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: July 1, 2014

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: January 21, 2014 LOCATION: New York

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MEMBERS PRESENT** | **YEAR**  **APPTD** | **MEMBERS**  **ABSENT** | **YEAR**  **APPTD** | **EX-OFFICIO MEMBERS & ADD'L ATTENDANCE** |
| Tim McDowell (CHAIR) | 2012 | Dan Fisher | 2011 | See attendance list for |
| Chip Barnaby (HDBKSC CHR) | 2010 | Malcolm Cook (Non-Quorum) | 2012 | additional attendees. |
| Chris Balbach (DDM CHAIR)  R | 2010 |  |
| Bass Abushakra (SEC) | 2012 |  |  |  |
| Keith Cockerham | 2013 |  |  |  |
| Michael Wetter | 2011 |  |  |  |
| Kamel Haddad | 2013 |  |  |  |
| Ronald Judkoff | 2013 |  |  |  |
| Erik Kolderup | 2013 |  |  |  |
| Wangda Zuo | 2013 |  |  |  |

Total attendance of voting members: 10 present, 1 absent.

DISTRIBUTION

**ALL MEMBERS OF THE TC/TG/TRG**

TAC CHAIR Walter T. Grondzik

TAC SECTION HEAD Michael R. Bilderbeck

SPECIAL PUBLICATIONS LIAISON Francis A Mills

STANDARDS LIAISON James Dale Aswegan

HANDBOOK LIAISON David P Yuill

RAC RESEARCH LIAISON Srinivas Garimella

PROF DEV COMM LIAISON Hugh D. McMillan

CHAP TECH TRANSFER LIAISON Harris Sheinman

STAFF LIAISON (RESEARCH) Michael Vaughn

STAFF LIAISON (TECH SERVICES) Michael Vaughn

STAFF LIAISON (STANDARDS) Stephanie Reiniche

**These draft minutes have not been approved and are not the official, approved record until approved by this committee.**

**ASHRAE TC 4.7 Energy Calculations  
New York Meeting**

**MOTIONS AND ACTION ITEMS**

MOTION: A motion passed, to accept the agenda and to table the minutes of the Denver meeting for approval by mail ballot; 9-0-0 CNV.

MOTION: A motion by Barnaby and seconded by Judkoff to co-sponsor the RTAR from TC4.4 (Venting Strategies & Components in Attic Spaces with Sloped Roofs). The TC accepted it with two conditions (results being available for energy simulation, and references on the outdoor pressure coefficients). Motion passed 9-0-0 CNV.

MOTION: Seattle Program: four seminars (Standard MOT for Calibration; Data Visualization; and two renamed and previously rejected seminars). McDowell moved and Barnaby seconded to approve this program for Seattle 9-0-0 CNV.

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|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TC/TG/TRG MEETING SCHEDULE** | | | | | | | | | | | |
| **LOCATION –**  **past 12 months** | | | **DATE** | | | **LOCATION - planned next 12 months** | | | **DATE** | | |
| Dallas  Denver | | | January 29, 2013  June 25 2013 | | | Seattle  Chicago | | | July 1 2014  January 27 2015 | | |
| **TC/TG/TRG SUBCOMMITTEES** | | | | | | | | | | | |
| **Function** | | | | | | | **Chair** | | | | |
| Program  Research  Handbook  Standards  Data Driven Models  Simulation and Component Models  Applications | | | | | | | Keith Cockerham  Jeff Haberl  Erik Kolderup  Joel Neymark  Chris Balbach  Drury Crawley  Joe Huang | | | | |
| **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** | |
| 2017 Fundamentals | | Energy Estimating Methods | | 19 | | | | June 2012 | | Kolderup/Yuill | |
| **STANDARDS ACTIVITIES - List and Describe Subjects** | | | | | | | | | | | |
| SPC 140 Standard Method of Test for Building Energy Software – Joel Neymark  SPC 205 Data Exchange Protocols for Energy Simulation of HVAC&R Equipment Performance - Chip Barnaby | | | | | | | | | | | |
| **TECHNICAL PAPERS from Sponsored Research - Title, when presented (past 3 yrs. present & planned)** | | | | | | | | | | | |
| Appendix 3 | | | | | | | | | | | |
| **TC/TC/TRG Sponsored Symposia - Title, when presented (past 3 yrs. present & planned)** | | | | | | | | | | | |
| Appendix 4 | | | | | | | | | | | |
| **TC/TG/TRG Sponsored Seminars - Title, when presented (past 3 yrs. present & planned)** | | | | | | | | | | | |
| Appendix 5 | | | | | | | | | | | |
| **TC/TG/TRG Sponsored Forums -** **Title, when presented (past 3 yrs. present & planned)** | | | | | | | | | | | |
| Appendix 6 | | | | | | | | | | | |
| **JOURNAL PUBLICATIONS -** Title, when published (past 3 yrs. present & planned) | | | | | | | | | | | |
| None | | | | | | | | | | | |

**Attendance**

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

**Appendix 1**

# TC 4.7 Research Projects Status

**ASHRAE**

**Technical Committee 4.7 Energy Calculations**

**(January 21, 2014)**

## Active projects

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#** | **Title** | **Joint TC** | **Cog SC/ Contractor** | **PMSC** | **Dates / status** |
| 1588-RP | Representative layer-by-layer descriptions for fenestration systems with specified bulk properties such as U-factor and SHGC | 4.5 | SCM/  White Box Technologies |  | In-Progress |
| 1629-RP | Testing and Modeling Energy Performance of Active Chilled Beam Systems | 5.3 | Applications/ |  | In-Progress |

## Completed projects

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#** | **Title** | **Joint TC** | **Cog SC/ Contractor** | **PMSC** | **Dates / status** |
| 1416-RP | Development of Internal Surface Convection Correlations for Energy and Load Calculations | 4.1 | SCM,,  Univ of Texas | Dan Fisher (Chair),  Steve Bruning,  Jan Kosny | Completed. Final report approved by Full Committee in Chicago Jan 24, 2012. |
| 1404-RP | Modeling, Analysis, and Reporting Protocols for Predicting Annual Energy Performance from Short-Term Building Energy Monitoring |  | DDM,  Milwaukee School of Engineering | R. Sonderegger (Chair)  J. Haberl,  V. Smith | Completed. Report approved by Full Committee in Chicago Jan 24, 2012. |
| 1413-RP | Developing standard procedures for filing missing weather data | 4.2 (lead) | Oklahoma State University |  | Completed. |

**Appendix 2**

**RESEARCH PLAN**

**ASHRAE**

**Technical Committee 4.7 Energy Calculations**

**Research Plan (January 21, 2014)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Title** | **Society status** | | | **TC 4.7 Status** | | **Actors or TC 4.7 Prime Contact** | | **Subcom- mittee\*** |
| **Active co-sponsored projects led by another TC** | | | | | | | | |
| 1413-RP  Developing standard procedures for filing missing weather data (TC 4.2 lead) | | Completed | Completed. | | Chip Barnaby  (member TC 4.2) | | DDM | |
| 1588-RP  Representative layer-by-layer descriptions for fenestration systems with specified bulk properties such as U-factor and SHGC (Co-sponsor TC 4.5) | | In Progress | In Progress | |  | | SCM | |
| 1629-RP  Testing and Modeling Energy Performance of Active Chilled Beam Systems (Co-sponsor tc 5.3) | | In Progress | In Progress | |  | | Applications | |
| **WSs approved by TC** | | | | | | | | |
|  | |  |  | |  | |  | |
| **WS under development** | | | | | | | | |
| 1456-RP  Assess and Implement Natural and Hybrid Ventilation Models in Whole-building Energy Simulations  (Phase Two) | RTAR unnecessary for Phase Two | | | WS under development (pending since Jan. 2011) | | Joe Huang , Simon Rees, Eric Kolderup, Malcolm Cook, Iain MacDonald | | SCM |
|  | | | | | | | | |
|  |  | | |  | |  | |  |

