

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 14, 1999

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: January 26, 1999 LOCATION: Chicago

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS & ADDIT'L ATTENDANCE
Chip Barnaby	1999	George Reeves	1993	
Bill Bahnfleth	1998	Per Sahlin	1996	
Dru Crawley	1999	Jean Lebrun	1996	
Dan Fisher	1998	Carol Gardner	1998	
Les Norford	1998	Jeff Haberl	1999	
Azami Reddy	1999	Sanford Klein	1998	
Robert Sonderegger	1999			
Jeff Spittler	1995			
George Walton	1996			
Fred Winkelmann	1996			
Michael Witte	1998			

DISTRIBUTION

ALL MEMBERS OF THE TC/TG/TRG

TAC CHAIR

Terry Townsend

TAC SECTION HEAD

Jeff Biskup/Byron Jones

RAC RESEARCH LIAISON

Carl Speich

STANDARDS LIAISON

Waller Clements

PROGRAM LIAISON

Emil Friberg

JOURNAL LIAISON

Kelly Cramm

HANDBOOK LIAISON

David Claridge

STAFF LIAISON (RESEARCH)

William Seaton

STAFF LIAISON (STANDARDS)

Claire Ramspeck

STAFF LIAISON (TECH SERVICES)

Martin Weiland

TC 4.7 Actions

Chicago, January 26, 1999

- 1. Request no-cost extension on 865-RP to 3/31/2000.**
- 2. 1051-WS resubmit at Seattle.**

ASHRAE TC/TG/TRG ACTIVITIES SHEET

DATE: May 14, 1999

TC/TG/TRG NO.: TC 4.7 TC/TG/TRG TITLE: Energy Calculations

CHAIRMAN Robert Sonderegger VICE CHAIRMAN Jeff Spittler SECRETARY Dru Crawley

TC/TG/TRG MEETING SCHEDULE			
LOCATION - past 12 months	DATE	LOCATION - planned next 12 months	DATE
Chicago	1/26/99	Seattle	6/22/99
Toronto	6/23/98	Dallas	2/8/2000

TC/TG/TRG SUBCOMMITTEES	
Function	Chair
Simulation and Component Models Applications Inverse Methods	Dan Fisher Joe Huang Jeff Haberl

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

LONG RANGE RESEARCH PLAN				
Rank	Title	W/S Written	Approv	To R & T
1.	See attachment 5			
2.				
3.				
4.				

HANDBOOK RESPONSIBILITIES					
Year & Volume	Chapter	Title	No.	Deadline	Handbook Subcom. Liaison
1997	28	Energy Estimating Methods			NONE
STANDARDS ACTIVITIES - List and Describe Subjects					
SPC 140P Standard Method of Test for Building Energy Software - Ron Judkoff					
TECHNICAL PAPERS from Sponsored Research - Title, when presented (past 3 yrs. present & planned)					
Appendix 2					
TC/TC/TRG Sponsored Symposia - Title, when presented (past 3 yrs. present & planned)					
Appendix 3					
TC/TG/TRG Sponsored Seminars - Title, when presented (past 3 yrs. present & planned)					
Appendix 4					
TC/TG/TRG Sponsored Forums - Title, when presented (past 3 yrs. present & planned)					
Characterizing the Performance of Central Plants for Multi-Building Campuses, Chicago (1/99) Who Needs Moisture Calculations in Building Energy Simulations? What Do You Need?, Toronto (6/98) How should ASHRAE Computer Models be Expressed? Boston(6/97) Priorities for Near-Term Developments in Building Simulation Programs, San Antonio(6/96), Fast Multizone Models for System Optimization, San Antonio(6/96)					
JOURNAL PUBLICATIONS - Title, when published (past 3 yrs. present & planned)					

Additional Attendance*

Present this meeting?	Present last meeting?	Last Name	First Name	E-Mail
		Addison	Marlin	msa@essinc.com
		Amistadi	Henry	amistadi@maine.com
		Arkin	Hillel	cvrarhi@tx.techniion.ac.il
X		Ayres	J. Marx	JMAyres@gte.net
X	X	Bahnfleth	Bill	wpb5@psu.edu
X	X	Barnaby	Chip	cbarnaby@wrightsoft.com
		Bauman	Fred	bauman@popper.ced.berkeley.edu
X	X	Beausoleil-Morrison	Ian	ibeausol@nrcan.gc.ca
X	X	Black	Al	mcclureeng@aol.com
		Bourdouxhe	Jean-Pascal	JEANPASCAL.BOURDOUXHE@ULG.AC.BE
X	X	Brandemuehl	Mike	michael.brandemuehl@colorado.edu
		Braun	Jim	jbrown@ecn.purdue.edu
X	X	Buhl	Fred	wfbuhl@lbl.gov
		Carpenter	J. Patrick	jpc@tklp.com
		Chen	Q. Yan	qchen@mit.edu
X		Claridge	David	claridge@esl.tamu.edu
X	X	Clark	Dan	dan.clark@carrier.utc.com
X	X	Crawley	Dru	drury.crawley@hq.doe.gov
	X	Degelman	Larry	larry@archone.tamu.edu
		Emerson	Keith	kemerson@msc.psc.com
		Feustel	Helmut	HEFEUSTEL@lbl.gov
X	X	Fisher	Dan	d_fisher@uiuc.edu
		Flake	Barrett	bflake@afit.af.mil
		Fraser	Kathleen	kfraser@transalta.com
		Gansler	Bob	rgansler@facstaff.wisc.edu
		Gardner	Carol	gems@teleport.com
		Haberl	Jeff	jhaberl@esl.tamu.edu
		Hanby	Vic	v.i.hanby@lboro.ac.uk
X		Haddad	Kamel	KHhaddad@nrcan.gc.ca
		Hansen	Jerry	
X	X	Haves	Philip	phaves@lbl.gov
		Henninger	Bob	rhenninger@gard.com
	X	Hensen	Jan	jan@esru.strath.ac.uk
		Herrlin	Magnus	magnus@vixen.bellcore.edu
X		Hittle	Doug	hittle@engr.colostate.edu
X	X	Huang	Joe	YJHuang@lbl.gov
		Hunn	Bruce	BHunn@ashrae.org
X		Hydeman	Mark	mmh0@pge.com
		Jarnagin	Ron	re_jarnagin@pnl.gov
X	X	Judkoff	R.	Ron_judkoff@nrel.gov
X	X	Katipamula	Srinivas	s_katipamula@pnl.gov
		Kelley	Mark	dragon@world.std.com
		Kelly	George	gekelly@enh.nist.gov
		Kelso	Dick	rkelso@utk.edu
		Klein	Sandy	klein@engr.wisc.edu
X	X	Knappmiller	Kevin	kevink@kevtec.com
X		Knebel	Dave	dknebel@mammoth-inc.com
		Krarti	Moncef	krarti@bechtel.colorado.edu

Present this meeting?	Present last meeting?	Last Name	First Name	E-Mail
X		Kreider	Jan	kreider@bechtel.colorado.edu
X		Lawrie	Linda	L.Lawrie@computer.org
X		Leber	Jon	jahbata@aol.com
		Lebrun	Jean	thermoap@ulg.ac.be
		LeClair	Scott	SLECLAIR@AFIT.AF.MIL
X		Liesen	Richard	r-liesen@uiuc.edu
		Liu	Mingsheng	mingshen@esl.tamu.edu
		Lorsch	Harold	solargoetz@aol.com
		Malmström	Tor	tgm@ce.kth.se
		McClellan	Todd	mcclella@iblast.me.uiuc.edu
X	X	McDowell	Tim	mcdowell@tess-inc.com
X		Medina	Mario	m-medina@tamuk.edu
		Meyer	Jeff	jmeyer@p04.mn10.honeywell.com
		Mitchell	John	mitchell@enr.wisc.edu
	X	Nall	Dan	DANNALL@MINDSPRING.COM
X	X	Neymark	Joel	neymarkj@csn.net
X	X	Norford	Les	lnorford@mit.edu
		Ober	David	
X	X	Pedersen	Curt	cpederse@uiuc.edu
		Pegues	Jim	james.f.pegues@carrier.wtk.com
		Pennington	Bill	Bpenning@energy.state.ca.usa
		Prasad	Jack	PRASAD@NY.FK.COM
X	X	Reddy	T. Agami	agami@erols.com
X		Rees	Simon	SJRees@okstate.edu
		Reilly	Sue	sreilly@enermodal.com
		Rock	Brian	barock@ukans.edu
		Sahlin	Per	plurre@engserve.kth.se
X		Selkowitz	Steve	seselkowitz@lbl.gov
X	X	Smith	Vernon	vsmith@archenergy.com
X		Sommer	Klaus	KLAUS.SOMMER@VT.FH-KOELN.DE
X	X	Sonderegger	Robert	rcs@oak.synergic.com
	X	Sowell	Ed	sowell@fullerton.edu
X		Spitler	Jeffrey	spitler@okstate.edu
		Strand	Rick	r_strand@uiuc.edu
		Swami	Mulhusamy	swami@fsec.ucf.edu
		Taylor	Russ	taylor@dilbert.me.uiuc.edu
		Thomaston	Bill	
		Todorovic	Bravko	
		v Heerden	Eugene	vheerden@eng.up.ac.za
X	X	Walton	George	gwalton@nist.gov
X	X	Willson	Jim	Jim.Willson@lgenergy.com
X	X	Winkelmann	Fred	fcw@gundog.lbl.gov
X	X	Witte	Mike	mjwitte@gard.com
X	X	Wray	Craig	CPWray@lbl.gov
X	X	Wright	Jonathan	J.A.Wright@lboro.ac.uk
		Wruck	Richard	rich.wruck@hbc.honeywell.com
		Yang	Steve	scyang@aol.com
		Yavuzturk	Cenk	cenk@okstate.edu
X	X	Yuill	Gren	yuill@unomaha.edu

