

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: December 3, 2002

TC/TG/TRG TITLE: Energy Calculations

DATE OF MEETING: June 25, 2002 LOCATION: Honolulu

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS & ADDIT'L ATTENDANCE
Jeff Snitler (CHM)	2000	Rick Strand	2001	
Dru Crawley (VC)	2000	Jan Hensen (INTL)	2000	
Les Norford (SECY)	2000	Carol Gardner	1998	
Chip Barnaby (RES)	1999	Gren Yuill	2000	
Ian Beausoleil-Morrison	2000			
Klaus Sommer (INTL)	1999			
Joel Nevmark	2000			
Moncef Krarti	1999			
Phil Haves	2000			
Agami Reddy	1999			
Vern Smith	2000			
Jim Willson	2000			
Craig Wray	2000			

DISTRIBUTION

ALL MEMBERS OF THE TC/TG/TRG

TAC CHAIR
TAC SECTION HEAD
SPECIAL PUBLICATIONS LIAISON
JOURNAL/INSIGHTS LIAISON
STANDARDS LIAISON
HANDBOOK LIAISON
PROGRAM LIAISON
RAC RESEARCH LIAISON
TEGA LIAISON
STAFF LIAISON (RESEARCH)
STAFF LIAISON (TECH SERVICES)
STAFF LIAISON (STANDARDS)

K. William Dean
Eckhard Achim Groll
Joseph Driscoll
Harvey Sachs
David Knebel
David Claridge
Emil Friberg
Sheila Hayter
William Knight
William Seaton
Martin Weiland
Claire Ramspeck

ASHRAE TC 4.7 Energy Calculations**HONOLULU MEETING****ACTION ITEMS**

Agenda for Honolulu and minutes from Atlantic City approved by voice vote.

TC 4.7 endorsement of the development of an ASHRAE short course on energy simulation, the proposal for which to be prepared by Gren Yuill. Approved 12-0-0, chair not voting.

TC 4.7 technical bulletin on estimating building-energy usage. Approved 12-0-1, chair not voting.

Final report for 865-RP. Approved 12-0-1, chair not voting.

No-cost extension through July 31, 2003 for 1049-RP. Approved 13-0-0, chair not voting.

Final report for 1222-RP. Approved 13-0-0, chair not voting.

Long-range research plan for 2003-2004. Approved 12-0-1, chair not voting.

Program plan for Chicago. Approved 13-0-0, chair not voting.

TC 4.7 co-sponsorship of a TC 9,6 seminar at Chicago on applying GP 14. Approved 13-0-0, chair not voting.

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TC/TG/TRG MEETING SCHEDULE				
LOCATION – past 12 months		DATE	LOCATION - planned next 12 months	
Atlantic City		January 15, 2002	Chicago	
Honolulu		June 25, 2002	Kansas City	
			January 28, 2003	
			July 1, 2003	
TC/TG/TRG SUBCOMMITTEES				
Function			Chair	
Simulation and Component Models			Dan Fisher	
Applications			Jim Willson	
Inverse Methods			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	Approved	To R & T
	Appendix 2.			
HANDBOOK RESPONSIBILITIES				
Year & Volume	Chapter Title	No.	Deadline	Handbook Subcom. Chair/Liaison
2005 Fundamentals	Energy Estimating Methods	31		Strand/Claridge
STANDARDS ACTIVITIES - List and Describe Subjects				
SSPC 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 3
TC/TC/TRG Sponsored Symposia - Title, when presented (past 3 yrs. present & planned)
Appendix 4
TC/TG/TRG Sponsored Seminars - Title, when presented (past 3 yrs. present & planned)
Appendix 5
TC/TG/TRG Sponsored Forums - Title, when presented (past 3 yrs. present & planned)
none
JOURNAL PUBLICATIONS - Title, when published (past 3 yrs. present & planned)
none

Additional Attendance

This is a complete listing of attendees at this and the prior three meetings. It includes the voting members of the committee listed on the first page. Email addresses are listed for those who have explicitly authorized their inclusion in the minutes, which are posted on the TC's web site.

Present at TC 4.7 meeting?					Last name	First name	Email
Agree to email on list	Honolulu June 2002	Atlantic City Jan 2002	Cincinnati June 2001	Atlanta Jan 2001			
			X	X	Anderson	J R	jrhazel@bellsouth.net
		X			Armstrong	Peter	parmstr@mit.edu
X	X	X			Bahnfleth	Bill	wbahnfleth@psu.edu
X	X	X	X	X	Barnaby	Chip	CBarnaby@wrightsoft.com
X	X				Bauman	Fred	fbauman@uclink.berkeley.edu
X	X	X	X	X	Beausoleil-Morrison	Ian	IBeausol@nrcan.gc.ca
		X		X	Black	Al	ablack@mcclureeng.com
X	X				Bojic	Milorad	bojic@knez.uis.ac.yu
X	X	X		X	Brandemuehl	Mike	
				X	Brau	Jean	
				X	Buhl	Fred	
X	X	X			Carpenter	J Patrick	pcarpenter@tklp.com
		X			Chantrasrisalai	Chanvit	chanvit@okstate.edu
		X	X	X	Claridge	David	Claridge@esl.tamu.edu
X	X	X	X	X	Crawley	Dru	Drury.Crawley@ee.doe.gov
			X		Dougherty	Brian	
				X	Del Porte	Scott	
		X			Deng	Zheng	zhengd@okstate.edu
			X		Domanski	Piotr	
			X		Dubrous	Francois	
				X	Eldridge	David	
X	X	X	X		Fisher	Dan	DFisher@okstate.edu
		X			Fleming	Bill	flemg@aol.com
				X	Garde	Francois	
X	X				Gowri	Krishnan	k_gowri@pnl.gov
				X	Gu	Lixing	
		X	X	X	Haberl	Jeff	JHaberl@esl.tamu.edu
		X		X	Haddad	Kamel	khaddad@nrcan.gc.ca
X	X	X	X	X	Haves	Philip	PHaves@lbl.gov
					Henderson	Hugh	
X	X		X	X	Hensen	Jan	j.hensen@tue.nl
				X	Howell	Jamie	
X	X	X			Huang	Joe	YJHuang@lbl.gov
				X	Hydeman	Mark	

Present at TC 4.7 meeting?					Last name	First name	Email
Agree to email on list	Honolulu June 2002	Atlantic City Jan 2002	Cincinnati June 2001	Atlanta Jan 2001			
		X			Iu	Ipseng	iip@okstate.edu
		X			Jin	Hui	jinh@okstate.edu
X	X				Judkoff	Ron	ron_judkoff@nrel.gov
				X	Kimura	Ken-ichi	
			X	X	Klaassen	Curtis	
			X		Klein	Sandy	
			X	X	Knappmiller	Kevin	
		X			Kong	Weixiu	weixiu@okstate.edu
		X	X	X	Kosny	Jan	kyo@ornl.gov
		X			Krarti	Moncef	krarti@colorado.edu
				X	Kreider	Jan	
X	X				Lawrence	Tom	lawrenct@ecn.purdue.edu
X	X			X	Liesen	Richard	r-liesen@uiuc.edu
			X		Logee	Terry	
				X	Lotfi	Nemat	
		X	X	X	McDowell	Tim	Mcdowell@tess-inc.com
			X	X	Mottillo	Maria	
X	X	X	X	X	Neymark	Joel	neymarkj@msn.com
			X		Nichols	Laurier	
X	X	X	X	X	Norford	Les	lnorford@mit.edu
			X		Nguyen	Phuong	
		X			Parson	Jim	parsons@me.msstate.edu
X	X	X	X	X	Pedersen	Curt	cpederse@uiuc.edu
					Purdy	Julia	
X	X	X	X	X	Reddy	T. Agami	reddyta@drexel.edu
X	X	X	X	X	Rees	Simon	SJRees@okstate.edu
		X			Riemer	Paul	paulr@twgi.com
				X	Scharpf	Dan	
			X		Schwarz	Walter	
X	X	X	X	X	Smith	Vernon	VSmith@archenergy.com
X	X	X	X	X	Sommer	Klaus	Klaus.Sommer@vt.fh-koeln.de
X	X	X		X	Sonderegger	Robert	rsonder@siliconenergy.com
X	X	X	X	X	Spitler	Jeffrey	Spitler@okstate.edu
X	X		X	X	Strand	Rick	R-Strand@uiuc.edu
X	X	X	X	X	Walton	George	GWalton@nist.gov
	X	X			Wassmer	Mike	wassmer@colorado.edu
		X	X	X	Willson	Jim	jimwill@indy.net
				X	Winkelmann	Fred	FCWinkelmann@lbl.gov
			X	X	Witte	Mike	MJWitte@gard.com
X	X	X	X	X	Wray	Craig	CPWray@lbl.gov
X	X		X	X	Wright	Jonathan	J.A.Wright@lboro.ac.uk
		X			Xiao	Dongyi	xdongyi@okstate.edu
			X		Yuill	Gren	yuill@unomaha.edu

Present at TC 4.7 meeting?					Last name	First name	Email
Agree to email on list	Honolulu June 2002	Atlantic City Jan 2002	Cincinnati June 2001	Atlanta Jan 2001			
			X		Zhang	Weiming	wz@gkceme.com
		X			Zhang	Yi	y.zhang@lboro.ac.uk

Appendix 1**RESEARCH PROJECTS****TC 4.7 RESEARCH PROJECTS STATUS****Active projects**

#	Title	Joint TC	Cognizant Subcommittee/ Contractor	PMSC	Dates / status
865-RP	Accuracy Tests for Mechanical System Simulation		Sim/Comp Penn State/ TAMU Gren Yuill	George Walton (chair), Ron Judkoff, Robert Sonderegger, Dave Knebel	Rec: 2-20-96 (San Antonio) NCE: 2-28-98 (7-1-97) NCE: 8-31-98 (1-20-98) NCE: 3-31-99 (6-23-98) NCE: 3-31-00 (1-27-99) NCE: 3-31-01 (2-8-00) NCE: 8-31-01 (1-30-01) NCE: 3-31-02 (6-26-01) Accept report : 6-25-02
1049-RP	Building System Synthesis and Design	1.5	Sim/Comp Loughborough University Jonathan Wright	Curt Pedersen (chair), Ed Sowell, Dave Knebel, Ron Nelson (TC 1.5), Mike Brandemuehl (TC 4.6), Jan Hensen	WS: 1-20-98 (SF) Rec: 6-22-99 (Seattle) NCE: 7-31-03 (6-25-02)
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) NCE: 3-31-01 (6-27-00) NCE: 10-1-01 (1-30-01)
1197-RP	Updated Energy Calculation Models for Residential HVAC Equipment	7.6	Sim/Comp U Colorado Michael Brandemuehl	Chip Barnaby (chair), Craig Wray, Brian Dougherty (TC 7.6)	WS: 2-8-00 (Dallas) Start: 1-02
1222-RP	Incorporation of Nodal Room Heat Transfer Models into Energy and Load Calculation Procedures		Sim/Comp MIT, Yan Chen	George Walton (chair), Ian Beausoleil- Morrison, Kevin Knappmiller, Phil Haves	WS: 6-00 (Minn) Start: 8-01 Accept report: 6-25-02

Appendix 2**RESEARCH PLAN**

**Technical Committee 4.7 Energy Calculations
2003-2004 Research Plan
1 August 2002**

Title	TC Priority 2003- 2004	Prior TC priority	Society status	TC Status	Sub- com
Procedures for Reconciling Computer-Calculated Results With Measured Energy Data (1051-TRP)	0	3 (1998-1999)	Work statement approved, awaiting funding		IM
Development of Comparative Test Cases for Evaluating Simulation Models of Slab, Crawl Space and Basement Heat Transfer Through Adjacent Ground	0	2 (2001-2002)	RTAR, accepted	Hold, IEA work underway	SCM
Inverse Bin Procedures for Analyzing Energy Savings	0	3 (2001-2002)	RTAR, accepted		IM
Procedures and Data for High-Performance Residential Design	0	1 (2002-2003)	RTAR, accepted	Draft WS	A
Development of a Procedure for Base-lining Energy Use at Large Central Plants	0	2 (2002-2003)	RTAR, prioritized	Draft WS	IM
Technical and Usability Enhancements to the Energy Calculation Toolkits	1			RTAR	SCM
Improving Load Calculations for Fenestrations with Shading Devices	Co-sponsor			TC 4.1 RTAR	

Appendix 3**TECHNICAL PAPERS FROM SPONSORED RESEARCH**

RP	Title	Contractor	Approved	Paper
987	Loads Toolkit	UIUC, Pedersen	Atlanta, January 2001	Pedersen, C.O., D.E. Fisher, R.J. Liesen, and R.K. Strand. 2003. "ASHRAE Toolkit for Building Load Calculations." ASHRAE Transactions 109(1). To be presented in Chicago, January 29, 2003
1052	Verification Test Suite	OSU, Spitler	Atlanta, January 2001	Rees, S.J., D. Xiao, and J.D. Spitler. 2002. "An Analytical Verification Test Suite for Building Fabric Models in Whole Building Energy Simulation Programs." ASHRAE Transactions. 108(1):30-41.
1145	Two- and Three-Dimensional Heat Transfer	Enermodal	Atlanta, January 2001	Carpenter, S.C., J. Kosny, and E. Kossecka. 2003. "Modeling Transient Performance of 2 and 3-D Building Assemblies: ASHRAE 1145-RP." ASHRAE Transactions 109(1). To be presented in Chicago, January 29, 2003
1093	Diversity Factors	TAMU, Haberl	Cincinnati, June 2001	Abushakra, B., D.E. Claridge and J.S. Haberl. "Electricity Diversity Profiles for Energy Simulation of Office Buildings;" "Electricity Diversity Profiles for Peak Cooling Load Determination in Office Buildings;" and "Overview of Literature on Diversity Factors and Schedules for Energy and Cooling Load Calculations." Submitted to ASHRAE December 27, 2001.
865	Accuracy Tests	UNO, TAMU	Honolulu, June 2002	Yuill, G.K. and J.S. Haberl. "Development of Accuracy Tests for Mechanical System Simulations." Submitted to ASHRAE July 29, 2002.
1222	Nodal Models	MIT, Chen	Honolulu, June 2002	Two papers submitted to Int. J. of HVAC&R Research