**Appendix 3**

**TECHNICAL PAPERS FROM SPONSORED RESEARCH**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **RP** | **Title** | **Contractor** | **Approved** | **Paper** |
|  | | | | |
| 1404 | ASHRAE RP1404 - *Measurement, Modeling, Analysis and Reporting Protocols for Short-term M&V of Whole Building Energy Performance* | MSOE-ASU | Louisville June 2009 | Singh, Reddy, Abushaka 2013 “Predicting Annual Energy Use in Buildings Using Short-Term Monitoring and Utility Bills: The Hybrid Inverse Model Using Daily Data (HIM-D)” |
| 1404 | ASHRAE RP1404 - *Measurement, Modeling, Analysis and Reporting Protocols for Short-term M&V of Whole Building Energy Performance* | MSOE-ASU | Louisville June 2009 | Singh, Reddy, Abushaka 2014 “Predicting Annual Energy Use in Buildings  Using Short-Term Monitoring:  The Dry-Bulb Temperature  Analysis (DBTA) Method” |
| 1051 | Procedures for Reconciling Computer-calculated Results with Measured Energy Data | Drexel | Chicago  January 2006 | Reddy, T.A., 2006. "Literature Review on Calibration of Building  Energy Simulation Programs: Uses, Problems, Procedures, Uncertainty and  Tools", ASHRAE Transactions, vol 112(1). |
| 1051 | Procedures for Reconciling Computer-calculated Results with Measured Energy Data | Drexel | Chicago  January 2006 | Sun J. and Reddy T.A., 2006, "Calibration of Building Energy Simulation Programs Using the Analytic Optimization Approach (RP-1051)", Int. J HVAC&R Research 12(1) 177-196. |
| 1051 | Procedures for Reconciling Computer-calculated Results with Measured Energy Data | Drexel | Chicago  January 2006 | Reddy, T.A., I. Maor and C. Ponjapornpon, 2006, "Calibrating  Detailed Building Energy Simulation Programs with Measured Data- Part I:  General Methodology", accepted for publication in Int. J HVAC&R Research. |
| 1051 | Procedures for Reconciling Computer-calculated Results with Measured Energy Data | Drexel | Chicago  January 2006 | Reddy, T.A., I. Maor and C. Ponjapornpon, 2006, "Calibrating  Detailed Building Energy Simulation Programs with Measured Data- Part  II: Application to Three Case Study Office Buildings", accepted for publication in Int. J HVAC&R Research. |
| 1050 | Development of an Inverse Model Toolkit | Univ. of Dayton,  Texas A&M | December 2001 | Kissock, K., Haberl, J., Claridge, D. 2003. “Inverse Model Toolkit (1050-RP): Numerical Algorithms for Best-Fit Variable-Base Degree-Day and Change-Point Models,” ASHRAE Transactions-Research, Vol. 109, Pt. 2, pp. 425 – 434. |
| 865 | Accuracy Tests for Simulations of VAV Dual Duct, Single Zone, Four Pipe Fan Coil and Four Pipe Induction Air Handling Systems (4796) | Univ Nebraska, Texas A&M | July 2002 | Yuill, G., Haberl, J. 2006. “Accuracy Tests for Simulations of VAV Dual Duct, Single Zone, Four Pipe Fan Coil and Four Pipe Induction Air Handling Systems (4796),” ASHRAE Transactions-Research, Vol. 112, Pt. 1 (January). |
| 865 | Accuracy Tests for Simulations of Constant Volume, Dual Duct and Variable Volume Air Handling Systems (4796). | Univ. Nebraska,  Texas A&M | July 2002 | Yuill, G., Haberl, J., Caldwell, J. S. 2005. “Accuracy Tests for Simulations of Constant Volume, Dual Duct and Variable Volume Air Handling Systems (4796, RP-865),” ASHRAE Transactions-Research, Vol. 111, Pt. 2, No. 4796, pp. 137 – 153 (June). |

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

**Appendix 3** (continued)

TECHNICAL PAPERS FROM SPONSORED RESEARCH

**Appendix 4**

**TC/TG/TRG SPONSORED TRANSACTIONS SESSIONS**

**Current as of June 2009 (never updated since. Should be dropped)**

**PRESENT:**

**PLANNED:**

**PAST:**

Louisville, June 20-24, 2009

Transaction “Improving Load Calculations for Fenestrations with Shading Devices”

Chicago, January 24-28, 2009

HVAC&R Research Seminar “Synthesis of Optimum HVAC System Configurations”

New York City/January 2008

How Low Can You Go?

Recent Advances in Energy Simulation (Chair: Dan Fisher)

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

Application of Inverse Models (Chair: Jeff Haberl)

**Appendix 5**

**TC/TG/TRG SPONSORED SEMINARS**

**Current as of January 2012**

**PRESENT:**

**Chicago, January 21-25, 2012**

“Standard 205P: Hassle-Free Equipment Performance Data for Energy Modeling

Chair: Chris Balbach

Speakers: Chip Barnaby, Mark Hydeman, Neal Kruis

“Improving Energy Modeling Consistency”

Chair: Joe Huang

Speakers: Erik Kolderup, Alan Daly, Ellen Franconi

“Integrated Multi-domain Simulations for Innovative Building Design and Operation, Part One”

Chair: Wangda Zuo

Speakers: Jan Hensen, John Zhai, Ian Beausoleil-Morrison

“Integrated Multi-domain Simulations for Innovative Building Design and Operation, Part Two”

Chair: Jerone Gagliano

Speakers: Michael Wetter, Wangda Zuo ,Yao-Jung Wen, Christoph Van Treeck

**PLANNED:**

**San Antonio, June 23-27, 2012**

“Three perspectives on SPC 205P” (title TBD)

Chair: Chip Barnaby

Three proposed speakers, including a consumer of 205P, a product manufacturer , and a software vender

Follow-up on model calibration (title TBD)

Chair: Chris Baker

Speakers: Jason Steinbock, Xia Fang, Joe Huang

“Using measured data of various fidelity with simulations”

Chair: Dave Bosworth

Speakers: Eric Bonnema, Jesse Dean, Tim McDowell

“Methods for quantifying water savings using regression models”

Chair: Chris Balbach (may be changed)

Speakers: Chris Balbach, Jerone Gagliano, Jeff Haberl

“Uncertainty and shortcomings in using building energy simulations” (resubmittal of Chicago seminar)

Chair: Joe Huang

Speakers: Jan Hansen, Tianzhen Hong, Moncef Krarti, Agami Reddy

**PAST:**

Montreal, June 25-29, 2011

Modeling Protocols for Building Energy Simulations for Code Compliance and Other

Regulatory Programs (Chair: Joe Huang)

Building Simulation 103: Inverse Modeling Toolsn (Chair : Chris Balbach)

Operation-oriented Flexible Building Systems Modeling (Chair: Wangda Zuo)

Simulation Quality Assurance (Chair : Carol Gardner )

**Appendix 5** (continued)

TC/TG/TRG SPONSORED SEMINARS

Las Vegas, Jan 29-Feb 2, 2011

Building Energy Simulation 102 (Chair: Keith Cockerham)

