

**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND  
AIR-CONDITIONING ENGINEERS, INC.  
1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400**

**TC/TG/TRG MINUTES COVER SHEET**

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

**TC/TG/TRG NO. TC 7.5**

**DATE: June 24, 2008**

**TC/TG/TRG TITLE: Smart Building Systems**

**DATE OF MEETING: June 24, 2008**

**LOCATION: Salt Lake City, UT**

<b>Members Present</b>	<b>Appt</b>	<b>Members Absent</b>	<b>Appt</b>	<b>E-Officio Members and Additional Attendance</b>
<b>Voting Members</b>		<b>Voting Members</b>		Reinhard Seidl
Michael Brambley, Chair (V)	2006	Jonathan Wright, IM (V)	2007	Janice Peterson (TAC Section Head)
Robert Old, (V)	2006	Todd Rossi, (V)	2006	Gregor Henze
Steve Blanc, (V)	2004	Rich Hackner, Building/Utility Interface	2007	Zheng O'Neill
William Healy, Wireless Application Subc., (V)	2006	Jin Wen, FDD Chair, (V)	2006	Vladimir Vukovic
Carol Lomonaco, Secretary, Program Subc., (V)	2007	Peng Xu, Vice Chair, Research Subc., (V)	2006	
Vernon A. Smith, (V)	2007	<b>Corresponding Members</b>		
Haorong Li, (V)	2007	Osman Ahmed, (CM)	2006	
<b>Corresponding Members</b>		Jerine Ahmed, (CM)	2007	
Chariti Young, (CM)	2002	Agami Reddy, (CM)	2006	
Xiaohui Zhou, (CM)	2003	Barry Rearden, (CM)	1999	
John House, Handbook	2006	Narendra Amarnani, (CM)	2004	
Natascha Castro,	2004	Dave Branson, (CM)	2001	
Srinivas Katipamula, (CM)	2005	Marty Burns, (CM)	2002	
Carlos Haiad, (CM)	2004	Jim Butler, (CM)	2002	
Barry Bridges, (CM)	2002	Charles Culp, (CM)	2000	
Gene Strehlow, (CM)	2006	Arthur Dexter, (CM)	2005	
Keith Temple, (CM)	2003	Piotr Domanski, (CM)	2005	
Michael Brandemuehl, (CM)		Mohsen Farzad, (CM)	2005	
James Braun, (CM)	2007	Mark D. Johnson, (CM)	2004	
		David Kahn, (CM)	1996	
		Michael Kintner-Meyer, (CM)	2007	
		Mingsheng Liu, (CM)	2003	
		Darrell Massie, (CM)	2003	
		John Mitchell, (CM)	2000	
		Ron Nelson, (CM)	1998	
		Hung Manh Pham, (CM)	2001	
		Kinga Porst, (CM)	2002	
		Mike Pouchak, (CM)	2003	
		Andrew Price, (CM)	2003	
		Ashok N. Kadakia, (CM)	2006	
		Glenn Remington, (CM)	2002	

<b>Members Present</b>	<b>Appt</b>	<b>Members Absent</b>	<b>Appt</b>	<b>E-Officio Members and Additional Attendance</b>
		James Winston, (CM)	1996	
		Martha Jo Brook, (CM)	2006	
		Philip Haves, (CM)	2005	
		James W. Gartner, (CM)	2007	
		Maria Corsi, (CM)	2003	
		Sharon Dinges, (CM)	2006	
		Cliff Federspiel, (CM)	2006	
		John Seem, (CM)	2003	
		Ahmed Husaunndee, (CM)	2006	
		George Kelly, (CM)	2001	
		William Pienta, (CM)	2006	
		Les Norford, (CM)	2006	
		Arun Vohra, (CM)	2006	
		Pornsak Songkakul, (CM)	2002	
		Jeffrey Schein, (CM)	2007	
		Menelaos Stylianou, (CM)	2007	
		Shengwei Wang, (CM)	2007	

(V) = voting member

(CM) = corresponding member

DISTRIBUTION:

ALL MEMBERS AND CORRESPONDING MEMBERS OF TC/TG/TRG,

TAC CHAIR: Patricia Graef

TAC SECTION HEAD: Janice Peterson

ALL COMMITTEE LIAISONS AS SHOWN ON TC/TG/TRG ROSTERS:

Program: William Klock

Standards: Jerry W. White Jr.

Research: Patrick Hughes

Special Publications: Mark Fly

CTT: Joseph Anderson

Staff Liaison (Stds): Claire Ramspeck

Prof. Dev.: Gordon Holness

Staff Liaison (Resch/Tech Srvc): Michael Vaughn

"These draft minutes have not been approved and are not the official, approved record until approved by this (council/committee)."