Appendix 4**TC/TG/TRG SPONSORED SYMPOSIA****Current as of November 19, 2002****PLANNED:**Kansas City, June-July 2003*Integrating Airflow Modeling into Energy Analysis Programs* (Chair: Jelena Srebric)Chicago, January 2003*Recent Advances in Building Energy Simulation* (Co-sponsored by TC4.1/Chair: Jan Hensen)*Inverse Methods for Calculating Savings from Energy Conservation Retrofits*
(Chair: Jan Kreider)**PRESENT:**Honolulu, June 2002*Recent Advances in the Thermal Simulation of HVAC Equipment*
(Co-sponsored by TC4.1/Chair: Ian Beausoleil-Morrison)**PAST:**Atlantic City, January 2002*Tools and Techniques for Calibration of Component Models*
(TC1.5 sponsor; TC4.7 co-sponsor/Chair: Agami Reddy)Cincinnati, June 2001*Better Inputs for Better Outputs* (TC9.6 co-sponsor/Chair: Jim Willson)Atlanta, January 2001*Analysis Tools for the Design of Low-Energy Cooling Systems* (Chair: Joe Huang)Minneapolis, June 2000*International Experience with Weather Data for Simulation and Design, Part 1: Simulation, Ventilation and Daylighting* (TC 4.2 co-sponsor/Chair: Dru Crawley)*International Experience with Weather Data for Simulation and Design, Part 2: Simulation*
(TC 4.2 co-sponsor/Chair: Dru Crawley)

Seattle, June 1999

Applications of Heat and Mass Balance Methods to Energy and Thermal Load Calculations
(Chair: Chip Barnaby)

Accuracy tests for simulation models (Chair: Mike Witte)

Appendix 5**TC/TG/TRG SPONSORED SEMINARS****Current as of November 19, 2002*****PLANNED:***

Anaheim, January 2004

Validation of Building Simulation Programs (Chair: Joel Neymark)

Successful Applications of Energy Simulation in Building Design (Chair: Ian Beausoleil-Morrison)

Kansas City, June-July 2003

Automated Baseline Procedures Using Inverse Methods (Chair: Jeff Haberl)

Inverse Methods in Support of Building Commissioning (Chair: Jean Lebrun)

Chicago, January 2003

Getting started in Building Simulation (Chair: Chip Barnaby)

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

PRESENT:

Honolulu, June 2002

none

PAST:

Atlantic City, June 2001

Commercial Use of Building Energy Simulation Software (Chair: Kamel Haddad)

Cincinnati, June 2001

A Review of State of the Art in Building Simulation Programs (Chair: Dru Crawley)

Atlanta, January 2001

Low-Energy Cooling Case Studies (Chair: Phil Haves)

Dallas - January 2000

ASHRAE's Software Toolkits for Energy Calculations (Chair: Dru Crawley)

ASHRAE TC 4.7 Energy Calculations
Tuesday, June 25, 2002, 6:00-8:30 p.m.
Rm. 324, Hawaii Convention Center

1. Roll call and introductions.

The meeting was called to order by Chair Spitler at 6:03 p.m. Secretary Norford called the roll. Present were Spitler, Crawley, Norford, Barnaby, Strand, Beausoleil-Morrison, Hensen, Sommer, Neymark, Haves, Reddy, Smith, Willson and Yuill. Members and guests introduced themselves. A card for Marx Ayres, who was unable to attend, was circulated for signatures.

2. Accept agenda & approve minutes of Atlantic City meeting.

Barnaby moved (Crawley second) that the agenda for the meeting (Attachment A) be accepted. The motion passed by voice vote. Barnaby moved (Smith second) that the minutes of the Atlantic City meeting be approved. The motion passed by voice vote.

3. Announcements.

Spitler announced that he had appointed Hittle as the TC 4.7 liaison to the ASHRAE Learning Institute. Spitler noted the August 2, 2002 deadline for program submittals for Chicago. After the Honolulu meeting the paper submission and review process will be conducted online and that the organizer of a session would be given an account to manage the process. RAC has requested that TCs identify research needs 5-10 years out. The list already prepared by the Simulation and Component Models Subcommittee will be augmented by others and provided to the new research subcommittee chair, Smith. ASHRAE has formed a task group for counter-terrorism. The president of ASHRAE will issue a letter of appreciation for attendance at ASHRAE meetings to those who request it.

4. Membership.

Spitler announced that Wray, Gardner and Spitler will roll off. McDowell and Sonderegger will join the TC. Crawley, Norford and Fisher will assume the roles of chair, vice-chair and secretary, respectively. Willson will continue to chair the Applications Subcommittee, Reddy will take over Inverse Models, and Beausoleil-Morrison will head Simulation and Component Models. Smith, Haberl and Neymark will head the research, program and standards subcommittees, respectively.

5. Subcommittee reports.

5.1 Applications Subcommittee.

Willson reported that the Applications Subcommittee met Tuesday from 3:30-5, with a focus on promotion of energy simulation. Willson moved (Smith second) that TC 4.7 endorse the preparation of an ASHRAE Professional Development Seminar on energy simulation. Yuill has prepared the proposal and will lead the seminar, if developed. Bahnfleth, knowledgeable about PDSs, has reviewed the proposal. The motion passed 12-0-0 CNV. The subcommittee is proposing three programs: a seminar in Chicago, chaired by Barnaby, on getting started on building energy simulation, a seminar in Kansas City (pushed back to Anaheim as of November 19, 2002) chaired by Beausoleil-Morrison, on case studies of successful simulation, and a seminar in Anaheim on validation of simulation programs, chaired by Neymark.

Witte is preparing an RTAR on procedures and data for high-performance residential design. Smith will prepare a WS for Chicago from the RTAR.

The Subcommittee has prepared a Technical Bulletin to answer frequently asked questions about energy simulation. Input on the document was received from TC 4.2 (Weather) and from several members of TC 4.7. Judkoff asked for information about SMOT 140. Willson stated that there will be another TB on validation but the TB under consideration will include a small amount of information about SMOT 140. Willson encouraged technical subcommittees to think of additional FAQ TBs. Willson moved (Barnaby second) that TC 4.7 accept draft 6 of the TB and submit it to ASHRAE staff. The motion passed 12-0-1 CNV. The minutes from the subcommittee meeting are in Attachment B and the TB is in Attachment C.

5.2 Inverse Methods.

865-RP Accuracy Tests for Mechanical System Simulation (PSU/TAMU).

Walton stated that the Project Monitoring Subcommittee received on June 12, 2002 a draft final report and that the PMSC met with one of the PIs (Yuill) Monday afternoon. The investigators developed six cases for seven systems, in both SI and IP units. Neymark moved (Haves second) that TC 4.7 accept the final report, subject to editorial corrections. The motion passed 12-0-1 CNV.

1050-RP Inverse Toolkit (U Dayton).

Spitler, reporting for PMSC chair Kreider, stated that the contractor has missed deadlines and is overdue in submitting work. The PMSC has given the contractor new deadlines but will not request another no-cost extension.

Reddy, substituting for subcommittee chair Haberl, stated that the subcommittee is reviewing its activities. It may suggest to the new TC chair that the name of the subcommittee be changed to something that better describes its focus, such as data-driven modeling. Reddy noted that such modeling pervades the activities of other technical committees, prompting the subcommittee to look for cross-cutting RTARs. Further, the subcommittee needs to digest past research and better disseminate material, perhaps via short courses or self-study courses. Reddy stated that Sonderegger identified three relevant issues for the subcommittee to consider: uncertainty and risk management, scalability (thousands of buildings) and physically plausible models. Sonderegger, in the subcommittee meeting, contrasted having data and trying to make sense of it with the work of the Simulation and Component Models Subcommittee, characterized by having physics and creating models. Sonderegger proposed the concept of "use cases," a business-school term for case studies without solutions. In load curtailment, for example, how should remuneration to participants be determined? The subcommittee will prepare a list of use cases.

The subcommittee will sponsor a seminar in Chicago on using monitored data to solve engineering problems, chaired by Reddy. The subcommittee has one approved work statement that awaits funding and a work statement on central plants that will be finalized for Chicago. The minutes of the subcommittee meeting are in Attachment D.

5.3 Simulation & Component Models.

1049-RP Building System Design Synthesis (Loughborough U.).

PMSC Chair Pedersen reported that the PMSC met with the PI in Honolulu, that the project is going well, and that it is almost on schedule but will require a little more time than planned. The contractor plans to finish the work in May, 2003. Barnaby moved (Hensen second) that the contractor be granted a no-cost extension through July 31, 2003. The motion passed 13-0-0 CNV.

1197-RP Updated Energy Calc. Models for Res. Equip. (UC-Boulder).

PMSC Chair Barnaby reported that the contractor started in the spring, before the official June 1, 2002 start date. The contractor surveyed the industry to identify market leaders and found that 6-7 manufacturers control 95% of the 1-5 ton residential cooling market. The contractor seeks measured performance data and will compare published data with DOE-2 models.

1222-RP Incorporation of Nodal Room Heat Transfer Models into Energy Calculation Procedures (MIT).

PMSC Chair Walton stated that the work considers more than one, well mixed, zone per room. The contractor has prepared a draft final report and software. PMSC member Strand moved (Beausoleil-Morrison second) that TC 4.7 accept the final report subject to editorial corrections and an understanding that the contractor will add passing of arguments in addition to modular data transfer. Walton noted that numerous corrections are needed but that they are editorial and not technical. The motion passed, 13-0-0 CNV.

S&CM Chair Fisher referred TC 4.7 members to the subcommittee minutes and noted that Beausoleil-Morrison has prepared a prioritized research wish list for the subcommittee. The minutes and the research wish list are in Attachment E.

5.4 Research.

Barnaby noted the August 1 deadline for submittal of TC research plans for 2003-2004, that some TC 4.7 projects were in the system from past years and that others could be added. Only one RTAR is ready to go forward: cleanup and improvements to toolkits, under the Simulation and Component Models Subcommittee. TC 4.1 has prepared an RTAR for improved load calculations with shading devices (interior shades and screens). TC 4.1 will submit it as its top priority and TCs 4.5 and 4.7 will list it on their research plans as co-sponsors. TCs 4.5 and 4.7 will have members on the PES/PMS.

Barnaby moved (Reddy second) that TC 4.7 submit to ASHRAE the 2003-04 research plan as prepared. Crawley suggested that those projects already in the queue be clearly denoted as such. Barnaby replied that the format is the same as that used last year. The motion passed 12-0-1 CNV. It was noted that the RTAR on baselining central-plant energy use, submitted in the 2002-2003 research plan, was prioritized by RAC and that the RTAR on comparative test cases for evaluating simulation methods for slabs, from the 2001-2002 plan, has been on hold because the International Energy Agency was working on the same topic. RTARs are removed from the research plan after four years. The 2003-2004 research plan and the RTAR on improvements to the toolkits are in Attachment F.

Reddy, advocating collaboration among technical committees, asked if more than one TC should have an RTAR on the same subject. Barnaby replied that such an approach could not be managed administratively and that the proposed project on load calculations with shading devices, noted above, would involve strong technical collaboration among the three TCs, even though TC 4.1 alone would take an administrative lead. Reddy countered that such an arrangement might not receive as much consideration from RAC as one that was more overtly collaborative. However, RAC members Hayter and Crawley are aware of the collaboration.

Hases reported on the work of the TC 4.7 ad hoc committee formed by Spittler to develop a strategic research plan. A meeting in Atlantic City led to a recommendation for a Section 4 meeting, which Hayter chaired in Honolulu. Those attending noted a benefit from sharing information, to be facilitated via a list-server that Smith will provide. The meeting also took up the links of the ASHRAE handbooks to research.

The ad hoc committee did not meet in Honolulu. Given that RAC wants a strategic research plan for the Society, should the ad hoc committee meet in Chicago to develop TC 4.7 input? Crawley favored a section-level approach, Haves asked for a more coherent TC plan that the S&CM wish list, and Spitler concluded that the TC should wait for a formal request from RAC.

5.5 Handbook.

Chair Strand noted that the subcommittee discussed electronic enhancements to the handbook chapter and that it has a working outline to guide revisions to the chapter. Neymark and Judkoff submitted a section on validation. The subcommittee asked the authors to expand their submittal and add references.

In response to Strand's request, volunteers offered to review sections of the chapter, emphasizing updated references and graphics:

General Considerations - Fisher

Component Modeling and Loads

Calculating Space Sens Loads - Beausoleil-Morrison

Ground Heat Transfer – Bahnfleth

Secondary System Components – Wray

Primary System Components – Lebrun

System Modeling

Overall Modeling Strategies – Huang

Degree-Day and Bin Methods – Huang

Correlation Methods – Huang

Simulating Primary and Secondary Systems – no volunteer

Modeling of System Controls – Haves

Integration of System Models – Spitler

Inverse Modeling – Sonderegger

Spitler asked the Applications Subcommittee to review the chapter for its usefulness to practitioners.