Energy Modeling of Existing Buildings (Chair: Sue Reilly)

Albuquerque, June 26-30, 2010

Building Energy Simulation 101 (Chair: Tim McDowell)

Simulation of HVAC/R equipment and systems using the limited data published by manufacturer

(Chair: Michael Wetter)

Orlando, January 23-27, 2010

Web-based Programs for Calculating Energy Code-Compliance (Chair: Larry Degelman)

How to Assess the Performance of Sustainable Buildings (Chair: Moncef Krarti)

Louisville, June 20-24, 2009

Energy modeling of large buildings systems

Salt Lake City June 21-25, 2008

Use of Equation Solvers for Simulation (Chair: Michael Wetter)

New York City/January 2008

How to model nothing – Energy Modeling for Zero Net Energy Buildings: Parts 1 & 2 (Chair: Jan Kosny)

Long Beach/June 2007

Simulation Support for the 2007 Solar Decathlon (Chair: Kamel Haddad)

Dallas/January 2007

Use of Equation Solvers for Simulation (Chairs: Jean Lebrun/Mike Wetter)

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

Québec City/June 2006

None

Chicago/January 2006

How and Why to Calibrate a Simulation to Measured Data (Chair: Robert Sonderegger)

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

Denver/June 2005

Neglected Topics in Building Simulation (Chair: Ian Beausoleil-Morrison).

Orlando/January 2005

What to do When Data Misbehave (Chair: Agami Reddy)

**Appendix 6**

**TC/TG/TRG SPONSORED FORUMS**

#### Current as of January 2012

**PRESENT:**

**Jan 21-25, 2012 – Chicago**

None

**PLANNED (w/priorities):**

None

**PAST:**

Chicago, January 24-28, 2009

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

Chicago/January 2006

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

**TC4.7 Energy Calculations – Main Meeting**

**Tuesday, January 21 2014**

**6:00 – 8:30 pm; Rendezvous Trianon (H3)**

**New York Hilton**

**Meeting Minutes**

**Minutes** (*recorded by B. Abushakra*)

**1. Roll call and introductions Abushakra**

**Quorum Members:**

B. Abushakra: We have quorum – (list with Tim)

1. Present: McDowell, Abushakra , Balbach , Wetter, Barnaby, Cockerham, Haddad, Judkoff, Kolderup, Zuo.
2. Absent: Fisher, Cook (non-quorum member).

10 Present out of 11 VM.

**2. Accept agenda & approve minutes of previous meeting (McDowell)**

Agenda was approved. The minutes were distributed late, and they were tabled two weeks for approval by mail ballot.

**3. Announcements/Liaisons (McDowell)**

**-** David Yuill:2017 Handbook of Fundamentals liaison talked about the versions of the current HoF that are available (hard copies + CD), and asked about revisers for the 2017 volume. The TC is still working on having enough revisers.

- High Tower recipient from 5.5 and 5.7

- a new award was created for “outstanding TC”.

- a review of the code of ethics should be done at the beginning of full committee meetings.

- CEC is looking for help with reviewers. If you’re interested in becoming a reviewer contact ASHRAE staff.

- ASHRAE is testing with some electronics to allow members not to be physically present at the meetings and yet participate in the activities including voting.

**4. Membership (McDowell)**

Tim will finish his term in June. Also Chip and Chris will roll off.

**5. Subcommittee reports**

**5.1 Applications (Huang)**

The meeting was well attended. Two potential program items were discussed. Keith Cockerham will discuss in details. Two RTAR’s were also discussed (under development) (updating below grade heat transfer, and updating the simulated building models)

**5.2 Data-Driven Modeling (Balbach)**

Chris Balbach talked about the DDM program. Conservation took place about developing RTAR’s and WS’s. No champions were assigned. A discussion follows on Guideline 14.

**5.3 Simulation and Component Models (Crawley)**

Dru talked about having a short meeting that was suspended to allow discussion on two different RTAR’s. A discussion took place on TC-5.3’s “active chilled beams”. No progress was achieved on current RTAR development.

**5.4 Research (Haberl)**

**5.4.1 Research Projects/Work Statements**

We have currently two active RP. TRP-1588 was awarded to White Box Technologies. The PMSC had the opportunity to meet the team which just got started and provided them with input.

Modelica RTAR 1661 was conditionally accepted by RAC. The authors will proceed with writing an WS.

An RTAR was distributed on updating RP-1050, with enhancement on the methods, input and output, linking it to RP-1093 and RP-1404. The author will revise the RTAR and improve it.

The RTAR on data modeling for smart-meters was initially rejected. DDM will rewrite the RTAR, with consultation with the original author (R. Sonderegger).

TC4.4 provided an RTAR to the Application SC for co-sponsorship (Venting Strategies & Components in Attic Spaces with Sloped Roofs). The TC accepted it with two conditions (results being available for energy simulation, and references on the outdoor pressure coefficients). Chip moved, Ron seconded to approve co-sponsorship of this RTAR (9-0-0 CNV).

** 1413-RP Missing weather data (co-sponsored with TC 4.2)**

** 1468-RP BIM to thermal modeling (co-sponsored with TC 1.5)**

**5.4.2 RTARs, Requests for Co-sponsorship**

** RTAR 1161 Modelica Models for the Evaluation of Supervisory Control Strategies in the ASHRAE Handbook (sent back to Authors) - SCM**

** Requests for co-sponsorship**

**5.5 Handbook (Kolderup)**

Kolderup: June 2016 is a deadline to get all revisions done. If members are interested in participate in the revisions are asked to contact Erik K.

**5.6 Program (Cockerham)**

Keith noted that proposals are due Feb 13 for Seattle. Chicago papers are due Jul 9 and seminars are due Aug 13. In Seattle there is going to be “Workshops”: 30 minutes of presentations and 30 minutes of Q&A.

Two sponsored events in NY: both are seminars.

BIM to BEM idea was proposed by J. Haberl.

Turning simulations into commodities also proposed by J. Haberl.

Standard MOT for calibration proposed by Judkoff

DDM proposed Data Visualization 102.

DDM was approached to co-sponsor a seminar on Analyzing Building Performance for Maintenance purposes (O&M)

Wangda renamed two originally submitted and rejected seminars (natural ventilation). TC7.4 is proposing a workshop on CO2 footprint analysis and it can help in designing a building, and they’re asking for co-sponsorship.

Efforts to automate modeling.

McDowell moved, Barnaby seconded approving the program (9-0-0 CNV).

**5.7 Standards (Neymark)**

**SSPC 140 SMOT for Eval Bldg Energy Analysis Computer Programs (Judkoff)**

Ron: Progress in putting new test suites in Standard 140 was reported. A first glance through some proofs showed some errors, which necessitated delaying the review until the next cycle of approval by ASHRAE (It will become an Addendum to the 2011 Standard). Simulation trials on the air-side HVAC based on RP-865 (Yuill and Haberl). NREL reconciled spreadsheets for those trials. Another project was to update the test that was developed in 1995 for the building envelope (surface coefficients). Many users of standard 90.1 used a reference of Standard 140. 13 programs are used for IRS purposes; 9 of them are updated.

**SPC 205 – Std. Repr. of Perf. Sim. Data for HVAC&R & Other Fac’l Eq. (Barnaby)**

Chip: Full draft is almost ready for advisory public review (water cooled chillers; unitary equipment, and fans). Standardized coefficient representation is being done, and a performance map is produced of parameters (independent variables) that are required for design (standardized format), Part-load is under discussion.