## ASHRAE TC Activities Sheet

DATE: June 24, 2008

TC NO. TC 7.5

TC TITLE: Smart Building Systems

CHAIR: Mike Brambley

VICE CHAIR: Peng Xu

### TC Meeting Schedule

Location, past 12 mo.	Date	Location, planned next 12 mo.	Date
Long Beach, CA	06/26/07	Chicago, IL	01/27/09
New York City, NY	01/22/08	Louisville, KY	06/23/09

### TC Subcommittees

Subcommittee	Chair
Secretary	C. Lomonaco
Fault Detection and Diagnostics	J. Wen
Wireless Applications	B. Healy
Building/Utility Interface	R. Hackner
Research	P. Xu
Program	C. Lomonaco
Handbook	J. House

### Program List for 2008 Salt Lake City Meeting:

Title	Chair	Status
Seminar 27. Exchanging Information Between EMCS and FDD Tools for Better Building Performance: Challenges and Lessons Learned	John House	Monday, June 23, 2008

### TC 7.5 is co-sponsoring the following program session:

Title	Chair	Status
Transactions Session 3: Optimal Control Approaches for Demand Limiting Utilizing Building Thermal Mass	Steven Blanc	Sunday, June 22, 2008
Also, sponsored by TC 7.4 Building Operation Dynamics		

## Current Research Projects

1275-RP "Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II" (Phil Haves – PMSC Chair)  
Completed.

1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)

1312-RP, "Tools for Evaluating FDD Methods for AHUs" – WS-1312. Contractor Selection in Denver. (Phil Haves, PMSC Chair)

## 2007 – 2008 Research Plan

Priority	Project	RTAR Contributors	Status
1 (highest)	1543-RTAR Demand response optimization protocol and integrated training	Rich Hackner	Submit work statement before May 2010. WS must be submitted and approved for bid by July 1, 2012.
2	Reduce Simultaneous Heating and Cooling	Peng Xu	This RTAR is not ready for vote yet. The action item is that the author should talk with relevant TCs to get requested inputs.
3	1511-RTAR A Building Systems Emulation Tool for Building Operators ( <i>aka "What If" Emulation Tool for Training and Strategizing on Building Operations</i> )	Steve Blanc	RAC returned RTAR after Fall Meeting 2007. Resubmit revised RTAR with letter explaining how RAC's comments were addressed in revision with new TC vote.
Not Prioritized per SLC Mtg June 2008	1429-RTAR FDD for Supermarket Refrigeration	Daniel Choinere and John House	RAC returned RTAR after Fall meeting 2007. Resubmit revised RTAR with Letter explaining how RAC's comments were addressed in revision with new TC vote or notify RAC that RTAR has been dropped by TC for further consideration.
Not Prioritized per SLC Mtg June 2008	Development of metrics to evaluate benefits of sensor networks in buildings (new title)	Jin Wen and Agami Reddy. Revised by Bill Healy	Approved and voted on at Long Beach meeting.
Not Prioritized per SLC Mtg June 2008	Status and benefits of demand response program for residential buildings	Jin Wen, Srinivas, Bill, Palieuta,	More work
Not Prioritized per SLC Mtg June 2008	Locate and identify IEEE 802.15.4 RF sources	Bob Old	Need justification and value to ASHRAE. Need a clear HVAC application.
Not Prioritized per SLC Mtg June 2008	Whole-Building FDD	Les Norford	On hold. Les is still interested in pursuing the idea.

Not Prioritized per SLC Mtg June 2008	Conceptual Design of a Self-Configuring HVAC Control System	Michael Kintner-Meyer	Revised draft WS discussed in Denver. Revisions planned. Tabled indefinitely. The RTAR has rolled off the RAC list.
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### **Co-Sponsorship**

None.

### **Technical Papers from Sponsored Research**

#### RP-1011

Kintner-Meyer, M, Burns, M. 1999. "Utility/Energy Management and Control Systems (EMCS) Communication Protocol Requirements" Final report for ASHRAE Research Project RP-1011. Available on the TC 7.5 web site.

Kintner-Meyer, M.; Burns, M. 2000. Utility/Customer Information Services Part1: Descriptions of Services and Discussion on Interoperability for Service Implementation. ASHRAE Transactions. Vol. AT-01-0-0. American Society of Heating, Refrigeration, and Air-conditioning Engineers, Inc., Atlanta, GA.

Kintner-Meyer, M. Burns, M. 2000. *Utility/Customer Information Services Part 2: Data Object Modeling and Mapping to BACnet*. ASHRAE Transactions. Vol. AT-01-0-0. American Society of Heating, Refrigeration, and Air-conditioning Engineers, Inc., Atlanta, GA.

#### RP-1020

Norford, L. K., J. A. Wright, R. Buswell, and D. Luo. 2000. "Demonstration of Fault Detection and Diagnosis Methods in a Real Building (ASHRAE 1020-RP)." ASHRAE 1020-RP Final Report.

