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 person listed below within 60 days following the meeting.)

TC/TG/TRG  No. _____ TC 4.7 _____            DATE: _____ May 2, 2005 _____

TC/TG/TRG TITLE: ___ Energy Calculations _____

DATE OF MEETING: February 8, 2005 _____ LOCATION: ___ Orlando _____

| MEMBERS PRESENT | YEAR APPT D | MEMBERS ABSENT | YEAR APPT D | EX-OFFICIO MEMBERS & ADDIT'L ATTENDANCE |
|---|---|---|---|---|
|  | 2004 | Les Norford (CHM) |  |  |
| Dan Fisher (VC, acting chair) | 2004 |  |  |  |
|  | 2004 | Ian Beausoleil-Morrison (SEC) |  |  |
| Jeff Haberl (PROG) | 2002 |  |  |  |
| Agami Reddy (DD) | 2004 |  |  |  |
| Bill Bahnfleth | 2003 |  |  |  |
|  | 2004 | Brent Griffith |  |  |
| Patrick Carpenter | 2003 |  |  |  |
| Joe Huang (RES) | 2004 |  |  |  |
| Michael Brandemuehl | 2003 |  |  |  |
| Tim McDowell | 2002 |  |  |  |
| Rick Strand (acting secretary) | 2001 |  |  |  |
| Robert Sonderegger | 2002 |  |  |  |
| George Walton | 2003 |  |  |  |
|  | 2004 | Simon Rees (INTL) |  |  |
|  | 2003 | John Wright (INTL) |  |  |
|  | 2004 | Mingsheng Liu |  |  |

DISTRIBUTION

**ALL MEMBERS OF THE TC/TG/TRG**
| | |
|---|---|
| TAC CHAIR | William P. Bahnfleth |
| TAC SECTION HEAD | Craig C. Wray |
| SPECIAL PUBLICATIONS LIAISON | Kimball E. Ferguson |
| STANDARDS LIAISON | George Reeves |
| HANDBOOK LIAISON | William S. Fleming |
| PROGRAM LIAISON | Mohammad H. Hosni |
| RAC RESEARCH LIAISON | Michael J. Brandemuehl |
| PROF DEV COMM LIAISON | Mark M. Hydeman |
| TECH TRANSFER LIAISON | Charles E. Gulledge III |
| STAFF LIAISON (RESEARCH) | Michael R. Vaughn |
| STAFF LIAISON (TECH SERVICES) | Michael R. Vaughn |
| STAFF LIAISON (STANDARDS) | Claire Ramspeck |

ASHRAE TC 4.7 Energy Calculations

ORLANDO MEETING

ACTION ITEMS

1.  1051-TRP: **MOTION**—request for no cost extension through February 2006 (motion by Sonderegger, Walton second).  **Motion carried 10-0-0 CNV.**
2.  Handbook: Crawley (incoming chair) requested that the meeting time for this subcommittee be moved
3.  Program: **MOTION** (Haberl/Reddy) to accept the program prioritization for Denver as listed in Attachment G.  **Motion carried 10-0-0 CNV.**
4.  Curt Pedersen to update the group via the list serve on any developments regarding the development of load calculation standards for residential and non-residential buildings.

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TC/TG/TRG  No.      TC 4.7                    DATE:      May 2, 2005

TC/TG/TRG TITLE:    Energy Calculations

DATE OF MEETING:  February 8, 2005                    LOCATION:    Orlando

| TC/TG/TRG MEETING SCHEDULE | | | |
|---|---|---|---|
| **LOCATION – past 12 months** | **DATE** | **LOCATION - planned next 12 months** | **DATE** |
| Nashville | June 29, 2004 | Denver | June 28, 2005 |
| Orlando | February 8, 2005 | Chicago | January 24, 2006 |
| **TC/TG/TRG SUBCOMMITTEES** | | | |
| **Function** | | **Chair** | |
| Simulation and Component Models | | Phil Haves | |
| Applications | | Chip Barnaby | |
| Data-Driven Modeling | | Agami Reddy | |
| **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 | | Strand/Fleming |
| **STANDARDS ACTIVITIES - List and Describe Subjects** | | | |
| SPC 140 Standard Method of Test for Building Energy Software – Joel Neymark | | | |
| **TECHNICAL PAPERS from Sponsored Research - Title, when presented (past 3 yrs. present & planned)** | | | |

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

## 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.

| Present at TC 4.7 meeting? | | | | | Last name | First name | Email |
|---|---|---|---|---|---|---|---|
| Add to email list | Orlando Feb. 2005 | Nashville June 2004 | Anaheim January 2004 | Kansas City July 2003 | | | |
| | X | | X | X | Abushakra | Bass | abushakr@msoe.edu |
| | X | X | X | X | Anderson | J.R. | jrhazel@bellsouth.net |
| X | X | | | | Ahmad | Mushtaq | mushtaq@esl.tamu.edu |
| | | X | | | Armour | Steve | sbarmour@southernco.com |
| X | X | | | | Armstrong | Peter | Peter.armstrong@pnl.gov |
| | | X | X | | Bahnfleth | Bill | wbahnfleth@psu.edu |
| | X | X | X | X | Barnaby | Chip | CBarnaby@wrightsoft.com |
| | | X | X | | Beausoleil-Morrison | Ian | IBeausol@nrcan.gc.ca |
| | X | | | | Bernier | Michel | michel.bernier@polymtl.ca |
| | X | | | | Bojic | Milorad | bojic@nq.ac.yu |
| | | | | | Bradley | Brian | bbradley@nrcan.gc.ca |
| | X | X | X | | Brandemuehl | Mike | michael.brandemuehl@colorado.edu |
| | X | | | X | Carpenter | J Patrick | pcarpenter@kling.us |
| | | | | X | Chantrasrisalai | Chanvit | chanvit@okstate.edu |
| | | X | X | X | Claridge | David | Claridge@esl.tamu.edu |
| | X | X | X | X | Crawley | Dru | Drury.Crawley@ee.doe.gov |
| | X | X | X | X | Degelman | Larry | larry@taz.tamu.edu |
| | | | | X | Deng | Zheng | zhengd@okstate.edu |
| | | | | X | Eldridge | David | dancingdavid@hotmail.com |
| | | | X | | Ellis | Peter | peter_ellis@nrel.gov |
| | X | X | X | X | Fisher | Dan | DFisher@okstate.edu |
| | | X | | | Gawin | Dariuh | gawindar@p.lodz.pl |
| | | | X | | Gardner | Carol | gems@teleport.com |
| | | | X | | Gehlin | Sigge | gehlin@siki.se |
| | | X | | | Gorwick | Susie | susan.gorwick@honeywell.com |
| | | | X | | Gowri | Krishnan | k_gowri@pnl.gov |
| | X | X | X | X | Haberl | Jeff | JHaberl@esl.tamu.edu |
| | | | | X | Haiad | Carlos | Carlos.haiad.sce.com |
| | X | X | X | X | Haves | Philip | PHaves@lbl.gov |
| | X | | | X | Hensen | Jan | j.hensen@tue.nl |
| | X | | X | X | Huang | Joe | YJHuang@lbl.gov |
| | X | | | | Judkoff | Ron | ron_judkoff@nrel.gov |
| | | | | X | Klaassen | Curtis | curtk@energy.iastate.edu |
| | | | | X | Kong | Weixiu | weixiu@okstate.edu |
| X | X | | | | Kootin-Sanwu | Victor | victor.kootin-sanwu@uc.edu |