*** In order to preserve the e-mail addresses for all attendees, this is actually a complete list of attendees and recent attendees. It includes the voting members of the committee listed on page 1. An X in the "Present?" column indicates presence at this meeting.**

Appendix 1
Current Research Projects

#	Title	Joint TC	Cognizant subcom / Contractor, PI	PMSC	Dates / status
865-RP	Accuracy tests for Mechanical System Simulation		Sim/Comp Penn/TAMU Gren Yuill	George Walton (chair), Ron Judkoff, Robert Sonderegger, Dave Knebel	Rec: 2-20-96 (San Antonio) NCE: until 2-28-98 (7-1-97) NCE: until 8-31-98 (1-20-98) NCE: until 3-31-99 (6-23-98) NCE: until 3-31-2000 (1-27-99)
987-RP	Preparation of a Toolkit for Building Load Calculations	4.1	Sim/Comp Univ. of Illinois Curt Pedersen	Dru Crawley (chair), Chip Barnaby, George Walton, Dave Knebel; Tom Romine (TC 4.1)	Rec: 1-28-97 (Phil) End: 12-31-99
1050-RP	Development of a Toolkit for Calculating Linear, Change-point Linear, and Multiple Linear Inverse Building Energy Analysis Models		Inv U. of Dayton Kelly Kissock	Jan Krieder (chair), Robert Sonderegger, Moncef Krarti, Agami Reddy	WS: 7-1-98 (Boston) Rec: 6-23-98 (Toronto)
1052-RP	Development of an Analytical Verification Test Suite for Whole Building Energy Simulation Programs – Building Fabric		Sim/Comp OSU Jeff Spitler	George Walton (chair), Ron Judkoff, Joel Neymark, Fred Winkelmann	WS: 7-1-97 (Boston) Rec: 6-23-98 (Toronto)
1093-RP	Compilation of Diversity Factors and Schedules for Energy and Cooling Load Calculations	4.1	App TAMU (TEES) Jeff Haberl	Agami Reddy (chair), Bill Bahnfleth, Joe Huang, Suzanne LeViseur (TC 4.1)	WS: 1-20-98 (SF) Start: 2-1-99

Appendix 2

TECHNICAL PAPERS FROM SPONSORED RESEARCH

June 1997

664-RP Fisher, D.E., C.O. Pedersen. 1997. Convective Heat Transfer in Building Energy and Thermal Load Calculations. ASHRAE Transactions V 103 n 2.

January 1997

787-RP Rock, B., D. Wolfe. 1997. A Sensitivity Study of Floor and Ceiling Plenum Energy Model Parameters. ASHRAE Transactions v 103 n 1 1997.

June 1995

741-RP Spitler, J.D., J.D. Ferguson. 1995. Overview of the ASHRAE Annotated Guide to Load Calculation Models and Algorithms ASHRAE Transactions v 101 n 2 1995.

Appendix 3**TC/TG/TRG SPONSORED SYMPOSIA****Title, When Presented*****FUTURE:***Seattle - June 1999

Symposium: *Recent Innovations in HVAC System Modeling*
Chair – Carol Gardner

Symposium: *Methods for Calibrating Building Energy Simulation Programs*
Chair -- Agami Reddy

Symposium: *Applications of Heat and Mass Balance Methods to Energy and Thermal Load Calculations*
Chair – Chip Barnaby

Dallas - February 2000

Symposium: *Accuracy tests for simulation models*
Chair – Mike Witte

PAST:Chicago - January 1999

Symposium: *Application of Heat Balance Methods to Energy and Thermal Load Calculation*
Chair – Chip Barnaby

Toronto - June 1998

Symposium: *Baseline Calculations for Measurement and Verification of Energy and Demand Savings*
Chair – Robert Sonderegger.

Boston - June 1997

TC 4.7/9.6 Symposium--“*Field Methods for Analyzing Equipment, Building and Facility Energy Use*”
Chair: Agami Reddy (409/862-2189, areddy@loanstar.tamu.edu).

San Antonio - June 1996:

Symposium: *External Environmental Impacts*
Chair - S. Reilly.

Symposium: *The Great Energy Predictor Shootout II*
Chair - Haberl

Atlanta - February 1996:

Symposium: *User Tools for Building Energy Simulation*
Chair - C. Gardner; three papers promised

Appendix 4

TC/TG/TRG SPONSORED SEMINARS

FUTURE:

Seattle - June 1999

"Parameter Estimation for Modeling Actual Building Systems" (or may be a symposium), to be chaired by Carol Gardner

PAST:

Chicago - January 1999

"Simulation Tool Interoperability and Component Model Portability", chaired by Phil Haves

Toronto - June 1998

"Neural Nets: What Are They and What Can They Do?" chaired by Moncef Krarti

Boston - June 1997

"Practical Applications of Energy Calculations" chaired by Chip Barnaby

Philadelphia - January 1997

"Calibration of Computer Simulation for Building Energy Analysis," chaired by Taghi Alereza, co-sponsored with TC 9.6, Systems Energy Utilization

Atlanta - February 1996:

"Measurement of Energy and Demand Savings-ASHRAE Guideline 14P," chaired by George Reeves, co-sponsored with TC 9.6, Systems Energy Utilization

San Diego - June 1995:

"Innovative Uses of Building Energy Simulations Programs", chaired by Chip Barnaby

Jan. 1995 - Innovative Uses of Computer Simulation - C. Gardner

Jan. 1995 - Predictor Shootout II: Measuring Results for Energy Conservation Retrofits - J. Haberl

Jan. 1995 - Energy Calculations for Measure Analysis - ?

Jan. 1994 - User Tools for Computer Energy Analysis - C. Gardner

Jan. 1994 - User Tools for Building Energy Simulation - C. Gardner

Jan. 1994 - Standardizing Formats for HVAC Component Models - How to Avoid Reinventing the Wheel - P. Sahlin

ASHRAE TC 4.7 Energy Calculations
Meeting Minutes

Chicago, Illinois
26 January 1999

1. Chairman Robert Sonderegger called the meeting to order at 6:05 p.m. The following members were present: Chip Barnaby, Bill Bahnfleth, Dru Crawley, Dan Fisher, Les Norford, Agami Reddy, Robert Sonderegger, Jeff Spitler, George Walton, Fred Winkelmann, and Michael Witte. Absent were George Reeves, Per Sahlin, Jean Lebrun, Carol Gardner, Jeff Haberl, and Sandy Klein.
2. Sonderegger introduced the new Section 4 Head, Byron Jones.
3. The agenda was distributed and is attached as attachment 1. Barnaby moved, Witte seconded to accept the agenda. Approved on a voice vote. Barnaby moved, Norford seconded to approve minutes from Toronto meeting. The motion carried unanimously.
4. Sonderegger made several announcements:
 5. New initiative to form ad hoc committee to focus on impact of indoor environment, 4.7 asked to submit delegate. To be recommended at next meeting.
 6. New TG proposed on HVAC/mechanical insulation.
 7. Technology Corner in Insights available to publicize TC activities, programs, and work statements. Witte volunteered to do an update.
 8. New award—Technical Achievement Award—to recognize individual excellence in technical contribution. Make recommendations to Sonderegger. Selected by TAC based on nominations from TC chairs. Presented in Dallas at recipient's TC meeting.
 9. All correspondence of TC is now electronic or by e-mail—any problems, let Sonderegger know.
10. Membership was then discussed by Sonderegger.
 11. New role in every TC—Webmaster. Jeff Spitler is now officially Webmaster, having done it a great job as the ad hoc Webmaster for the last few years.
 12. George Reeves rolling off as CM. Sandy Klein has resigned effective after this meeting. Two new slots, Jim Wilson and Joel Neymark will be new members beginning after the Annual meeting. Klaus Summer, new international member.
 13. Effective at the annual meeting, Bill Bahnfleth will be program chair.
14. Huang reported on the Applications subcommittee (see attachment 2). Applications met on Tuesday afternoon just before this meeting. At their second meeting, they worked to define scope and focus—developing data and guidelines. Better inputs for better outputs. Working on several work statements, all deal with developing better input. Developing Performance Factors for Primary and Secondary Equipment Simulation Inputs for Commercial Buildings. Standard Operating Conditions in North American Residential Buildings. Development of a Web-based Directory of Case and/or Design Studies Representing Good Practice Examples of HVAC Applications. (decided that it's outside scope of TC and dropped). Compile Input Data for Air Flow Models. Develop Procedures to Use Weather Data from the New Automated (ASOS) Stations in Hourly Simulation Programs (WS under development in TC 4.2).
15. Reddy reported on 1093-RP Diversity Factors & Schedules for Energy & Loads. Texas A&M University is the contractor; project anticipated to start 1 February 1999.
16. Reddy chaired the Inverse Methods subcommittee (chairman Haberl unable to attend) (see attachment 3). Chicago Forum: Characterize the Performance of Central Plants in Multi-Building Campuses, chaired by Reddy (for Haberl), 60 participants, recommended symposium (see notes). One work statement under development, WS-1051, no real progress at this meeting. Haberl will continue work on it.