Luo, D., L. K. Norford, S. R. Shaw, and S. B. Leeb. 2002. "Monitoring HVAC Equipment Electrical Loads from a Centralized Location – Methods and Field Test Results." ASHRAE Transactions Vol. 108(1).

Shaw, S. R., L. K. Norford, D. Luo, and S. B. Leeb. 2002. "Detection of HVAC Faults via Electrical LoadMonitoring." International Journal of HVAC&R Research, 8(1):13-40.

Norford, L.K., J. A. Wright, R. A. Buswell, D. Luo, C. Klaassen, and A. Suby. 2002. "Demonstration of Fault Detection and Diagnosis Methods for Air-Handling Units (ASHRAE 1020-RP)." International Journal of HVAC&R Research, 8(1):41-72.

### RP-1043

Bendapudi, S., Braun, J.E., and Groll, E.A., “A Dynamic Model of a Centrifugal Chiller System – Model Development, Numerical Study and Validation,” ASHRAE transactions, Vol. 111, Pt. 1, 18 pages, 2005.

Final report for ASHRAE Research Project RP-1043, “ Fault Detection and Diagnostic Requirements and Evaluation Tools for Chillers” is available on the TC 7.5 web site.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., “The Sensitivity of Chiller Performance to Common Faults,” International Journal of HVAC&R Research, Vol. 7, No. 3, pp. 263-279, 2001.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., “A Survey of Common Faults for Chillers,” ASHRAE Transactions, Vol. 108, Pt. 1, 2002.

### RP-1139

Andersen, K.K., and Reddy, T.A., 2002. “The Error in Variable (EIV) Regression Approach as a Means of Identifying Unbiased Physical Parameter Estimates: Application to Chiller Performance Data”, International Journal of HVAC&R Research, vol.8, no.3, pp. 295-309, July.

Reddy, T.A. and Andersen, K.K., 2002. “An Evaluation of Classical Steady-state Off-line Linear Parameter Estimation Methods Applied to Chiller Performance Data”, International Journal of HVAC&R Research, vol.8, no.1, pp.101-124.

Reddy, T.A., Niebur, D., Andersen, K.K., Pericolo, P.P. and Cabrera, G., 2003. “Evaluation of the Suitability of Different Chiller Performance Models for Online Training Applied to Automated Fault Detection and Diagnosis”, International Journal of HVAC&R Research, Vol.9, No.4, pp. 365-384, October.

Reddy, T.A., Andersen, K.K. and Niebur, D., 2003. “Information Content of Incoming Data During Field Monitoring: Application to Online Chiller Modeling”, International Journal of HVAC&R Research, Vol.9, no.4, pp.385-414, October.

TC Sponsored Symposia, Transactions, Poster Sessions (past 3 years, present, planned) check this – August 18, 2008 Monday

<b>Title</b>	<b>Date</b> (Given or Planned)
Software Tools for Enhanced Building Operation (House)	Dallas, 1/07
Automated Fault Detection and Diagnostics (FDD)	Long Beach 6/07
Formulation of Generic Methodology for Assessing FDD Methods and Its Specific Adoption to Large Chillers	Long Beach 6/07

TC Sponsored Seminars (past 3 years, present, planned)

<b>Title</b>	<b>Date</b> (Given or Planned)
Load Management: Why You Should Care and What Technology is Emerging (Katipamula, TC 1.4 and TC 7.4 co-sponsor)	Chicago, 1/06
User Experience with HVAC Fault Detection and Diagnostics – Part 1 (Cherniack, TC 1.4 and 7.6 co-sponsor)	Quebec City, 6/06
User Experience with HVAC Fault Detection and Diagnostics – Part 2 (Thomle, TC 1.4 and 7.6 co-sponsor)	Quebec City, 6/06
Emerging Wireless Technologies (Brambley)	Dallas, 1/07
Approaches to Deploying Wireless Technologies (Wen)	Dallas, 1/07
Fault Detection and Diagnostics – But What About Correction (Katipamula)	Dallas, 1/07
Issues in “Real” Wireless Network Applications (Planned)	NYC, 1/08
Challenges and Lessons-Learned from Exchanging Data/Information Between EMCS and FDD Tools (Planned)	NYC, 1/08
FDD ---But What About Correction? (Planned)	TBD
Challenges and Lessons Learned From Showing Data From FDD (Submitted and accepted as Seminar 27 “Exchanging Information Between EMCS and FDD Tools for Better Building Performance: Challenges and Lessons Learned” (Wen) for SLC 6/08)	SLC, 6/08
Part II: Issues in “Real” Wireless Network Applications (Planned)	TBD
Aggregators Panel (Planned for Chicago 01/09)	TBD
Will Wireless Controls Save Me Money? (Planned for Chicago 01/09)	TBD

TC Sponsored Forums (past 3 years, present, planned)