**SPC 209 Energy Simulation Aided Design (Glazer)**

C. Baker: They have a 1st draft. The standard has a similar scope to 90.1 (compliance standard), with no modeling, or with performance modeling. However, Standard 209 is about Modeling before design phases are complete (it’s a process standard).

**5.8 Web Site New**

Webmaster: Tim thanked C. Kinney for serving as webmaster. Oakridge National Lab will take over as webmaster. They gave a presentation on what they’re proposing as modern web technologies. Using Wordpress allowing content management system, which is PHP based. 20 MB of space are given to TC’s. [WWW.TC47.ORG](http://WWW.TC47.ORG) is the new website (prototype).

Discussion follows on privacy, posting seminars, what can the TC do with the new capabilities of the website. Document-sharing would be great for benefiting TC members in conducting business. “Comments” can be possibly done, along with “version control”, similar to “dropboxes”.

Developing RTAR’s using the new website may be a possibility.

**6. Related activities reports**

**SPC 191 Water Conservation**

Chip: is a liaison, public review for a draft and 177 comments were received.

**MTG.EAS Energy Eff AHU Systems**

Jeff: no progress during this meeting. Tim: asked for volunteers to review proposals.

**SGPC 20 Documenting HVAC&R Work Process and Data Exchange Requirements**

Chip: use case guideline is published on formatting cases. Work with TC4.1 on how to generate use cases.

**TC 2.8 Building Environmental Impacts and Sustainability**

**None reported**

**TC 4.1 Load Calculation Data and Procedures**

Chip: initiate a standard on office equipment convective and radiant heat during operations, instead of using nameplates. Manufacturers were not interested or maybe they can’t do the tests (measurements).

**TC 4.2 Climatic Information**

Dru: Standard 169 was published.

**TC 4.3 Infiltration & Ventilation Requirements**

None reported

**TC 4.5 Fenestration**

Work on TC4.7 RP-1588 is ongoing. Data on fenestration in Chapter 15 in HoF is developed 20 years ago. RP 1414 will update these tables.

**TC 6.5 Radiant Heating and Cooling**

None reported

**TC 7.5 Smart Building Systems (now includes TC 7.4)**

None reported

**TC 7.6 Building Energy Performance**

Jeff: A renewed discussion on energy use indices (EUI’s) for energy targets, should be revisited for new types of buildings (multiuse, tall, passive solar, etc.).

Standard 100 has some multipliers for EUI’s.

**BuildingSMART (formerly IAI International Alliance for Interoperability)**

Phil Haves: Data transfer protocols (from BIM, for instance) is moving slowly.

**IBPSA: USA, Canada, World**

USA Wetter: preparing to scale up activities. Hired an executive director. Usual meeting on Saturday was attended by 80 peoples. 220 abstracts received 147 were accepted in the upcoming conference. Membership dues are now $90.

Canada: preparing for the conference in May, Ottawa.

World: Chip: conference in France in 2013. 600 peoples attended.

Upcoming conference is in India.

All papers and presentations are available for free on the IBPSA website

**BPI-2400-S-2011 Standardization Qualification of Whole-house Energy Savings Est.**

None reported

**Guideline 14**

Jeff: comments were resolved (they came from people in a national lab, and a utility company)

**IEA Annex 60**

Wetter: focusing on developing software technologies. Mostly using Modelica.

Occupancy Modeling Simulation Annex has started, and called Annex 66.

**7. Old Business (McDowell)**

None.

**8. New business (McDowell)**

Jeff: ASHRAE Historical Committee met during this meeting. TC’s should have a place around the table to archive the findings.

**9. Executive Session (McDowell)**

None.

**10. Adjourn**

Meeting adjourned at 7:56PM.

##### Attachments

1. Agenda
2. Simulations and Component Models Subcommittee Agenda and Minutes
3. Data-Driven Models Subcommittee Agenda and Minutes
4. Applications Agenda and Minutes
5. Handbook Subcommittee Minutes
6. Program Plan
7. SSPC 140 Agenda and Minutes

**Attachment A**

**Agenda**

**ASHRAE TC 4.7 Energy Calculations – Main Meeting**

**Rendezvous Trianon (H3)**

**New York City, New York**

**Tuesday, January 21, 2014, 6:00-8:30 pm**

1. Roll call and introductions (5 minutes) Abushakra

2. Accept agenda & approve minutes of previous meeting (10 minutes) McDowell

3. Announcements/Liaisons (5 minutes) McDowell

4. Membership (5 minutes) McDowell

5. Subcommittee reports

5.1 Applications (10 minutes) Huang

5.2 Data-Driven Modeling (10 minutes) Balbach

5.3 Simulation and Component Models (10 minutes) Crawley

5.4 Research (20 minutes) Haberl

5.4.1 Research Projects/Work Statements

 1588-RP Representative Layer-by-Layer Descriptions for Fenestration Systems with Specified Bulk Properties Such as U-factor and SHGC” (co-sponsored with TC 4.5)

 1629-RP Testing and Modeling Energy Performance of Active Chilled Beam Systems (co-sponsored with TC 5.3)

5.4.2 RTARs, Requests for Co-sponsorship

 1661-RTAR Modelica Models for the Evaluation of Supervisory Control Strategies in the ASHRAE Handbook (sent back to Authors) - SCM

 Requests for co-sponsorship

5.5 Handbook (10 minutes) Kolderup

5.6 Program (10 minutes) Cockerham

5.7 Standards (15 minutes) Neymark

SSPC 140 SMOT for Eval Bldg Energy Analysis Computer Programs Judkoff

SPC 205 – Std. Repr. of Perf. Sim. Data for HVAC&R & Other Fac’l Eq. Barnaby

SPC 209 Energy Simulation Aided Design Glazer

5.8 Web Site (10 minutes) Sanyal

6. Related activities reports (15 minutes)

SPC 191 Water Conservation

MTG.EAS Energy Eff AHU Systems

SGPC 20 Documenting HVAC&R Work Process and Data Exchange Requirements

TC 2.8 Building Environmental Impacts and Sustainability

TC 4.1 Load Calculation Data and Procedures

TC 4.2 Climatic Information

TC 4.3 Infiltration & Ventilation Requirements

TC 4.5 Fenestration

TC 6.5 Radiant Heating and Cooling

TC 7.5 Smart Building Systems (now includes TC 7.4)

TC 7.6 Building Energy Performance

BuildingSMART (formerly IAI International Alliance for Interoperability)

IBPSA: USA, Canada, World

BPI-2400-S-2011 Standardization Qualification of Whole-house Energy Savings Est.