| Present at TC 4.7 meeting? | | | | | Last name | First name | Email |
|---|---|---|---|---|---|---|---|
| Add to email list | Orlando Feb. 2005 | Nashville June 2004 | Anaheim January 2004 | Kansas City July 2003 | | | |
| | | X | | X | Koran | Bill | William.koran@honeywell.com |
| | X | X | | X | Kosny | Jan | kyo@ornl.gov |
| | X | | | X | Krarti | Moncef | krarti@colorado.edu |
| | | | X | | Lebrun | Jean | J.lebrun@ulg.ac.be |
| | X | | X | | Levermore | Geoff | geoff.levermore@umist.ac.uk |
| | | X | X | | Liesen | Richard | rliesen@uiuc.edu |
| | X | X | X | X | Lisenbee | Larry | lrlisenb@southern.com |
| | | | | X | Liu | Xiaobing | Xiaobin@okstate.edu |
| | | | X | | Long | Nicholas | Nicholas_long@nrel.gov |
| | | X | | | Luo | Dong | luod@utrc.utc.com |
| | | | | X | MacCracken | Mark | mmaccracken@calmac.com |
| | X | X | X | X | McDowell | Tim | Mcdowell@tess-inc.com |
| | X | X | X | X | Neymark | Joel | neymarkj@msn.com |
| | | X | | X | Norford | Les | lnorford@mit.edu |
| | | | X | | Pegues | Jim | james.f.pegues@carrier.utc.com |
| | X | | | | Pinel | Patrice | ppinel@nrcan.gc.ca |
| | X | X | X | X | Pedersen | Curt | cpederse@uiuc.edu |
| | | X | | | Radosevic | Marija | m.radosevic@bwk.tve.nl |
| | | | X | | Ramirez | Bob | Bob.Ramirez@itron.com |
| | X | X | X | X | Reddy | T. Agami | reddyta@drexel.edu |
| | | | | X | Sahlin | Per | per.sahlin@equa.se |
| | | | X | | Selkowitz | Steve | seselkowitz@lbl.gov |
| | X | X | X | X | Shirey | Don | shirey@fsec.ucf.edu |
| | | | | X | Silvetti | Brian | bslivetti@calmac.com |
| | X | | X | X | Smith | Vernon | VSmith@archenergy.com |
| | X | X | X | X | Sonderegger | Robert | Robert.sonderegger@itron.com |
| | X | X | X | X | Spitler | Jeffrey | Spitler@okstate.edu |
| | X | X | X | X | Strand | Rick | rkstrand@uiuc.edu |
| | X | | X | X | Walton | George | GWalton@nist.gov |
| | X | | | | Weaver | Kevin | KWeaver@tamu.edu |
| | | X | | | Wen | Jin | jinwen@drexel.edu |
| | | | X | X | Willson | Jim | jimwill@indy.net |
| | X | X | X | X | Wray | Craig | CPWray@lbl.gov |
| | | X | X | X | Wright | Jonathan | J.A.Wright@lboro.ac.uk |
| | | | | X | Xiao | Dongyi | xdongyi@okstate.edu |
| | | X | X | X | Xu | Peng | pxu@lbl.gov |
| | | | X | X | Yuill | Gren | yuill@unomaha.edu |

# Appendix 1

# RESEARCH PROJECTS

## TC 4.7 RESEARCH PROJECTS STATUS

### Active projects

| # | Title | Joint TC | Cognizant Subcommittee/ Contractor | PMSC | Dates / status |
|---|-------|----------|-----------------------------------|------|----------------|
| 1051-RP | Procedures for Reconciling Computer-calculated Results with Measured Energy Data | | Data Driven Models Drexel Univ., Agami Reddy | Robert Sonderegger (chair) | WS approved June 2003 Start: 12-03 NCE: 02-28-06 (02-08-05) |
| 1311-TRP | 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 6-04 Start: 02-05 |

## Appendix 2

## RESEARCH PLAN

# ASHRAE
# Technical Committee 4.7 Energy Calculations
# 2004-2005 Research Plan
### 8 February 2005

TC 4.7 approved no new RTARs for consideration on the 2005-2006 Research Plan.

| Title | TC Priority 2003-2004 | Prior TC priority | Society status | TC Status | Comments | Subcom |
|---|---|---|---|---|---|---|
| Technical and Usability Enhancements to the Energy Calculation Toolkits | 0 | 3 (2003-2004 | RTAR 2004 accepted | WS draft in progress | Dan Fisher:, Jean LeBrun | SCM |
| Development of a Procedure for Base-lining Energy Use at Large Central Plants | 0 | 2 (2003-2004) | RTAR approved and prioritized by RAC | WS draft in progress | Moncef Krarti will bring to Denver as completed WS | DDM |
| Procedures and Data for High-Performance Residential Design | 0 | 1 (2003-2004) | RTAR accepted | WS draft in progress | Joe Huang, Danny Parker, Tim McDowell | A |

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

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## Appendix 3
## TECHNICAL PAPERS FROM SPONSORED RESEARCH

| RP | Title | Contractor | Approved | Paper |
|---|---|---|---|---|
| 865 | Accuracy Tests | UNO, TAMU | Honolulu, June 2002 | Yuill, G.K. and J.S. Haberl. "Development of Accuracy Tests for Mechanical System Simulations." |
| 1222 | Nodal Models | MIT, Chen | Honolulu, June 2002 | Two papers submitted to Int. J. of HVAC&R Research |
| 1050 | Inverse Modeling TK | U Dayton, TAMU | Kansas City June 2003 | *Kissock;JK., J.S.Haberl D. E. Claridge*, "Inverse Modeling Toolkit - Numerical Algorithms" |
| 1050 | Inverse Modeling TK | U Dayton, TAMU | Kansas City June 2003 | *Haberl, J.S., A. Sreshthaputra, D. E. Claridge, J.K. Kissock,"* Inverse Modeling Toolkit - Applications" |

## <u>Appendix 4</u>
## <u>TC/TG/TRG SPONSORED SYMPOSIA</u>

## Current as of May 2005

*PRESENT:*
<u>Orlando/February 2005</u>
   *None.*

*PLANNED:*
<u>Chicago/January 2006</u>
   *What to do when Data Misbehave (Chair: Agami Reddy)*

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

   *Recent Advances in Energy Simulation (Chair: Dan Fisher)*

   *Validation of building simulation programs through ASHRAE Standard 140 (Chair: Chip Barnaby)*

   *How Low Can You Go? Low-Energy Buildings Through Integrated Design* (Chair: Dru Crawley)

   *Inverse Models for Optimal Control* (Chair: Jeff Haberl)

<u>Québec City/June 2006</u>
   *How and Why to Calibrate a Simulation to Measured Data* (Chair: Robert Sonderegger)

   *Modelling of Residential Cogeneration Systems: IEA/ECBS Annex 42* (Chair: Ian Beausoleil-Morrison)

*PAST:*
<u>Nashville/June 2004</u>
   *Modeling Moisture Sorption/Desorption by Building Materials* (Chair Jan Kosny)

<u>Anaheim / January 2004</u>
   *Applications and Knowledge-based Tools for Enhanced Building Energy Simulation* (Chair, Vern Smith)

<u>Kansas City,  June-July 2003</u>
   *Inverse Methods for Calculating Energy Savings from Energy Conservation Retrofits* (Chair: Jan F. Kreider)

   *Coupling of Building Airflow and Energy Modeling Programs* (Co-sponsored with TC4.10 Chair: Jelena Srebric)

<u>Chicago, January 2003</u>
   *Recent Advances in Energy Simulation:  Building Loads* (Co-sponsored with TC4.1/Chair: Jan Hensen)

<u>Honolulu, June 2002</u>
   *Recent Advances in the Thermal Simulation of HVAC Equipment* (Co-sponsored by TC4.1/Chair: Ian Beausoleil-Morrison)

*Atlantic City,  January 2002*
   *Tools and Techniques for Calibration of Component Models* (TC1.5 sponsor; TC4.7 co-
   sponsor/Chair: Agami Reddy)

## Appendix 5
## TC/TG/TRG SPONSORED SEMINARS

## Current as of May 2005

*PRESENT:*
*Orlando/February 2005*
   *What to do when Data Misbehave? (Chair: Agami Reddy).*

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

   *How and Why to Calibrate a sSimulation to Measured Data* (Chair: Robert Sonderegger)
   *(Note: not approved by ASHRAE Program for Denver)*

