</td>
</tr>
<tr>
<td>Jon Wright</td>
<td>Loughborough University</td>
</tr>
<tr>
<td>Ron Judkoff</td>
<td>NREL</td>
</tr>
<tr>
<td>Moncef Krarti</td>
<td>University of Colorado</td>
</tr>
<tr>
<td>Kamel Haddad</td>
<td>Natural Resources Canada</td>
</tr>
<tr>
<td>Jan Kosny</td>
<td>ORNL</td>
</tr>
<tr>
<td>Chip Barnaby</td>
<td>Wrightsoft</td>
</tr>
<tr>
<td>Ian Beausoleil-Morrison</td>
<td>Natural Resources Canada</td>
</tr>
<tr>
<td>Dan Fisher</td>
<td>OSU</td>
</tr>
<tr>
<td>Jeff Haberl</td>
<td>Texas A&amp;M</td>
</tr>
<tr>
<td>Joel Neymark</td>
<td>JNeymark Associates</td>
</tr>
<tr>
<td>Diego Arias</td>
<td>University of Wisconsin-Madison</td>
</tr>
<tr>
<td>Jean Lebrun</td>
<td>University of Liege</td>
</tr>
<tr>
<td>Michael Wetter</td>
<td>United Technologies Research Center</td>
</tr>
<tr>
<td>Simon Rees</td>
<td>De Montfort University</td>
</tr>
<tr>
<td>Jeff Spitler</td>
<td>Oklahoma State University</td>
</tr>
<tr>
<td>Joe Huang</td>
<td>LBNL</td>
</tr>
<tr>
<td>Steve Cornick</td>
<td>NRC</td>
</tr>
<tr>
<td>Atila Novoselac</td>
<td>University of Texas-Austin</td>
</tr>
<tr>
<td>Kris Subbarao</td>
<td>Texas A&amp;M</td>
</tr>
<tr>
<td>Vern Smith</td>
<td>Architectural Energy Corp</td>
</tr>
<tr>
<td>Joe Deringer</td>
<td>The Deringer Group Inc</td>
</tr>
<tr>
<td>Klaus Sommer</td>
<td>Cologne Univ of Applied Sciences</td>
</tr>
<tr>
<td>Curt Pedersen</td>
<td>University of Illinois</td>
</tr>
<tr>
<td>Sankar Padhmanabhan</td>
<td>Oklahoma State University</td>
</tr>
<tr>
<td>Don Shirey</td>
<td>Florida Solar Energy Center</td>
</tr>
<tr>
<td>Noel Susskind</td>
<td>Arora Engineers</td>
</tr>
<tr>
<td>Richard Liesen</td>
<td>Owens Corning</td>
</tr>
</tbody>
</table>

PROGRAM
Dallas (January 2007)
- **Seminar** on *Use of ‘Equation Solvers’ for Simulation* (Chaired by: Mike Wetter)

Long Beach (June 2007)
- **Seminar** on *Modeling and Experimental Validation of Active Building Components* (Chaired by: Jan Kosny)

New York (January 2008)
- **Symposium** on *Modeling and Experimental Validation of Active Building Components* (Chaired by: Jan Kosny)
- **Symposium** on *Use of ‘Equation Solvers’ for Simulation* (Chaired by: Mike Wetter)
- **Seminar** on *Performance Models of HVAC components from manufacturer’s data* (Chaired by Mike Wetter)

Salt Lake City (June 2008)
• Symposium on Evolution Design of HVAC Systems for RP 1049 (Chaired by Les Norford)

WORK STATEMENTS
• Development of Internal Surface Convection Correlations for Energy and Load Calculation Methods WS-1416 (Dan Fisher, Ian Beausoleil-Morrison). Draft work statement was circulated for comments. The inclusion of different diffusers and what coefficients will be measured was discussed. Whether the proposed budget of $200,000 is enough was discussed. TC 4.1’s interest in co-sponsorship – Jeff Spitler will contact TC 4.1 about co-sponsorship. Subcommittee voted to bring Work statement to full TC for approval.

• Assess and Implement Natural and Hybrid Ventilation Models in Whole-Building Energy Simulation WS-1456 (Joe Huang, Simon Rees, George Walton). TC 4.10 expressed support of work statement. Simon Rees will approach TC 5.3. CEC will co-fund 50% up to $50,000. ARTI will co-fund 20% or $20,000. CIBSE would work with ASHRAE on project. The difficulty of the scope and whether more basic wind tunnel tests to provide pressure coefficients. The purpose of the project is to determine if the data available is any good. A better reference to previous IEA work is needed. Work Statement is intended to assess the current state of the models and whether they can be validated. A question of whether more detail on the different types of mixed modes is necessary. The mixed mode is more of a controls issue of the system. It might be helpful to be explicit about the type of building being considered. Joe Huang will work to finish and get approval by letter ballot.