Mark Modera announced that SPC 152P would soon be available for public review. SPC 152P is on rating the seasonal performance of residential systems. Because the draft standard contains a program to calculate the performance of ducts, asking to TC 4.7 review.

17. Walton reported on 865-RP Accuracy Tests for Mechanical System Simulation. The PMS met on Monday at 1:15 pm. Not much progress. Expecting a report in September. PMS requests a no-cost time extension to March 31, 2000. Barnaby/Norford moved to accept PMS recommendation. 9-0-1 (chair not voting).
18. Kreider reported on 1050-RP Inverse Toolkit, a new project just under way. University of Dayton is the contractor. Contract signed two weeks ago. PMS to have a conference call with contractor in the next few weeks. More to report in Seattle.
19. Fisher reported on the Simulation & Component Models subcommittee meeting (see attachment 4). Fisher pointed out draft work statements—items 2 and 3.
20. Crawley reported on 987-RP Loads Toolkit. Contractor is University of Illinois, Curt Pedersen is PI. The contractor handed out CD-ROMs to the PMS. CD had proposed format. Contractor will be providing monthly updates to the PMS beginning in March. PMS is looking for reviewers.
21. Walton also reported on 1052-RP Analytical Test Suite Whole Building Energy Programs. The contractor is Oklahoma State University—project just started at beginning of month. No PMS meeting here.
22. Chip Barnaby reported a status update on Research status (see attachment 5).
 23. WS-1051 Modeling Two- and Three-Dimensional Heat Transfer Through Composite Wall and Roof Assemblies in Hourly Energy Simulation Programs. Although the TC approved the work statement at the last meeting, it did not make it to ASHRAE. Sonderegger appointed Beausoleil-Morrison (Chair), Walton, and Winkelmann to the PEC.
 24. Proposed new work statement/research plan method. Barnaby requests that TC authorize Sonderegger to write letter expressing TC's concerns. The TC prepares a 2-pager, which is reviewed by RAC. Once approved by RAC, TC then prepares WS. WS are then only reviewed by RAC for clarity and bidability. Current draft will be e-mailed to TC. Comments will be compiled and transmitted by Sonderegger.
 25. Sonderegger challenged the TC to think beyond our normal 'Fortran' to web, DLL, distributed COM, etc. Wants to see work statements at new meeting and looking for new ideas.
 26. Pedersen provided an update on the status of bidding on 1049-TRP Building System Design Synthesis. Bids are due to ASHRAE on May 14. Three potential bidders have contacted Curt, Curt challenged those who were thinking about bidding to do so.
27. Norford reported on the Handbook subcommittee (see attachment 6). TC 4.7 is responsible for Chapter 30 in the 2001 Fundamentals. Major changes noted such as ground coupled section and inverse methods. Plan to have review draft to the entire TC in time for Seattle.
28. Sonderegger went through previous Program plan and corrections were made. (Chair Gardner was not able to attend.). Numbers on Seattle represent TC ranking priorities.

1 Seattle Symposium: Accuracy tests for simulation models

Witte

2 Seattle Symposium: Application of Heat Balance Methods to Energy &
Thermal Load Calculations

Barnaby

Dallas Seminar: ASHRAE Software Toolkits for Energy Calculations	Crawley
Dallas Symposium: Recent Innovations in HVAC Modeling	McDowell
Dallas Symposium: Calibrating Building System Models	Knapmiller
Minneapolis Symposium: Better Inputs for Better Output	Jim Willson
Minneapolis Symposium: Practical Methods for Baselineing Central Plants at Multi-Building Facilities.	Haves

At this meeting, TC 4.7 had 1 forum and 1 seminar:

Chicago Forum: Characterize the Performance of Central Plants in Multi-Building Campuses, chaired by Reddy (for Haberl).

Chicago Seminar: Simulation Tool Interoperability & Component Model Portability, chaired by Crawley (for Haves).

29. Neymark reported on SPC 140P progress (see attachment 7). The SPC 140P draft has been reviewed by ASHRAE staff and minor changes suggested. These were approved by the SPC. Neymark says to expect a public review by the summer.
30. Pedersen reported on IBPSA/IBPSA-USA activities. IBPSA-USA met Saturday, had software demo session, and dinner featuring a 45-second member meeting and a speech by Doug Hittle. IBPSA's next Building Simulation conference is September 1999 in Kyoto. Interested people in becoming members should contact Mike Witte.
31. Sonderegger reported on GPC 14P Measurement of Energy and Demand Savings. Draft nearing completion. GPC draft approved for public review pending edits being implemented as reflected in the minutes. Expect to be available for public review by summer.
32. Reddy reported on related activities in TC 9.6 Systems Energy Utilization. TC 9.6 working on a symposium—Use of Uncertainty Analysis in Design and Performance Evaluation—and three seminars: update on GPC 14P, users of short-term datasets for energy savings, commissioning of building.
33. Crawley reported that the IAI (International Alliance for Interoperability) planned to release version 2.0 of their IFCs (Industry Foundation Classes) later in 1999. Expect to begin seeing IFC-compliant software later this year.
34. Under new business, Reddy suggested more reports on related activities—TCs 4.1, 4.6, and 4.11 and SPC 152P. Walton agreed to report on 152P at next meeting. Spitler will report on 4.1, Brandemeuhl on 4.6, Norford on 4.11.

Spitler, reporting on TC 4.1 Load Calculation, said the TC is working on WS about actual internal heat gains of equipment, comparing rating to nameplate, and experimental validation of heat balance procedure. For 2001 HOF, heat balance to be method, older methods will only be listed in references.

Brandemeuhl, reporting on TC4.6 Building Operation Dynamics, said they're heading back to area of developing dynamic models. WS under development dealing with dynamic models of cooling coils. Includes fault detection, diagnostics, broader than just energy simulation.

Norford, reporting on TC 4.11 Smart Building Systems, said there is not much overlap with 4.7 at this point, Applications, Utility/Building Interface, Dynamic?, and Fault Detection. Very active in Fault detection, mostly at component level.

Selkowitz, reported on TC 4.5 Fenestration, said that for the 2001 HOF, the TC is thinking about dropping reference to shading coefficients and some tables. Revising SHGC for specularly selective glazing. Pedersen said that 4.1 is concerned with SHGC being together instead of split. SPC 142 detailed calculation method (Arasteh is chair).

Barnaby, reporting on TC 4.2 Weather Information, described several projects—generate IWEC (International Weather for Energy Calculations) representative hourly files for about 200 locations around the world (not US/Canada), Extremes Weather Sequence Generator—generates hourly sequences of weather data based on statistics of days, intended for applications such as thermal storage, ASOS, NWS now is converting all weather observations to automated systems. No cloud observations made—will impact simulation WS under development to come up with solution.

Knapmiller, reported that TC 4.10, Indoor Environment. Modeling currently does not overlap much with TC 4.7.

35. The meeting was adjourned at 8:28 pm.

Agenda

Tuesday, January 26, 1999, 6:00-8:30 p.m., Adams (6th floor, Palmer House)

- | | | |
|---|-------------|-------------|
| 1. Roll call and introductions | | Crawley |
| 2. Accept agenda & approve minutes of Toronto meeting | | Sonderegger |
| 3. Announcements | | Sonderegger |
| 4. Membership | | Sonderegger |
| 5. Subcommittee reports | | |
| 5.1 Applications | | Huang |
| 1093-RP Diversity Factors & Schedules for Egy & Loads | (TA&M) | Reddy |
| 5.2 Inverse Methods | | Haberl |
| 865-RP Accuracy Tests for Mech System Simulation | (Penn/TA&M) | Walton |
| 1050-RP Inverse Toolkit | (U Dayton) | Kreider |
| 5.3 Simulation & Component Models | | Fisher |
| 987-RP Loads Toolkit | (UoIll) | Crawley |
| 1052-RP Analyt Test Suite Whole Bldg Egy Progs | (OSU) | Walton |
| 5.4 Research | | Barnaby |
| 1049-TRP Building System Design Synthesis update | | Pedersen |
| 5.5 Handbook | | Norford |
| 5.6 Program | | Gardner |
| Chicago Forum: Charact. the Performance of Central Plants in Multi-Building Campuses | | Haberl |
| Chicago Seminar: Simulation Tool Interoperability & Component Model Portability | | Haves |
| Seattle Symposium: Recent Innovations in HVAC System Modeling | | Gardner |
| Seattle Symposium: Application of Heat Balance Methods to Energy & Thermal Load Calcs | | Barnaby |
| Seattle Symposium: Methods for Calibrating Building Energy Simulation Programs | | Reddy |
| Seattle Symposium: Accuracy tests for simulation models | | Witte |
| →Dallas: PLEASE SUGGEST NEW TOPICS ← | | YOU |
| →Minneapolis: PLEASE SUGGEST NEW TOPICS ← | | YOU |
| 5.7 Standards (SPC-140 SMOT) | | Judkoff |
| 6. Reports on related activities | | |
| IBPSA | | Pedersen |
| GPC 14P Measurement of Energy and Demand Savings | | Sonderegger |
| TC 9.6 Systems Energy Utilization | | Reddy |
| IAI International Alliance for Interoperability | | Crawley |
| 7. Old Business | | |
| 8. New business | | |
| 9. Adjourn | | |