<b>Title</b>	<b>Date</b> (Given or Planned)
What the utility wants to do to your building and how you will benefit (Kintner-Meyer, TC 7.4 co-sponsor)	Denver, 6/05
Wireless Sensing and Control: Where is it Needed and What Should it Control? (Brambley, TC 1.4 co-sponsor)	Chicago, 1/06
Fault Detection and Diagnostics: Are You Ready to Put it in Your Building? (Brambley, TC 1.4 and 7.6 co-sponsor)	Dallas, 1/07
How Secure Is Your Wireless Control Network? (Planned) [[aka “How Secure and Reliable Is Your Wireless Control Network? (Planned) for NYC]]	TBD

TC Sponsored Public Sessions (past 3 years, present, planned): None

Journal Publications (past 3 years, present, planned): None

**Main TC 7.5 Meeting**  
**ASHRAE TC 7.5, Smart Building Systems**  
**June 24, 2008**

**1. Call to Order, Roll Call, and Introductions**

The meeting was called to order at 3:31pm with Chairman Mike Brambley presiding and Carol Lomonaco as Secretary.

Carol took the roll call for all the voting members for TC7.5. A quorum was established 6/11.

Mike Brambley read the scope of TC 7.5 and handed out the agenda for the main meeting. The sign-up sheet for the General TC 7.5 Meeting was passed around for everyone to sign. Also, the server was not yet set up at the start of the meeting but would be shortly.

Another voting member entered the meeting and so the numbers of voting members rose to 7/11. A quorum was still established 7/11.

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Motion : "Approve Amended New York City TC 7.5 Meeting Minutes", Moved by Bob Old, and seconded by Steve Blanc.

Discussion: no further discussion.

Vote: 6-0-0 CNV. Motion approved.

Carol Lomonaco, Secretary, will make John House's changes sent via email before the SLC meeting and send out the final NYC TC 7.5 minutes.

Note: CNV= Chair not voting.

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**1. Chair's Report by TC 7.5 Chair Mike Brambley:**

Mike reported on things he learned from the Section Head 7's chair's breakfast on Sunday morning.

Mike passed around the things that he wanted everyone to have a change to look at:

- the CTC report, it is a colorful newsletter.
- a list that you can sign up on for "Thank you letters" from ASHRAE to your employer thanking them for supporting their employees who have participated in ASHRAE activities during the 2007-2008 Society year. Please fill in your name.

Mike announced that the Society Program committee is going away after the Salt Lake City Meeting (June 2008 Annual Meeting) and will be replaced by something called the Conferences and Expositions Committee (CEC). So it will be the new body responsible for more than just the program at the regular ASHRAE meetings and other conferences that ASHRAE co-sponsors.

On the other hand, ASHRAE is going to be moving towards 50% of the content by TCs and

50% content of the program by the new CEC at the Annual and Winter meetings. Rather than 100% by from the TC's at the Annual and Winter meeting. There will no Program liaison between the CEC and the TCs as we have had in the past. But there will be a meeting of all the Program subcommittee chairs of all the TCs with the CEC at each ASHRAE meeting. We weren't told about the details about the CEC change. Mike Brambley reported that he made a motion and it was approved in the Section 7 Breakfast meeting for the section head to send a letter "...that the CEC to provided additional details for this change and hold off implementing this new change to after Chicago January 2009 Winter Meeting." It was unanimously approved by the attendees at the TC Chair Breakfast.

Note" on the CTC news letter there was mention of a satellite broadcast which had more than 20,000 participants and it also is being repeated for US Government agencies per their request.

There is a new TAC chair. His name is Craig Wray.

Drury B. Crawley will be the new TAC Section Head for Section 7 beginning July 1, 2008. Our out going Section 7, Janice Peterson just joined the meeting. Mike asked if Janice wanted to interrupt the meeting to make any announcements.

Janice Peterson asked when we will talk about "Old Business" of the Potential Merger (of TC 7.5) with TC 7.4 Building Operation Dynamics. Mike asked if any opposition as Mike is done with announcements. (There was none.) Mike suggested that thank her for the good job she has done for the last three years and the attendees gave her a round of applause.

There is a new ASHRAE Strategic Plan, however, the current ASHRAE Strategic Plan as well as supporting documents have been put into one booklet which Mike showed everyone at the meeting. The booklet includes the supporting plans, for example, the ASHRAE 2010-2015 Strategic Research Plan. You can obtain a copy of this Strategic Plan online at [www.ashrae.org/strategicplan](http://www.ashrae.org/strategicplan). We (as a TC) will work towards these plans for research and program. Everyone is encouraged to go out and get a copy of it from the website.

Note: Wireless network by Mike Galler 192.168.0.102 is up. "smart" (all lowercase) is the password.

George Jackins, our former ASHRAE President, is our new RAC Liaison.

Richard Rully is new the new chair for honors and awards. Richard is encouraging for nominations for "ASHRAE Fellows" members. He is asking the members and TCs to consider members that are not so academic in nature. Because most of the nominations for Fellows are coming from ASHRAE local chapters he wanted to be sure and get the word out to the TCs and to announce this in all TC meetings.