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). (a HIGHEST priority item) Put on the shelf until the completion of the IEA Task on this.
• 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).
• Development of Humidstat-Driven Air-Conditioner Model for Residential Applications (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)
• Modeling of Green Roofs (Jeff Haberl)

New Business

Adjourned 9:10
## ASHRAE
### Technical Committee 4.7 Energy Calculations
#### 2006-2007 Research Plan
##### (January 29, 2007)

<table>
<thead>
<tr>
<th>Title</th>
<th>TC Priority 2005-2006</th>
<th>Prior TC Priority</th>
<th>Society status</th>
<th>TC Status</th>
<th>Authors or Prime Contact</th>
<th>Sub com.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prioritized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1416-RTAR Developing internal surface convection correlations for energy and load calculations</td>
<td>1</td>
<td>1 (2005-2006)</td>
<td>RTAR accepted 05, WS due before Aug 07</td>
<td>WS approved by subcommittee, and referred to full committee</td>
<td>DFisher, IBeausoleil-Morrison</td>
<td>SCM</td>
</tr>
<tr>
<td>1404-RTAR Development of protocol for accurate prediction of building annual energy use based on minimum short-term monitoring</td>
<td>2</td>
<td>2 (2005-2006)</td>
<td>RTAR accepted 05, WS due before Aug 07</td>
<td>WS draft developed, modifications needed, will be represented at Long Beach</td>
<td>AReddy, YJHuang</td>
<td>DDM</td>
</tr>
<tr>
<td>1456-RTAR Models for Natural and Hybrid Ventilation</td>
<td>3</td>
<td>0 (2005-2006)</td>
<td>RTAR accepted Jun 06, WS due before Jun 08</td>
<td>WS draft reviewed in subcommittee, modifications needed, may be referred to full committee for letter ballot</td>
<td>YJHuang, SRees, GWalton</td>
<td>SCM</td>
</tr>
<tr>
<td>Unprioritized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 enclosure and furnishings</td>
<td></td>
<td></td>
<td>RTAR draft under revision, no progress since Quebec City, awaiting completion of related IEA work</td>
<td>JKosny</td>
<td>SCM</td>
<td></td>
</tr>
<tr>
<td>Development of reference Building Information Model (BIM) for thermal model compliance testing</td>
<td></td>
<td></td>
<td>Expression of interest to work with TC 1.5</td>
<td>LNorford</td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

SCM = Simulations and Component Models
DDM = Data Driven Modeling (formerly Inverse Methods)
A = Applications
Meeting Minutes
Handbook Subcommittee
ASHRAE TC 4.7 Energy Calculations
5:00-6:00 pm, Tuesday, January 30, 2007
Adam's Mark Houston Ballroom A
Dallas, Texas

Present: Dru Crawley (Subc Chair)
Dan Fisher
Jeff Haberl
Joel Neymark
Les Norford
Michael Wetter

Chair Crawley called the meeting to order at 5:15 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, 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.

By March 1, Crawley will put out a call for topic areas/updates to the chapter on the TC 4.7 mail list. Also, Crawley will make a call for reviewers of the existing chapter. To provide input by
Crawley will include a strawman of a proposed outline with annotation of existing text/need for updates/new sections/text.

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

Meeting ended at 5:40 PM.
1. Does this chapter, in your opinion, truly reflect the state of the art? Yes ☒ No ☐ Somewhat ☐

If you answered “no” or “somewhat,” please indicate typical example(s) below or provide an attachment.