Guideline 14

IEA Annex 60

7. Old Business McDowell

8. New business McDowell

9. Executive Session McDowell

10. Adjourn McDowell

**Attachment B**

|  |  |  |
| --- | --- | --- |
| logo_ashrae.png | | **AGENDA** |
| TC 4.7 Simulation and Component Models Subcommittee 6:00-7:30 pm, Monday, January 20th, 2014  Concourse E, Concourse Level, New York Hilton  New York, New York |
|  | |  |
| 6:00 | Call to order / introductions / changes to the agenda Crawley | |
|  |  | |
| 6:10 | **Research Projects** | |
|  |  | |
|  |  | |
| 6:20 | **Draft Work Statements/RTARs** | |
|  | * **1629-TRP** Testing and Modeling Energy Performance of Active Chilled Beam Systems   (TC 5.3 / TC 4.7) Crawley | |
|  | * **17xx-WS** Development of Improved and Integrated Energy Modeling Software for Data   Centers (TC 9.9 / SPC 90.4P / TC 4.7) Davidson | |
|  | * **17xx-WS** Development of a Reference Building Information Model (BIM) for Daylighting   Optimization (TC 1.5 / TC 4.7) Haberl | |
|  | * **17xx-RTAR** (Phase 2 of 1456-RP Assess and Implement Natural and Hybrid Ventilation   Models in Whole-Building Energy Simulations) (TC 4.10 / TC 4.7) Huang | |
|  |  | |
| 6:50 | **New Research Topics/Research Plan** | |
|  | * New Research Topics (RTARs and WSs can be submitted 4 times a year—six weeks before Winter and Annual meetings and 1 March/1 August.) | |
| 7:20 | **Program Ideas** | |
|  |  | |
| 7:25 | **New Business** | |
|  |  | |
| 7:30 | **Adjourn** | |
|  |  | |
| **Next Meeting: Monday, June 30, 2014 Seattle, Washington** | | |

#### TC 4.7 Simulation and Component Models Subcommittee

6:00-7:30 pm, Monday, January 20th, 2014

Concourse E, Concourse Level, New York Hilton

New York, New York

**Minutes**

**Note:**

**The minutes were not submitted. Below are notes that resulted from a brainstorming session held at the end of the meeting.**

The SCM SC meeting ended early and broke up into two brainstorming sessions to work on RTARS. Below are the notes from one of the sessions, chaired by Joe Huang:

A brainstorming session was held from approximately 6:45 to 7:30 to map out how to proceed in developing an RTAR, and more critically, an approach and work plan, for Phase Two of 1456-RP on hybrid and natural ventilation.  The following seven people were in attendance:  
  
Alamelu Brooks,  ICF  
Anthony Fontanini, Fraunhofer Institute  
Ali Fallahi, Fraunhofer Institute   
Kamel Haddad, Natural Resources Canada  
Phil Haves,  LBNL  
Joe Huang, White Box Technologies  
Kris Kinney, affiliation unclear  
  
The brainstorming identified the following needs that could be investigated in a Phase Two study (in order of mentioning only):  
 1. more validation  
 2. better model  
 3. confidence in process for data input and output  
 4. how adequate are existing data sets? (Phase I assumed  that they exist, but what was obtained proved not to be adequate)  
 5. strengths and weaknesses of existing tools  
 6. evaluate symptoms and faults of existing tools  
 7. identify benchmarking tools, e.g., data sets from real buildings  (since TC 4.10 is already identifying data sets for verifying CFD models, can the same data   
     sets  be shared for CFD and Multi-Zone modeling ?)  
  
There was some discussion of goals and impact, but nothing really gelled by the time the session had to be ended at 7:30 to avoid running into the next SC meeting.   
  
Huang expressed satisfaction at the number of people expressing interest in developing this RTAR, and will set up a conference call  
in two weeks' time.  
  
Brainstorming session ended at 7:30.

**Attachment C**

**TC4.7 Data-Driven Modeling Subcommittee Monday January 20, 2014, 7:30–9:00 PM**

**Location: New York City**

**Agenda:**

7:30 Call to order / Introductions / Changes to the agenda

7:40 Discussion of Program (10 minutes)

* + - Summer Meeting 2014 (Seattle)
    - Winter Meeting 2015 (Chicago)

7:50: Work Statements / RTAR’s (50 minutes)

* + - Existing WS and RTAR’s
    - Ideas for new RTAR’s

*RTAR’s need to be aligned with the ASHRAE Research Strategic plan for 2010-2015 (attached, below).*

* + - Ideas previously discussed:
      1. AI for data-driven modeling
      2. In-situ procedures for energy savings from renewable projects
      3. In-situ procedures for actual energy performance of LEED-Certified buildings (**Draft RTAR**)
      4. Electricity demand savings
      5. Water use in a facility
    - New ideas.

8:40 Discussion on: (15)

* + 1. Better ways to digest past research
    2. Disseminate research results
    3. Coordinate research and results with allied TC and SC (co-sponsoring RTAR’s)
    4. Participate in newly-formed “Multi-disciplinary Task Groups (MTG’s)
    5. Maintain expertise within SC even when membership changes.

8:50 Old Business

8:55 New Business

9:00 Adjourn

**Background Information**:

Review of ASHRAE Strategic Plan for Research:

* Research themes include:

1) Energy and Resources,

2) Indoor Air Quality,

3) Tools and Applications, and

4) Equipment, Components and Materials

* Weighted criteria:

1) Supports strategic plan 45%,

2) Co-funding support 10%,

3) Anticipated application 10%,

5) RAC vote 20%, and

6) Tech Council Preview Feedback 5%

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

**ASHRAE Research Strategic Plan – 2010-2015**

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

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

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

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

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

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

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

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

**Goal 9** Support the development of improved HVAC&R components ranging from residential through

commercial to provide improved system efficiency, affordability, reliability and safety.

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

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

**TC4.7 Data-Driven Modeling Subcommittee Monday January 20, 2014, 7:30–9:00 PM**

**Location: New York City**

**Concourse Room E**

**Minutes:**

7:30 Call to order / Introductions / Changes to the agenda

7:40 Discussion of Program (10 minutes)

* + - Summer Meeting 2014 (Seattle)
    - Winter Meeting 2015 (Chicago)
    - The request for ideas for Seminars, Workshops and Forums went out.
    - It was mentioned that there is one TC4.7 sponsored seminar to be held on Wednesday and one TC 4.7 co-sponsored seminar also to be held on Wednesday.
    - We received notice from Mr. David Jump is looking to resubmit an abstract that he completed before for a recent meeting, but was not accepted, for the upcoming Seminar in Seattle.

7:50: Work Statements / RTAR’s (50 minutes)

* + - Existing WS and RTAR’s
      1. Update to 1404 – According to Bass Abushakra, the RTAR was submitted today. There have been two papers presented and three more papers that will be based upon the RTAR research performed.
    - Ideas for new RTAR’s
      1. The Draft RTAR “Development of an Improved Inverse Model Toolkit (IMT) for Analyzing Building Energy Savings from Time Series Data (An Enhancement to the RP-1050 Inverse Modeling Toolkit)” was brought to the floor by Jeff Haberl. Discussion of this new RTAR was held. Jeff received some good feedback and will resubmit the draft in Seattle.
    - Jeff Haberl made a quick five minute presentation of what is an RTAR and how does the work statement actually work.
    - David Jump discussed a potential RTAR to develop and test a methodology to validate public domain and proprietary energy baseline modeling capabilities well as savings estimation using inverse modeling methods on whole building data. The goal is to create a method of test fo inverse models.
    - An idea put forward by Ralph Muehleisen, who may not have time to continue pushing it forward, is to analyze databases of government retrofits to develop a large set of retrofit data to use for comparison in various modeling projections. The reason for using that data is very detailed data are available because it is federal buildings
    - A second idea from Ralph Muehleisen is that there are private companies working with DOE labs right now, to develop a work flow to use 3D GIS data along with IR satellite data to generate building prototype building models. The plan is to then automatically calibrate the model to utility data (this workflow is being developed). This is not an inverse method, but a calibrated forward method as it involves creation of building models.
    - New / updated Guideline 14 was discussed by Jeff Haberl. There were a number of comments that are being addressed.

8:50 Old Business

* None

8:55 New Business

* Joe Huang asked what people are using for Data Visualization for large quantities of data.