Other announcements made by Mike include, there are now three (3) Tech Council Steering Committees. The three steering committees are:

1. Building Information Modeling (BIM) and Interoperability, chaired by Gordon Holness
2. Advanced Energy Design Guides, chaired by Gordon Holness
3. Building Performance and Metrics, chaired by Terry Townsend

There are status reports available from each committee on the ASHRAE website

[www.ashrae.org/technology](http://www.ashrae.org/technology) and then select “Tech Council – Technology Focus Activity”. Mike will have the information about the three steering committees posted on our TC 7.5 website.

On the subject of TC Rosters, you should be aware if you are a member or a corresponding member of a TC. You can find those TC rosters on the member’s only sections on [www.ashrae.org](http://www.ashrae.org).

Up coming 90% online reviews of two new ASHRAE design guides.  
The two are:

- 1) Advanced Energy Design Guide for Highway Lodging
- 2) IAQ Design Guide: Best Practices for Design, Construction, and Commissioning

The past response of 60% design reviews was smaller than ASHRAE desired. So ASHRAE is actively publishing the design reviews. The dates are Monday July 14-25, 2008 for the Advanced Energy Design Guide for Highway Lodging, and Friday, July 25-August 17, 2008 for the IAQ Design Guide: Best Practices for Design, Construction, and Commissioning. Both guides can be found at [www.ashrae.org/aedg](http://www.ashrae.org/aedg).

If you had problems with ASHRAE web site, email, etc. The ASHRAE servers have had numerous problems recently but things have been moved to new servers. Thus things should get back to normal relatively soon.

The ASHRAE Headquarters Building Renovation is nearly completed. Occupancy is expected in late July (2008). The renovated building will be formally dedicated late October 2008. The newly renovated building will be a LEED Gold NC building. So ASHRAE is “walking the talk”. ASHRAE is promoting energy efficiency and sustainability and we will have a new headquarters building. There is a new 4000 sq ft for training center. All (mechanical HVAC) systems were replaced. There are different systems on the first floor vs. the second floor. Partly to provide a “Living Laboratory” for us to monitor over time and get data that researchers and others can analyze. Open plan space and a very small number of enclosed offices and a greater use of daylight. They are using a variable refrigerant system on the second floor and heat pumps on the first floor. There is a lot of innovation compared to the original design. There is a website to see photos, documents, and very soon very real –time or near real-time data for members to access. See [www.ashrae.org/building](http://www.ashrae.org/building).

Final announcement is related to certification. Certification ideas are requested from technical committees. There are two areas that have been suggested that are new:

1. Energy Logger Certification
2. Energy Assessors Certification.

If you have any ideas we should get those identified and submitted.

Questions and comments on announcements? There were none.

### **Old Business**

Now go to item #13 on the TC 7.5 Main Meeting Agenda. The subject is a potential TC 7.5 Merger with TC 7.4 Building Operation Dynamics. Mike Brambley spoke about our last mtg NYC you empowered Mike the chair of TC 7.5 with members of TC 7.4 to form an ad hoc

committee and this committee to undertake the issue of merger of TC 7.4. This was an idea that originated from TC 7.4 and TC 7.5 was responding to that request from TC 7.4. (Mike passed around the “post merger document.”) Mike discussed that at the NYC ASHRAE Winter TC7.5 Meeting January 2008, we took a straw poll vote nearly unanimous except one “opposition” vote. We formed an ad hoc committee with the chair of TC 7.4 Srinivas Katipamula (the chair of TC 7.4) and Mike Brambley (the chair of TC 7.5) and members appointed from TC7.5 and others appointed from TC 7.4 All were officers or involved in leadership from both TCs. All understood the issues and the committee went through a short round of meetings and came up with a proposal that is in the document that Mike just circulated.

The main TC 7.5 committee after merger will have 18 voting members and 68 Corresponding Members (CM). The voting membership was formed by taking all voting members from TC 7.4 that would be appointed or active in 2007-2008, and the same for TC 7.5 and merging them together. And in one case we had to remove one person because there would be two people from the same company, that was Bill Healy but he was rolling off anyways. Thus we had 18 voting members. The proposed committee structure is shown in the document that Mike passed and we would add to TC 7.5 “Buildings Operations Dynamics as a new subcommittee to TC7.5. (We would retain TC 7.5 Smart Building Systems and the names of the subcommittee as they currently are.) The management Building Operations Dynamics subcommittee will be chaired by Steve Blanc. We inherited from TC 7.4 the handbook Chapter 41. There are changes to be made to handbook. The lead for the handbook Chapter 41 is Moncef Krarti.