   *Application and Experiences with the New Simulation Software* (Chair: Dan Fisher)
   *(Note: not approved by ASHRAE Program for Denver)*

*PAST:*
*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)

*Kansas City, June-July 2003*
   *Successful Applications of Energy Simulation in Building Design* (Chair: Vernon A. Smith)

*Chicago, January 2003*
   *Getting started in Building Simulation* (Chair: Chip Barnaby)

   *Using Monitored Data for Solving Engineering* Problems  (Chair: Agami Reddy)

# ASHRAE TC 4.7 Energy Calculations
## Tuesday, February 8, 2005, 6:00-8:30 p.m.
## Ireland B; Wyndham Palace Resort and Spa
## Orlando, FL

## 1. Roll call and introductions  (Fisher/Strand)
- Convened at 6:06 pm
- Fisher acting chair, Strand acting secretary

## 2. Accept agenda & approve minutes of Kansas City meeting Fisher (Attachment A)
- Agenda accepted (Haberl/Sonderegger  **10-0-0 CNV**)
- Minutes accepted (McDowell/Walton  **10-0-0 CNV**)

## 3. Announcements/Liaisons (Fisher)
- Craig Wray (Section 4 head).  Report on Section 4 head—new idea to have overall goals and objectives for the section, coordination of research areas.
- Dave Banks (TC4.10 representative)—desire to become a liaison to this committee, common interest natural ventilation; Joe Huang to participate.

## 5. Subcommittee reports
### 5.1 Applications:  Chip Barnaby reporting: (**Attachment B)**
- Minutes will be sent via email
- Discussion of goals of subcommittee—to produce results that are more uniform rather than varying by huge amounts between different groups
- Research—went through wish list and RTARs, assignments made and work moving forward on these RTARs, work on generic utility rates to be used for broad studies for cost effectiveness (proto-RTAR), several other RTARs relate to Standard 90.1 and 90.2, suggestion (for Denver?) to spend time to provide a brief tutorial during the full TC meeting on Standard 90.1 and 90.2 (perhaps a presentation by Jason Glazer?)
- Can blogs be used to advance the goals of the subcommittee?

### 5.2 Data-Driven Modeling Agami Reddy (chair) reporting: (**Attachment C)**
- Met with 11 attendees
- Spent time discussing what the subcommittee ought to do (analysis of mission statement), need to have a strong simulation component that acknowledges presence of data—look at ECMs and other measures, attempt to differentiate the subcommittee from the work of other TCs somewhat, intend to modify mission statement as a result of these discussions
- The committee has nine different RTARs for the consideration on the research plan, one RTAR (Bass Abushakra, Baselining Building Energy Use Based on Short Term Data) was returned with comments—this will be revised by Reddy and Vern Smith with the intention of having it ready for the next meeting; another RTAR (Sonderegger "Datamarts") was rejected by the TC at last meeting received interest from TC7.5 who will work with this committee to modify and will seek endorsement of both TC7.4 and TC7.5; third RTAR (how do you rehabilitate missing building data) by Claridge will be worked on by Joe Huang, will seek endorsement of TC4.2; work statement (Baselining of Large Central Plants) rejected by RAC, was dormant for 3-4 years, will be changed and reworked to be submitted as a "new" RTAR, Brandemuehl noted that RTAR was already approved and prioritized and that we only need to rework the work statement and resubmit it, Reddy encouraged to bring a revised/expand RTAR to a work statement to Denver
- 1051-TRP Procedures for Reconciling Computer-Calculated Results with Measured Energy Data (Sonderegger reporting)  Contractor: Drexel University.  Continued good progress in very rigorous academic fashion, should be done with project by next meeting (scheduled to finish by end of 2/05), in process of publishing two ASHRAE papers, **MOTION**—request for no cost extension through February 2006 (motion by Sonderegger, Walton second) **motion carried 10-0-0 CNV**

*5.3 Simulation & Component Models* Phil Haves reporting: **(Attachment D)**
- Discussion of RTAR (Models for Natural and Hybrid Ventilation) along with TC4.10, hope to have an RTAR ready for Denver
- Discussion of RTAR (Internal Surface Convection Modeling) seeking input from TC5.3
- Radiant Modeling—Strand reported that TC6.5 has a work statement that was approved and that committee is pushing forward without the request for co-sponsorship from TC4.7 (concerns about delays in the approval process)
- Moisture Modeling (Kosny)—expect both co-sponsorship from TC4.4 and a completed RTAR by Denver
- Toolkit Extension RTAR—this will move forward led by Lebrun and Fisher
- Research Topic Prioritization/Wishlist—due to lack of time it was proposed that this be done via email by the end of February 2005, discussion of information collection process including interest and willingness to work on the various issues

*5.4 Research*, Joe Huang reporting **(Attachment E)**
- Notes on turnover in the subcommittee chairs, request for help from subcommittee chairs
- TC 4.7 Research Plan Status: one project underway (RP-1051), one (RP-1311) with co-sponsorship from TC4.1 and TC4.5 (first PMSC meeting here in Orlando); two RTARS that are approved but no work statements (High Performance Residential Design—trying to get co-sponsorship and input from other institutions, Danny Parker to help work on moving this along, RTAR in Applications subcommittee), Baselining Energy Use at Large Central Plants approved as RTAR moving to Work Statement phase, Bahnfleth noted potential interest of TC6.1, Krarti noted potential interest of TC9.1, other TCs also discussed; Toolkit Extension RTAR approved but on hold to confirm agreement on the scope before moving this (close to work statement now, should be work statement by Denver)
- Current Research Plan: all three RTARs are accepted and work statements being development; priority—Residential Design top, Baselining next, Toolkit Extension third
- Section 4 Research Subcommittee Chairs Ad Hoc: Brandemuehl reported that strategic research plan seeking user input (send email to John Mitchell at RAPchair@ashrae.net), Mike Vaughn has done a great job to put all information up on web (text of all RTAR and WS), final reports may also be put up on the web at some point, active effort to get research plan to be more accessible to the members, things that remain stagnant on research plans for too long will be dropped (some of ours fall into this category)
- Crawley report on RP-1311: just got underway Waterloo as PI with Barnaby subcontracted

**5.5 Handbook,** Strand (chair) reporting **(no attachment)**
- Still waiting for the galleys from HQ, discussed this with Handbook Liaison Bill Fleming who will contact ASHRAE HQ to speed up the process
- Crawley (incoming chair) requested that the meeting time for this subcommittee be moved

**5.6 Program,** Haberl reporting **(Attachment G)**
- Concerns about availability of meeting rooms, packages due soon
- Orlando: very successful seminar "What to do when data misbehave?"
- Request for seminars (one from each subcommittee) for Denver; proposed ranking , "Neglected Topics" first since it was bumped from Orlando, "Calibrate a Simulation" second, "Application and Experiences" third but still expect all three to be submitted
- Discussion of program items for Chicago and Quebec City as shown in Attachment G
- **MOTION** (Haberl/Reddy) to accept the program prioritization for Denver as listed above, **motion carried 10-0-0 CNV**

**5.7 Standards,** Judkoff reporting **(Attachment H)**
SSPC 140 SMOT for Eval of Building Energy Analysis Computer Programs:
- Second version (2004) of the standard is out and "going like hotcakes"
- Discussion of web site that would include results from the tests in Standard 140 but concerns about ASHRAE controls over the process, committee would develop format of web site and this would then be posted on a DOE web site rather than an ASHRAE web site
- Future developments: next 6-18 months—Furnace BESTEST (NRCan), HERS--BESTEST (? Simplified Programs/Tools, Home Energy Rating System), HVAC BESTEST Volume 2 (NREL); longer term— multi-zone tests, ground coupling tests, daylight/shading/load interaction tests, hydronic system tests

IEA Annex 34/43 Test and Validation of Building Energy Simulation Tools (included in previous topic)
**5.8 Web Site,**
- Rich Liesen will be taking over after Denver meeting, web site will move to ASHRAE server though this is limited to 30MB, main information will be put on ASHRAE server others on remote servers