Willson will post a survey on the TC web site, with a pointer from the ASHRAE home page.

Subcommittee-meeting minutes are in Attachment G.

5.6 Program.

Beausoleil-Morrison noted a TC 4.7 symposium to be held Wednesday at 8 a.m. and stated that Barnaby's seminar was bumped off the Honolulu program and would be proposed for Chicago. The proposed Chicago program will also include (in rank order, following Barnaby's seminar) a symposium chaired by Hensen, Reddy's seminar on use of data-driven models to solve engineering problems, and a symposium on inverse modeling. Beausoleil-Morrison moved (Crawley second) approval of the program for Chicago. The motion passed. 13-0-0 CNV. Program plans are in Attachment H (current as of November 19, 2002).

Carpenter stated that TC 9.10 would like to sponsor a program on energy analysis for laboratory buildings, including the impact of fume hoods and other ventilation. Crawley advised Carpenter to ask TC 4.7 for co-sponsorship in Chicago.

5.7 Standards (SSPC-140 SMOT).

Judkoff and Neymark met with Standard 90.1 subcommittee chair Jason Glazer about using Standard 140 to certify software for use in Standard 90.1's performance path. Glazer was interested and an SSPC-140 SMOT subcommittee is considering how to define targets (ranges of acceptable performance) that must be met by a simulation tool proposed for use in performance-path calculations. Fairey is tracking revisions

to the International Energy Conservation Code, which could reference Standard 140. He is also tracking tax-credit legislation, which would require simulation.

There is potential for adding new tests to Standard 140: the analytic HVAC BESTEST, analytic airside HVAC tests from 865-RP, analytic building fabric tests from 1052-RP, furnace tests via the International Energy Agency, radiant floor tests developed in Switzerland, and ground-coupling tests.

The committee heard a presentation about a CEN standard for testing software, which is limited to conduction. Minutes of the committee's meeting are in Attachment I.

6. Reports on related activities.

IBPSA

Barnaby reported that IBPSA-USA met on Saturday, with new officers and that regional activities and tasks were divided up. The next Building Simulation conference, included in the announcement for this TC meeting, will be in Eindhoven in August 2003. Abstracts are due September 15, 2002.

GPC 14P Measurement of Energy and Demand Savings

Sonderegger noted that the committee recently lost a letter and is now GC 14. Galleys for the guide were submitted to ASHRAE and that guide should be available in Chicago.

IAI International Alliance for Interoperability

Crawley deferred to the report on the XML committee.

TC 4.1 Load Calculations

Barnaby reported that contractor Oklahoma State U. (Fisher, PI) is finishing work on 1117-RP, a project to physically validate the heat-balance and RTS methods for loads calculations. Oklahoma State (Spitler) and Wrightsoft (Barnaby) have just started work on 1199-RP. TC 4.1 has received some criticism for the loads calculations chapter in the 2003 Handbook of Fundamentals and is working on revisions.

TC 4.2 Weather Information

Crawley reported that TC 4.2 is preparing an RTAR to develop a "roll-your-own" weather year, with custom weighting.

TC 4.5 Fenestration

Pedersen cited the three-way TC cooperation on the RTAR on load calculations involving shading systems, noted above.

TC 4.6 Building Operation Dynamics

Haves noted that a combination of building construction, electricity rates and a need for demand responsiveness led to TC 4.6's efforts to model building thermal mass. The TC is considering the link between on-site generation and optimal control of HVAC systems.

TC 4.11 Smart Building Systems

Norford noted possible cooperation among Section 4 TCs and others on HVAC operation and diagnostics and TC 4.11's ongoing work on diagnostics for chillers.

TC 9.6 Systems Energy Utilization

Reddy reported that TC 9.6 selected a contractor for 1092-TRP, to measure in-situ performance of commonly used HVAC equipment. Of interest to the TC 4.7 Inverse Modeling Subcommittee, TC 9.6 has prepared an RTAR for the development of tools to mine data. TC 9.6 will sponsor a seminar in Chicago on applying GP 14. Reddy moved (Barnaby second) that TC 4.7 co-sponsor this seminar. The motion passed 13-0-0 CNV.

XML Committee

Haves reported that GPC20 is attempting to make progress and must work with existing XML and data-exchange standards. The committee is making an effort to coordinate with IAI.

After Haves' report, Bauman briefly described a project at UC Berkeley, in collaboration with Linden at UC San Diego and Winkleman and Buhl at LBNL, to model room airflows associated with underfloor distribution systems. Spitler noted that a TC 4.7-sponsored project on underfloor plena found a small impact from variations in heat-transfer coefficients.

7. Old Business.

Spitler wrote to the ASHRAE Special Publications liaison for TCs about publication of the analytic toolkit that resulted from 1052-RP, at a lower price than the \$200+ ASHRAE charges for the loads toolkit, which eliminates classroom use.

8. New business.

Rees asked for presentations for the TC web page, which Spitler stated has been cited as an example of what ASHRAE desires in a TC web site. Crawley will send a Dallas seminar on tool kits. Spitler was thanked by acclamation for his work as TC chair.

9. Executive Session.

Spitler stated that there were no items to be considered in executive session.

10. Adjourn.

The meeting adjourned at 8:08 p.m.

Attachments

- A. Agenda
- B. Applications Subcommittee Minutes
- C. Energy Usage Technical Bulletin
- D. Inverse Methods Subcommittee Minutes
- E. Simulation and Component Models Subcommittee Minutes
- F. Research Subcommittee Minutes
- G. Handbook Subcommittee Minutes
- H. Program

I. SMOT 140 Minutes

1. We have a symposium scheduled for Wednesday 8 a.m. See below.
2. If you're a voting member and/or your name is listed on the agenda and you won't be at the meeting, please let me know.

Meeting Announcements

The Sixth International Conference on System Simulation in Building (SSB2002) will be in Liège, Belgium, 16-18 December 2002. Abstracts were due February 15, 2002; papers were due May 31, 2002. Contact Jean Lebrun (j.lebrun@ulg.ac.be) or watch the web site: <http://www.ulg.ac.be/labothap> for more information.

Building Simulation 2003, the Eighth International Building Performance Simulation Association Conference will be held in Eindhoven, The Netherlands, August 11-14, 2003. Abstracts are due September 15, 2002; full papers are due February 15, 2003. See the web site: <http://www.bs2003.tue.nl> for more information.

Agenda

Tuesday, June 25, 2002, 6:00-8:30 p.m.
Rm. 324, Hawaii Convention Center

- | | |
|--|---------------------|
| 1. Roll call and introductions | Norford |
| 2. Accept agenda & approve minutes of Atlantic City meeting | Spitler |
| 3. Announcements | Spitler |
| 4. Membership | Spitler |
| 5. Subcommittee reports | |
| 5.1 Applications | Willson |
| 5.2 Inverse Methods | Reddy |
| 865-RP Accuracy Tests for Mech System Simulation (PSU/TAMU) | Walton |
| 1050-RP Inverse Toolkit (U Dayton) | Kreider |
| 5.3 Simulation & Component Models | Fisher |
| 1049-RP Building System Design Synthesis (Loughborough U.) | Pedersen |
| 1197-RP Updated Energy Calc. Models for Res. Equip. (UC-Boulder) | Barnaby |
| 1222-RP Incorporation of Nodal Room Heat Transfer Models ... (MIT) | Walton |
| 5.4 Research | Barnaby |
| <i>Ad hoc</i> subcommittee: Strategic Research Plan | Haves |
| 5.5 Handbook | Strand |
| 5.6 Program | Beausoleil-Morrison |
| 5.7 Standards (SPC-140 SMOT) | Judkoff/Neymark |
| 6. Reports on related activities | |
| IBPSA | Barnaby |
| GPC 14P Measurement of Energy and Demand Savings | Sonderregger |
| IAI International Alliance for Interoperability | Crawley |
| TC 4.1 Load Calculations | Barnaby |
| TC 4.2 Weather Information | Crawley |
| TC 4.5 Fenestration | Pedersen |
| TC 4.6 Building Operation Dynamics | Brandemuehl |
| TC 4.11 Smart Building Systems | Norford |
| TC 9.6 Systems Energy Utilization | Reddy |
| XML Committee | Haves/Barnaby |
| 7. Old Business | |
| 8. New business | |
| Subcommittee Restructuring | Spitler |
| 9. Executive Session (no items currently scheduled) | Spitler |
| 10. Adjourn | |

Web Site and Mailing List

TC 4.7 Web Site: <http://www.mae.okstate.edu/tc47/>

TC 4.7 E-mail List: This list is to be used only for communications related to TC 4.7. Do not distribute messages of any commercial nature. To subscribe or unsubscribe to the list, you must send an e-mail command to the address:

MAIL-SERVER@GARD.COM

Leave the subject line blank (if your e-mail software requires a subject, you may use a space). To subscribe to the mailing list, the body of the message should include the following:

SUBSCRIBE TC47-L

To unsubscribe from the mailing list, include the following in the body of the message:

UNSUBSCRIBE TC47-L

To see a list of subscribers, include:

LIST TC47-L

For a list of all available commands, include:

HELP

To send a message to all subscribers to the list, address your message to:

TC47-L@GARD.COM

Note: ASHRAE staff are not involved in the operation of these lists. Please do not ask them for help. If you have any questions, please contact: Mike Witte
mjwitte@gard.com 847-698-5685 FAX 847-698-5600

TC 4.7 Subcommittee Meeting Schedule

(excerpted from <http://www.ashrae.org> -- Search for TC 4.7)

Meeting Room Locations: All rooms with numbers are in the Hawaii Convention Center. Meeting rooms beginning with H/ are in the Hilton Hawaiian Village. Rooms are subject to change.

Meeting Room Locations:

NUMBER TITLE DAY TIME ROOM #

TC 4.7 Energy Calculations (50)(OVH) Tuesday 6:00-8:30p 324

TC 4.7 1049-RP (10) (OVH) Sunday 10a-12N 321A

TC 4.7 1197-RP (10) Sunday 12N-2:00p 321A

TC 4.7 Handbook (10) Monday 5:00-6:00p 324

TC 4.7 Simulation and Component Models (30) Monday 6:00-7:30p 324

TC 4.7 Inverse Methods (25) Monday 7:30-9:00p 324

TC 4.7 1222-RP PMSC (10) (OVH) Tuesday 12:00-2:00p Iolani 5

TC 4.7 Applications (15) Tuesday 3:30-5:00p 325A

TC 4.7 Programs

Wed. 8-10 a.m. Symposium HI-02-18. Recent Advances in the Thermal Simulation of HVAC Equipment, **Coral 4**

**TC 4.7 Applications Subcommittee
Honolulu Meeting, June 25, 2002**

Attending:

Jim Willson	Jimwill@indy.net
Gren Yuill	Yuill@unomaha.edu
Bill Bahnfleth	Wbahnfleth@psu.edu
Charlie Curcija	Curcija@ceere.rog
Jason Theios	Jason_theios@guardian.com
Klaus Sommer	Klaus.Sommer@vt.fh-koeln.de Or KlausESommer@aol.com
Jan Hensen	J.Hensen@tue.nl
Ian Beausoleil-Morrison	lbeausol@nrcan.gc.ca
Vernon Smith	Vsmith@archenergy.com
Chip Barnaby	Cbarnaby@wrightsoft.com
Dru Crawley	Drury.crawley@ee.doe.gov

Applications Subcommittee Chair Jim Willson called the meeting to order at 3:35 p.m.

Introductions

Reviewed agenda.

Jim made some general comments about recent and pending improvements to ASHRAE HQ's web site.

The ASHRAE main web site is being updated to host TC web pages. This may be way to draw more ASHRAE members to TC-4.7's web page. Secondly, it may be possible to implement a web-based survey aimed at the design practitioner. Jim wants to discuss implementation of web based survey at the Chicago meeting.

Jim handed out a one-page document showing a list of end-user classes who might use TC-4.7's work product. The list was proposed at the last SC meeting as a means of analyzing how TC project results might be used in the industry.

Structure of User Industry

TIER 1:	Developer of software
TIER 2:	Energy Engineer
TIER 3:	Design Engineer
Other:	Educator
(Gren	Client Building Owner
	Yuill's suggestion)

ASHRAE HQ statistics show about 1700 registrants for typical Annual or Winter Meetings. Most seminars are attended by 30 to 50, so the ability to reach potential users of our TC work products is very low. Although, seminars are good for getting the word out on recent developments, there is no official record of the presentations. TC web sites are permitted to post presentations. Symposia are good because they are a permanent record and can be referred to later by potential users.

Bill Bahnfleth: Participates on SSPC 90.1 and he thinks TC-4.7 could help on investigating the Energy Cost Budget (ECB) method and assessing how well it works relative the prescriptive method under 90.1. Rob Briggs (PNNL) wrote most of Appendix G: 90.1, on how the ECB method can be applied to LEEDS ratings – Rob says there are things in Appendix G could be directly incorporated into ECB. Jim: should this be a research project or committee work? Bill: Standards might have funds to help with a review; but he is not sure.

Survey would probably show that few practitioners use ECB. The Oregon Energy Office is actually discouraging use of simulation methods because code officials cant' tell if outcome is OK. (Jason Glazer is ECB Subcommittee Chair).