Additional information is provided on Mike’s handout Titles of Handbook chapters, current research projects, etc.. You will see the current research projects coming over from TC 7.4. RP-1340 (Near Optimal Scheduling Control of Combined Heat and Power Systems for Building) and TRP-1390 (Short-Term Curtailment of HVAC Loads in Buildings). The proposed revised scope is listed with changes that are bolded and with the changes of our TC 7.5 scope, including supervisory management including components and systems (new wording).

Finally, the proposed meeting times are listed. The Sunday TC 7.5 subcommittee meetings will remain the same. They are:

- Fault Detection & Diagnosis, Sunday, 3:00-4:00pm
- Wireless Applications, Sunday, 4:00-5:00pm
- Building/Utility Interface, Sunday, 5:00-6:00pm

- The TC 7.5 Main TC meeting (would remain the same on) Tuesday, 3:30pm to 6:00pm
- The Building Operation Dynamics Subcommittee Meeting, Monday, 3:00pm – 4:30pm
- The Handbook meeting Monday, 6:00 to 6:45pm
- Research would meet on Monday, 4:30pm to 6:00pm.

Note: All PMS meetings proposed are listed on the sheet/file.

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Motion: (by Steve Blanc) “I move that TC 7.5 merge with TC 7.4 with TC 7.4 joining TC 7.5 as a topical subcommittee parallel to the other topic subcommittees, FDD, Wireless Applications, and Building/Utility Interface.” The motion was seconded by Bill Healy.

Discussion by Agami Reddy why the motion was stated the way it was. TC 7.4 held an email ballot before the Salt Lake Meeting and the motion. Srinivas (TC 7.4’s chair) reported by email that TC7.4 already approved the merger with TC 7.5 before the SLC meeting.

No further discussion or questions.

Vote: 7:0:0: CV. Motion approved.

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A second motion was then raised by Steve Blanc.

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Motion: ( by Steve Blanc) “I move that TC 7.5 be restructured after merger with TC 7.4 as described in the document “Proposed New Structure of TC 7.5 Smart Building Systems’ after merger with TC 7.4 Building Dynamics for July 2008 – June 2009. The motion was seconded by Vern Smith.

Discussion: Srinivas clarified renaming the sub committee now is wise to do at this time. He noted that the chair of the TC can change the names of the sub committees on his/her technical committee . Also, Srinivas Katipamula asked to list TC7.4 (to see TC 7.5) and put a note in the Program Book for Chicago that says that TC 7.4 merged with TC 7.5, and to see TC 7.5’s listing in the book. Also Srinivas mentioned that after the conference Chicago Winter January 2009 ASHRAE Meeting, we can re-name the subcommittee names is we so desire with the TC chair’s agreement. It is up to the Chair of the TC 7.5 to do that. Michael Brandemuehl asked. Is “Building Operation Dynamics” the proper name? There is a typo in the post-merger document. Is the word Operation plural? Steve Blanc accepted the amendment so Building Operations Dynamics is the proper name instead of Building Operation Dynamics. Mike asked if it matters. Janice Peterson said he does not matter. There was no other discussion or questions.

Vote: 7-0-0 CV. Motion approved.

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Janice Peterson, TAC has to approve this proposal. They will meet Wednesday morning on June 25, 2008. Mike Brambley (the current chair of TC 7.5) and Srinivas Katipamula (the current chair of TC 7.4) will go with Janice to the TAC meeting to help answer any questions about the merger.

Janice Peterson – New Business—presented a certificate. to Mike Brambley for being a “great” TC chair.

## **Subcommittee Chair Reports:**

### **Fault Detection and Diagnosis (FDD) Subcommittee Report – Haorong Li for Jin Wen**

Haorong Li summarized the TC7.5 FDD Subcommittee report as follows:

*During Sunday's FDD subcommittee meeting, an old RTAR entitled "Heating System FDD" was discussed. The purpose of this RTAR is to evaluate problems with the heating systems. Jin Wen, the champion of the RTAR, made three major changes based on the comments she collected so far: 1) one of them is to limit the scope to hydronic heating systems and exclude steam systems; 2) the second one is to include more details for the Task section; and 3) the third one is to leave Phase I only for literature and survey study, and use Phase II for method assessment. Jin specifically asked the subcommittee to comment on the survey scope session. Mike commented that members in this subcommittee were not supposed to have the right expertise to respond to her request and suggested that she should get the answers by talking with other relevant TCs. So the RTAR is not ready for vote yet. The action item is that the author should talk with relevant TCs to get requested inputs.*

*Two not-so-new research ideas were re-introduced in the meeting. The reason for calling them not-so-new ideas is that both of them were introduced years ago but back then nobody in the subcommittee was committed to write the RTAR's. One of the ideas is entitled "Automated Field Sensors Calibration for Real World FDD". Members of the committee agreed that this is a very important issue for commercializing AFDD and finally Haorong Li agreed to write the RTAR and Veron Smith and Srinivas volunteered to help. The other idea is entitled Plug and Play FDD Using Existing Measurements Onboard the Equipment. During the Research subcommittee meeting, Li agreed to write the RTAR as well. The action item in this regard is to write the two new RTARs and make them ready for the Chicago meeting.*

*In the end, we also discussed programs and handbook issues related to FDD. Carol and John will report those parts.*

## **Wireless Applications Subcommittee Report – Bill Healy**

TC7.5 Main Committee Meeting report for the Wireless Applications Subcommittee

The Wireless Applications Subcommittee met on Sunday from 4-5 pm. We first discussed research. There are currently two draft RTAR's that are being circulated.