## 6. Reports on related activities
### 6.1 GPC 20 XML Definitions for HVAC&R
- Chip Barnaby reporting
- Draft in existence but RTAR out of TC1.5 that will keep/get things going
### 6.2 TC 2.8 Sustainability
- Crawley reporting
- Has developed three strong subcommittees (Energy Resources and Materials, Impacts, Process) with enthusiastic attendance and aggressive research agenda
### 6.3 TC 4.1 Load Calculations
- Chip Barnaby reporting
- Work on ASHRAE HQ example (loads calculations using various methods, some information presented at Orlando seminar)
- Consideration of ASHRAE getting into the software business?
- Discussion of load calculation standards for residential and non-residential (Standard 183—placeholder) as a result of movements by ACCA to implement their own standards, proposal to be written by February 18; concerns about lack of sophistication of ACCA method; Curt Pedersen to update the group via the list serve on any developments
### 6.4 TC 4.2 Climatic Information
- Joe Huang reporting
- Committee approved name change from Weather Information to Climatic Information
- 2005 HoF Design Tables will only by on the CD, no longer in the print version; seminar discussing that issue tomorrow
- In the process of pulling all of the climatic information spread throughout the chapters into central place under the control of TC4.2
### 6.5 TC 4.5 Fenestration
- Curt Pedersen reporting
- Nothing to add other than what has already been mentioned
- Pedersen asked that someone else take over as the liaison since he has conflicts with the meeting time, Victor Kootin-Sanwu (University of Cincinnati) volunteered to become the new liaison
- Noted increased collaboration with TC4.1, TC4.5, and TC4.7
- Barnaby discussed briefly a new project about spectral data (bins)
### 6.6 TC 6.5 Radiant Heating and Cooling
- Rick Strand reporting
- Reformulated committee still trying to get traction, approved a work statement for modeling radiant systems/development of a design tool, TC6.5 decided not to seek formal co-sponsorship from TC4.7 for work statement due to potential delays in the project being sent out for bid
### 6.7 TC 7.4 Building Operation Dynamics
- Mike Brandemuehl reporting
- Starting to wrap up dynamic cooling coil model; optimization and other issues also being studied
### 6.8 TC 7.5 Smart Building Systems
- Agami Reddy reporting
- Committee considering merging all three of its subcommittees into a single subcommittee
- Looking at wireless and fault detection
- Two on-going projects: RP 1274 (Packaged Equipment), Drexel University Project
### 6.9 TC 7.6(9.6)Systems Energy Utilization
- Jeff Haberl reporting
- Ad hoc committee with TC2.8 for measuring performance of high performance buildings (forum), response from USGBC is a request to ASHRAE to come up with something as soon as possible, could become a special publication on how to attempt this and what is not currently known
### 6.10 IAI International Alliance for Interoperability
- Phil Haves reporting
- IAI is now a subcommittee within NIBS (National Institute of Building Science)

- General Services Administration will require in 2006 that information used in construction of government buildings be IFC compliant

**6.10 IBPSA (USA, Canada, IBPSA, BS 2005)**
- Phil Haves reported.
- Michel Bernier reported on successful ESim conference in Vancouver.

**6. 10 IBPSA International**
- Spitler reported on BS '05 in Montreal, Michel Bernier noted that over 200 abstracts have been accepted
- IBPSA Board entertaining a proposal to hold BS '07 in China
- Haves reported on IBPSA-USA: discussions with regional USGBC chapters in Boston, California, and Denver for training materials for simulation in sustainable design; plans starting for SimBuild 2006 with Cambridge, MA as the front runner

**7. Old Business**
- No old business

**8. New business**
- Curt Pedersen noted new policy of ASHRAE to publish all seminar presentations, concerns about ASHRAE policy that takes all rights of presenter, concerns about potential copyright violations; Craig Wray commented that authors can decline to provide their presentations (Pedersen and Crawley countered that there is no place on the approval form to state a decline)—Wray and Bahnfleth will follow up this issue; other discussion followed
- IBPSA-Canada has set a date for eSim 2006 (May 2006)—noted to help IBPSA-USA avoid a date conflict

**9. Executive Session**
- None required at this meeting

**10. Adjourn**
- o Meeting adjourned 8:13pm

**Attachments**
    A. Agenda
    B. Applications Subcommittee Minutes
    C. Inverse Methods Subcommittee Minutes
    D. Simulation and Component Models Subcommittee Minutes
    E. Research Subcommittee Minutes
    F. Handbook Subcommittee Minutes (not included—no meeting held in Orlando)
    G. Program
    H. SSPC 140 Minutes

# ASHRAE TC 4.7 Energy Calculations
Tuesday, February 8, 2005, 6:00-8:30 p.m.
Ireland B (Ground Level)
Wyndham Palace Resort
Orlando, Florida

| | |
|---|---|
| 1. Roll call and introductions | Beausoleil-Morrison |
| 2. Accept agenda & approve minutes of Anaheim meeting | Fisher |
| 3. Announcements/Liaisons | Fisher |
| | |
| 5. Subcommittee reports | |
| 5.1 Applications | Barnaby |
| Applications Research Wish List | Barnaby |
| | |
| 5.2 Data-Driven Modeling | Reddy |
| Data-Driven Modeling Research Wish List | Reddy |
| 1051-RP Procedures for Reconciling Computer-Calculated Results with Measured Energy Data (Drexel Univ) | Sonderegger |
| | |
| 5.3 Simulation & Component Models | Haves |
| Simulation & Component Models Research Wish List Update | Haves |
| | |
| 5.4 Research | Huang |
| TC 4.7/ASHRAE Research Plan Status | Huang |
| Section 4 Research Subcommittee Chairs Ad Hoc | Huang |
| 1311-TRP Improving Load Calculations for Fenestration with Shading Devices (TC 4.1/4.5/4.7) | Crawley |
| | |
| 5.5 Handbook | Strand |
| 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 | -- |
| | |
| 6. Related activities reports | |
| GPC 20 XML Definitions for HVAC&R | Haves/Barnaby |
| TC 2.8 Building Environmental Impacts and Sustainability | Crawley |
| TC 4.1 Load Calculation Data and Procedures | Barnaby |
| TC 4.2 Climatic Information | Huang |
| TC 4.5 Fenestration | Pedersen |
| TC 6.5 Radiant Heating and Cooling | Strand |
| TC 7.4 (4.6) Building Operation Dynamics | Brandemuehl |
| TC 7.5 (4.11) Smart Building Systems | Reddy |
| TC 7.6 (9.6) Systems Energy Utilization | -- |
| IAI International Alliance for Interoperability | Haves |
| IBPSA:  USA, Canada, IBPSA, BS 2005 | Haves, Beausoleil-Morrison, Spitler, Bernier |

7. Old Business
8. New business
9. Executive Session
10. Adjourn

ASHRAE TC 4.7 Energy Calculations
## Applications Subcommittee
Tuesday, February 8, 2005, 3:30 – 5 PM
Westminister, Wyndham Palace Resort, Orlando, Florida

## MINUTES

Present: Tim McDowell, George Walton, Mushtaq Ahmad, Patrice Pinel, Jan Kosny, Robert Sonderegger, Jan Hensen, Jeff Haberl, Joel Neymark, Milorad Bojic, Ron Judkoff, Joe Huang, Chip Barnaby
Meeting began at 3:35 p.m.  The agenda circulated and introductions made.  Chip Barnaby asked for comments on the agenda and/or notes from the last meeting.  No comments received.