9:00 Adjourn

* Meeting Adjourned at 8:59 PM

**Attendees:**

(Not submitted)

**Attachment D**

**TC 4.7 Applications Subcommittee**

**Draft Agenda**

**New York**

**Tuesday, 21 January 2014**

**3:30-5:00pm Rendezvous Trianon**

1) Introductions and Agenda Review (5 minutes)

2) Program (15 minutes) (Keith Cockerham)

a. 2014 Winter (New York)

b. 2014 Summer (Seattle)

c. 2015 Winter (Chicago)

d. Beyond

3) Research (65 minutes)

a. Updates on related activities (10 minutes each)

Update on BEMBook and other COMNET-related activities (Ellen Franconi)

Update on SPC209P, *Energy Simulation Aided Design for Buildings Except Low-Rise*

*Residential Buildings* (Jason Glazer, if available)

* 1. Ideas for new RTARS (15 minutes each)

Draft RTAR from TC 4.4 on “Research to Determine the Pressure Coefficients &

Pressure Drop for Standard Venting Strategies & Components in Attic Spaces with

Sloped Roofs” (Tony Fontanini/Fraunhofer Institute)

Draft RTAR on reconciling differences between simulation results and actual energy

use (Joe Huang)

Any other ideas?

* 1. Topics for discussion (whatever time remains)

Should TC 4.7 maintain a set of prototypical building models and input files,

possibly building on DOE's "Reference Building Models"?

Any other issues or concerns (does not have to be turned into an RTAR or WS).

**Minutes of the TC 4.7 Applications Subcommittee Meeting**

**New York**

**Tuesday, 21 January 2014**

**3:30-5:00pm Rendezvous Trianon**

**Agenda**

1. Introductions and Agenda Review (5 minutes)
2. Program (15 minutes) (Keith Cockerham)
   1. 2014 Winter (New York)
   2. 2014 Summer (Seattle)
   3. 2015 Winter (Chicago)
   4. Beyond
3. Research (65 minutes)
   1. Updates on related activities (10 minutes each)

* Update on BEMBook and other COMNET-related activities (Ellen Franconi)
* Update on SPC209P, *Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings* (Jason Glazer, if available)
* Ideas for new RTARS (15 minutes each)
  + - Draft RTAR from TC 4.4 on “Research to Determine the Pressure Coefficients & Pressure Drop for Standard Venting Strategies & Components in Attic Spaces with Sloped Roofs” (Tony Fontanini/Fraunhofer Institute)
    - Draft RTAR on reconciling differences between simulation results and actual energy use (Joe Huang)
    - Topics for discussion (whatever time remains)
    - Should TC 4.7 maintain a set of prototypical building models and input files, possibly building on DOE's "Reference Building Models"?
* Any other issues or concerns (does not have to be turned into an RTAR or WS).

**Attendance**

|  |  |  |
| --- | --- | --- |
| **First Name** | **Last Name** | **Affiliation** |
| Joe | Huang | White Box Technologies |
| Jeff | Haberl | TAMU |
| Ron | Judkoff | NREL |
| Russ | Taylor | United Technologies |
| Michael | Wetter | LBNL |
| Alamelu | Brooks | ICF International |
| Wangda | Zuo | Univ. of Miami |
| Neal | Kruis | Big Ladder |
| Chris | Balbach | Performance Systems Develop. |
| Keith | Cockerham | DLB Associates |
| Tim | McDowell | TESS |
| Mark | Adams | ORNL |
| Mark | Seymour | Future Facilities |
| Paul | Raftery | UC Berkeley |
| John | Pruett | ZMM, Inc. |
| Thierry | Nouidui | LBNL |
| Hyojin | Kim | The Catholic Univ. of America |
| Greg | Tayco | Cooper Union |
| Anthony | Fontanini | Fraunhofer CSE |
| Ron | Nelson | IMT |
| Chip | Barnaby | Wrightsoft |
| Umberto | Bererdi | WPI |

**Minutes**

* J.Huang started the meeting at 3:40 PM, followed by introductions.
* K.Cockerham informed the committee about the program items for the 2014 Summer and 2015 Winter Conferences. Keith reminded the subcommittee about the submission dates.
* J.Haberl suggested that Keith contact BIM vendors (Autodesk and Bentley), specifically BIM to BEM models.
* C.Balbach suggested another session on applications of calibration of BEM.
* R.Judkopf said that there was some discussion about the need for a test for calibration. There is clearly interest for this.
* J.Huang recalled that part of this discussion was even about doing another “shootout” for calibrations.
* Another comment was made about the progress with Standard 209, specifically how to model the baseline building to ASHRAE Standard 90.1
* J.Huang said he was not comfortable sponsoring a session about 90.1 without getting support from 90.1
* J.Haberl said he would be happy to do a seminar on creating an API-based simulation for a RESNet-certified
* M.Wetter said he would be willing to do a presentation on his Modelica toolkit.
* J.Huang then asked about an update for COMNET. The committee was then informed that COMNet was on hold due to a loss in funding.
* J.Huang then moved the discussion to the RTAR on determining pressure coefficients & pressure drops for standard venting strategies for attic spaces.
* A.Fontanini described the RTAR to the subcommittee.
* R.Judkopf said he read the RTAR and thought it was about determining the pressure coefficients on the outside of the attic, but did not see anything about the pressure coefficients on this.
* A.Fontanini said that the outside coeff would be determined using known methods in the HOF.
* R.Judkopf asked about the method. Did it take into account the environment around the building?
* A.Fonanini said that TC 4.4 said that he had advice to do this for a range of coefficients. Then correlations would be made to develop these coefficients.
* R.Judkopf said that the RTAR, as written, needs to define this better. Where’s the coefficient library? It is easy to talk about the theory of this, but doing this is hard.
* A.Fontani said that these are usually done in wind tunnels, and then the results normalized.
* J.Haberl said that he was concerned that this RTAR needed a sentence or two that discussed how the results would be used by a building energy simulation. How the outdoor pressure coefficients would be modified, what are the variables? How would these be formatted to be used by energy simulations programs.
* J.Haberl recommended that TC 4.7 vote to support this with the amendment that: 1) how the output results will be described to be useful to energy simulations, 2) that a description be provided about where the external pressure coefficient are coming from.
* J.Huang then called for a straw vote. The subcommittee agreed that they supported this as amended.
* J.Huang then moved to another idea about an RTAR to update the tables about ground heat transfer.
* Neal Kruis then described how the new tables would be created, and how they would be reconfigured for use in the HOF. He said that he was discussing this at TC 4.7 and TC 4.1.
* J.Huang said that N.Kruis needed to contact J.Neymark about the method of test for ground heat coupling.
* R.Judkopf then reviewed how the previous work was performed, using Fluent, and how these were checked against the close-form analytical solutions. The procedure then used the solution to check simulations that ground coupling in the slab.
* N.Kruis then said that the next step would be to match these against the “C-factor”and “F-factor” tables in the HOF.
* J.Huang agreed that there was a lot of uncertainty in the use to the tables in the HOF.
* R.Judkopf said that this was just are relevant for 90.1 and 90.2.
* J.Haberl asked if there were definitive papers about this being an issue.
* N.Kruis said that there were some papers on this.
* J.Huang said that Neal needed to make sure to run this RTAR pass the research liaison to make sure he understood it.
* J.Huang said he would work with Neal to help get this RTAR going.
* J.Huang said that it might be a good idea to get co-sponsorship from 90.1 and 90.2.
* C.Barnaby said that TC 4.1 and 4.7 should be consulted.
* J.Huang then asked about any new ideas for the committee.
  + One new idea was whether ASHRAE should have “reference building” files?
  + R.Muelhson said that this made sense. The current reference files that are in different simulation codes do not agree.
  + J.Huang said that he was concerned that the DOE reference buildings, which are monolithic files are not well suited for this. He thought these could be more modular, then one could assemble a file from the modules.
  + R.Muehlson said the had had experience with this. It took more work to change the files.
  + J.Huang said that the original files that were created were modular, but that DOE then wanted them to be complete building files.
  + J.Haberl suggested starting by looking at the different files that are available: PNNL files for DOE and the files that come with EQUEST and use this as a basis for the issue.
  + C.Barnaby said that this was needed for the future since it was hard to tell what programs will be around, and having a standard set would be helpful.
  + J.Huang asked for volunteers to develop the standard files: J.Haberl, Paul Rashmussen, Mark Adams, ORNL, Ralph Muehlson.
  + Meeting was adjourned.