Bill Healy is leading the writing of an RTAR entitled "Development of Guidelines for the Use of Wireless Technologies in Buildings." The purpose of this proposed research project is to develop guidelines for potential users of wireless technologies that could potentially be developed into an ASHRAE publication. The effort would compile existing work into a document that would talk about the benefits and challenges, selection of appropriate technologies, and appropriate application areas. We had a discussion at the meeting about who the potential users of this guideline would be. It was concluded that the most likely end users would be consulting engineers and engineers in design-build firms who are considering using wireless. Bill will modify the RTAR to ensure that it is focused on those end users for Chicago Winter meeting.

Carol Lomonaco then discussed a new idea and presented a draft outline of the topic...it was originally called "Wireless Control for Mission Critical Environments such as Pharmaceutical Manufacturers." The idea here is to develop guidelines for the use of wireless control systems in facilities that require very high levels of reliability. There were suggestions that the RTAR should not necessarily be limited to pharmaceutical facilities, but to other critical facilities. Subsequently, Carol changed the title of the RTAR. She also plans to contact the TC's that are responsible for healthcare facilities to gauge their interest in co-sponsoring the research for Chicago Winter Meeting.

## **Building/Utility Interface Subcommittee Report – Steve Blanc for Rich Hackner**

Two RTARs were discussed that are in progress.

The first RTAR in progress is RTAR “Status and Benefits of Demand Response Program for Residential Buildings”. Jin Wen is the champion for this RTAR. It was approved by TC 7.5 but not yet submitted.

The other RTAR is for commercial buildings “Demand Response Optimization Protocol and Integrated Training”. This RTAR is championed by Rich Hackner. It was approved by TC 7.5 before and will be submitted in March 2008. It has been approved by RAC as RTAR-1543. There was one question in the subcommittee meeting about whether or not RTAR-1543 overlaps with RP-1390 which is just getting started. One action item for Rich Hackner for the Chicago Winter Meeting is to provide a comparison of the two projects.

New research ideas were brought up but there were no volunteers to pursue them. One of the issues, is how buildings are going to meet up with utilities, and other related issues related to the automated meter interface, etc.

The next topic is handbook material. One issue is that there are committees working on these topics. Rich did try to outline potential handbook. We need to identify the committees that have chapters that we may be able to add to.

Program will be discussed by Carol Lomonaco later. But Rich had been contacting some aggregators and some power system people as speakers for the Aggregators Seminar for the Chicago Winter meeting.

## Research Subcommittee Report – Carol Lomonaco for Peng Xu

The meeting convened at 2:00 pm. chaired by Carol Lomonaco for Peng Xu. Peng was not able to attend the Salt Lake City meeting.

Carol went over the Research Announcements:

- a. Carol attended the Research Subcommittee Chairs' Breakfast on Monday, June 23, 2008. There is a newly revised ASHRAE Research Manual available and may be downloaded from:

[http://www.ashrae.org/docLib/20080201\\_RESMANUAL.W08.doc](http://www.ashrae.org/docLib/20080201_RESMANUAL.W08.doc)

The link will also be on TC 7.5's website after the Salt Lake Meeting.

- b. Patrick Hughes, Section 7 Research Liaison will be rolling off on June 30, 2008 and Past President of ASHRAE George Jackins will be the new Section 7 Research Liaison beginning July 1, 2008.

- c. The ASHRAE strategic plan and directions were also discussed. It was stressed that the TC's must align themselves with that plan.

- d. They discussed the relationship with the US Green Building Council (USGBC). ASHRAE has a goal to coordinate more with the USGBC and some ASHRAE co-funding of USGBC projects.

- e. They are mentioned the European umbrella organization REHVA for HVAC & R engineering societies in Europe. ASHRAE's goal is to reach out and collaborate to a greater degree.

Two URLs were given out"

[http://ec.europa.eu/energy/intelligent/index\\_en.html](http://ec.europa.eu/energy/intelligent/index_en.html)

[www.manageEnergy.net](http://www.manageEnergy.net)

ASHRAE will make a matrix and compare our organization with REHVA's organization.

- f. The ASHRAE Living Lab was mentioned that it will be heavily monitored building with long term data trending. The Staff Lead is Mike Vaughn and the RAC lead is Hugh Henderson. More information will be forthcoming.

- g. They are looking for more nominations for Service to ASHRAE Research Awards. TC chairs submit nominations to Research Liaisons by September 30, 2008.