MINUTES

TC 4.7 Subcommittee on Applications
Tuesday, 26 January 1999, 3:30 - 5:00 p.m.
Palmer House, Parlor F (7th Floor)
Chair: Joe Huang

REVISED AGENDA

- 1. Introductions (5 minutes)**
- 2. Accept agenda & approve minutes of Toronto meeting (5 minutes)**
- 3. Announcements (5 minutes)**
IBPSA Conference in Kyoto
- 4. Program (10 minutes)**
Chicago: Seminar on Simulation Tool Interoperability and Component Model Portability
Seattle : Symposium on Applications of Heat and Mass Balance Methods to Energy and Thermal Load Calculations
Dallas : Symposium on Recent Innovations in HVAC System Modeling
Suggestions and ideas
- 5. Research**
 - **Ongoing Projects (5 minutes)**
1093-RP Diversity Factors & Schedules for Energy and Loads (Reddy)
 - **Work Statements Under Development (30 minutes)**
Standard operating conditions in North American residential buildings (Parker/Huang)
Defining Performance Factors for Primary and Secondary Equipment Simulation Inputs for Commercial Buildings (Nall)
Development of a Web-based Directory of Case and/or Design Studies Representing Good Practice Examples of HVAC Applications (Hensen)
 - **Other ideas (10 minutes)**
Compile input data for air flow models (also TC 4.3 ?)
Develop procedures to use weather data from the new automated (ASOS) stations in hourly simulation programs (also TC 4.2 ?)
 - **Long Range Research Plan (10 minutes)**
- 6. Old Business (5 minutes)**
- 7. New Business (5 minutes)**
- 8. Adjourn**

ATTENDEES:

NAME	AFFIL.	EMAIL
Bill Bahnfleth	Penn State	wpb5@psu.edu
Chip Barnaby	Wrightsoft	cbarnaby@wrightsoft.com
Jean Boulin	U.S. DOE	jean.boulin@ee.doe.gov
Fred Buhl	LBNL	wfbuhl@lbl.gov
Allen Carpenter	NRCan	acarpent@nrcan.gc.ca
Kamel Haddad	NRCan	khaddad@nrcan.gc.ca
John Hogan	Seattle DCLU	john.hogan@ci.seattle.wa.us
Joe Huang	LBNL	yjhuang@lbl.gov
Jim Kelsey	KW Energy Engineering	kelsey@kw-energy.com
Kevin Knappmiller	Kevtec LLC	kevink@kevtec.com
Linda Lawrie	USACERL	l.lawrie@computer.org
Tim McDowell	TESS	mcdowell@tess-inc.com
Simon Rees	OSU	sjrees@okstate.edu
Klaus Sommer	Univ. of Applied Science, Cologne Germany	sommer.roycroft@t-online.de
Robert Sonderegger	SRC Systems	rsc@src-systems.com
George Walton	NIST	gwalton@nist.gov
Jim Willson	LG&E Enertech	jim.willson@lgenergy.com
Fred Winkelmann	LBNL	fcw@pegasus.lbl.gov

Joe Huang (JH) called the meeting to order at 3:40 p.m. and introductions were then made.

There were no additions to the agenda.

The minutes from the Toronto meeting were reviewed and the following typographical corrections duly noted (all on the second page) : (1) Dan Nall, not Dan Null, (2) Kevin Knappmiller's affiliation and e-mail should be Kevtec LLC and kevink@kevtec.com, and (3) Fred Buhl's e-mail address should be wfbuhl@lbl.gov.

Program

JH reviewed the upcoming program for TC 4.7, and encouraged the attendees to suggest ideas to the program. Robert Sonderreger (RS) noted that the symposium planned for Dallas on Recent Innovations in HVAC System Modeling was in danger of danger of being scratched owing to the lack of a chairperson and papers. There was some ambiguity whether Carol Gardner or Russ Taylor had agreed to coordinate the session. *Action Item* : Tim McDowell (TM) volunteered to chair this symposium.

RS announced that he would be appointing a new TC 4.7 program chair, which will help in coordinating the TC's program in the future.

Research

JH announced that the Subcommittee currently has one ongoing research project (1093-RP, "Diversity Factors and Schedules for Energy and Load Calculations"), and several work statements under development, which unfortunately have not progressed much since they were proposed at the Toronto meeting.

Since the chair of the PMS for 1093-RP, Agami Reddy, was not present, JH gave a brief summary of the status of the project. At the Toronto meeting, the project was awarded to Texas A&M, pending some clarifications on technical points requested by the proposal review committee. The contractor responded satisfactorily in writing to these questions in the fall, so that the project was formally awarded to Texas A&M in December 1998. The Project Monitoring Committee consists of Agami Reddy (chair), Bill Bahnfleth, Joe Huang, and Susan LeViseur. Since the project has just gotten underway, the PMS chair decided that a meeting was not necessary at this conference.

JH described the objective of 1093-RP as developing load shapes for lighting and office equipment in office buildings. Chip Barnaby (CB) mentioned that TC 4.1 (Loads Calculations) had just completed a project (1055-RP) that measured the actual power consumption of various office equipment. This information does not cover the usage patterns of office equipment, but should still be of use to this project. Someone mentioned another project that compared measured schedules to ASHRAE-90.1, and found the lighting schedules were okay, but the plug load schedules were way off.

JH circulated and reviewed two one-pagers for Work Statements (WS) based on ideas proposed in Toronto. The first is titled, "Standard operating conditions in North American residential buildings", aimed at developing a better or at least more systematically-derived set of modeling assumptions for residential houses, such as window shading, thermostat settings, and amount of internal mass. JH stated that Danny Parker (DP), who had originally proposed this topic in Toronto, said he could not attend this meeting but was still interested to develop the Work Statement. Fred Winkelman asked whether the modeling assumptions would be regionally specific. JH thought that it would have to be since regional differences could be significant. CB asked whether the work would cover only single-family detached, or also multi-family and attached housing. JH thought that decision should be left to the authors of the WS. *Action Item* : Fred Buhl agreed to work with DP to develop this WS,

JH reviewed the second one-pager on "Defining Performance Factors for Primary and Secondary Equipment Simulation Inputs for Commercial Buildings". This idea was first proposed in Toronto by Dan Nall, who felt that there was very little advice about what to use for the default

curves in DOE-2 and BLAST programs, or how to recast available manufacturer's data into the inputs needed by typical simulation programs. JH rued that although this topic has been well received by the full committee and ranked first in the long-range research plan, there has been almost no progress on the WS since a rough one-pager was written in August 98. JH also differentiated between this WS, which is focused on interpreting currently available data, and a related WS being developed in the Components Subcommittee by CB, which is focused at defining a better set of system characterizations. In keeping with this scope, it was felt that the 3rd benefit listed in the one-pager, "promote the development of more uniform technical specifications...", should be deleted. Several people pointed out that some of this work has been done by PGE's Cool Tools project. *Action Items* : Bill Bahnfleth agreed to work with Dan Nall or others to develop this WS. JH agreed to check with PGE's Cool Tools project and forward that information to the WS authors.

JH described a new potential WS received by e-mail from Jan Hensen on "Development of a Web-based Directory of Case (and/or) Design Studies Representing Good Practice Examples of HVAC Application". CB felt that the scope of such a WS would be beyond the purview of TC 4.7. FB felt that such a WS might be more appropriate for the new TC on "Integrated Building Design". Kevin Knappmiller (KK) thought that ASHRAE could put their yearly Award Winners on the Web. Others also felt that ASHRAE could also put the Poster Sessions on the Web with little effort. The general consensus was that while they were in favor of various Web-based activities, these were beyond the scope of TC 4.7, and thus the proposed WS was inappropriate.

JH mentioned two other ideas for possible WS's. The first was the compilation of input data for use in airflow models. This idea developed out of discussions following a Symposium at this conference on airflow modeling. In particular, Craig Wray of TC 4.3 (Infiltration) thought there might be interest in his committee on this topic, which could be co-sponsored by TC 4.7. George Walton (GW) re-affirmed this interest on the part of TC 4.3. JH asked how much of that is currently available in the ASHRAE Handbook. GW said that some of it was available, but that it was limited. *Action Item* : George Walton agreed to explore this topic with TC 4.3 and report back to this Subcommittee whether further action is warranted.

JH mentioned another topic in which TC 4.7 might get involved, which is a WS being developed in TC 4.2 (Weather Information) by JH and FB to develop procedures to use weather data from the new automated (ASOS) weather stations in hourly simulation programs. The problem addressed by this WS is the switch from cloud to minutes of sunshine data as the Weather Service changes over from human observers to automated weather stations. Since almost all energy simulation programs rely on cloud data to estimate the amount of solar. Although this topic fostered much discussion on the implications on building energy simulations, the consensus was that it fell within the expertise and jurisdiction of TC 4.2 and that TC 4.7 co-sponsorship was not needed.

JH briefly reviewed the Long-Range Research Plan, in which the two WS under development by this Subcommittee are ranked 1 and 3.

Old Business

There was no old business.