**Attachment E**

**TC 4.7 Handbook Subcommittee**

**Agenda**

**Denver**

**Tuesday, 21 January 2014**

**5:00-6:00pm,**

**Room: Rendezvous Trianon (H3)**

1) Introductions and Agenda Review (5 minutes)

2) Schedule for 2017 Fundamentals Handbook Revision

a. January 2014, review current chapter, list of proposed updates, appoint “Lead Reviser”

b. June 2014, outlines of changes

c. January 2015, 25% draft

d. June 2015, 50% draft

e. January 2016, 95% draft to TC for review

f. June 2016, TC approves revised chapter

g. Early 2017, review galley prints

h. June 2017, publication

3) Finalize description of target audience

a. https://docs.google.com/document/d/174pP\_sNyLlSMAldZTMToMwh9wiUibwTdl7i4EY7nB

rE/edit?usp=sharing)

4) Prioritize list of potential updates

a. https://docs.google.com/document/d/1xMb-wnU5erAxUoGqgePb508X0hD1yZ0LhlWKEmkKnI/

edit?usp=sharing

5) Discuss editing process

a. Link to drop box folder with 2013 Chapter 19:

https://www.dropbox.com/sh/9vnz7g99u6xyev2/Uv3Nv8LdeJ

6) Assign writers to create outlines of updates

7) Assign action items

a. Outlines

**TC 4.7 Handbook Subcommittee**

**Meeting Minutes**

**New York City**

**Tuesday, 21 January 2014**

**5:00-6:00pm,   
Room: Rendezvous Trianon (H3)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Email** | **Interest** | **Present** |
| Erik Kolderup, chair | [erik@kolderupconsulting.com](mailto:erik@kolderupconsulting.com) |  | X |
| Agami Reddy |  | Data driven modeling |  |
| Alamelu Brooks | [Alamelu.brooks@icti.com](mailto:Alamelu.brooks@icti.com) |  | X |
| Bass Abushakra | [abushakr@msoe.edu](mailto:abushakr@msoe.edu) |  |  |
| Chip Barnaby | [cbarnaby@wrightsoft.com](mailto:cbarnaby@wrightsoft.com) | Loads | X |
| Chris Baker | [chrisb@twgi.com](mailto:chrisb@twgi.com) |  | X |
| Craig Wray | [cpwray@lbl.gov](mailto:cpwray@lbl.gov) |  |  |
| Dan Fisher | [dfisher@okstate.edu](mailto:dfisher@okstate.edu) |  |  |
| Hyojin Kim | [kiml@cua.edu](mailto:kiml@cua.edu) | DD, calibration, occ beh | X |
| Jeff Haberl | [jhaberl@tamu.edu](mailto:jhaberl@tamu.edu) | DD, calibration | X |
| Joel Neymark | [neymarkj@msn.com](mailto:neymarkj@msn.com) | Validation | X |
| John Pruett | [jap@zmm.com](mailto:jap@zmm.com) | Calibration | X |
| Mitch Paulus | [mitchpaulus@tees.tamus.edu](mailto:mitchpaulus@tees.tamus.edu) | Data driven modeling |  |
| Neal Kruis | [Neal.kruis@bigladdersoftware.com](mailto:Neal.kruis@bigladdersoftware.com) | Ground heat transfer | X |
| Patrick Carpenter | [facperfeng@comcast.net](mailto:facperfeng@comcast.net) | DD | X |
| Ralph Muehleisen | [rmuehleisen@anl.gov](mailto:rmuehleisen@anl.gov) | Uncert., occ behav, cal. | X |
| Ron Judkoff | [Ron.judkoff@nrel.gov](mailto:Ron.judkoff@nrel.gov) | Validation | X |
| Russell Taylor | [tailored@utcc.utc.com](mailto:tailored@utcc.utc.com) | Calibration | X |
| Tianzhen Hong | [thong@lbl.gov](mailto:thong@lbl.gov) | Occupant behavior |  |
| Tim McDowell | [mcdowell@tess-inc.com](mailto:mcdowell@tess-inc.com) |  | X |
| Umberto Berardi | [uberardi@wpi.edu](mailto:uberardi@wpi.edu) | Calibration | X |
| Vern Smith | [Vernon.a.smith@gmail.com](mailto:Vernon.a.smith@gmail.com) |  |  |

1. Schedule
   1. June 2014, outlines of changes
   2. January 2015, 25% draft
   3. June 2015, 50% draft
   4. January 2016, 95% draft to TC for review
   5. June 2016, TC approves revised chapter before June 21, 2016
   6. Early 2017, review galley prints
   7. June 2017, publication
2. Target audience
   1. The definition of the target audience for the chapter was discussed. The definition is in a Google doc:
      * (<https://docs.google.com/document/d/174pP_sNyLlSMAldZTMToMwh9wiUibwTdl7i4EY7nBrE/edit?usp=sharing>)
   2. General consensus is that the audience definition is ok, with the caveat that we should keep in mind not only what the audience would want to know but also what we think they should know.
3. List of potential changes
   1. Reviewed the Google doc list of potential changes. Some additions and edits were made to the list during the meeting. Next step is to organize the list to group related topics, add known references, and assign committee members to outline the potential changes prior to the June meeting.
   2. <https://docs.google.com/document/d/1xMb-wnU5erA-xUoGqgePb508X0hD1yZ0LhlWKEmkKnI/edit?usp=sharing>
4. Editing process
   1. The Word version of HOF chapter 19 is in a Dropbox folder. Committee members must use track changes to add notes and edits. Otherwise any changes not indicated with track changes will not make it into the 2017 version. (ASHRAE staff does not use the Word version directly for publication. They find edits indicated with track changes and them make the corresponding edits in another publishing program. If there are proposed graphics, then the source file/spreadsheet should also be provided).
   2. Files with tracked changes may be emailed to Erik Kolderup, [erik@kolderupconsulting.com](mailto:erik@kolderupconsulting.com).
   3. Source files and references may be uploaded to the Dropbox folder.
   4. Dropbox folder:
      * <https://www.dropbox.com/sh/9vnz7g99u6xyev2/Uv3Nv8LdeJ>
5. Adjourn 5:55 pm

**Attachment F**

**TC 4.7 Program Plan**

**June 22-26, 2013, Denver, CO Theme: N/A!**

**TC 4.7 SPONSORED PROGRAMS PRESENTED AT CHICAGO:**

MONDAY: SEMINAR 18: Standard 205P: Hassle-Free Equipment Performance Data for Energy Modeling

Chair: Chris Balbach, P.E. Speakers: Charles S. Barnaby, Mark Hydeman, P.E., Neal Kruis,