Jim showed a copy of the ARTI State-of-the-Art Review, Whole Building, building Envelope, and HVAC Component and System Simulation and Design Tools which was posted to ARTI's web site (www.arti-21cr.org) today. He said that the study reveals a lot about attitudes and barriers to getting practitioners to use simulation models.

Simulations valuable, but are they are getting more complex. AS they get more complex, the results are usually more accurate, but understanding the inputs and outputs becomes more difficult. We need simple and easy to use interfaces.

Chip: Interfaces are not the key issue. Many bad programs have terrible interfaces but designers use them because they get used to the interface. The results must be something that they really want. There are other barriers that are bigger.

Klaus: Many European standards and codes require using software, but it is not simulation based. On the other hand, some companies use TRNSYS; but this is very time consuming; some universities provide support to industry for the more complex simulation packages; but simple load calculations are used – often by hand and these meet the requirements of code. These calculations are not for dynamic conditions, so hand methods work.

Jim: HAP and Trace used in the US. These packages are relatively easy to use. When software is too complicated; designers don't want to spend the time learning it or using it.

Jan: Netherlands: government regulations require using simulations, so all practitioners use simulations; Belgium – no regulations require it, so practitioners don't use it.

Need an applications manual to show engineers the value of using simulations; show how to do it (Similar to AM11:1998)

Ian: we need to have technical sessions and seminars at every ASHRAE meeting: topics could cover energy and cost analysis; guidance and comparison of simulation tools; how to get started; case studies of how engineers use models and dynamic simulations. We need one or two seminars at each session.

Jim: 168 chapters in ASHRAE always need presentations; perhaps we could prepare a PowerPoint presentation that could be used by chapters.

Chip: IBPSA-USA has suggested that they want to have an outreach program; looking to develop a presentation for use at chapters. We should coordinate with IBPSA and share materials.

Gren: 9000 design firms in the US; many never even go to chapter meetings, much less attend the ASHRAE national meetings. We need educational programs to reach them.

Klaus: We need to answer two questions: (1) what is the reason that the typical design engineer has to make calculations? And, (2) under what conditions should a full simulation be used?

Gren: its easier and more accurate to run a simulation to answer many design questions.

Klaus: "Standard of Care" defense in lawsuits is a reason that designers should care. What is the typical practice regarding use of simulations or standardized software?

Chip: incentives from Utilities; LEEDS requires a simulation in compliance with 90.1 to establish baseline; this is a volunteer program; can use simulations to optimize the design – bottomline, basic design does not require simulations;

Bill: IAQ liability may drive use of simulations – if you could package a program that could provide warnings about potential problems, more engineers would use it.

Dru: LEEDS now has over 50 approved buildings in the database and 15 more in progress; will be publishing a number of case studies that use simulations to get the LEEDS rating – probably by fall this year.

Chip: in the seminar: we should define what things require a simulation; Chip and Dru to coordinate in September about content.

Gren: Proposal for a Professional Development Seminar Series on the Use of Building Energy Analysis Computer Programs

The Audience: (1) Non-users and (2) Beginners

Covering: show how to use the results – to explain strengths and weaknesses – will not attempt to explain how to run any particular program.

Discussion: Two day courses are waning in popularity. (Gren just joined CEC committee and he learned that a PDS course cost about \$800, price varying depending on the site). Gren wants to fit this syllabus into two, one-day courses. (at ASHRAE and Chapter meetings). Bill: suggests developing into modules – PDS is not as popular due to length and cost; re-focusing to one-day and/or develop into modules. Modules could be used for a one day , half day or lunch time lecture series. PowerPoint plus course speaker notes. ASHRAE pays honorarium to speaker, doesn't pay to develop the course content.

Bill: need a proposal in the right format with an endorsement from the TC to get go ahead on this proposal.

Joe: need to be sure to add include details about how much time it takes to do input. Many first time users are surprised and then discouraged.

MOTION: TC-4.7 Applications Subcommittee moves to request Main TC to endorse a recommendation to CEC that two short courses be developed along the lines suggested by Gren's proposal. (Bill Bahnfleth moved, Vern Smith second). Carried unanimously.

PROGRAM:

Chip: we should develop next title for next seminar in the series.

Bill: does any one know of work on energy impact of counter-terrorism measures? Joe: LBNL has a study underway, but not published.

Kansas City: Seminar: Show Casing Successful Applications

Anaheim:

Nashville:

Co-sponsors: TC 1.5

Jim: will be new member of Society Program Committee, representing Section 9, but he will be able to provide this committee with some insight regarding decisions about including or dropping proposed program items.

Symposium on Validation

Potential participants:

1. Gren
2. Joel

RESEARCH

Chip: only one new RTAR at this point. We have a number of projects approved on the plan; one waiting for bidding; Chip does not think we need more RTARS at this point.

1093-RP: will be reported on at the next TC meeting in Chicago by Jeff Haberl, PI.

The meeting was adjourned at about 5:05 pm.

DRAFT #6**TB – 2002 – X****TECHNICAL BULLETIN****Estimating Building Energy Usage****OVERVIEW**

The purpose of this Technical Bulletin is to provide guidance to prospective users of building energy usage estimating tools with respect to three areas:

1. Available energy estimating software packages and whether any are recommended by ASHRAE.
2. The readily available sources of applicable hourly, daily, and monthly weather data for a given location.
3. The readily available sources of bin weather data for a given location.

AVAILABLE ENERGY ESTIMATING SOFTWARE PACKAGES

It is not the role of ASHRAE to recommend one particular energy estimating software package over another. Instead, ASHRAE provides in Chapter 31 (Energy Estimating and Modeling Methods) of the 2001 ASHRAE Handbook – Fundamentals a section entitled “Selecting Energy Analysis Computer Programs”. This section discusses the major considerations in making a selection. They principally include:

- Complexity of input
- Quality of the output
- Availability of weather data
- Auxiliary capabilities
- Availability of good support to answer questions

Chapter 31 also covers the broader issue of “Choosing an Analysis Method”.

In regard to a listing of the available energy estimating programs, the U.S. Department of Energy (DOE) maintains an up-to-date listing of such programs. Available at no charge through their website (www.energytoolsdirectory.gov), it currently includes over 200 building energy software tools including whole building as well as component and special application programs. This website includes a summary of each software program’s characteristics, strengths and limitations, plus hotlinks to other sites for specific cost and availability information.

ASHRAE has recently published ANSI/ASHRAE Standard 140-2001, “Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs”. It is recommended that energy estimating software be tested according to the procedures in this Standard.

SOURCES OF HOURLY, DAILY, AND MONTHLY WEATHER DATA

The most commonly used sources of energy modeling weather data are:

- **TMY2 – 239 US locations**
Also available from http://rredc.nrel.gov/solar/old_data/nsrdb/tmy2/. This website also has a good discussion of TMY2 vs. TMY data
- **SAMSON – 239 US locations**
SAMSON (Solar and meteorological Surface Observation Network) is available from the National Climatic Data Center at www.ncdc.noaa.gov
- **WYEC – 77 locations (51 original WYEC + 26 TMY locations)**
Available from ASHRAE as the WYEC2 Data and Toolkit CD-ROM. This is an ASHRAE production converting and cleaning up the original WYEC data plus additional sites.
- **CWEC – 47 Canadian locations**
Available from <http://www.cmc.ec.gc.ca/climate/energy2.htm>
- **IWEC – 227 International locations**
New and available from ASHRAE as the International Weather for Energy Calculations CD. Available from <http://www.ashrae.org>

SOURCES OF BIN WEATHER DATA

There are multiple ways to obtain bin weather data.

One approach is to go to a source which has pre-made bin weather data based upon predetermined hours of the day and days of the week. The often used U.S. Air Force 1978 *Engineering Weather Data* is an example of this. This has now been superseded by the *Engineering Weather Data CD-ROM* which contains approximately 800 world wide weather stations. It can be found at:

<http://ols.nndc.noaa.gov/plolstore.prodspecific?prodnum=C00515-CDR-A0001>

Another approach is to use the ASHRAE Weather Data Viewer (WDVIEW 2.1) which is available from the ASHRAE bookstore at: <http://www.ashrae.org>. This tool was developed from by the ASHRAE Research Project 890 and enables one to develop 1F frequency of occurrence bins for dry-bulb, wet-bulb, dew-point temperatures, enthalpy, and windspeed for each of the 1440 locations listed in the ASHRAE Handbook – Fundamentals. These values can be determined for by month or for the year. Further information can be found at the TC 4.2 web site: <http://www.ashrae.org/TECHCOMM/tc42.htm>

Bin weather data specific to ASHRAE Region X is also available. Ordering information can be found at: <http://www.ashraex.org/FSInfo.htm>

Bin weather data can also be developed from certain commercially available programs. Some of these are listed in the DOE Tools Directory at: www.energytoolsdirectory.gov

AGENDA

TC 4.7 Subcommittee on Inverse Methods
Monday, June 24th, 2002, 7:30 - 9:00 p.m.
Honolulu

1. Introductions (all)
2. Discussion of the minutes from Atlantic City (January 2002)
3. Rethink the scope and focus of the SC
 - cross-cutting across many section 4 TC
 - how to get others from different TC to participate
 - who are our target users (what level of expertise)
 - how to define/identify their needs
 - SC title change?
4. Discuss mix and weight of SC on different activities: WS/RTARs, Program?
5. Discuss on Long Range Research Plan
 - WS 1051 “Development of Toolkit for Comparing Results of Hourly Building Energy Simulation Programs against Measured Energy and Internal Environmental Data”
 - Development of a procedure for baselining energy use at large central plants.
 - Use of Evolutionary Computation for Inverse Problems
 - Inverse Bin Procedures for Analyzing Energy Savings
 - Development of Standardized Computer Simulation Input Files for Describing Typical Residential Homes and the Most Common Energy Conservation Retrofits
 - Methodology Development to Extend ASHRAE Semi-empirical Chiller Models to include Models for Screw Chillers, Package Air-conditioners, and Heat Pumps
 - Other work statements
6. Program (all)
 - + January 2003 meeting (Chicago)
7. Old Business (all)
8. New Business (all)
9. Adjourn

- Meeting called to order by subcommittee (SC) chair Reddy (substituting for Haberl at 7:40 pm)
- Agenda and Atlantic City minutes circulated to all attendees.
- Most of the meeting was spent discussing items (3) and (4) of the agenda. Reddy informed the attendees of the need to rethink the scope and objectives of the SC, and the need to identify other TC of section 4 with overlapping interests. The most obvious ones were TC 4.6 and TC 4.11.

After some discussion, it was felt that “**Data-driven modeling**” was more descriptive of the function of the SC than did “Inverse modeling”.

Action Item: Seek approval of the full TC membership to make this change to SC name.

- Reddy expressed the view that the Simulation SC developed modules for specific functionality (to be coupled with simulation programs) which end-users need not know the details. On the other hand, users of data driven models had to have a certain amount of expertise in order to use the required tools (say of regression, or calibration) properly. Perhaps the SC should try to fill this gap.

Reddy suggested that there were three primary tasks of the SC:

- (a) To identify and perform research by developing RTARs and WS
- (b) To find better ways to digest past research and maintain expertise within SC even when membership changes
- (c) Info dissemination by way Handbook, Programs (symposiums and seminars), special publications, workshop/short courses

Some discussion ensued as to whether the SC should develop short course material or even self study design manuals like those developed by ASHRAE. The final consensus was that this should be shelved for the time being till the SC is better able to define the need and dissemination mechanism..

- In order to select the issues which the SC needs to focus on, Reddy prepared a view graph with Tools (regression, time series, change point models, ANN, genetic, calibration, expert systems) on one end and Applications (equipment models to be used for simulation, sub-systems, systems, and whole building, M&V, FDD, supervisory control, peak shaving, start-up commissioning, CC). Lively discussion ensued with Haves pointing out that this looked more like a case of someone with a hammer in search of a nail. The proper way would be to identify practical problems, and then determine the appropriate tools. This view was endorsed by Norford also.

Sonderegger stated that the issues of (a) uncertainty (risk assessment), (b) scalability/automation i.e., exercising the models to several buildings (robustness, generality, speed,...), (c) physically plausible model development were pertinent to this SC. He also stated that monitored data was increasingly available, while many professionals did not know how to make full (or even “any”) use it.

The issue of calibration of say DOE-2 to monitored data was a neglected area, and should be addressed properly given that this is widely done with varying degrees of success. Reddy pointed out that a WS was with the RAC pending funding approval.

The idea was floated by Sonderegger, subsequently added by others, that the SC should assemble a list of “USE CASES”, i.e., specific needs for which commercially realistic need exists, i.e., the user would be willing to provide funding if an appropriate solution was available- similar to a case study but without a solution. Two examples were how to measure load curtailment initiated by a building owner, and what specific measures to implement in order to reduce demand in a building by a pre-specified amount.

Action Item: Sonderegger to prepare a few sample use cases (each about 5-6 sentences) and email them to Reddy who would then contact the TC members for their input. The aim is to have a list of such use cases by Chicago meeting.

- The attendees felt that a seminar at Chicago would be a good start. After some discussion, Huang proposed, with a change by Sonderegger, that a seminar with the following title “Using Monitored Data to Solve Engineering problems” be organized by Reddy. Potential speakers are: Sonderegger, Smith (energy analysis), Claridge (CC), Braun (building thermal mass to shave peak), Norford (FDD). Other speakers which Reddy would contact are Lebrun and Katipamula (implementing peak shaving measures).