## SUBCOMMITTEE GOAL

Chip Barnaby then moved the discussion toward the redirection for the goal for the subcommittee and offered "facilitate reproducible simulation results" as a straw statement for discussion.  Sources of variance could then be characterized (error, lack of user information, poorly defined terminology, etc.) and research and/or program directed at individual problems.
Points that came out in the ensuing discussion –
- Consistency of terminology would help reproducibility
- User education should be emphasized.  Program documentation is often the last priority of software development.  George Walton noted the common lack of understanding among users of his application.
- Jan Hensen observed that the name of the subcommittee doesn't match the proposed goal, perhaps the name should be "Application" (no s) in the sense of "how to use simulation."
- Typical results could be very useful for checking simulation results.  Perhaps CBECS data could serve this purpose or reformatted into more useful check data.
- George Walton observed that many users don't know when to stop adding detail to a simulation model, resulting in overly complicated and error-prone input.
- Joel Neymark pointed out that there is a discussion of simulation error sources in the TC 4.7 chapter and supplied Chip Barnaby with that text.
- Several people noted that Standard 140 might (or might not) help users be able to identify unreasonable simulation results.

Simulation calibration discussed.  Probably that topic should move to the Data Driven subcommittee.  Robert Sonderegger reported that there was a discussion of that in the Data Driven meeting.  The consensus of the group was that although calibration does not exactly fit any of the TC 4.7 subcommittees, its home should probably be Data Driven Methods.
Chip Barnaby volunteered to draft a subcommittee goal statement based on the discussion and circulate it before Denver for further discussion.

## PROGRAM

Jeff Haberl discussed the program for the Applications Subcommittee. There were two items of interest:

Seminar -- Denver

>   "Application and Experiences With the New Simulation Software"
>
>   Organized by: TC 4.7 (Applications)
>
>   Chaired by: Dan Fisher
>
>   Status: Moved from Orlando
>
>   Contributions by: (Yuill, Haves, Pedersen, Crawley)

Symposium -- Chicago

>   "Validation of building simulation programs through ASHRAE Standard 140"
>
>   Organized by: TC 4.7 (Applications)
>
>   Chaired by: Chip Barnaby to take over from Ian Beausoleil-Morrison
>
>   Status: 4 papers being considered: (865-RP Yuill & Haberl), Standard 140 & HVAC Bestest Experience (McDowell), Overview of Validation (Judkoff & Neymark), IEA Empirical Validation of Test Suite for Iowa Building (Maxwell, Lutzinheizen)

## RESEARCH

The committee then reviewed the status of current "wish list" research ideas.

RTAR #1: Development of Enhanced Window Simulation Capability for Standard 90.1 Prescriptive simulation. (Jeff Haberl, Joe Derringer). Jeff Haberl said that he had contacted Joe Derringer about this, but that there was no progress to report. He said the issue was running window simulations with U-factors and SHGC with Windows 5, which requires files from actual buildings with real window types. Chip Barnaby thought that this problem might be resolved by 1311-RP ("Improving Load Calculations for Fenestration with Shading Devices", sponsored by TCs 4.1 / 4.5 / 4.7). See below for further discussion re Standard 90.

RTAR #2 "Representative Data for Residential Energy and Load Calculations (Joe Huang). Joe reported that he had made an effort to contact Danny Parker about this RTAR, but nothing had been done. He will continue to work with Danny and strive to make progress for Denver. Several folks said that this needed to take advantage of the Building America program work at NREL.

RTAR #3 "Toolkit of Energy Conservation Measures for ASHRAE Standard 90.1 ECB", and RTAR #4 "Prototypical Buildings for use in ASHRAE Standard 90.1 ECB" need to be merged into one RTAR and someone needs to take responsibility for writing this. No volunteers stepped forward. Jeff Haberl noted that this would be very helpful attempting to measure the performance of new construction.

RTAR #5 "Standard Utility Rate formatter and Converter for the common building energy simulation program". There was extensive discussion about this, leading to Ron Judkoff suggesting that a very helpful step would be the assembly of a collection of prototypical utility rates (both structure and typical prices). This would provide a consensus operating cost basis for broad-based studies. Ron and Joe Huang produced a "half-pager" at the meeting (attached).

RTAR #6 "Sensitivity analysis of the prototypical buildings for 90.1 and the ECMs in the RTAR for enhanced window simulations". This additional RTAR related to Standard 90 led to a discussion on how TC 4.7 could better review and/or inform Standard 90 about the best methods for simulating buildings for 90.1 and 90.2. Suggestions include:

1) Could TC 4.7 chair invite selected individuals to come to 4.7 and give a presentation about what's being done to support 90.1 (Jason Glazer, Merle McBride, Joe Deringer)?
2) Should TC 4.7 write a letter to 90.1 expressing concern about the need to review the algorithms and/or computer simulations being used to support 90.1?

These ideas will be transmitted to the full committee. Chip Barnaby will contact Les Norford. RTAR #7 "Demonstration Toolkit on Building Energy Simulation use in Building Design for Training and ASHRAE Handbook CD+ Use" Jan Hensen noted that ASHRAE is looking for TCs to make simple apps that could go into the handbook to demonstrate how one would take ASHRAE toolkits and insert them into the handbook. Chip Barnaby and Jan Hensen agreed to work on this RTAR.


## OTHER BUSINESS

Chip Barnaby brought up the idea of "Blogs" and "Wiki" and asked how these might help the subcommittee. Examples include the "Wikipeida" web site where an encyclopedia that is compiled by 60,000 volunteers. Robert Sonderegger volunteered to look into Wiki and see if they might be useful for RTAR / WS development and/or user information maintenance. Jeff Haberl agreed to look into WebX or other Web schemes that might serve as electronic whiteboards during meetings
Meeting adjourned 5:05 PM.


## SUMMARY OF ACTION ITEMS

| Who | When | What |
|---|---|---|
| Barnaby | Prior to Denver | Circulate subcommittee goal statement |
| Barnaby | Program deadlines for Chicago presentation | Chair Std 140 Symposium |
| Huang | Prior to Denver | Corral Danny Parker, review Building America, revise RTAR #2 ("Representative Data for Residential Energy and Load Calculations") |
| Judkoff / Huang | Prior to Denver | Expand "Prototypical Utility Rates" RTAR |
| Barnaby / Hensen | March 15 | Demo Toolkit RTAR draft |
| Barnaby | Immediate | Contact Les Norford re better liaison with Standard 90 applications. Plan Denver activities as appropriate |
| Sonderegger | Prior to Denver | Investigate Wikis and what they might do for us. Verbal report, perhaps propose an experiment if a suitable host site can be set up. |
| Haberl | Prior to Denver | Investigate network / web meeting aids (working toward a paperless meeting) |


## TC-4.7 APPLICATIONS SUBCOMMITTEE
## RESEARCH ABSTRACT
# PROTOTYPICAL UTILITY RATES
Ron Judkoff & Joe Huang
2/8/05

One of the valuable uses of building energy simulations is for national or market-sector analysis of energy and cost savings. To facilitate these kinds of studies, researchers have developed analytical tools such as prototypical buildings to represent a large collection of buildings, and prototypical climate zones to represent a large range of climates. Despite their complexity and large impact on the cost-effectiveness and market viability of various building technologies, no such analogue currently exists for utility bill rates. Virtually all such studies simply multiply the simulation results by a flat

electricity rate that can be very different from actual utility rates.   This project would analyze the various rate structures, and rates, and attempt to define a manageable number of prototypical rates. In addition the project would develop weighting factors associated with the prototypical rates. These weighting factors would associate each prototypical utility rate with the number, size, type, and location of buildings to which that prototypical rate is applicable. It would then be much easier to conduct studies in which the national and regional energy cost implications of various efficiency strategies could be analyzed.

## TC 4.7 SUBCOMMITTEE: DATA-DRIVEN MODELING

Monday, 7th February 2005
7:30 to 9:00 p.m.
Orlando, FL
Chair: Agami Reddy (AR)

## MINUTES

Secretary: Jeff Haberl (JH1)

1)  AR started the meeting with introductions at 7:40 pm. An agenda was circulated (Attachment A)

    Attendee list is assembled in Attachment B.

2) AR then asked the committee to review the minutes from Nashville.