New business

Jim Willson offered to chair a symposium for Minneapolis on “Better Inputs for Better Outputs”. KK thought the timing would be good for getting a paper from TC 4.1’s recently completed 1055-RP on office equipment loads. JH wondered if it might make sense to ask TC 4.1 to co-sponsor the Symposium. *Action Item* : Jim Willson agreed to explore various alternatives and begin planning for this symposium.

The meeting was adjourned at 5:05 p.m.

TECHNICAL COMMITTEE 4.7 – ENERGY CALCULATIONS
APPLICATIONS SUBCOMITTEE
Work Statement under Development

PROJECT TITLE***Standard Operating Conditions in North American Residential Buildings*****OBJECTIVE**

The objective of this research is to develop a standard series of recommendations on operating conditions applicable to simulation analysis of residential buildings in North America. The project seeks to remedy know gaps in knowledge associated with the standard operating conditions for performing hourly energy simulations such as DOE-2 or BLAST when using them for analysis of features in residential buildings. This research would include: (1) thorough literature review of information on standard operating conditions as used in residential simulation analysis currently, (2) development of information and recommendations on set points, schedules, procedures and assumptions backed by empirical data where possible and (3) assembling such information into an ASHRAE Toolkit including the appropriate documentation so that the assumptions, functions or other recommendations might be incorporated into a variety of simulation software types.

BENEFITS

The project will benefit ASHRAE membership as well as the general public as follows:

1. ASHRAE to develop a comprehensive series of guidelines to assist with performing simulations in residential buildings. Assist Committee 90.2 in better analyzing energy and IAQ related options in residential buildings.
2. Software suppliers to provide better methods, examples and default characteristics for use with building energy analysis software programs.
3. Utilities for better estimating peak load and load profile impacts of residential programs.
4. State code agencies for providing a better framework for performing simulation analysis in support of energy codes and home energy rating systems (HERS).
4. ASHRAE for developing more effective training programs for teaching engineers how to effectively apply building energy simulation software.
5. Improving energy efficiency by providing ASHRAE members with improved guidelines for calculating energy conservation savings and associated impacts with building energy simulations.

ESTIMATED COST

\$75,000

ESTIMATED DURATION

18 calendar months

METHOD OF PUBLISHING RESEARCH RESULTS

A Technical Paper will be presented at an ASHRAE meeting. An ASHRAE special pub. may also result.

POTENTIAL CO-SPONSORS

None yet identified.

WORK STATEMENT AUTHORS

Danny Parker

Fred Buhl

Joe Huang

TECHNICAL COMMITTEE 4.7 – ENERGY CALCULATIONS
APPLICATIONS SUBCOMITTEE
Work Statement under Development

PROJECT TITLE

Defining Performance Factors for Primary and Secondary Equipment Simulation Inputs for Commercial Buildings

OBJECTIVE

The objective of this research is to develop guidelines on how to model commercial HVAC equipment in hourly building energy simulation program relying only on performance specifications obtained from the manufacturer. This is the situation typically confronted by users of simulation programs in engineering applications, but the mapping of manufacturer's performance data to the inputs needed by programs such as DOE-2 or BLAST is neither straightforward nor well-understood. The available data are often incomplete, and may differ in their assumptions and terminology. On the other hand, the input descriptions required by simulation programs often appear to many engineers as idiosyncratic and differ from industry conventions. The project seeks to bridge this gap between what the manufacturer's data provide and what the simulation programs need. This research would include: (1) literature review of what types of technical information are available from manufacturers and an assessment of their usefulness for building energy simulations, (2) review and explanation of how commercial HVAC equipment are modeled in commonly used simulation programs, (3) develop guidelines and procedures on transforming manufacturer's specifications to input data for simulation programs, and (4) assembling such information into an ASHRAE Toolkit including the appropriate documentation, software if needed, and examples of its application for various types of equipment.

BENEFITS

The project will benefit ASHRAE membership as well as the general public as follows:

1. Improve the accuracy of energy simulations and design calculations by eliminating or reducing a source of error in modeling assumptions.
2. Promote the use of computer simulations as a tool for engineering design and evaluating system performance.
3. Inform the ASHRAE membership and the wider engineering profession of the relationships between manufacturer's specifications and seasonal performance of HVAC equipment.

ESTIMATED COST

\$50,000

ESTIMATED DURATION

12 calendar months

METHOD OF PUBLISHING RESEARCH RESULTS

A Technical Paper will be presented at an ASHRAE meeting. An ASHRAE special pub. may also result.

POTENTIAL CO-SPONSORS

None yet identified.

WORK STATEMENT AUTHORS

Dan Nall

Bill Bahnfleth

TECHNICAL COMMITTEE 4.7 – ENERGY CALCULATIONS
APPLICATIONS SUBCOMITTEE
Work Statement under Development

PROJECT TITLE

Development of a web based directory of case(and/or) design studies representing good practice examples of HVAC applications.

OBJECTIVE

Most (HVAC) designs are based on previous experience of the designer. The basic idea is that, as a designer, you can learn a lot of good (and bad) case studies. The work would also involve, specifying the requirements for case studies in terms of what material should be included and how the material should be presented.

BENEFITS

ESTIMATED COST

ESTIMATED DURATION

METHOD OF PUBLISHING RESEARCH RESULTS

POTENTIAL CO-SPONSORS

WORK STATEMENT AUTHORS

Jan Hensen

Inverse Subcommittee Meeting Minutes

Monday, January 25, 1999

Chicago

MINUTES

- Introductions

Meeting was called to order at 7:40 pm. There were seven attendees plus the chairman. Agami Reddy chaired the session instead of Jeff Haberl who could not attend the Chicago meeting.

- Approval of Toronto minutes

- Program

1. Forum 4 (sponsored by TC 4.7) 9:00 am—9:50 am (January 24, 1999) “Characterizing the Performance of Central Plants in Multi-Building Campuses.” Very good turnout—more than 60 people. Good discussion, seems that there is a real need to develop methodologies for baselining. Industry seems to adopt an ad hoc approach. Awareness of issues & how to tackle these issues seems low.

Action: After a certain amount of internal discussion, it was decided that TC 4.7 should sponsor a symposium entitled, ‘Practical Methods for Measuring Savings of Central Plants.’ A volunteer to chair this symposium is needed.

2. Agami Reddy reported that a symposium entitled “Methods for Calibrated Building Energy Simulation Programs” which he was trying to put together made no progress. Though the authors had expressed interest in submitting papers, no papers were received. After some discussion, it was decided to rename the symposium, “Calibrating Building Systems Models with Measured Data,” and try again. Two of the attendees (Claridge & Witte) expressed interest in preparing papers for the symposium.

- Work Statements in Progress

3. WS –1051: Development of a toolkit for comparing the results of hourly building simulation programs against measured energy and internal environmental data. Discussion on this work statement resulted in no real progress. It was decided that Jeff Haberl will continue working/developing this WS.

- New Research

4. Lots of discussion on what type of quantum jump & synthesis with other TCs is needed.

- Meeting adjourned at 9:15 pm.

Simulation & Component Models Subcommittee Meeting Minutes

Monday, January 25, 1999

Chicago

Chairman Dan Fisher called the meeting to order at 6:03 PM

Program

Program planned by S&CM for Seattle and beyond were discussed.

1. Seattle Symposium: *Application of Heat (and Mass) Balance Methods to Energy and Thermal Load Calculations*: Robert Sonderegger indicated that this symposium, chaired by Chip Barnaby, is in good shape. Papers are in second review, and the program should be on schedule for Seattle.
2. Dallas Seminar: *ASHRAE Software Toolkits for Energy Calculations*: The primary objective of this seminar is to make the ASHRAE membership aware of the existence and utility of the TC 4.7 toolkits. A secondary objective is to encourage other TCs to sponsor research that will result in additional models for the toolkits. Dru Crawley volunteered to organize and chair the seminar.
3. The symposium, *Recent Innovations in HVAC System Modeling* originally scheduled for Dallas, will be moved to the Minneapolis program. Jim Kelsey (kelsey@kw-energy.com) volunteered to organize and chair this symposium.
4. Kevin Knapmiller and Agami Reddy suggested that a seminar explaining the research interests of the Section 4 technical committees would be interesting. The committee agreed that this would be interesting, but would be difficult to organize.

Research Projects

1. RP-987 Loads Toolkit Update: Dru Crawley reported that work was progressing well. Contractor distributed CDs to the PMS with a proposed structure and method for publishing the Toolkit. At the TC 4.1 and TC 4.7 meetings, potential reviewers of the draft toolkit will be solicited. It is expected that reviewers would receive a draft for review by May or June.
2. RP 1049 Building System Design Synthesis: Curt Pedersen, chair of the PES, reported that the project is out for re-bid with proposals due May 14. It is anticipated that a contractor will be selected at the next meeting.

3. Research Plan. Chip Barnaby passed out a TC 4.7 Research Status sheet. Asked for updates before the TC meeting. Will be included in TC minutes.