Action Item: Reddy to organize seminar

- Workstatements:
 - a) Reddy to follow up with Krarti on finalizing the draft WS on baselining of large central plant so that the SC could take a vote in Chicago.
 - b) The RTAR on Developing of Standardized Computer Simulations..... to be handed over to the Applications SC where it is more appropriate.
 - c) The Genetic algorithms RTAR, the Inverse Bin Procedures RTAR, and the Chiller model proposed RTAR should be dropped.
 - d) List of Use Cases should be used to define RTARs and WS in the future.
- No time left to discuss programs
- Meeting adjourned at 9:05 pm.

ATTENDEES

NAME	EMAIL
Joe Huang	yjhuang@lbl.gov
Les Norford	lnorford@mit.edu
Milorad Bojic	bojic@knez.uis.ac.yu
Dru Crawley	Drury.crawley@ee.doe.gov
Robert Sonderegger	rsonder@siliconenergy.com
Vernon Smith	vsmith@archenergy.com
Chip Barnaby	cbarnaby@wrightsft.com
Philip Haves	phaves@lbl.gov

**TC 4.7 Simulation and Component Models Subcommittee
Honolulu Meeting
Minutes**

Monday, June 24, 2002
6:00-7:30pm, Room 324 Hawaii Convention Center

INTRODUCTIONS/ADDITIONS TO AGENDA (5 MINUTES)

Meeting called to order at 6:05pm. No additions to the agenda were requested. There were 25 in attendance as shown in attachment 1.

PROGRAM (15 MINUTES)

Chicago – January 2003

- **Symposium**--*Recent advances in energy simulation: Part II* (Chaired by Jan Hensen.)—everything on-track to be presented. Papers are out for review.

Kansas City – June 2003

- **Symposium**--Integrating Airflow Modeling into Energy Analysis Programs (Ian Beausoleil-Morrison)—call for abstracts, 7 received; 6 selected to be developed into papers, coorganized with TC4.10; Jelena Srebic will chair, expect that one paper may not make it so probably won't have the problem of too many papers.
- **Symposium**--Interoperability and Portability (Chip Barnaby)—Ian talked to Chip; TC1.5 (Computer Applications) had a similar symposium so Chip wants us to cosponsor this. It is now off of our list.

New Program Ideas?—*We are on a short fuse for Anaheim; Jeff Spitler had an idea for a simulation validation symposium (he is twisting Joel Neymark and Ron Judkoff's arm to write a paper)*

WORK STATEMENTS IN PROGRESS (25 MINUTES)

Energy performance simulation model for refrigerated warehouses (*Kosny, Huang, Haddad*)

- Co-Sponsorship with Section 10 (Fisher)
- Justification: How many are out there?
Joe Huang reported that this work statement is not ready to go forward.

Consideration of New RTARs

Fenestration RTAR (Chip Barnaby): sponsored by TC 4.1. Chip Barnaby gave an overview of the work statement noting that it is difficult to calculate heat gain for certain fenestration

products/combinations (like interior or exterior shading elements) using the data in the handbook; the goal of the project is to correct this and give people an idea of what to do (not necessarily absolute accuracy). Dan Fisher noted that it is difficult to figure out what to do with blinds in the current toolkit (need an update to the toolkit). Jan Hensen noted that there is a European project (Window Information System) that can handle shading elements; demo version can be downloaded off the web from an agency in Dublin. Chip noted that tomorrow we will vote on the research plan and that this would be on the list as a co-sponsor but not one of our own prioritized RTARs.

Toolkit Enhancement RTAR: The work statement was put on the “back-burner” at an earlier meeting because it didn’t seem like this could get funded. Dru Crawley noted that the consideration of the project had been delayed while waiting on loads toolkit. The committee agreed that it was time to resurrect the work statement under a new title. Two ideas for titles are:

“Technical and Usability Enhancements to the Energy Calculation Toolkits”

“Bringing the Toolkits into the 21st Century”

The work statement should include a toolkit done by TC4.6 and the compendiums like the annotated bibliography

RESEARCH PROJECTS IN PROGRESS (15 MINUTES)

1049 RP Design Synthesis (Curt Pedersen, Chair; Jon Wright, PI)

Meeting on Sunday that went quite long but got through all of issues PI wanted to discuss. Going fairly well, but would like to request a no-cost extension. Jon would like to push this past the next summer meeting (Kansas City). Committee is assuming that final report will have final report by Kansas City and ready for final approval. Deadline request would be end of July 2003. Chip Barnaby will make a motion at the full committee meeting tomorrow to request such an extension.

1197-RP Updated Energy Calculation Models for Residential HVAC Equipment (Chip Barnaby, Chair; Mike Brandemuehl, PI)

Chip gave a quick update on the purpose of the project and noted that this is just starting. Research team reviewed of market share of small (1-5 tons) unitary equipment manufacturers (small number of manufacturers control the market) and investigated performance information for those manufacturers (not all provide information). Used DOE-2.1E model to try to replicate performance map of manufacturer and this was certainly enlightening (not all of the results are good—some didn’t put much effort into their maps). So, research team now trying to find good data sets. Purdue and Texas A&M may have some data as well as PG&E (Bruce Wilcox may know more about this). Mike is also actively trying to find contacts through appropriate ASHRAE TCs to find better data. Project is progressing well (comment from Chip Barnaby).

1222-RP Incorporation of Nodal Room Heat Transfer Models into Energy and Load Calculation Procedures (George Walton, Chair; Yan Chen, PI)

George noted that we do have a draft final report and the meeting will take place tomorrow. Contractor sent report in about 3 weeks ago and is hoping to put this to a vote (perhaps?)

FUTURE RESEARCH AGENDA (15 MINUTES)

The research “wish list” Ian Beausoleil-Morrison led a “brain-storming” session on the future direction of S&CM research. He presented a research “wish list” with over thirty topics for discussion and ranking. Suggested additions to the list included

- Dan Fisher noted “hybrid” systems and other problematic controls issues for energy analysis.
- Jeff Spitler noted the potential for “magic carpet” (referring to RP 1117 results) to be a topic for further research.
- Jan Hensen noted that components were covered by the list but what was missing was (high level) system modeling.
- Dru Crawley noted that the internal blinds item should be expanded to include other effects.
- Les Norford noted that “natural/hybrid ventilation” covers a wide range of topics (might need to be expanded?).
- Simon Rees suggested double facades as a potential topic. Jan Hensen—ground coupled air pre-cooling.
- Les Norford—hydronic panels (improvement over E+ model which is more massive slab oriented). Jeff Spitler—toolkit packaging and turning selected items into VBAs.
- Joe Huang—underfloor air distribution.
- Dru Crawley—solar thermal chimeys.
- Dan Fisher—vegetation models for both interior and exterior plants.

Discussion of what to do with the “wish list”: combine with other ideas from other subcommittees and section 4 committees and see if we can exchange ideas and come up with a coordinated plan. Chip noted that there is already a list-serve to facilitate some of this discussion.

Ian requested that people in attendance mark 7 of the topics as priorities so that he can better prioritize the items. Also requested that if there is a potential cosponsoring TC to note that as well. Several minutes was spent on this activity and Ian will compile the votes. Results will be posted on web site and list-serve.

OLD AND NEW BUSINESS (5 MINUTES)

No old business; no new business. As of Wednesday, Ian will be taking over!

ADJOURN

Meeting was adjourned at 7:25pm.

Attachment 1:

Honolulu	Atl. City	Cinci.	Last Name	First Name	E-Mail
			Armstrong	Peter	pr_armstrong@pnl.gov
X		X	Barnaby	Chip	cbarnaby@wrightsoft.com
X	X	X	Beausoleil-Morrison	Ian	ibeausol@nrcan.gc.ca
X			Bojic	Milorad	bojic@knez.uis.ac.yu
X	X		Brandemuehl	Mike	michael.brandemuehl@colorado.edu
			Buhl	Fred	wfbuhl@lbl.gov
X	X	X	Crawley	Dru	drury.crawley@ee.doe.gov
	X		Chanvit	Chantrasrisalai	chanvit@okstate.edu
X			Curcija	Charlie	curcija@ceere.org
	X		Deng	Zheng	zhengd@okstate.edu
	X		Deringer	Joseph	jderinger@deringergroup.com
	X		Deru	Michael	michael_deru@nrel.gov
X		X	Fisher	Dan	d-fisher@uiuc.edu
	X		Gardner	Carol	gems@teleport.com
	X	X	Griffith	Brent	griffith@mit.edu
		X	Haberl	Jeff	jhaberl@tamu.edu
	X	X	Haddad	Kamel	Khaddad@nrcan.gc.ca
X	X	X	Haves	Philip	phaves@lbl.gov
X		X	Hensen	Jan	j.hensen@tue.nl
X	X		Huang	Joe	YJHuang@lbl.gov
	X		Iu	Calvin	iip@okstate.edu
X	X	X	Judkoff	R.	Ron_judkoff@nrel.gov
	X		Jin	Hui	jinh@okstate.edu
	X		Kong	Weixiu	weixiu@okstate.edu
		X	Knappmiller	Kevin	kevink@kevttec.com
	X	X	Kosny	Jan	kyo@ornl.gov
	X		Krarti	Moncef	krarti@colorado.edu
X			Liesen	Richard	r-liesen@uiuc.edu
		X	Lubun	mike	mlubun@nrcan.gc.ca
	X		Lawrence	Tom	lawrenct@ecn.purdue.edu
	X		Lebrun	Jean	j.lebrun@ulg.ac.be
	X		Liu	Xiaobing	xiaobin@okstate.edu
	X		Mangini	Jim	jim.mangini@carrier.utc.com
	X	X	McDowell	Tim	mcdowell@tess-inc.com
X	X	X	Neymark	Joel	neymarkj@sni.net
		X	Nguyen	Phuong	pnnnguyen@pplant.msu.edu
X	X	X	Norford	Les	lnorford@mit.edu

Attachment E Simulation and Component

Models Subcommittee Minutes

TC 4.7 Minutes, Honolulu

25 June 2002

Honolulu	Atl. City	Cinci.	Last Name	First Name	E-Mail
		X	Novoselac	Atila	aqn102@psu.edu
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X	X	X	Pedersen	Curt	cpederse@uiuc.edu
X			Reddy	T. Agami	Reddyta@drexel.edu
X	X	X	Rees	Simon	SJRees@okstate.edu
		X	Shipley	David	Shipley@marbek.ca
	X	X	Shirey	Don	Shirey@fsec.ucf.edu
X	X	X	Smith	Vernon	vsmith@archenergy.com
	X	X	Sommer	Klaus	klaus.sommer@vt.fh-koeln.de , Sommer.Roycroft@T-online.De
X	X		Sonderegger	Robert	rsonder@siliconenergy.com
X	X	X	Spitler	Jeffrey	spitler@okstate.edu
		X	Sreedharan	Priya	psreedharan@lbl.gov
X	X	X	Strand	Rick	r-strand@uiuc.edu
X			Theios	Jason	jason-theios@guardian.com
X	X	X	Walton	George	gwalton@nist.gov
	X		Wassner	Mike	wassner@colorado.edu
	X	X	Witte	Mike	mjwitte@gard.com
		X	Wray	Craig	cpwray@lbl.gov
X		X	Wright	Jonathan	J.A.Wright@lboro.ac.uk
	X		Xiao	Dongyi	xdongji@okstate.edu
	X	X	Xu	Peng	pxu@lbl.gov
	X		Zhang	Peter	peter@deringergroup.com

TC 4.7 Simulation Subcommittee Research “Wish List” July 19, 2002

Purpose

This document is a work in progress. Its purpose is to allow TC 4.7’s Simulation subcommittee to establish a “wish list” of research priorities for the future. The intention is for the subcommittee to focus the development of new RTARs/work statements on the priorities developed from this exercise.

The items that have been identified to date as worthy of further research by TC 4.7’s Simulation subcommittee are listed below. The research items are listed in decreasing order of priority and grouped into four categories. The priority rankings were determined from votes which were cast at the Honolulu (June 2002) subcommittee meeting.

Highest priority

- 1) Models for natural and hybrid ventilation, e.g. solar chimneys, raised floor and displacement ventilation distribution systems, controls, wind-driven air flow.
- 2) Create algorithms to allow mapping of manufacturer’s or available data to simulation inputs.
- 3) More detailed modelling of internal surface convection and stratification within rooms.
- 4) Assess impact of explicit modelling of radiant heating (in-floor, wall panels, gas fireplaces, etc.) and radiant cooling and devise appropriate modelling strategies.
- 5) Moisture absorption/desorption by building materials and furnishing (necessary to accurately model night ventilation).

High priority

- 6) Development of pragmatic strategies for using integrated network air flow models for simulating infiltration and inter-zone air flow.
- 7) Integration of dynamic thermal comfort models with spatial distribution.
- 8) Integration of intra-zone air flow models.
- 9) Duct models to consider air leakage and thermal losses.
- 10) HVAC-integrated fuel cells.
- 11) Shading and reflection by external objects: buildings, trees (including impact of seasonal leaf cover).
- 12) Impact of internal shading devices associated with windows on room heat transfer.
- 13) Modelling of micro-climate effects (e.g. courtyards, heat islands, city wind, local landscape).

- 14) Integration of electric power flow modelling.
- 15) Integration of IAQ modelling.