2. Check the description that most nearly categorizes the relevance and balance between theory and practice in this chapter:

☐ a. Too much theory, not enough practical application.
☒ b. Just about right.
☐ c. Too little theory to support the recommendations.
☐ d. Obsolete—remove this subject from ASHRAE publication.
☐ e. Other: ________________________________

3. Tables in this chapter are (check all that apply):

☒ a. Clear and understandable.
☒ b. Adequately footnoted.
☒ c. Properly referenced in the text.
☒ d. Sufficient for the average user.
☐ e. Too voluminous for a Handbook chapter.
☐ f. Inadequately documented.
☐ g. Not required (please list specific tables):
☐ h. Other: ________________________________

1. Please identify tables prompting negative comments:

2. Please suggest tables, if any, that should be added to make the chapter more useful:
4. Equations and derivations are (check all that apply):

☐ a. Clear and understandable.
☒ b. Sufficient for the average user.
☐ c. Properly referenced in text.
☒ d. Properly footnoted to identify variables.
☐ e. Too voluminous for a Handbook chapter.
☐ f. Inadequately documented.
☐ g. In need of improvement.
☐ h. Not required (please list specific equations or passages):
☐ i. Other: See comments at end.

1. Please identify derivations/equations prompting negative comments:

2. Please suggest alternatives:

5. The examples given in this chapter are (check all that apply):

☒ a. Clear and understandable.
☒ b. Adequate for the average user.
☒ c. Appropriately interfaced with the text.
☒ d. Mathematically correct.
☐ e. Use the tables as indicated by the text.
☐ f. Inappropriate.
☐ g. Obsolete.
☐ h. Too complicated.
☐ i. Useless.
☐ j. Not required (please list specific examples):
☐ k. Other: See comments at end.

1. Please identify examples prompting negative comments:

2. Please identify sections that need more explanation or examples to clarify them:
6. The figures and graphics in this chapter are (check all that apply):

☐ a. Clear and understandable.
☐ b. Adequate for the average user.
☐ c. Appropriately interfaced with the text.
☐ d. Properly footnoted.
☐ e. Hard to read.
☐ f. Inappropriate.
☐ g. Obsolete.
☐ h. Not required (please list specific figures):

☐ i. Other:

1. Please identify figures or graphics prompting negative comments:

2. Please suggest additional figures, if any, that should be added to the chapter:

7. ASHRAE maintains a reputation as the “Standard of the Industry” in HVAC&R matters, with the Handbook series serving as its “bible.” In this context, and on an ascending scale from 0 to 7, please rate your overall evaluation of this chapter as a worthy representative of and contributor to this traditional role:

☐ 7 Couldn’t be better in any way.
☒ 6 Well done—only nominal review required.
☐ 5 Okay, but needs update more often.
☐ 4 Technically correct, but needs editing.
☐ 3 Technically acceptable, but needs amplification.
☐ 2 Not technically up to date, but better than nothing.
☐ 1 Completely revise and update or drop immediately.
☐ 0 Drop from Handbook or any other publication.

COMMENTS:
1) On page 32.5 in the first full paragraph, third sentence, reference to Equation (36) of Chapter 30 should be Equation (27) of Chapter 30. Also needs to be corrected from (36) to (27) in third paragraph.

2) On page 32.5 in the fourth paragraph, reference to Equations (35) and (34) in Chapter 30 should be Equations (26) and (25).

3) On page 32.16 second column second line, reference to Equation (36) should be Equation (48).

4) On page 32.16 second column fourth and fifth paragraphs, references to Equation (34) should be Equation 47 in three places.

5) The following were noted in 'References' but not found in the body of the chapter text:
   a) Haberl et al 1997
   b) Reddy et al 2003

6) Reference for Bonne and Jansen dated 1989 in 'References' and 1985 in chapter text.

7) Reference for Yazdanian & Klems dated 1994 in 'References' and 1993 in chapter text and under 'Empirical Validation'.

☐ Please check this box if you wish to receive feedback via e-mail on your comments from this chapter’s TC. (Please note that any contact information you provide will be used only for this purpose, and will not be shared with any other parties.)

Name: Rennie Tisdale

E-mail:
TC 4.7 Program Plan
Dallas ASHRAE Meeting
January 30th, 2007

Long Beach  June 23-27th, 2007  ***Deadlines: Package 2/9/07

   Organized by: TC 2.8 (Co-sponsor)
   Chaired by: Dru Crawley
   Status: Moved from Dallas, 4 papers in review

#1 Seminar “Simulation Support for the 2007 Solar Decathlon”
   Organized by: TC 4.7 (Application)
   Chaired by: Kamel Haddad
   Status: Moved from Dallas (6 possible presentations)

#2 Seminar “Modeling and Experimental Validation of Active/Phase Change Building Envelope Components”
   Organized by: TC 4.7 (Simulation and Component Models)
   Chaired by: Jan Kosny
   Status: Moved from Dallas, 4 presenters

#3 Seminar “What Ever Happened to AI for Simulation”
   Organized by: TC 4.7 (Data Driven Models)
   Chaired by: Agami Reddy
   Status: Moved from Dallas, 3 abstracts received (Cal Poly; PNNL, ISU)

New York, January 19-23, 2008  *** Deadlines: Manuscripts 4/6/07; Package 8/3/07

Symposium “Modeling and Experimental Validation of Active/Phase Change Building Envelope Components”
   Organized by: TC 4.7 (Simulation and Component Models)
   Chaired by: Jan Kosny
   Status: Moved from Dallas, 2 papers done.