Work Statements

1. Modeling Two- and Three-Dimensional Heat Transfer Through Composite Wall and Roof Assemblies in Hourly Energy Simulation Programs: Chip Barnaby reported that the work statement, approved by TC 4.7 at last meeting, has not yet been sent to ASHRAE HQ for bidding. The minor editorial changes requested at the last meeting have been made and the work statement will be sent to RAC for approval immediately following the Chicago meeting.
2. Standard HVAC Equipment Characteristics for Energy Calculation: Chip Barnaby led a spirited discussion on this work statement which will focus on performance data and equipment parameters that are required in order to adequately model unitary equipment. The project will develop a standard means of presenting equipment characteristics, and is viewed by the committee as an important step in developing IFC (Industry Foundation Class) standards for unitary equipment. A residential focus and possible coordination with TC 7.6 (Unitary Equipment) was suggested. Kevin Knappmiller and Vernon Smith volunteered to help Chip on the work statement. A draft was promised by Seattle.
3. Development of HVAC System Templates for Simulation Programs: Dru Crawley, Ed Sowell, Ian Beausoleil-Morrison, and Jan Hensen will draft a work statement to develop standardized information (templates) for simulating different HVAC systems. Draft will be ready for Seattle.

Potential Work Statements

1. Agami Reddy suggested a potential research project focused on uncertainty related to variability in schedules. For different types of building stock and climate, using existing data on variability of equipment, occupant, lighting, and HVAC operation, come up with range of impact on simulation results. Agami agreed to work on a 1-pager for Seattle.
2. Agami's second idea was to take the current simulation algorithms and introduce displacement ventilation. Kevin Knappmiller volunteered to work on a draft work statement. Need something between fully mixed and CFD.
3. Michael Brandemuehl suggested possible co-sponsorship of a TC 4.6 work statement on dynamic coil models. Anyone interested in this topic should contact Mike.

4. Agami suggested another potential topic that would investigate the impact of different controllers and control algorithms on simulation results.

New Business

Jeff Spitler noted that we needed a new room in order to carry on any new business. The room was much too small for the 28 people in attendance.

Dan Fisher adjourned the meeting at 7:29 pm.

TC 4.7 Research Status

Last updated Feb. 1, 1999

Active projects

#	Title	Joint TC	Cognizant subcom / Contractor	PMSC	Dates / status
865-RP	Accuracy tests for Mechanical System Simulation		Sim/Comp Penn/TAMU Gren Yuill	George Walton (chair), Ron Judkoff, Robert Sonderegger, Dave Knebel	Rec: 2-20-96 (San Antonio) NCE: until 2-28-98 (7-1-97) NCE: until 8-31-98 (1-20-98) NCE: until 3-31-99 (6-23-98) NCE: until 3-31-2000 (1-27-99)
987-RP	Preparation of a Toolkit for Building Load Calculations	4.1	Sim/Comp Univ. of Illinois Curt Pedersen	Dru Crawley (chair), Chip Barnaby, George Walton, Dave Knebel; Tom Romine (TC 4.1)	Rec: 1-28-97 (Phil) End: 12-31-99
1050-RP	Development of a Toolkit for Calculating Linear, Change-point Linear, and Multiple Linear Inverse Building Energy Analysis Models		Inv U. of Dayton Kelly Kissock	Jan Krieder (chair), Robert Sonderegger, Moncef Krarti, Agami Reddy	WS: 7-1-98 (Boston) Rec: 6-23-98 (Toronto)
1052-RP	Development of an Analytical Verification Test Suite for Whole Building Energy Simulation Programs – Building Fabric		Sim/Comp OSU Jeff Spitler	George Walton (chair), Ron Judkoff, Joel Neymark, Fred Winkelmann	WS: 7-1-97 (Boston) Rec: 6-23-98 (Toronto)
1093-RP	Compilation of Diversity Factors and Schedules for Energy and Cooling Load Calculations	4.1	App TAMU (TEES) Jeff Haberl	Agami Reddy (chair), Bill Bahnfleth, Joe Huang, Suzanne LeVisuer (TC 4.1)	WS: 1-20-98 (SF) Start: 2-1-99

In process

#	Title	Joint TC	Champion(s)	Committee	Dates / status
930-WS	Development of Procedures for Predicting Building Thermal and Electricity Use from Measured Data Using Neural Networks		N/a	Jeff Haberl (chair), Mike Brandemuehl, Mike Witte	WS: 7-1-97 (Boston) Withdrawn: 1-20-98 (SF)
1049-TRP	Building System Synthesis and Design	1.5	Sim/Comp Phil Haves	Curt Pedersen (chair), Ed Sowell, Dave Knebel, Robert Potter (TC 1.5)	WS: 1-20-98 (SF) Rejected all proposals: 6-23-98 (Toronto) Reopened for bids, due May 14, 1999

1051-WS	Development of a Toolkit for comparing the results of hourly building simulation programs against measured energy and internal environmental data		Inv Jeff Haberl	Curt Pedersen (chair), Dave Knebel, Fred Winkelmann	WS: 7-1-97 (Boston) Returned by RAS Resubmit in Seattle
	Modeling Two- and Three-Dimensional Heat Transfer Through Composite Wall and Roof Assemblies in Hourly Simulation Programs		Sim/Comp Joe Huang	Ian Beausoleil-Morrison (chair); George Walton; Fred Winkelmann	Approved in Toronto (6-23-98) Must be submitted by 2-15-99

Work statements – Applications

Title	Champion(s)	Ranking	Dates/status
Define Performance Factors for Primary and Secondary Equipment Simulation Inputs for Commercial Buildings	Dan Nall, Bill Bahnfleth	1	WS being developed
Standard Operating Conditions for North American Residential Buildings	Danny Parker, Joe Huang, Fred Buhl	3	WS being developed

Work statements – Inverse Methods

Title	Champion(s)	Ranking	Dates/status
Extend and Develop Methodology of 827-RP to include models for Screw Chillers, Air-Conditioners, and Heat Pumps	Inverse Methods	4	WS being developed

Work statements – Simulation and Component Models

Title	Champion(s)	Ranking	Dates/status
Standard HVAC Equipment Characteristics for Energy Calculations	Chip Barnaby, Kevin Knapmiller	2	WS being developed
Development of HVAC System Templates for Energy Simulation Programs	Jan Hensen, Dru Crawley, Ian Beausoleil-Morrison	5	WS being developed

TC 4.7 Handbook Subcommittee Meeting

Handbook of Fundamentals
Chapter 30
Energy Estimating and Modeling Methods
Monday, January 25, 1999

Present:

Bill Bahnfleth	wpb5@psu.edu	814-863-2076
Dave Claridge	claridge@esl.tamu.edu	409-845-1280
Agami Reddy	reddyta@post.drexel.edu	215-895-1502
Vernon Smith	vsmith@archenergy.com	303-444-4149
Robert Sonderegger	rsc@src-systems.com	510-848-8400
Chris Subbarao	chris.subbarao@ps.net	303-279-1190
Les Norford (chair)	lnorford@mit.edu	617-253-8797

The meeting began at 5:00 p.m. Norford and Claridge (the ASHRAE Handbook Committee liaison for Chapter 30) reviewed the schedule for the 2001 Handbook of Fundamentals:

June 1999 draft approved by the TC
January 2000 final version approved by TC

Norford stated that Krarti has prepared material on ground-coupled heat transfer. Krarti has covered slabs and will also treat basements. Claridge noted that the HoF chapter on residential heating and cooling loads may be removed from the 2001 Handbook, that this chapter is the only place where ground-coupled heat transfer is covered, and that it is appropriate for the energy calculations chapter to provide information on this subject. Claridge urged that Krarti include equations suitable for simple calculations.

Claridge stated that TC 4.1 still plans to cover the heat-balance method in the loads calculation chapter, with a draft due by the Seattle meeting. Norford will confirm that TC4.1 will both cover heat balances and use an example comparable to the example that Spittler prepared for the 1997 energy calculations chapter. Spittler and Norford have agreed that the example has value for ASHRAE members and should remain, in some form, in the HoF.

Reddy has reviewed the chapter material on degree-day and bin methods and on inverse methods. Norford will incorporate Reddy's suggestions about how to introduce inverse methods in the General Considerations section of the chapter and will also incorporate Reddy's comments, relatively minor, on

the degree-day and bin methods section. Reddy's outline for the inverse section met with general approval, as a framework that should boost a reader's understanding of the types of inverse methods and their applications. Reddy will prepare an outline of his recommended changes to the organization of the inverse-modeling section within six weeks, Norford will circulate the outline to those attending the subcommittee meeting, and provide comments to Reddy within two weeks. Reddy will then take an additional six weeks to prepare a draft of the revised section, including an example.

Norford noted that Brandemuehl has yet to suggest any required revisions to the secondary and primary components sections, but that there is still time for such suggestions. Norford will incorporate changes suggested by Brandemuehl and modifications made by Bahnfleth and Hittle, who have reviewed the entire chapter, into a revision draft.

In accordance with the above schedule, it is planned to have a review draft to the entire TC in time for comments at the Seattle meeting in June 1999.

The meeting adjourned at 6:00 p.m.

NATIONAL RENEWABLE ENERGY LABORATORY (NREL)
1617 COLE BLVD
GOLDEN CO 80401
USA
email: ron_judkoff@nrel.gov

PHONE: 303-384-7520
FAX: 303-384-7540
DATE: 01/26/99

MINUTES
SPC-140 SMOT FOR BUILDING ENERGY SOFTWARE
Chicago 01/25/99
R. Judkoff

ATTACHMENTS

- A. Agenda for January 25, 1999 meeting
- B. Meeting handout of substantive and editorial changes
- C. Page 7 of meeting handout after amendments
- D. Mailing List

CORRESPONDANCE SINCE LAST MEETING

Chair corresponded with ASHRAE Staff regarding ASHRAE staff review. ASHRAE Staff submitted their review to the SPC 140 Chair on Jan 13, 1999. Review clarifications submitted by ASHRAE Staff on January 19, 1999.