Several people mentioned that their names were misspelled. AR  and JH1 tendered their apologies with assurances that this would not happen again.

3) AR then proposed to move directly to Program.

JH1 described the program plan for Data Driven Modeling. And after some discussion, the following four program items were finalized:

| Type | Title | When | Chair | Speakers |
|---|---|---|---|---|
| Seminar | How and why to calibrate simulation to measured data | June 2005 | Sonderegger | Claridge, Reddy, Smith, Abushakra |
| Symposium | What to do when data misbehave | Jan 2006 | Reddy | Claridge, Sonderegger, Gillespie, Elleson |
| Symposium | Inverse models for optimal control | Jan 2006 | Haberl | Sonderegger, Norford, Krarti, Reddy |
| Symposium | How and why to calibrate a simulation to measured data | June 2006 | Sonderegger | Claridge/Liu, Reddy, Smith, Abushakra |

**Action 1**: Sonderegger to contact all four speakers ASAP since the packet has to be complete by Feb 18th.
**Action 2**: Reddy to contact the four speakers and determine if they would be willing to expand their presentations in symposium papers.

4) AR suggested that the scope for Data Driven Models SC be expanded and better defined so that it is both in better harmony with the two other SC of TC 4.7, as well as keep a distinct identify than other TC (such as TC 7.4 and 7.5) which also do inverse modeling. The current scope reads as follows:

Scope of the SC: *To develop physically plausible modeling methodologies and models using monitored data. These models should be applicable to base-casting energy use, secondary and primary*

*equipment, systems and whole building energy use, and should be easy to use and suitable for automation.*

He suggested to include "calibration of simulation" to allow for inverse methods for calibration. RS said that Barnaby had redefined Applications Subcommittee to be focused on making simulation usable, or something to that extent.

All agreed that this possible change in names was worthwhile.

**Action 3:** AR proposed to modify the scope of the SC and discuss it, as well as any change in name,  at Denver.

5) AR suggested that the subcommittee consider tracking 90.1 simulation support/review.
JH1 voiced the opinion that would be too daunting a task.

6) AR then moved discussion to RTAR 1404:Baselining Building Energy Use Based on Short-term Data proposed by Bass Abushakra (BA) which was returned with comments by RAC. Several of the committee members offered their advice on how to respond to these changes. Norford explained as to why the RTAR went to RAC in the first place which was an oversight.

**Action 4**: It was suggested that BA seek out co-sponsorship from TC 7.6 which meets next day at 1:00 pm.

There was then an extensive discussion to provide advice about how to enhance the RTAR to satisfy the need for more specific information about what the RTAR was trying to accomplish this.

**Action 5**: AR to modify the objective and scope of the RTAR and email it to Vern Smith and BA so that a revised RTAR could be discussed and hopefully approved in June.

7) AR then moved discussion to the RTAR by RS "Owner-centered building energy datamarts" proposed by Robert Sonderegger (RS). The draft RTAR was turned down by the main TC last June with suggestions that it be reworked.

RS said that he had done significant work in this area since this RTAR had been written, which has convinced him that this concept needed changing to allow for a more "dynamic datamart".

JH1 said that he had been doing work recently on developing a similar tool for evaluating commercial building windows.

AR mentioned that a very similar idea was floated by Steve Blanc in TC 7.5 and that he had spoken to Blanc about it. A similar interest was also shown by members of TC 7.4. AR suggested getting endorsement of 7.4 and 7.5.

**Action 6:** AR agreed to revise this RTAR and email to RS and Blanc so that this RTAR could be presented again to the main TC in June. He will also seek support from 7.4 and 7.5

8) AR then moved discussion to the RTAR originally proposed by Claridge on filling gaps in data which was tasked to Joe Huang (JH2) last January.

JH2 apologized for not working on this RTAR. He said that this RTAR still needed to be discussed at TC 4.2 which would be interested. On the weather side he had suggested making it simple. Claridge agreed that simple methods worked best, but that there were cases where more sophisticated methods were needed.

**Action 7:** JH2 to work on this RTAR and have it ready by June for discussion. He will also seek endorsement from TC 4.2

9) AR then moved discussion to the WS on baselining large central plants. AR said that to his understanding this WS was returned by RAC with recommended changes. He apologized for not working on it, and suggested that since Krarti, who originally championed this WS was present, it would be best if he were to take it up again.

**Action 8**: Moncef Krarti agreed to revise the WS into an RTAR and resubmit. He will contact Mike Vaughn to get a copy of rejection letter from RAC so that the WS can be appropriately modified and a rebuttal letter prepared later by the SC at the time of resubmission.

Meeting adjourned at 9:10 pm

AGENDA

1. Introductions

2. Approval of the minutes from the Nashville, TN meeting, June 28th 2004

 1. Discussion and prioritizing "Research Wish List"- Long Range Research Plan

4. Discussion of WS and RTARs

- RTAR- Methodology to identify which specific load curtailment measures…..- Sonderegger

- RTAR- Characterizing building cooling thermal loads from short-term monitoring- Abushakara

- RTAR- Determining Standard (Robust) Procedures for Filling Data Gaps Important for Energy  Analysis - Huang

WS- Development of a procedure for baselining energy use at large central plants - Reddy

5. Discussion on:
   - better ways to digest past research
   - how best to disseminate research results
   - how best to coordinate research and results with allied TC and SC
   - maintain expertise within SC even when membership changes

6. Program

7. Old Business

8. New Business

9. Adjourn

| | 6/05 | 2/05 | NAME | *EMAIL* |
|---|---|---|---|---|
| | | X | Bass Abushakra | Abushakr@msoe.edu |
| | | X | David Claridge | dclaridge@tamu.edu |
| | | X | Jeff Haberl | jhaberl@esl.tamu.edu |
| | | X | Joe Huang | yjhuang@lbl.gov |
| | | X | Moncef Krarti | krarti@colorado.edu |
| | | X | Les Norford | lnorford@mit.edu |
| | | X | Vernon Smith | vsmith@archenergy.com |
| | | X | Robert Sonderegger | Robert.sonderegger@itron.com |

| | | X | Kevin Weaver | kwaever@tamu.edu |
|---|---|---|---|---|
| | | X | Victor Kootin-Sanwu | Victor.kootin-sanwu@uc.edu |
| | | X | Mushtaq Ahmad | mushtaq@esl.tamu.edu |

# TC4.7 Simulation and Component Models Subcommittee

## Meeting Minutes: Monday, February 07, 2005

## Introductions and Agenda Review

The meeting was scheduled to run from 6:00pm to 7:30pm.  The meeting was called to order at ~6:10 but most attendees did not arrive until ~6:30.  The ultimate attendance was ~30.

## Program

Programs for Denver and Chicago were discussed.  See Program Subcommittee report for the current status of all program items.

- **Symposium** on *Recent Advances in Energy Simulation* (Chaired by Dan Fisher).  Originally planned for Denver, now planned for Chicago.  Dan has three reviewed papers in hand.  One was pulled by the Program Committee because of commercialism concerns but it is expected that this issue will be resolved.  Mike Brandemuehl has a paper on the modeling work performed in 1197-RP that is nearly ready for submission. There is an opportunity for a fifth paper if it could be ready for review by early March.
- **Symposium** on *Validation of building simulation programs through ASHRAE Standard 140.*  Three papers (two have completed the review process): 865-RP (Yuill & Haberl), Standard 140 & HVAC Bestest Experience (McDowell), Standard 140 & TRNSYS/EnergyPlus Experiences (Witte, Henniger) Provisionally planned for Chicago – **needs chair**
- **Symposium** on *Thermal Modeling of Phase change Materials in Building Envelopes: Old Problem, New Development.*  (Chaired by Jan Kosny) Planned For Chicago.
- **Symposium** on *How Low Can You Go? Low-energy Buildings Through Integrated Design* (Chaired by Dru Crawley) 1 paper in hand.  Planned for Chicago(?)