Symposium “How and Why to Calibrate a Simulation to Measured Data”
   Organized by: TC 4.7 (Data Driven Models)
   Chaired by: Robert Sonderegger
   Status: Moved from Dallas (Claridge and Liu from 1092-RP, Reddy from 1051-RP)

Seminar “Use of ‘equation solvers’ for Simulation”
   Organized by: TC 4.7 (Data Driven Models)
   Chaired by: Michael Wetter
   Status: Changed from Symposium to Seminar, 4 presenters identified

Seminar “Genetic Algorithms for Energy Calculations”
   Organized by: TC 4.7 (Data Driven Models)
   Chaired by: Bass Abushakra
   Status: Moved from Dallas
Seminar “Modeling of Double Envelope Facades and Active Windows”
Organized by: TC 4.7 (Simulation and Component Models)
Chaired by: Mike Brandemuehl
Status: Moved from Dallas

Seminar “Fenestration Data Needs for Energy and Loads Calculations”
Organized by: TC 4.1 Loads
Co-Sponsored by TC 4.7 (Application)
Chaired by Glen Friedman
Status: Moved from Dallas

Seminar “Web-based Programs for Calculating Code-Compliance”
Organized by: TC 4.7 (Applications)
Chaired by: Norm Bourassa, CEC
Status: Moved from Dallas, would focus on web-based, XML or IFC applications

Seminar “Applying Performance Assessment Tools to mitigate Climate Change”
Organized by: TC 4.7 (Applications)
Chaired by: Carol Gardiner
Status: New

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: New

Salt Lake City June 12-25, 2008 *** Deadlines: Manuscripts 9/28/07; Package 2/8/07

Symposium “Use of ‘equation solvers’ for Simulation”
Organized by: TC 4.7 (Data Driven Models)
Co-chaired by: Jean LeBrun/Mike Wetter
Status: New, would be based on 4 abstracts from Dallas

Seminar “Experience with Simulation of Standard 90.1 Code-compliant Buildings”
Organized by TC 4.7 (Applications)
Chaired by: Carol Gardiner
Status: Moved from Dallas
SSPC 140 Dallas Meeting Summary
January 29, 2007

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

MEETING SUMMARY

The primary purposes of the meeting were to:

- Report on pending publication of Addendum a (Furnace BESTEST cases) prior to public review
- Report on public review outcome of Addendum b (adapting HVAC BESTEST Volume 2 cases to Standard 140-2004)
- Data Format Subcommittee progress report (regarding posting Standard 140-results data on the DOE Tools web site).

Chair Announcements

Chair Announcements/Communications since last meeting [Judkoff]

- Per ASHRAE Staff, publication of Addendum a (furnace test cases) by ASHRAE is expected after January 2007 (Dallas meeting), with the next supplement/reprints of code intended standards. NREL completed a (probably final) galley review in January and submitted editorial comments to ASHRAE Staff.
- Addendum b (HVAC BESTEST Volume 2, unitary cooling equipment dynamic comparative test cases) passed through public review (Sep 22 – Nov 6, 2006) with no comments. Per ASHRAE Staff, publication of the addendum by ASHRAE is expected after January 2007 (Dallas meeting), with the next supplement/reprints of code intended standards. NREL completed an initial galley review in December and submitted a number of editorial comments to ASHRAE Staff. ASHRAE distributed a revised galley, and NREL completed a second (probably final) galley review in January, and submitted further editorial comments to ASHRAE Staff.
- In July, the Chair distributed FSEC’s electronic version of NREL’s HERS BESTEST to the full PC for comments. Neymark was the only commenter, and during Aug 30 – Sep 1 provided a number of comments to Fairey regarding how to proceed with adaptation for Standard 140.
- IEA has published a newsletter article which describes Standard 140 as a project that exemplifies transfer of IEA research to industry. IEA BESTEST and HVAC BESTEST Vol. 1 (basis of Standard 140-2004) have been translated into Japanese. HVAC BESTEST Vol.2 (basis of 140-2004 Addendum B) translation into Japanese is in progress.