GENERAL

None

INTERMODEL COMPARISON BASED TESTS

The purpose of the meeting was to incorporate changes to Standard 140 Working Draft 98/2 recommended by ASHRAE Staff.

Attendees (see mailing list for full names, etc)

- Crawley
- Judkoff (chair)
- Neymark (non-voting)
- Sonderegger
- Walton
- Winkelmann
- Witte

Committee Discussion

Approval of Prior Minutes

Motion (Winkelmann): Accept Minutes of June 1998 meeting (Toronto).

2nd (Walton):

Vote: Yes = 6, No = 0

Absent = (Wilcox, Maeda, Fraser, Haberl)

Motion passed.

Motion (Crawley): To approve substantive changes documented on p. 7 of the meeting handout (page changes entitled "Weather data format table should be normative as that is what the user must refer to if they do not have a TMY processor on board with their software." [See attachment C]

2nd (Witte)

Vote: Yes = 6, No = 0

Absent = (Wilcox, Maeda, Fraser, Haberl)

Motion passed.

The committee also reviewed editorial (non-substantive) changes described in pp. 1-6 of the meeting handout (see attachment B). The committee had no negative comments regarding incorporating the editorial changes.

Discussion regarding justification for SPC 140 eventually becoming an SSPC:

The Chair needs to write a letter of justification to our liaison to SPLS, Jim Ranfone (copy to Claire Ramspeck). The Chair also needs to check with Claire Ramspeck on the proper timing of the request. Reasons discussed with SPC-140 for becoming an SSPC were:

-To fill out framework of SMOT (see Standard 140 Working Draft 98/2 informative Annex B13).

-Refinements will be needed because this is a new SMOT and conceptually a new type of SMOT (software test) for ASHRAE.

-There will be a need for a standing committee to respond to requests for interpretations because of the complexity and newness of the standard.

-SSPC 140 should start with the current personnel of the SPC for continuity to be able to effectively handle requests for interpretation.

-The letter to Ranfone and the SPLS should be submitted once the Standards Committee has approved the SMOT, but before the Board has approved it. (If the request goes in too soon, it might look like the SMOT was not complete, and therefore not appropriate to approve for publication.)

Adjourned

Attachment A - Meeting Agenda

AGENDA

SPC 140
January 25, 1999
Chicago, IL

- 0) Approval of prior meeting minutes
- 1) Recommended changes to Standard 140 based on ASHRAE Staff Review
 - citations of informative annexes and references (editorial)
 - make weather data format table normative
- 2) Discuss justification for becoming an SSPC

Attachment B - Meeting handout of substantive and editorial changesRecommendations to SPC 140 to address ASHRAE Staff comments regarding normative versus informative references.
sp012199.wp5 24 Jan, 1999

Note: a review of classification of references by ASHRAE staff led to a review of citation of Annexes by the Chair's designee. Language consistent with citing the informativeness of various references and annexes has been revised accordingly. Mandatory sounding language is now not used in conjunction with informational references and annexes. Liz Baker of ASHRAE Staff has reviewed these proposed changes and confirmed (telephone conversation with Neymark, 01/22/99) that the changes below are considered editorial and do not require a vote by the committee. However, informing the committee of these proposed changes was recommended.

Page numbers and section numbers below refer to Standard 140 Working Draft 98/2.

Regarding citation of informative annexes.

#1) Regarding Annex B1 replace in Section 6.1.1, p. 47

"(see Annex B1 for a summary listing of all the cases)"

with

"(Annex B1 includes an informational summary listing of all the cases)"

#2a) Regarding Annex B3 replace in 5.2.1.6 (p. 14)

"For further discussion of this input see informative Annex B3."

with

"The calculation technique used to develop Table 2 is provided as background information in informative Annex B3."

#2b) Regarding Annex B3 replace in 5.2.2.1.5.2 (p. 29)

"For informational discussion of this adjustment, see informative Annex B3."

with

"The calculation technique used to develop Table 10 is provided as background information in informative Annex B3."

#2c) Regarding Annex B3 replace in 5.2.3.6 (p. 41)

"For further discussion of this input see informative Annex B3."

with

"The calculation technique used to develop Table 19 is provided as background information in informative Annex B3."

#3a) Regarding Annexes B4 & B5 replace in Section 5.2.1.9 (p. 17)

"See informative Annexes B4 and B5 more information is needed on exterior film coefficients."

with

"The calculation technique used to develop Table 4 is provided as background information in informative Annex B4. A calculation technique which may be used for comparing combined surface coefficients as a function of infrared emittance is provided as background information in informative Annex B5."

#3b) Regarding Annexes B4 & B5 replace in Section 5.2.1.9 (p. 17)

"See informative Annexes B4 and B5 if more information is needed on exterior film coefficients."

with

"The calculation technique used to develop Table 18 is provided as background information in informative Annex B4. A calculation technique which may be used for comparing combined surface coefficients as a function of infrared emittance is provided as background information in informative Annex B5."

#4) Regarding Annex B4 delete 1st par. of Annex B4 (p. 68)

"If the program does not automatically calculate exterior surface radiation and convection internally, then use the information given below."

[No replacement language]

#5a) Regarding Annex B5 replace in Section 5.2.1.10 (p. 18)

"See informative Annex B5 for more discussion about interior combined radiative and convective film coefficients."

with

"Informative Annex B5 includes background information about combined radiative and convective film coefficients."

#5b) Regarding Annex B5 replace in Section 5.2.3.2 (p. 40)

"See informative Annex B5 if more information is needed on interior combined radiative and convective film coefficients."

with

"Informative Annex B5 includes background information about combined radiative and convective film coefficients."

#6) Regarding Annex B6 replace in Section 5.2.1.11 (p. 20, 2nd sentence of 1st par.)

"For programs which need transmittance or reflectance at other angles of incidence, calculate them using the equations given in informative Annex B6, or interpolate between the values in Table 7 using the cosine of the incident angle as the basis for interpolation."

with

"For programs which need transmittance or reflectance at other angles of incidence, the user may interpolate between the values in Table 7 using the cosine of the incident angle as the basis for interpolation."

and replace in Section 5.2.1.11 (p. 20, last sentence of 1st par.)

"For further informational discussion related to calculating angle dependent glazing optical properties, refer to informative Annex B6."

with

"For further informational discussion related to calculating angle dependent glazing optical properties, refer to informative Annex B6; this information may be useful for deriving inputs not given in this section that some software may need."

#7a) Regarding Annex B7 replace in Section 5.2.1.12 (p. 21)

"Annex B7 has a detailed description of the algorithm and other assumptions used for calculating these solar fractions."

with

"Informative Annex B7 gives background information regarding the calculation technique used for developing these solar fractions."

#7b) Regarding Annex B7 replace in Section 5.2.2.1.2.2 (p. 26)

"Informative Annex B7 discusses the algorithm used for calculating these solar fractions."

with

"Informative Annex B7 gives background information regarding the calculation technique used for developing these solar fractions."

#7c) Regarding Annex B7 replace in Section 5.2.2.2.7.4 (p. 34)

"Informative Annex B7 has a detailed description of the algorithm used for calculating these solar fractions."

with

"Informative Annex B7 gives background information regarding the calculation technique used for developing these solar fractions."

#7d) Regarding Annex B7 replace in Section 5.2.3.9.3 (p. 42)

"Informative Annex B7 has a detailed description of the algorithm used for calculating these solar fractions."

with

"Informative Annex B7 gives background information regarding the calculation technique used for developing these solar fractions."

#7e) Regarding Annex B7 replace in Section 5.2.3.10.2 (p. 43)

"Informative Annex B7 has a detailed description of the algorithm used for calculating these solar fractions."

with

"Informative Annex B7 gives background information regarding the calculation technique used for developing these solar fractions."

#7f) Regarding Annex B7 replace in Section 5.2.3.12.2 (p. 44)

"Informative Annex B7 has a detailed description of the algorithm and other assumptions used for calculating these solar fractions."

with

"Informative Annex B7 gives background information regarding the calculation technique used for developing these solar fractions."

#8) Regarding Annex B11 replace in Annex A1 (p. 50, last paragraph)

"For more information regarding the difference between solar time and standard time, see informative Annex B11 (Section B11.3)."

with

"Additional background information regarding the difference between solar time and standard time is included in informative Annex B11 (Section B11.3)."

#9) To be consistent that Reference #1 is informative, we propose to revise 5.2.1.10 (p. 18) as follows.

delete from 1st paragraph on p. 18

"from Chapter 24 of the *1997 ASHRAE Handbook-Fundamentals*¹"

And then revise the last paragraph of 5.2.1.10 (p. 18) so that it will read as

"Background information regarding values listed in Table 5 is available in Chapter 24 of the *1997 ASHRAE Handbook-Fundamentals*¹. Informative Annex B5 includes background information about combined radiative and convective film coefficients."

#10) Similarly to be consistent that Reference #4 is informative, we propose to revise p. 50 as follows.

from 2nd to last sentence on page, delete the superscript "4".