Medium priority

- 16) Building-integrated photovoltaics and wind turbines.
- 17) Improved models for exhaust-air heat recovery, including moisture exchanger and defrost cycles (residential).
- 18) Model that gives ground reflectivity as function of current and time-history of weather data (snow cover, snow age) and ground temperatures.
- 19) Formal treatment for quantifying impact of uncertainty in input data (experimental design and analysis of results).
- 20) Stochastic modelling of occupant behaviour (operating schedules, occupancy patterns, lighting usage, window openings, etc).
- 21) Development of models to simulate window air conditioners in residential buildings, including the effects of partially conditioned buildings and inter-zone air movement.
- 22) More accurate models to determine heat transfer from lighting equipment: radiant/convective split, heat transfer to plenums.
- 23) Integration of illumination simulation (daylighting and artificial lighting).
- 24) Development of techniques to use simulation to assist in design synthesis.
- 25) Building-level cogeneration equipment (e.g. micro-turbines, Stirling cycle) other than fuel cells.
- 26) Accurate characterization of occupant-driven electric demand profiles in residential buildings. Necessary for accurate simulation of cogeneration equipment.
- 27) Models to simulate domestic hot water loads, rather than treating as user-input.
- 28) Geothermal heat pumps (model for ground field).
- 29) More accurate models for predicting deep-sky temperature for night-time radiation from external surfaces of envelope (important for modelling “cool roofs”).
- 30) Models to simulate the effect of rain and snow on the building envelope.
- 31) Development of validation tests for SPC 140 that cover all significant building-load and HVAC processes: ground heat transfer, heating equipment, cooling equipment, ventilation equipment, calculating infiltration rates, etc.
- 32) Development of techniques to predict GHG emissions, embodied energy, capital and maintenance costs, primary energy requirements, and life-cycle costing.

Lower priority

- 33) Buried ducts for pre-heating or pre-cooling ventilation air.
- 34) Modelling the control of hybrid HVAC systems wherein multiple systems condition a space.
- 35) Modelling HVAC systems at different levels of resolution.

- 36) Under-floor air distribution systems, including the thermal coupling with the ground.
- 37) Impact of shading upon surrounding surface temperatures which are in radiant contact with the external envelope.
- 38) Model for moisture sources within housing (cooking, cleaning, from ground).
- 39) Ventilated double facades.
- 40) Modelling the effect of carpets on the room energy balance (unexpected results from RP 1117).
- 41) Package primary systems, secondary systems, and loads toolkits as VBA so that they can be invoked from spreadsheet programs.
- 42) Update primary systems and secondary systems toolkits and package all toolkits in a single CD.
- 43) Models for air- and water-based thermal solar systems.
- 44) Determine impact of surrounding vegetation on infiltration.
- 45) Modelling the impact of vegetation (e.g. green roofs, vines on walls) upon evaporative heat transfer and solar gains.

ASHRAE
Technical Committee 4.7 Energy Calculations
2003-2004 Research Plan
1 August 2002

Title	TC Priority 2003-2004	Prior TC priority	Society status	TC Status	Sub-com
Procedures for Reconciling Computer-Calculated Results With Measured Energy Data (1051-TRP)	0	3 (1998-1999)	Work statement approved, awaiting funding		IM
Development of Comparative Test Cases for Evaluating Simulation Models of Slab, Crawl Space and Basement Heat Transfer Through Adjacent Ground	0	2 (2001-2002)	RTAR, accepted	Hold, IEA work underway	SCM
Inverse Bin Procedures for Analyzing Energy Savings	0	3 (2001-2002)	RTAR, accepted		IM
Procedures and Data for High-Performance Residential Design	0	1 (2002-2003)	RTAR, accepted	Draft WS	A
Development of a Procedure for Base-lining Energy Use at Large Central Plants	0	2 (2002-2003)	RTAR, prioritized	Draft WS	IM
Technical and Usability Enhancements to the Energy Calculation Toolkits	1			RTAR	SCM
Improving Load Calculations for Fenestrations with Shading Devices	Co-sponsor			TC 4.1 RTAR	

Additional Work TC 4.7 Work Statements in Process – status as of 1 August 2002

Title	TC Priority 2002-2003	Prior TC priority	Society status	Status	Sub-com
Development of a Toolkit of HVAC Models (Algorithms) for Refrigerated Warehouses					SCM
Development of Standardized Computer Simulation Input Files for Describing Typical Residential Homes and Common Energy Conservation Retrofits					A
Methodology to Define Bounds of Variability in Building Energy Use Predictions Using Detailed Simulation Models and How it can be Incorporated in the Design Process					A
Define Performance Factors for Primary and Secondary Equipment Simulation Inputs for Commercial Buildings		2 (2000 – 2001)		No progress	A
Analysis and Testing of the Energy Cost Budget Method in ASHRAE 90.1					A
Use of Evolutionary Computation for Inverse Problems					IM
Characterization of Building Secondary Thermal Loads from Chiller Electric Use Data					IM
Extend and Develop Methodology of 827-RP to Include Models for Air-Conditioners and Heat Pumps					IM
Standard Operating Conditions in North American Residential Buildings (1163-TRP)				Cancelled by Tech Council	A
Development of Detailed Descriptions of HVAC Systems (Templates) for Energy Simulation Programs (1198-WS)		3 (2000 – 2001)		Rejected 3/00	SCM

RESEARCH TOPIC ACCEPTANCE REQUEST (RTAR)

Title: Technical and Usability Enhancements to the Energy Calculation Toolkits

TC/TG: 4.7

Research Category: Design Tools

Research Classification: Projects related to Technology Transfer

TC/TG Priority: 1

Estimated Cost: \$100,000

Other Interested TC/TGs: 4.1

Possible Co-funding Organizations: DOE, IBPSA

Handbook Chapters to be Affected by Results of Project: Chapters 28, 29, and 31 of Fundamentals

Background / State-of-the-Art:

Over the last ten years, ASHRAE TC 4.7 has directed the development of a trilogy of toolkits for energy and loads calculations. Algorithms from the toolkits have been used in the development of building energy simulation software (e.g., EnergyPlus, DOE-2, TRNSYS, BLAST) and most recently in the development of commercial load calculation programs using ASHRAE's new cooling load calculation procedures.

Recent research initiatives by ASHRAE have focused on models and algorithms required to design state-of-the art, low energy building systems. Although this work has resulted in toolkit compatible FORTRAN modules, these modules have never been integrated into a release version of the toolkits and are therefore unavailable to the ASHRAE membership in a usable format.

ASHRAE research project RP1117 , experimentally validated the algorithms in the ASHRAE loads toolkit. As a result of this work, several defects in the toolkit algorithms were identified. In addition several serious omissions in the original scope of the toolkit were identified. New toolkit modules required to maintain the technical integrity of the toolkit were identified.

The toolkits were originally designed to work together as an integrated package. However, the rapid evolution of electronic documents and the advent of Fortran 90/95 while the trilogy was

being developed resulted in three separate toolkits published in completely different formats using different versions of Fortran. The first toolkit was published in printed form only with Fortran 77 subroutines on an accompanying diskette. The Second toolkit was published electronically as single document with Fortran 77 subroutines. The third toolkit was published using state of the art html format with well-developed links and navigation schemes. The code modules were written in Fortran 90.

Prior to the development of the toolkits, TC 4.7 sponsored the development of several annotated bibliographies. These provided background material and served as guiding documents for the development of the toolkits. Although portions of the bibliographies are cited or included in the toolkit documentation, the bibliographies would serve the ASHRAE membership best by directly linking the bibliographies to the toolkits.

Advancement to State-of-the-Art:

Eliminating the software code incompatibilities between the three toolkits would significantly enhance their usability. In conjunction with the code upgrade, enhancing the toolkit documents to support electronic distribution will facilitate production, distribution and use of the toolkits. Including the annotated bibliographies developed under the direction of TC 4.7 would further enhance the integrated toolkit.

Justification and Value to ASHRAE:

In order to support the recently developed ASHRAE cooling load procedures (Pedersen, C.O., Fisher, D.E., Spitler, J.D., Liesen, R.J. Cooling and Heating Load Calculation Principle. 1998. ASHRAE, Atlanta, GA) and in order to make the results of recent ASHRAE research available to the ASHRAE membership, it is critical that the ASHRAE loads toolkits be technically enhanced, integrated, and updated using the latest electronic publishing technology. Since the cooling load procedures are based explicitly on toolkit algorithms, it is essential that the integrity of the toolkits be maintained at the highest level. Toolkit defects and omissions identified by ASHRAE research project RP1117 should be immediately addressed in order to ensure that reliable cooling load calculation procedures are developed for the ASHRAE membership. The work product from the proposed project could become an ASHRAE special publication.

Objective: To produce a unified, updated Building Energy Calculations Toolkit CD.

TC4.7 Handbook Subcommittee Minutes

Monday, June 24, 2002, 5:00-6:00PM

Hawaii Convention Center Room 324

1. Introductions

Present: Rick Strand (chair), Jeff Spitler, Vern Smith, Dan Fisher, Rich Liesen, Gerhard Zweifel, Simon Rees, Ron Judkoff, Joel Neymark

2. Additions to the Agenda

Appointment of committee

Feedback on chapter

3. Progress on Action Items from Atlantic City

- **Continued Contact with Handbook Liaisons:** Rick Strand reported that contact has been maintained with Bill Fleming, our handbook liaison, since Atlantic City to keep him updated on our progress and plans for the new Chapter 31.
- **Initial Examples of Electronic Enhancements:** We currently do not have any examples, but this is a subject for discussion at this meeting.
- **TC4.7 Web Site Usage for Review of Enhancements:** Simon Rees has agreed to post any ideas on the web for evaluation. Should start happening before the next meeting.

4. Developments Since Atlantic City

- **Discussion of Expansion of Validation Section:** Ron Judkoff gave the committee an overview of the new validation section. Spitler suggested that the validation procedure be “beefed up” a bit— with more attention given to explicitly connecting the steps of the validation method to references in the literature (perhaps in a table). Spitler also suggested that additional references should be included. Strand noted that the section applied primarily to forward modeling. Spitler suggested that the main body of the text could be included in an appendix with a reference early on.
- **Addition of Reference to Loads Toolkit (RP-987):** Reference to Loads Toolkit should be added. We need some volunteers to review the reference section and bring the references up to date. A way forward is to look through our research projects. Rick Strand volunteered to compile a list of projects for the next meeting.
- **Corrections to Current Chapter 31:** Corrections are always possible and Rick Strand noted that there may be one potential typo in the reference list, referring to SPARK as SPANK (though this may actually be correct). Otherwise, no other corrections received to date.
- **Discussion of Enhancing Chapter 31 to Include “How-To” Examples:** This was not discussed in great detail. Another ASHRAE TC floated the idea of “how-to” examples.
- **Other Ideas for Additions/Electronic Enhancements:** The energy calculation chapter (31) may be a good candidate...but we need to find out about the technology. What sort of animations would we do: shadowing algorithms?
 1. Toolkit to VBA in Excel spreadsheet
 2. Color image of a “calibration tool” (Haberl).
 3. Psychrometric chart visualization of room conditions (Schaeztle)
 4. Don’t forget the simple stuff! (color pictures, spreadsheets, etc)

Questions:

1. What sort of things will be supported on the CD (animations?, web engines?...)

2. Will we be able to put other files on the CD, or does everything need to be fired from the pdf file?

5. Action Items for Chicago

- Revise new validation section as noted above (Neymark, Judkoff)
- Addition of Loads Toolkit Reference and check of SPARK reference (Strand)
- Investigation of other ideas for electronic enhancement of Chapter 31 (everyone). Rick Strand will also contact Jim Willson (Applications subcommittee chair) for assistance with making the chapter more practical)
- Forward minutes to handbook liaison (Strand)
- Assignments made during the full TC4.7 meeting regarding an initial review of the current chapter:
 1. GENERAL CONSIDERATIONS (Dan Fisher—all sections)
 2. COMPONENT MODELING AND LOADS
 - a. Calculating Space Sensible Loads (Ian Beausoleil-Morrison)
 - b. Ground Heat Transfer (Bill Bahnfleth)
 - c. Secondary System Components (Craig Wray)
 - d. Primary System Components (Jean Lebrun)
 3. SYSTEM MODELING
 - a. Overall Modeling Strategies (Joe Huang)
 - b. Degree-Day and Bin Methods (Joe Huang)
 - c. Correlation Methods (Joe Huang)
 - d. Simulating Secondary/Primary Systems (no one volunteered!)
 - e. Modeling of System Controls (Phil Haves)
 - f. Integration of System Models (Jeff Spitler)
 4. INVERSE MODELING (Robert Sonderegger—all sections)

Rick Strand will remind those who volunteered periodically.

6. Appointment of Committee

The chair of TC4.7 needs to appoint official members of the handbook subcommittee. Jeff Spitler proposed that Strand take an outline of Chapter 31 to the full TC4.7 meeting and get volunteers for an initial review of all sections of chapter 31 to at least update the references (see action items above).

7. Feedback on Chapter 31

There were no complaints on Chapter 31 received to date.

8. Adjourn

The meeting was adjourned at 6:05.

**TC 4.7 program plan
Pre-Chicago**

CHICAGO / JANUARY 2003

Seminar

“Getting started with building simulation”

Organized by TC 4.7 (Applications).

Chaired by Chip Barnaby.

Symposium

“Recent advances in building energy simulation: Loads”

Organized by TC 4.7 (Sim and comp models); co-sponsored by TC 4.1.

Chaired by Jan Hensen.

Seminar

“Using monitored data for solving engineering problems”

Organized by TC 4.7 (Inverse methods).

Chaired by Agami Reddy.

KANSAS CITY / JUNE & JULY 2003

Symposium

“Inverse methods for calculating savings from energy conservation retrofits”

Organized by TC 4.7 (Inverse methods).