- **Seminar** on *Neglected Topics in Building Simulation* (Chaired by: Ian Beausoleil-Morrison)  Status: Moved from Orlando, planned for Chicago.  Contributions: (Spitler, McDowell, Huang, Brandemuehl, Pedersen)

## Work Statements/RTARS in Progress

*Models for Natural and Hybrid Ventilation* (George Walton, Joe Huang, Paul Linden, Philip Haves).  (a HIGHEST priority item)

Some minor additions had been made to the RTAR presented in Nashville.  Discussion focussed on the need for experimental validation of models to predict convective heat transfer in unmixed naturally ventilated spaces. George Walton noted that work by Jim Axley indicates that the assumptions used in interzone airflow models such as COMIS and CONTAM may not be valid at large airflow rates.  In addition, there may be multiple solutions under some conditions of interest.  Concern was expressed that there may be little or no existing

experimental data suitable for validation purposes; in which case, the scope of the project would have to be rather narrowly defined if new experimental data are to be generated by the project.  Action items are to make further efforts to involve TC4.10 and to assess the availability of existing experimental data from outside North America.

*Internal Surface Convection Modeling* (Dan Fisher, Ian Beausoleil-Morrison).  (a HIGHEST priority item)

Dan Fisher presented a revised RTAR.  The issue of which diffuser types should be included was discussed; it was recommended that Dan seek input from TC5.3 on this issue.  The question of whether the scope should be extended to include fenestration; the consensus was that this should be left to a follow-on project.

*Assess impact of explicit modelling of radiant heating (in-floor, wall panels, gas fireplaces, etc.) and radiant cooling and devise appropriate modelling strategies* (Rick Strand, Jan Kosny).  (a HIGHEST priority item)

No developments were reported.

*Moisture absoprtion/desorption by building materials and furnishing* (Kosny, Karagiozis, Holm).  (a HIGHEST priority item)  An RTAR on this topic from TC4.4 was returned as being too theoretical and lacking any experimental validation.  There is the possibility of collaboration with a European Union research project on the topic – this is expected to be resolved within the next few weeks.

*Create algorithms to allow mapping of manufacturer's or available data to simulation inputs* (Milorad Bojic, Bruce Billedeaux, Mike Brandemuehl).  No progress was reported.

*Technical and Usability Enhancements to the Energy Calculation Toolkits* RTAR 2004-19 (Dan Fisher, Jean Lebrun)  Jean Lebrun emailed some suggestions shortly before the meeting.  Dan will interact with Jean and others to move this forward.

*Energy Performance Simulation Model for Refrigerated Warehouses* (Joe Huang, Jan Kosny).  There was no interest from other TC's so the topic is to be dropped

## Review of Research Topic Prioritization

A process for reprioritizing the subcommittee's 'wish list' had been prepared but was not carried out for lack of time.  It is planned to carry it out by email by the end of March.

## Adjourn

The meeting was adjourned at 7:35.


Submitted by Philip Haves

# ASHRAE
# Research Committee 4.7 Energy Calculations
# 2004-2005 Research Plan
## 8 February 2005

TC 4.7 approved no new RTARs for consideration on the 2004-2005 Research Plan.

| Title | TC Priority 2003-2004 | Prior TC priority | Society status | TC Status | Comments | Subcom |
|-------|------------------------|-------------------|----------------|-----------|----------|--------|
| Technical and Usability Enhancements to the Energy Calculation Toolkits | 0 | 3 (2003-2004 | RTAR 2004 accepted | WS draft in progress | Dan Fisher:, Jean LeBrun | SCM |
| Development of a Procedure for Base-lining Energy Use at Large Central Plants | 0 | 2 (2003-2004) | RTAR approved and prioritized by RAC | WS draft in progress | Moncef Krarti will bring to Denver as completed WS | DDM |
| Procedures and Data for High-Performance Residential Design | 0 | 1 (2003-2004) | RTAR accepted | WS draft in progress | Joe Huang, Danny Parker, Tim McDowell | A |
| Procedures for Reconciling Computer-Calculated Results With Measured Energy Data (1051-TRP) | 0 | | Contract award approved, June 2003 | Project under way | Project delayed, Agami Reddy PI, NCE to end Feb 2006 | DDM |
| Improving Load Calculations for Fenestrations with Shading Devices (1311-RP) | Co-sponsors TC 4.1, TC 4.5 | | | Project under way, started Fall 2004. | 1st PMS meeting held in Orlando Feb 2004 | |

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

**Additional TC 4.7 RTARs and WSs in Process – status as of 8 February 2005**

| Title | TC Priority 2004-2005 | Prior TC priority | Society status | TC STATUS | Lead/ Comments | Subcom & Priority |
|---|---|---|---|---|---|---|
| Models for Natural and Hybrid Ventilation | | HIGHEST | | RTAR under development | Paul Linden, Joe Huang, Phil Haves (some progress made on RTAR) | SCM |
| Internal Surfaces Convection Modeling | | HIGHEST | | Revised RTAR. Not ready for full TC discussion ? | Dan Fisher, Ian Beausoleil-Morrison | SCM |
| Explicit Modeling Strategies for Radiant Heating and Cooling | | HIGHEST | | New RTAR draft (Jan-03); no progress Jun-03 | Rick Strand, Jan Kosny | SCM |
| Moisture absorption/desorption by building materials and furnishings | | HIGHEST | | Concept proposed Jan-03; Draft RTAR distributed for comment Jun-03 | Rich Liesen, Jan Kosny, Mike Brandemuehl (forum input). Needed for better night ventilation modeling. | SCM |
| Algorithms for Mapping Manufacturer's or Available Data to Simulation Inputs | | | | no progress | Milorad, Bruce Billedeaux, Mike Brandemuehl | SCM |
| *Owner-centered Building Energy DataMart* | | | | *RTAR draft returned from Full TC* | **Robert Sonderegger** | *DDM* |
| *Baselining Building Energy Use Based on ShortTerm Data* | | | | *RTAR approved by TC, returned by RAC Dec 2004* | **Agami Reddy, Bass Abushakara** | *DDM 3* |
| *Development of a procedure for baselining energy use at large power plants* | | | | *Draft WS being reworked into RTAR* | **Jeff Haberl, Moncef Krarti, Agami Reddy** | *DDM 4 (Jun-03)* |
| *Determining standard (robust) procedures for filling data gaps important for energy analysis* | | | | *Concept proposed Jan-03; discussed Jun-03* | *Dave Claridge, Joe Huang (TC 4.2 co-sponsor)* | *DDM 5* |
| *Procedures for adjusting baseline model for M&V projects due to creep and other causes.* | | | | *Concept proposed Jun-03* | **Dave Claridge** | *DDM 6* |
| Algorithms for Mapping Manufacturer's or Available Data to Simulation Inputs | | | | New RTAR draft (Jan-03); no progress Jun-03. | Milorad Bojic, Bruce Billedeaux, Mike Brandemuehl | SCM |

SCM = Simulations and Component Models

DDM = Data Driven Modeling (formerly Inverse Methods) / A = Applications

**Work Statements listed below were on Prior Society Research Plans, but will not go forward for reasons listed.**

| Title | TC Priority 2004-2005 | Prior TC priority | Society status | TC Status | Lead | Sub-com |
|---|---|---|---|---|---|---|
| Algorithms for Mapping Manufacturer's or Available Data to Simulation Inputs | | | | New RTAR draft (Jan-03); no progress Jun-03. | Milorad Bojic, Bruce Billedeaux, Mike Brandemuehl | SCM |
| Development of Comparative Test Cases for Evaluating Simulation Models of Slab, Crawl Space and Basement Heat Transfer Through Adjacent Ground | 0 | 2 (2001-2002) | RTAR, accepted | Hold, IEA work underway | | SCM |
| Inverse Bin Procedures for Analyzing Energy Savings | 0 | 3 (2001-2002) | RTAR, accepted | Drop | Subcommittee reviewed draft WS at Atlantic City and decided not to develop | DDM |
| Standard Operating Conditions in North American Residential Buildings (1163-TRP) | | | Cancelled by Tech Council after bids received and evaluated | | | A |
| Development of Detailed Descriptions of HVAC Systems (Templates) for Energy Simulation Programs (1198-WS) | | 3 (2000 – 2001) | Rejected 3/00 (?) | TC will not pursue further (Jan-02) | | SCM |

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

# ASHRAE TC4.7 HANDBOOK SUBCOMMITTEE NOTES
Orlando


The handbook chapter has been completed.  The subcommittee did not meet.