And then revise the 2nd to last paragraph on p. 50 so it will read as

"E varies roughly ± 15 minutes throughout the year because of cosmology. Additional background information on the equation of time may be found in *Solar Engineering of Thermal Processes*⁴."

[Also, while we're in Annex A1 we should note that for $E = \dots$, that E is in minutes and B, Lst and Lloc are in degrees (this is editorial - implicit in a calculation like this is that it would have consistent units)].

#11) Similarly, the proposed revision #6) (above) is consistent with Reference #11 as being informative. [presumably no vote is required here if #6 passes {if a vote is required for that}]

Weather data format table should be normative as that is what the user must refer to if they do not have a TMY processor on board with their software. To make this change do the following:

- revise 2nd paragraph of Annex A1 to read as:

"Site and weather characteristics are summarized in Table A1-1. For those software that do not have TMY weather processors, Typical Meteorological Year (TMY) weather data file format is provided in Table A1-2.⁸ This reprint of tables also includes some additional notes from our experience with TMY data. If this summary is insufficient, the complete documentation on TMY weather data can be obtained from the National Climatic Center (NCC) in Asheville, North Carolina. Their address is Federal Bldg., Asheville, NC 28801-2733, telephone 704-271-4800. Informative Annex B2 contains additional background information regarding TMY weather data."

- Table B2-1 relocated to normative Annex A1 and renamed as Table A1-2.
- Reference #8 ("Typical Meteorological Year", National Climatic Center, 1981) must be voted as a normative reference.
- revise Annex B2 to just give background info about TMY data, so that the title and first paragraph are:

**"Appendix B2
About Typical Meteorological Year (TMY) Weather Data**

This Annex is not part of the Standard Method of Test, but is included for information purposes only.

For convenience we have reprinted the following discussion from the documentation for DOE2.1A *Reference Manual*, (p. VIII-31)⁷."

And in the second paragraph, 1st sentence change "NCC" to "National Climatic Center (NCC)"

Attachment C. Page 7 of meeting handout after amendments

Weather data format table should be normative as that is what the user must refer to if they do not have a TMY processor on board with their software. To make this change do the following:

- revise 2nd paragraph of Annex A1 to read as:

"Site and weather characteristics are summarized in Table A1-1. For those programs that do not have TMY weather processors, Typical Meteorological Year (TMY) weather data file format is provided in Table A1-2. This reprint of tables also includes some additional notes based on experience with TMY data. If this summary is insufficient, the complete documentation on TMY weather data⁸ can be obtained from the National Climatic Data Center (NCDC) in Asheville, North Carolina. Their address is Federal Bldg., Asheville, NC 28801-2733, telephone 828-271-4800. Informative Annex B2 contains additional background information regarding TMY weather data."

- Table B2-1 relocated to normative Annex A1 and renamed as Table A1-2.

[editor's note: SPC 140 agreed that Reference #8 will remain as informational.]

- revise Annex B2 to just give background info about TMY data, so that the title and first paragraph are:

**"Appendix B2
About Typical Meteorological Year (TMY) Weather Data**

This Annex is not part of the Standard Method of Test, but is included for information purposes only.

For convenience we have reprinted the following discussion from the documentation for DOE-2.1A *Reference Manual*, (p. VIII-31)⁷."

And in the second paragraph, 1st sentence change "NCDC" to "National Climatic Data Center (NCDC)"

Attachment D - SPC 140 ADDRESS LIST

(note: in general email attachments should go out as both *.DOC, *.RTF and *.WP5)

VOTING MEMBERS

Dru Crawley (User)
U.S. Department of Energy
EE-41
1000 Independence Avenue SW
Washington, DC 20585
Ph: (202) 586-2344
Fax: (202) 586-1628
email: drury.crawley@hq.doe.gov

Kathleen Fraser (Producer)
Fraser & Associates
Suite 356
305-4625 Varsity Drive, NW
Calgary, Alberta, T3A029
Ph: (403) 815-4876
Fax: (403) 267-2131 c/o TransAlta Utilities
email: kfraser@canuck.com

Jeff S. Haberl, Ph.D., P.E. (User)
Department of Architecture
Texas A&M University
College Station, Texas 77843-3581
Ph: (409) 845-6065 -6507
Fax: (409) 862-2457
email: jhaberl@loanstar.tamu.edu
(note: send email attachments as *.RTF using MIME)

Ron Judkoff (General, Chair)
NREL
1617 Cole Blvd
Golden CO 80401
ph: 303 384 7520
fax: 303 384 7540
email: ron_judkoff@nrel.gov

Bruce Maeda (General)
California Energy Commission
1516 Ninth St MS42
Sacramento CA 95814
ph: 916 654 4077
fax: 916 654 4304
email: bmaeda@energy.state.ca.us

Robert C. Sonderegger (Producer)
SRC Systems Inc.
2855 Telegraph Avenue
Suite 410
Berkeley, CA 94705
Ph: (510) 848-8400
Fax: (510) 848-0788
email: rcs@oak.synergic.com

George Walton (General)
NISTAdmin
343 Route 270
South Quincy @ Orchard Road
Gaithersburg, MD 20899
Ph: (301) 975-6421
Fax: (301) 975-4032
gwalton@nist.gov

Bruce Wilcox (Producer)
BSG
1327 Grand Ave.
Piedmont, CA 94610
Ph: (510) 601-7475
Fax: (510) 601-7415
bwilcox@b-s-g.com.

Fred Winkelmann (Producer)
LBNL
One Cyclotron Road
MS 90-3149
Berkeley, CA 94720
Ph: (510) 486-4925
Fax: (510) 486-4089
email: fcw@gundog.lbl.gov

Michael J. Witte (User)
GARD Analytics, Inc.
1028 Busse Hwy.
Park Ridge, IL 60068
Ph: (847) 698-5685
Fax: (847) 698-5600
email: mjwitte@gard.com

SPC 140 RECENT PRIOR MEETING ATTENDEES (NON-VOTING)

Ian Beausoleil-Morrison
Natural Resources Canada
CANMET Energy Technology Centre
580 Booth St., 13th Floor
Ottawa, Ontario
K1A0E4 Canada
Ph: 613 943 2262
Fax: 613 996 9909
email: beausoleil-morrison@etb.mets.nrcan.gc.ca

Fred Buhl
LBNL
One Cyclotron Road
Berkeley, CA 94720
Ph: (510) 486-4912
Fax: (510) 486-4089
email: buhl@gronk.lbl.gov

Gale Corson
1333 Broadway Ste 1015
Oakland, CA 94612
Ph: 510 444 6500, x27
email: galec@schiller.com

Joel Neymark
2140 Ellis Street
Golden, CO 80401
Ph: (303) 384-3672
Fax: (303) 384-9427
email: neymarkj@csn.net

Jim Pegues
Carrier Corporation
TR1, Room 250
P.O. Box 4808
Syracuse, NY 13221
Ph (315) 432-6526
Fax: (315) 432-6844
email: james.f.pegues@carrier.wtk.com

Lawrence R. Schaefer
Carrier Corporation
P.O. Box 4808
Carrier Parkway. TR-1
Syracuse, New York 13221

Ph: 315 432 6838

Fax: 315 432 6844

email: larry.schaefer@carrier.utc.com

Klaus Sommer

Fachhoch-Schule Koeln

klaus.sommer@vt.fh-koeln.de

SPC 140 ASHRAE Liasons & Cognizant ASHRAE Staff

SPLS LIASON

James A. Ranfone
American Gas Association
1515 Wilson Blvd.
Arlington VA, 22209
Ph: 703 841 8648
Fax: 703 841 8689
email: jranfone@aga.com

STAFF LIASON

Claire Ramspeck
Manager of Standards
ASHRAE
1791 Tullie Circle NE
Atlanta GA 30329-2305
ph: 404 636 8400
fax: 404 321 5478
email: cramspeck@ashrae.org

Sandra Armstrong
Standards Administrator
ASHRAE
1791 Tullie Circle NE
Atlanta GA 30329-2305
ph: 404 636 8400 ext. 508
fax: 404 321 5478
email: sarmstrong@ashrae.org

Doug Tucker
Assistant Manager of Standards - American
ASHRAE
1791 Tullie Circle NE
Atlanta GA 30329-2305
ph: 404 636 8400 ext. 503
fax: 404 321 5478
email: dtucker@ashrae.org

SPC 140 OTHER CORRESPONDING PARTICIPANTS

Charles S Barnaby
Wrightsoft
394 Lowell St.
Lexington MA 02173
ph: 781 862 8719
fax: 781 861 2058
cbarnaby@wrightsoft.com

Jason Glazer
GARD Analytics, Inc.
1028 Busse Hwy.
Park Ridge, IL 60068
Ph:
Fax: (847) 698-5600
email:

Jeffrey D Spitler
Oklahoma State University
School of Mechanical & Aerospace Engineering
Engineering North 218
Stillwater, OK 74078
ph: 405 744 5900
fax: 405 744 7873
email: spitler@osuunx.ucc.okstate.edu

Gren Yuill
University of Nebraska
Department of Architectural Engineering
Room 123E, Engg
6001 Dodge St.
Omaha, NE 68182-0176
ph: 402 554 3859
fax: 402 554 3860
email: Grenville_Yuill/CET/UNO/UNEBR@unomail.unomaha.edu