Chaired by Jan Kreider.

Status: Three papers (one from 1050-RP) have been submitted and are under review (first round).

Symposium

“Integrating air flow modelling into energy analysis programs”

Organized by TC 4.7 (Sim and comp models) and TC 4.10.

Chaired by Jelena Srebric.

Status: Abstract call released in March + listed in ASHRAE Insights in May. 7 abstracts submitted. 6 accepted by review committee.

Seminar

“Inverse methods in support of building commissioning”

Organized by TC 4.7 (Inverse methods).

Chaired by Jean Lebrun.

Status: Unknown.

ANAHEIM / JANUARY 2004

Seminar

“Successful applications of energy simulation in building design”

Organized by TC 4.7 (Applications).

Chaired by Ian Beausoleil-Morrison.

Status: New

Seminar

“Validation of building simulation programs”

Organized by TC 4.7 (Applications)

Chaired by Joel Neymark

Status: New

**TC 4.7 programme plan
HONOLULU
June 25, 2002**

HONOLULU / JUNE 2002

1) Symposium

Recent advances in the thermal simulation of HVAC equipment.

Organized by TC 4.7 (Sim and comp models); co-sponsored by TC 4.1.

Chaired by Ian Beausoleil-Morrison.

CHICAGO / JANUARY 2003

1) Seminar

Getting started in building simulation.

Organized by TC 4.7 (Applications).

Chaired by Chip Barnaby.

Status: Submitted for Honolulu, but bumped by Programme Committee due to space limitations. 4 speakers lined up. Package already prepared.

2) Symposium

Recent advances in building energy simulation.

Organized by TC 4.7 (Sim and comp models); co-sponsored by TC 4.1.

Chaired by Jan Hensen.

Status: 4 papers under review. Plans to pull in 1093-RP paper. First reviews still being done. May or may not be ready for August 2 deadline.

3) Seminar

Using monitored data for solving engineering problems (new title)

Organized by TC 4.7 (Inverse methods).

Chaired by Agami Reddy.

Status: 5-6 speakers lined up..

4) Symposium

Inverse methods for calculating savings from energy conservation retrofits.

Organized by TC 4.7 (Inverse methods).

Chaired by Jan Kreider.

Status: Three papers (one from 1050-RP) have been submitted and are under review (first round). Chair expects to have package together to meet August 2 deadline.

KANSAS CITY / JUNE & JULY 2003

1) Symposium

Integrating air flow modelling into energy analysis programs.

Organized by TC 4.7 (Sim and comp models) and TC 4.10.

Chaired by Jelena Srebric.

Status: Abstract call released in March + listed in ASHRAE Insights in May. 7 abstracts submitted. 6 accepted by review committee.

2) Seminar

Automated baselining procedures using inverse methods.

Organized by TC 4.7 (Inverse methods).

Chaired by Jeff Haberl.

Status: Deferred from Honolulu and Chicago.

3) Seminar

Inverse methods in support of building commissioning

Organized by TC 4.7 (Inverse methods).

Chaired by Jean Lebrun.

Status: Unknown.

4) Seminar

Successful applications of energy simulation in building design

Organized by TC 4.7 (Applications).

Chaired by Ian Beausoleil-Morrison.

Status: New

ANAHEIM / JANUARY 2004

1) Seminar

Validation of building simulation programs

Organized by TC 4.7 (Applications)

Chaired by Joel Neymark

Status: New

MINUTES
SSPC-140 SMOT FOR BUILDING ENERGY SOFTWARE
Honolulu, June 24, 2002
Chair: R. Judkoff (submitted June 25, 2002)

ATTACHMENTS

- A. Agenda for June 24, 2002 meeting
- B. Minutes of Compliance SubC (unofficial SubC) from Sunday 6/23
 - B1. Compliance SubC / 90.1 ECB liason report
 - B2. Compliance SubC address list
- C. Previous minutes
- D. Mailing List

CORRESPONDENCE SINCE LAST MEETING

Proposed revisions to Std 140 to incorporate HVAC BESTEST were sent out to the voting members on June 14, 2002.

DIAGNOSTIC TESTS

The primary purposes of the meeting were to address a request by SSPC 90.1 ECB Subcommittee to assist with the development of compliance criteria, and to discuss addition of HVAC BESTEST and HERS BESTEST to Standard 140.

Attendees (see mailing list for full names, etc)

Voting Members

Beausoleil-Morrison
Crawley
Fairey
Judkoff (chair)
Rees
Walton
Wilcox

Yuill
Zweifel

Non-Voting Members

Neymark (vice chair)

Absent Voting Members

Other
Knebel
Millet
Yuill
Zweifel

Haberl
Winkelmann
Witte

General

Haberl has submitted his resignation from SSPC 140; roster change should be formalized by StdsC at their October meeting.

Knebel has expressed a desire to become a VM on SSPC 140.

Action Item: resend membership paperwork to Knebel (Neymark)

Walton reported that RP 865 PMSC voted that TC 4.7 accept the final report with minor revisions.

Committee Discussion

Approval of Prior Minutes

Motion (Fairey): Accept Minutes of Dec 2001 conference call [See attachment B].

2nd (Beausoleil-Morrison):

Vote: Yes = 7, No = 0

Absent = ()

Motion = passed.

Consideration to reference Standard 140 by others

Committee discussed efforts under way by others to reference Std 140 in other Stds/codes/legislation.

A. Fairey gave an update on activities regarding federal Senate Bill 1709 (and companion HR 3455) that includes tax credit legislation for energy efficiency in buildings, and could reference Std 140 for qualifying software that could be used in developing calculations. These bills have both passed their respective chambers. In commercial buildings the tax credit would be \$2.25/ft² for a building that can be demonstrated to be 50% more energy efficient than 90.1-1999 requires. For residential buildings, a building that can be demonstrated to be 30% more efficient than IECC chapter 4 would get \$1250 tax credit, and a building that is 50% more efficient than IECC chp. 4 would get a \$2000 credit. However, there is a strong possibility that these credits could be reduced or eliminated because of overall deficit spending.

[vice chair's note: In previous discussions of this topic it has been noted that something like HERS BESTEST may be needed in Std 140 because HERS BESTEST requires no peak demand outputs (that require hourly outputs); hourly outputs are not generally obtainable from simplified software tools.]

B. Fairey also gave update regarding referencing of 140 in International Energy Conservation Code (IECC). Currently, PNNL wants to make IECC thinner (easier to use), to not scare builders. Nothing new will happen regarding citing Std 140 until IECC's next revision cycle.

C. Wilcox gave an update regarding California's alternative compliance method (ACM). 80% of houses use performance calculations to comply. The ACM requires modeling of equipment and time-of-use electric rates.

IEA 22 Task Update

Updates regarding activities of International Energy Agency Solar Heating and Cooling Programme Task 22 were given. These are activities to develop new validation test cases for:

- Ground coupling; these are cases being developed by NREL and being simulated using detailed simulations incorporating multi-dimensional numerical analysis or other detailed models (SUNREL/GC, ESP/HOT3000, EnergyPlus)
- Gas-fired furnace; analytical verification test cases being developed by NRCAN, similar to HVAC BESTEST E100 series. Results are being simulated with ESP/HOT3000, DOE-2.1E, EnergyPlus
- Radiant surface heating and cooling tests; being developed by HTAL, Switzerland for embedded hydronic systems, being simulated using IDA, TRNSYS, DOE-2 and ESP
- HVAC BESTEST E300-series comparative test cases being developed NREL, being simulated using DOE-2.1E, TRNSYS, CODYBA, and EnergyPlus
- Empirical test cases including daylighting tests, 3 economizer cases using different control schemes.

CEN Update

Jean-Robert Millet of CSTB presented a CEN standard for testing software that can be used for doing cooling load and free float zone temperature calculations. This was to allow discussion of differences in testing techniques between CEN and Std 140. Biggest difference is that CEN assigns film coefficients to be used; Std 140 allows film coefficients to vary. Philosophical differences were discussed regarding (con) limiting the state of the art to possibly bad assumptions versus (pro) obtaining a narrower range of reference results for use with qualification testing software.

Request for Assistance with Compliance Criteria by SSPC 90.1 ECB Subcommittee

Neymark went over the meeting notes from the SSPC 140 Compliance SubC (informal) meeting held on Sunday 6/23, see Attachment B. Neymark's 140 Compliance SubC / 90.1ECB SubC liaison report is included as Attachment B1.

SSPC 140 is interested in formalizing the existence of the SubC. Per Crawley all we need to do is have a name for our subcommittee, a Chair, and an informal mission statement; for a subcommittee Standards Committee only needs to approve the Chair, and nothing else.

Action item:

- contact ASHRAE regarding submittal materials for formalizing the existence of the Compliance SubC (Neymark)

Rees discussed passing ranges and possible range expansion techniques that can be applied to a set of reference results. Current results revised after Sunday's meeting include:

(Range Min) [(Tested Simulation Result) [(Range Max)

where

Tested Simulation Result = Result from the simulation being tested with Std 140.

Range Min = (Reference Min) + ((Reference Max) – (Reference Min)) * (n)

$$\text{Range Max} = (\text{Reference Max}) + ((\text{Reference Max}) - (\text{Reference Min})) * (n)$$

and where

“Reference Max” and “Reference Min” are the maximum and minimum respectively of the “reference results”, where “reference results” are the reference simulations results set that will be defined by 90.1 ECB SubC (with review of the selection by SSPC 140 Compliance SubC). For example, 90.1 ECB SubC may be interested in obtaining results for other simulation programs in addition to results that were distributed at SSPC 140.

n = 0.1 or 0.2

Current language proposed to be used by 90.1 for qualifying a program is: “If a program cannot pass a specific test case regarding a specific feature or parametric sensitivity, that program cannot be used to model that feature or parametric sensitivity in the 90.1 ECB chapter.”

Other possible referencing language could use an increasing field of application ... e.g. class A compliance can do “x”+”y”, Class B compliance can do “y”, ...

Action items:

- contact Rees regarding instructions for setting up a full set of ranges that SSPC 140 Compliance SubC can review; this will be annual and peak heating and cooling loads for cases ≥ 250 , for all “absolute” results, and all sensitivity results types listed in Appendix B8, but using the results set of 9 different programs distributed by GARD analytics (i.e. old BLAST and DOE-2.1D results to be excluded). (Neymark)
- Generate full set of graphs depicting passing ranges (Rees)

Discussion of Test Cases that could be added to Standard 140

Fairey indicated no progress with adapting HERS BESTEST for inclusion into Standard 140.

Neymark presented changes to Std 140 necessary to include HVAC BESTEST, that were sent out on June 14, 2002. The committee agreed that the HVAC BESTEST analytical solution results should be included as part of an informational annex. The PC members did not have time to review the other changes. New deadline for that review is August 24, 2002.

Action items:

- contact SSPC 140 to remind them to review changes to incorporate HVAC BESTEST (Neymark, around Aug. 3, 2002)
- consider renumbering the old HVAC BESTEST sections to conform with new 140 outline, to avoid confusion [this was not done yet because of uncertainty regarding other renumbering needed for including HERS BESTEST]

New Business

None.

Meeting Adjourned.

References

ANSI/ASHRAE Standard 90.1-2001, *Energy Efficient Design of New Buildings*. ASHRAE, Atlanta, GA.

ANSI/ASHRAE Standard 140-2001, *Method of Test for the Evaluation of Building Energy Analysis Computer Programs*. ASHRAE, Atlanta, GA.

Judkoff R., and J. Neymark. (1995). *Home Energy Rating System Building Energy Simulation Test (HERS BESTEST), Volume 2, Tier 1 and Tier 2 Tests Reference Results*. NREL/TP-472-7332. Golden, CO: National Renewable Energy Laboratory.

Attachment A

AGENDA – SSPC 140 24 June 2002

Time: 14:15 to 18:15 on Monday, June 24
Location: Room 307A in the Hawaii Convention Center,
Chair: Ron Judkoff

TOPICS

1. Introductions (Judkoff)
2. Acceptance of Previous Minutes (Judkoff)
3. Adjustments to Agenda (Judkoff)
4. RP-865 Update (Walton, 5 minutes)
5. Tax Credits and IECC Chp 4. Update (Fairey, 10 minutes)
6. IEA Task 22 Activities
 - Ground Coupling Tests (Judkoff, 5 minutes)
 - Furnace Tests (Beausoleil-Morrison, 5 minutes)
 - RADTEST (Zweifel, 5 minutes)
 - New HVAC BESTEST cases (Neymark 5 minutes)
 - Empirical Tests (Judkoff, 5 minutes)
7. CEN Standards Related to Simulation Software (Millet, 20-30 minutes)
8. Standard 90.1 Pass/Fail Criteria regarding Std 140 (Neymark, 15 minutes)
9. Revisions to Std 140 to incorporate HVAC BESTEST (Neymark, 30-60 minutes)
10. Revisions to Std 140 to incorporate HERS BESTEST (Fairey, 30-60 minutes)
11. Update current Annex B8 informational results? (see previous minutes) (Judkoff)

Attachment B – Minutes of SSPC 140 Compliance SubC

MINUTES

SSPC-140 SMOT FOR BUILDING ENERGY SOFTWARE

COMPLIANCE CRITERIA SUBCOMMITTEE

(AND REPORT ON 90.1 ECB SubC DISCUSSIONS RELATED TO STD 140 COMPLIANCE CRITERIA)

Honolulu, HI, June 23, 2002

Liaison to 90.1 SubC: Neymark

ATTACHMENTS

B1. SSPC 140 Compliance SubC liason report on 90.1 ECB meeting

B2. Participant address list

CORRESPONDANCE SINCE LAST MEETING

Various email correspondance regarding Rees' work with range setting for pass/fail criteria. See Neymark for email record.