Attendance:

MONDAY - SEMINAR 28: Improving Energy Modeling Consistency

Chair: Joe Huang, Speakers: Erik Kolderup, P.E., Thomas White, P.E., Ellen Franconi,

Attendance:

WEDNESDAY - SEMINAR 44: I Integrated Multi-Domain Simulations for Innovative Building Design and Operation, Part 1

Chair: Wangda Zuo, Ph.D., Speakers: Jan Hensen, Ph.D., John Zhai, Ph.D., Ian Beausoleil-Morrison, Ph.D

Attendance:

WEDNESDAY SEMINAR 53: Integrated Multi-Domain Simulations for Innovative Building Design and Operation, Part 2

Chair: Jerone Matthew Gagliano, P.E. Speakers: Michael Wetter, Ph.D., Wangda Zuo, Ph.D., Yao-Jung Wen, Christophe Von Treeck/Sebastian Stratbucker

Attendance:

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**ASHRAE High Performance Buildings Conference - A Focus on Deep Energy Savings**

March 12-13, 2012, San Diego, CA

**Call for Posters due February 3rd**

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**Energy Modeling Conference: Tools for Designing High Performance Buildings**

October 01 - 03, 2012 Atlanta, GA, USA

**Abstracts due:** 2/15/12, **Decisions**: 3/15/12 **Accepted speaker forms due**: 4/15/12 **Presentations due**: 9/1/12 **Conference**: 10/12

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

Track 1 HVAC&R Systems & Equipment

Track 2 HVAC&R Fundamentals and Applications

Track 3 Integrated Energy Systems

*Track 4 Building Modeling Applications*

*Track Chair: Pam Androff Email:* [*pamela.androff@gmail.com*](mailto:pamela.androff@gmail.com)

*In our modern times, building design almost always demands some version of modeling, but the debate continues as to what is the most effective method to simulate various building systems. The stakes are especially high for building designs that require validation in effectiveness prior to installation. This track seeks papers and programs that focus on understanding, manipulating, and optimizing building design choices via modeling.*

*The programs will cover modeling fundamentals, building component contributions, system right-sizing, 3-D computer simulation advantages, and advanced energy modeling techniques*

**Attachment F**

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

Track 5 Refrigeration Applications

Track 6 Indoor Environmental Applications

Track 7 Integrated Building Controls

**SAN ANTONIO PROGRAMS SCHEDULE:**

February 13 Seminar, Forum, TPS and CPS Program Proposals Due

February 13 Technical Papers Final Reviews

March 7 Final Technical Papers Due

March 9 Revised Conference Papers Due

March 16 Notifications of Seminar and Forum Accept/Reject Distributed

March 30 Conference Papers Accept/Reject Notifications

April 5 Final Conference Papers Due

May 4 Upload of PPTs Begin

June 4 All PPTs Due Online

June 23 Speaker's Lounge Opens

**POTENTIAL SEMINAR SUBMISSIONS FOR SAN ANTONIO**

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

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

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

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

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

White Box (Joe Huang) RE: differences between different programs for same process AtticSim coupling w/

DOE-2 vs EnergyPlus;

Weidt Group on 10 school model calibrations;

Speaker from Group 14 (Sue Reilly) RE: Informed energy audits for MF;

Speaker from NREL (Ron Judkoff?) RE: BESTEST-EX

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

Speaker from NREL (Eric Bonnema) RE: AEDG – use of building profiles (schedules, to inform modeling;

Speaker from NREL (Jesse Dean) RE: NREL RSF - Generating fully articulated models from building sub-metered data);

Speaker TES (Tim McDowell) RE: How to calibrate and what can be learned when very detailed measured data of system output of a collection of components (flow rate, temp, pressure) are available (how to we take that data and match it to a theoretical model and extract value).

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

Speaker 1 (Chris Balbach) - Can reliable baseline regressions be determined (across different geography) using monthly bills and average monthly dry bulb ( or another variable) across the country? (need 5 - 7 different locations and a decent 12month data set for each bldg). Quantifying CV-RMSE-> Uncertainty to say whether or not (2) is valuable;

Speaker 2 (Jerone) - Determining Water Savings associated w/ a specific project Pick one building where a prediction of savings was made. Determine pre, post and predicted and evaluate uncertainty, etc. Do we have a property where Can we get it for ONE bldg;

**Attachment F**

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

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

**Other ideas from prior TC 4.7 subcommittee meetings?**

1) TCTC 4.7 (Simulation and Component Models) Seminar Chair: Joe Huang:

Topic Reasons or Causes for Uncertainty in Building Energy Simulation

Speakers: Ian, NREL, Jan Hansen

2) TCTC 4.7 (Applications) Seminar Chair: Chair Needed (Tim McDowell) EK – submit & Fail…

Topic Building Simulation 104 Analysis of uncertainty….Uncertainty validation and calibration input uncertainty, output uncertainty of the result…

Speakers Phil Haves, Nick Long, Ron Judkoff

3) TCTC 4.7 (Data Driven Models) Seminar Chair: Bill Koran

Topic UNCERTAINTY Technical

Speakers TBD

Code-Compliance Scheduled

Organized by: TC 4.7 (Applications)

Chair: Larry Degelmann

Status: Moved from Dallas. (Jeff Haberl, Eric Richmond, Paul Mathew).

Seminar “How to Assess the Performance of Sustainable Buildings” Scheduled

Organized by: TC 4.7 (Data Driven Models)

Chair: Moncef Krarti

Status: 4 speakers (B. Koran, Bass Abushakra, David Claridge)

Seminar “Computer Simulation of Supermarkets” Not scheduled

Organized by: TC 10.7 (co-sponsored by TC 4.7)

Chair: Van D. Baxter, ORNL

Status: Since 7/09. Has 4 speakers

Transaction “Use of ‘equation solvers’ for Simulation”

Organized by: TC 4.7 (Data Driven Models)

Co-Chair: Jean Lebrun/Michael Wetter

Status: Have 1 paper (Lebrun), need one more paper.

Forum “Should ASHRAE Develop a Standard for Simulation Aided Design of High Performance Buildings”

Track: Sustainability/LEED

Organized by: TC 4.7 (Applications)

Chair: Jason Glazer

Status: Since 6/08

Conference Paper “Use of Building Energy Simulation in Energy Code and Policy Analysis”

Organized by: TC 4.7

Chair: Russ Taylor

Status: Since 1/09. 3 speakers (R. Taylor, R. Brahme, K. Otto)

**Attachment F**

**TC 4.7 Program Plan** (continued, page 4 of 4)

Seminar “Simulation Support for the Solar Decathlon”

Track: Applications

Organized by: TC 4.7 (Applications)

Chair: Kamel Haddad

Status: Since 6/07. Has speakers.

Seminar “Shoot-out of Code Compliance Simulation for Residential Buildings”

Organized by TC 4.7 (Applications)

Chair: Jeff Haberl

Seminar “Simulation of HVAC/R equipment and systems using the limited data published by manufacturer”

Track: Systems and Equipment

Organized by: TC 4.7 (Simulation and Component Models)

Chair: Michael Wetter

Status: Since 6/08. Joel Neymark, Vincent Lemort, Stephane Bertagnolio & Jean Lebrun, Craig Wray.

Seminar “You don't know what you've got 'till it's checked! The importance of QA in benchmarking energy analysis results”

Organized by: TC 4.7 (Simulation and Component Models)

Chair: Russ Taylor

Status: Since 1/08. Had two speakers (summer 09).