Proposed Addendum b to 140-2004 (HVAC BESTEST Volume 2 cases)

See Chair announcements, publication of the addendum by ASHRAE is expected in February or March, with the next supplement/reprints of code intended standards.

Simulation Requirements, Federal Tax Deductions in Energy-Efficient Commercial Buildings

In Quebec, Judkoff reported Current Federal Tax Deduction for Energy Efficient Commercial buildings, released Jun 2, 2006, cites ANSI/ASHRAE Standard 140-2004 for qualifying software used for certifying deductions. DOE is only required to post a list of approved software. DOE is
allowed (optional) to post Standard-140 results, and DOE would like to work toward that in the next couple of months.

Fairey updated in Dallas. Preliminary legislation is in the U.S. Senate (sponsored by Snowe and Feinstein) to extend commercial buildings energy-efficiency tax deductions to 2011, with some modifications. Revisions to existing residential deductions will be performance based; cost of labor will be included in qualifying deductions.

*Ad-Hoc Data Format Subcommittee Report*

Neymark summarized SubC meeting minutes of 1/28 (see Attachment D). The PC discussed proposed changes to 140-2004 for consistency with proposed rules for DOE Tools site posting. Knebel observed that the changes would add new requirements to the standard output reports and must therefore be an addendum.

*Proposed Addendum b to 140-2004 (HVAC BESTEST Volume 2 cases)*

See Chair announcements, publication of the addendum by ASHRAE is expected in February or March, with the next supplement/reprints of code intended standards.

*Simulation Requirements, Federal Tax Deductions in Energy-Efficient Commercial Buildings*

In Quebec, Judkoff reported Current Federal Tax Deduction for Energy Efficient Commercial buildings, released Jun 2, 2006, cites ANSI/ASHRAE Standard 140-2004 for qualifying software used for certifying deductions. DOE is only required to post a list of approved software. DOE is allowed (optional) to post Standard-140 results, and DOE would like to work toward that in the next couple of months.

Fairey updated in Dallas. Preliminary legislation is in the U.S. Senate (sponsored by Snowe and Feinstein) to extend commercial buildings energy-efficiency tax deductions to 2011, with some modifications. Revisions to existing residential deductions will be performance based; cost of labor will be included in qualifying deductions.

*Ad-Hoc Data Format Subcommittee Report*

Neymark summarized SubC meeting minutes of 1/28 (see Attachment D). The PC discussed proposed changes to 140-2004 for consistency with proposed rules for DOE Tools site posting. Knebel observed that the changes would add new requirements to the standard output reports and must therefore be an addendum.

*RP-865*

David Yuill has done some work with field trials, and according to Haberl has identified some issues regarding compatibility of the test cases with whole-building energy simulation tools.

*RP-1052*

Adaptation should be doable.

*Annex 42 Tests*

These are a suite of test cases for modeling CHP systems including combustion-based systems and fuel cells. They are 98% complete, and include empirical validation cases. The test cases emphasize narrower aspects of the models, and Ian thinks they may be too esoteric (non-mainstream) to include in Standard 140 at this time.
“Wet” BESTEST
This IEA Annex 41 work relates to moisture absorption/desorption modeling of the thermal fabric, and will not be available for review until June 2008.

Investigate Possibility of ASHRAE Funding Research Projects for Standard 140
There are 2 areas where SSPC 140 could use help from ASHRAE research:
- Field testing (with simulation programs) existing test suites being considered for adaptation into Std 140, and modifying the test suites such that a greater variety of simulation programs can apply them
- Developing new test cases for Std 140

Update for IEA Task/Annex 34/43
Judkoff reported on IEA Task 34/43 activities. This new IEA research effort focuses on validation and testing of building simulation tools. The work is making progress, and is due for completion in late 2007. Some of this work could be included with Standard 140 in the future. The following projects are included:
- Comparative Tests (Software-to-software comparisons)
  - Ground coupled heat transfer related to floor slabs. This includes analytical verification tests (NREL, US)
  - Multi-zone envelope test cases (NREL, US) including:
    - Analytical verification conduction test
    - 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)
  - Double-façade building – Aalborg U. (Denmark)
  - Mechanical equipment test cases - Dresden University of Technology (Germany):
    - Focusing on water-side components/systems: chillers, boilers, pumps, piping, valves, etc