AGENDA

1. Reaffirm what Jason Glazer needs from us for ECB chapter of 90.1, and general mission.
2. Discuss possible range expansion techniques
3. Work on language that could be used to reference Standard 140 and incorporate compliance criteria
4. Discuss which results should be used

ATTENDEES

Glazer
Judkoff
Neymark
Rees

COMMITTEE DISCUSSION

1. Mission.

The group worked out a mission statement, [at the time we thought we needed to have one]. [Neymark volunteered to contact ASHRAE regarding procedures for formalizing the existence of the subcommittee.]

Mission Statement: The mission of the SSPC 140 “Standard 140 Compliance Subcommittee” is to assist codes and standards governing bodies with compliance issues related to implementing Standard 140.

[Possible amendment (?): The mission of the SSPC 140 “Standard 140 Compliance Criteria Support (CCS) Subcommittee” is to assist codes and standards governing bodies with development of compliance criteria related to implementing Standard 140.]

It was agreed that this subcommittee will provide a table of numbers representing ranges of results that 90.1 can incorporate as “pass/fail” criteria, and that Rees would do the spreadsheet work on that. It was agreed that 90.1 ECB subcommittee (primarily Glazer) would write language to incorporate results ranges, and that this Compliance SubC would closely review and comment on that language.

2. Range Expansion.

The consensus of the group was to develop a passing range for each test case of:

$$(\text{Range Min}) [(\text{Tested Simulation Result}) [(\text{Range Max})$$

where

Tested Simulation Result = Result from the simulation being tested with Std 140.

$$\text{Range Min} = (\text{Reference Min}) + ((\text{Reference Max}) - (\text{Reference Min})) * (n)$$

$$\text{Range Max} = (\text{Reference Max}) + ((\text{Reference Max}) - (\text{Reference Min})) * (n)$$

and where

“Reference Max” and “Reference Min” are the maximum and minimum respectively of the “reference results”, where “reference results” are the reference simulations results set that will be defined by 90.1 ECB SubC (with review of the selection by SSPC 140 Compliance SubC). For example, 90.1 ECB SubC may be interested in obtaining results for other simulation programs in addition to results that were distributed at SSPC 140.

$$n = 0.1 \text{ or } 0.2$$

Rees will work with varying “n” in his spreadsheet, and we will ask to discuss the new range expansion formula at SSPC 140 on Monday June 24.

3. Work on language that could be used to reference Standard 140 and incorporate compliance criteria

Language regarding pass/fail criteria could say something like:

“If a program cannot pass a specific test case regarding a specific feature or parametric sensitivity, that program cannot be used to model that feature or parametric sensitivity in the 90.1 ECB chapter.”

[secretary's note: also see below for notes regarding earlier discussions of this topic]

4. Results Set

Passing ranges will be developed for the following results set for all cases where 6 or more results were possible to be generated in informational Annex B8 of Standard 140:

- Annual heating load (MWh)
- Annual cooling load (MWh)
- Annual hourly integrated peak heating load, peak hour per year (kWh/h)
- Annual hourly integrated peak cooling load, peak hour per year (kWh/h)

These results will include both the absolute results for each case, and the sensitivity results (differences between specific cases) as defined in Standard 140 informational Annex B8.

All other types of results listed in Annex B8 will NOT be included in 90.1 ECB chapter, including:

- all free float temperature results, including binned annual hourly temperature results
- all intermediate solar data output (e.g. incident and transmitted solar radiation results)
- all daily hourly output profiles

The results set discussed at the meeting includes results developed by GARD Analytics for newer versions of software included in Annex B8, specifically: BLAST 3.0-334 and DOE-2.1E. These results are based on input decks from the original IEA Task 12 work, so it is recommended that results from the older versions of BLAST and DOE-2 currently listed in Annex B8 not be used for pass/fail range setting in 90.1.

5. Schedule of Activities

The 140-Compliance SubC members are hoping that since the only new work remaining is final development of passing ranges and wordsmithing of existing ideas, then proposed changes to 90.1 ECB chapter can be put forth to 90.1 ECB SubC by the January 2003 meeting in Chicago.

Meeting Adjourned.

References

ANSI/ASHRAE Standard 90.1-2001, *Energy Efficient Design of New Buildings*. ASHRAE, Atlanta, GA.
ANSI/ASHRAE Standard 140-2001, *Method of Test for the Evaluation of Building Energy Analysis Computer Programs*. ASHRAE, Atlanta, GA.

Attachment B1

SSPC 140 COMPLIANCE SUBC LIASON REPORT ON 90.1 ECB MEETING (Neymark)

90.1 ECB SubC concensus suggested to pro-actively try to get additional results sets for HAP (Carrier), TRACE (Trane), EQUEST/DOE-2.2 and PowerDOE, among others.

Independent (third party) certification was also discussed. ECB SubC noted that 90.1 cannot do that, and suggested that some 90.1 ECB-adopting state, federal or other agency could do that.

Schedule

ECB SubC is hoping to have a proposal from 140 Compliance SubC in the next 6 months.

Attachment B2 - SSPC 140 Compliance SubC ADDRESS LIST 23 June 2002

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Attachment C. Previous SSPC 140 meeting minutes

MINUTES
SSPC-140 SMOT FOR BUILDING ENERGY SOFTWARE
Atlantic City, January 14, 2002
Chair: R. Judkoff (submitted January, 15 2002)

Only changes from submitted atl city minutes are: simon's address, Calbert's name and email, Gardner's name and email.

CORRESPONDANCE SINCE LAST MEETING

In late October 2001 ASHRAE published Standard 140, and was supposed to send complementary copies to all SPC 140P members and SSPC 140 members; however, not everyone has received their copy ... yet.

A conference call was held on Dec 10, 2001 for the purpose of discussing test cases that could be added to Standard 140, and specifically prioritizing between HVAC BESTEST and HERS BESTEST. Those minutes are included as attachment B.

GENERAL

RP 865 is further delayed. Yuill is having health problems. The 865 PMSC wishes to propose to Yuill to accept the current results, and that Yuill issue a final report based on those results. Walton will propose another task extension at TC 4.7 meeting.

DIAGNOSTIC TESTS

The primary purposes of the meeting were to address a request by SSPC 90.1 ECB Subcommittee to compliance criteria, and to discuss test cases suites that could be added to Standard 140.

Attendees (see mailing list for full names, etc)

Voting Members

Beausoleil-Morrison

Fairey

Haberl

Judkoff (chair)

Rees

Walton

Wilcox

Witte

Other

Calbert

Gardner

Shirey

Absent Voting Members

Crawley

Winkelmann

Non-Voting Members

Neymark (vice chair)

General

Haberl indicated that he will need to roll off because of a conflict with another meeting (this conflict will begin in Honolulu).

Fairey and Rees did not receive complementary copies of Standard 140; Neymark will contact ASHRAE about that.

Committee Discussion

Approval of Prior Minutes

Motion (Haberl): Accept Minutes of Dec 2001 conference call [See attachment B].

2nd ():

Vote: Yes = 7, No = 0

Absent = ()

Motion = passed.

Consideration to reference Standard 140 by others

Committee discussed efforts under way by others to reference Std 140 in other Stds/codes/legislation; this in response to request by ASHRAE asst-mgr of Standards-American (Weber) transmitted via TC 4.7 Chair (Spitler)

A. At next International Code Council meeting Fairey intends to propose that Chp. 4 of International Energy Conservation Code (IECC) should seek to reference Standard 140.

B. Fairey also gave an update on activities regarding federal Senate Bill 1709 (and companion HR 3455) that includes tax credit legislation for energy efficiency in buildings, and could reference Std 140. Energy efficiency tax credit legislation (listed above) references use of certified software in accordance with the California ACM. These bills related to tax credits for retrofit improvements to existing buildings. There is a possibility to reference Standard 140 in these, but something like HERS BESTEST would be needed in Std 140 because it requires no peak demand outputs (that require hourly outputs); hourly outputs are not generally obtainable from simplified software tools.

[Fairey's prior criticisms (see June 2001 Cincinnati minutes) of using ACM 98 for this are that it is too complex and too constrained – some specifics are:

- ACM requires a minimum of 300 simulations for compliance.
- In some cases the state of the art in modeling is limited because some specific algorithms are required, e.g. for:
 - o Ground modeling
 - o Duct modeling
- ACM needs a range of acceptability rather than a single number.]

C. Haberl indicated that Texas Senate Bill 5 is considering a reference that would indirectly cite Std 140 by referencing Texas A&M Energy Systems Laboratory (ESL) requirements and IECC. He indicated that ESL would require Std 140 tested software in relevant situations in Texas.

D. Neymark discussed SSPC 90.1 ECB subcommittee's interest in referencing Std 140 (see below).

Recommendation of RP-1052 final report for special publication by ASHRAE as a CD.

SSPC 140 generally agrees that this is a good idea ... Neymark will make a motion that TC 4.7 recommend to do this at the full TC 4.7 meeting.

Request for Assistance with Compliance Criteria by SSPC 90.1 ECB Subcommittee

Neymark reported on discussions with SSPC 90.1 ECB SubC (ECB SubC) on Sunday. At that meeting Jason Glazer of ECB SubC indicated that a problem with 90.1 is that for simulation general requirements (90.1, sec. 11.2) only operational requirements of software are stated (e.g. minimum number of hours its possible to analyze, minimum number of zones possible to analyze, etc); there are no quality requirements. Glazer wants 90.1 to be able to utilize Std 140 for software quality requirements – but Std 140 does not give specific compliance requirements. At ECB SubC Neymark briefly presented the HERS BESTEST (NREL/TP-472-7332) example pass/fail criteria, and emphasized that this only represents the beginning of thinking in this area, and also discussed its Sec. 4.6 entitled “Adjustment of Passing Ranges”. JN indicated that SSPC 140 is planning to appoint a liaison to 90.1 ECB SubC.

At this meeting Glazer made the following additional comments:

What he he'd really like is normative compliance criteria delineated in Std 140, to which Neymark replied that this is inappropriate for a Method of Test but more appropriate for other standards that would reference the method of test.

Glazer then seemed open to the idea of adding language to 90.1 something like:

“Results for programs that are allowed to be used in the 90.1 ECB Method (currently Section 11) shall have results tested in accordance with Standard 140 within the ranges of results shown in “Table A””

- where Table A is a listing of max, min range setting using basic statistical methods incorporating a confidence interval
- where Table A would also be a part of 90.1, and NOT part of Std 140 (although it could be an informative appendix in 140)
- where Table A would be based on a subset of the full Std 140 results set: e.g. possibly for only the “basic” tests, and possibly for just a limited set of outputs from those (e.g. just the annual consumptions and peak demand results).

Neymark and Glazer discussed revising Sec 4.1.1 of 140, [but on second thought it might be easier to just put language in 90.1 saying that their requirements supercede language of Sec. 4.1.1 of 140.]

Glazer requested a table of max,min results from 140 [but its possible he would be willing to generate these himself if 140 can give good guidance]. Glazer indicated he is definitely available to interact with 140 on this issue, although this would have to occur outside the regular ASHRAE meetings. The ECB SubC Chair (Don

Steiner) also indicated that he is willing to arrange a conf call with full ECB SubC (7 members) when a proposed compliance method is ready.

Getting back to our 140 meeting, Judkoff presented a discussion regarding the underlying philosophy and mathematics of the example pass/fail criteria of HERS BESTEST, including possible random and non-random sources of error related to the distribution of the HERS BESTEST example results.

Based on these presentations, SSPC 140 generally agreed to go ahead and assist ECB SubC with development of compliance criteria for Std 140. SSPC 140 generally agreed that Neymark should act as liaison to ECB SubC and that there should be an informal (ad hoc) subcommittee of SSPC 140 to address compliance criteria. Fairey, Beausoleil-Morrison, Rees, and Witte volunteered to serve on this subcommittee; we will also ask Glazer to be a part of this subC.

Action items for Neymark are to: contact Glazer regarding what we want to do, and send a kick-off email to the 140 Compliance Criteria SubC after discussions with Glazer.

Action item for Judkoff: email a mission statement to the Compliance Criteria SubC.

Discussion of Test Cases that could be added to Standard 140

A straw poll at this meeting, and a similar poll during the 12/10/01 conference call indicate that SSPC 140 considers addition of both the HERS BESTEST and HVAC BESTEST suites as high priorities. As a result there were no objections to Judkoff and Neymark working to “codify” HVAC BESTEST while Fairey leads a similar effort regarding HERS BESTEST.

New Business

The committee wishes to discuss the following at the next meeting: updating the current set of reference results (informational Appendix B8), and should 140 try to initiate an ASHRAE work statement to do this?

Meeting Adjourned.

References

ANSI/ASHRAE Standard 140-2001, *Method of Test for the Evaluation of Building Energy Analysis Computer Programs*. ASHRAE, Atlanta, GA.

Judkoff R., and J. Neymark. (1995). *Home Energy Rating System Building Energy Simulation Test (HERS BESTEST), Volume 2, Tier 1 and Tier 2 Tests Reference Results*. NREL/TP-472-7332. Golden, CO: National Renewable Energy Laboratory.

Attachment D - SSPC 140 ADDRESS LIST 25 June 2002

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