**TC 4.7 program plan**
**Orlando ASHRAE Meeting**
**February 8th, 2005**

## Scheduled for Orlando/February 5-9th, 2005

Seminar

"What to do When Data Misbehave?"

Organized by: TC 4.7 (Data Driven Models)

Chaired by: Agami Reddy

Seminar 36, Tuesday, 8:00 to 10:00 a.m., (Ireland C)

Status: (Contributors: J.Elleson, R.Sonderegger, Gillespie, Claridge, Levermore)

## Scheduled for Denver/June 25-29th, 2005     ***Package Due 2/18/2005***

Seminar (Priority #1)

"Neglected Topics in Building Simulation"

Organized by: TC 4.7 (Simulation and Component Models)

Chaired by: Ian Beausoleil-Morrison

Status: Moved from Orlando

Contributions: (Spitler, McDowell, Huang, Brandemeuhl, Pedersen)

Seminar (Priority #2)
"How and Why to Calibrate a Simulation to Measured Data"

Organized by: TC 4.7 (Data Driven Models)

Chaired by: Robert  Sonderegger

Status: New (contributions by: Claridge, Reddy, Smith, Abushakra)

Seminar (Priority #3)

"Application and Experiences With the New Simulation Software"

Organized by: TC 4.7 (Applications)

Chaired by: Dan Fisher

Status: Moved from Orlando

Contributions by: (Yuill, Haves, Pedersen, Crawley)

**Scheduled for Chicago/January 27-31st, 2006     \*\*\*Package Due 8/5/2005 \*\*\***

Symposium

    "What to do When Data Misbehave?"

    Organized by: TC 4.7 (Data Driven Models)

    Chaired by: Agami Reddy

    Status: New (contributions by: Claridge, Sonderegger, Gillespie, Elleson)

Symposium

    "Thermal Modeling of Phase Change Materials in Building Envelopes: Old Problem, New Developments"
    Organized by: TC 4.7 (Sim. and Com. Models)
    Chaired by: Jan Kosny
    Status:  4 papers received, 1 rejected for translation probs.

Symposium

    "Recent Advances in Simulation"
    Organized by: TC 4.7 (Sim and Comp Models)

    Chaired by: Dan Fischer

    Status: 2 papers in hand, 1 paper from Brandemuehl - 1197

Symposium

    "Validation of building simulation programs through ASHRAE Standard 140"

    Organized by: TC 4.7 (Applications)

    Chaired by: Chip Barnaby

    Status: 4 papers being considered:  865-RP (Yuill & Haberl),

    Standard 140 & HVAC Bestest Experience (McDowell),

    Overview of Validation (Judkoff & Neymark),

    IEA Empirical Validation of Test Suite for Iowa Building (Maxwell, Lutzinheizen)

Symposium

    "How Low Can You Go? Low-Energy Buildings Through Integrated Design"
    Organized by: TC 4.7 (Sim. and Com. Models)
    Co-sponsored by: TC 2.8 & 7.1
    Chaired by: Dru Crawley
    Status: New, (1) paper in hand, 1 paper from Jeff Christensen?

Symposium

    "Inverse Models for Optimal Control"
    Organized by: TC 4.7 (Data Driven Models)

    Chaired by: Jeff Haberl

    Status: New (contributions by: Sonderegger, Norford, Krarti, Reddy)

**Quebec City/June 24-28th, 2006   \*\*\* Package Due 2/10/2006 \*\*\***

Symposium
　　　"How and Why to Calibrate a Simulation to Measured Data"

　　　Organized by: TC 4.7 (Data Driven Models)

　　　Chaired by: Robert Sonderegger

　　　Status: New (contributions by: Claridge/Liu, Reddy, Smith, Abushakra)

Symposium
　　　"Modelling of Residential Cogeneration Systems: IEA/ECBS Annex 42"
　　　Organized by: TC 4.7 (Sim. And Com. Models)
　　　Chaired by: Ian Beausoleil-Morrison
　　　Status: New

**Dallas/January 27-31st, 2007**

**Long Beach/June 23-27th, 2007**

**SSPC 140 Orlando Meeting Summary – 2/7/05 (submitted 2/8/05)**

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

## PUBLICATION OF STANDARD 140-2004

- Continuous maintenance revision 140-2004 was published Dec 16, 2004, and is available
  from ASHRAE. This revision rolls together 140-2001 (IEA BESTEST envelope tests)
  and Addendum *a* to 140-2001 (HVAC BESTEST Vol. 1 unitary space cooling equipment
  cases).

## Consideration of SSPC 140 Maintaining a Standard 140 Results Web Site

**SSPC 140 agreed to create a format and encourage DOE to use that format for**

**posting Std 140 data on the DOE web site. An ad-hoc subcommittee was formed to**

**treat the above motion**

SubC Chair: Neymark
SubC Members: McDowell, Pegues, Witte, Knebel (as proofreader)

**Addition of new test procedures (as addenda):**

*Furnace BESTEST:*

Furnace BESTEST was originally developed by NRCan (Beausoleil-Morrison and Purdy) and
field tested during IEA SHC Task 22. NRCan (Patrice Pinel) recently incorporated detailed
comments by Neymark related to adaptation of Furnace BESTEST to 140.  A draft addendum is
expected to be distributed to full SSPC 140 for review and "internal" field trials during February.

*HERS BESTEST:*

HERS BESTEST was originally developed by NREL (Judkoff and Neymark) in conjunction with
the HERS (Home Energy Rating Systems) Council.  HERS BESTEST is similar to IEA
BESTEST, but is meant for software that produce seasonal outputs rather than hourly outputs
(hourly outputs are required by IEA BESTEST). Florida Solar Energy Center (Fairey) is
championing adaptation of HERS BESTEST for Std 140, and is moving forward with adaptation
of HERS BESTEST for Std 140 based on PC discussion comments at the meeting.

*HVAC BESTEST VOLUME 2:*

NREL will put together a draft for adaptation of HVAC-BESTEST Volume II to Standard 140 by Sept 2005. Volume II is similar to Volume I except that dynamic cases that cannot be solved analytically are treated.

## UPDATE FOR IEA TASK/ANNEX 34/43

This new IEA research effort focuses on validation and testing of building simulation tools.  The work is mostly in its early stages.  Some of this work could be included with Standard 140 in the future.  The following projects are included:

- Comparative Tests (Software-to-software comparisons)
    - o  Ground coupled heat transfer related to floor slabs and basements. The objective of this work is to develop an enhanced set of reference results using numerical methods programs, and employing a 3-D analytical solution reference (Delsante et al, which was included in RP-1052 [Spitler et al]) as a reference for determining that the numerical methods programs are being properly implemented. Additional test cases will allow other simulation programs to be compared with detailed numerical methods results. An initial set of results for these cases has recently been generated. Revisions to the test specification are planned based on these initial results.
    - o  Multi-zone envelope test cases including single- and multi-zone air flow. Non-airflow test cases include an analytical verification test for multi-zone conduction and additional in-depth cases for testing:
        - ▪ 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.
- Empirical Validation Tests (Compare software to empirical data)
    - o  Daylighting/shading/load interaction – EMPA (Switz.); ERS (Iowa)
    - o  Double-façade building – Aalborg U. (Denmark); FIBP (Germany);
    - o  Mechanical equipment test cases:
        - ▪ Focusing on water-side components/systems: chillers, boilers, pumps, piping, valves, etc