- h. RTARs and WSs must be reviewed by your TC, your Research Liaison and the TC that you may want ask to co-sponsor before the RTAR is submitted. The co-sponsoring TC must vote on the co-sponsorship of your RTAR or WS.

New Research Ideas:

Carol mentioned that during the Research subcommittee meeting Reinhard Seidl spoke about Seminar 27 “Exchanging Information Between EMCS and FDD Tools for Better Building Performance: Challenges and Lessons Learned” and how many individuals were interested after Monday’s seminar in developing an ASHRAE guide line for a standard approach to data exchange.

We also discussed at the subcommittee meeting a new Guideline Project Committee (GPC) be the proper vehicle to get this standard going or would a Standing Standard Project Committee (SSPC) like SSPC 135 BACnet be the appropriate avenue? Reinhard and Carol will pursue help from Clare Ramspeck. It was also suggested that Reinhard talk to Dave Holmberg (because Dave is a member of SSPC 135).

Reinhard added that this proposed guideline could help vendors standardize their trend data too. Commissioning agents and others would greatly benefit from it too, added Reinhard.

Research Plan:

During the Research subcommittee, we approved the following:

Proposed Priority	Project	Lead Person
Priority =1 (highest)	“1543-RTAR Demand Response Optimization Protocol and Integrated Training”	Rich Hackner
Priority =2	Reduce Simultaneous Heating and Cooling	Peng Xu
Priority =3 (lowest)	“1511-RTAR “What if” Emulation Tool for Training and Strategizing on Building Operations”	Steve Blanc

Note: FDD for Chiller Diagnosis because it is now 1486-RP.

Steve asked if he should give his responses on RTAR-1511 to Carol to give to RAC. Carol agreed. This is an action item for Carol.

There were no comments or objections to the proposed priority of TC 7.5’s Research Plan and Carol will prepare this list for TC 7.5 Main Meeting.

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Motion: Carol moved to have TC 7.5 accept the proposed Research Plan as stated above as our Research Plan for 2008-2009. It was seconded by Steve Blanc.

Discussion. 1) Michael Brandemuehl asked about the Research plan for TC 7.4 and if we will be addressing it at this meeting? John House answered that there were no issues on the TC 7.4 Research plan to vote on at the SLC meeting. 2) It was asked if we can submit the RTARs without a priority. Michael Brandemuehl responded that it does not see a place on the submittal form for the TC’s voted priority for ASHRAE.

Vote: 6-0-0, CNV. Motion approved.

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The TC 7.5 Research subcommittee for Chicago will be Monday, January 26, 2009 4:30pm-6:00pm. Carol will take an action item to remind Peng Xu (our TC 7.5 Chair after July 1, 2008) to schedule the TC 7.5 Research subcommittee for Chicago Winter January 2009 meeting.

Current “Research Projects (RP)” Reports:

During the TC7.5 Research subcommittee meeting, the three (3) current research projects were discussed.

- a. 1312-RP: Tools for Evaluating FDD Methods for AHUs.

Drexel University is the contractor. Phil Haves is the PMS chair.

Phil stated that the PMS will meet on this morning Tuesday, June 24, 2008 from 8:00am to 9:30am. Phil was not at the main meeting but Srinivas was and had the updated.

The project started September 2005.

Srinivas discussed in great detail the issues with a numerical error found in one of the models, including the coil model and some mismatch of data. John House did comment that a lot of the data looked very good. For example, the temperature were within 1 Deg F and the flows were good too. The power calculations were also within 10%. John mentioned that there are a couple of nagging things that must get resolved. Phil is getting someone to help from Carrier and another person.

A question was asked if the problems are out of the scope of 1312-RP? John House commented that the proposal had specifically mentioned that the coil model would be used.

A plan has been devised to get to the root of the problems. Thus it was discussed to request a no-cost extension for 6 months.

There was a fair amount of discussion about if the no-cost extension was sufficient. Steve Blanc mentioned that because the project team has to use the coil model that we have sufficient resources and funding to cover the realities. Carlos asked is it fair for the PMS to ask the contractor to fix someone else’s model? John House said that some more investigation will take to place to pinpoint if it is the integration of the model or the model itself that is the problem. Barry Bridges brought the issue if ASHRAE should cover the extra costs associated with pinpointing the problems with the coil model. Carol asked if the contractor was requesting extra funding and Steve Blanc answered no, the contractor is not requesting additional funding.

Carol asked if Peng Xu the Research Chair should make the request for the no-cost extension. Mike Brambley said that Carol should to accept the responsibility to email RAC about the extension for RP-1312. This is an action item for Carol.

Discussion centered on if a 6 months no-cost extension was sufficient. Steve Blanc wanted to give a one year no-cost extension.

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Motion: Steve Blanc made a motion that the request for a no cost extension (from the current deadline of August 31, 2008) for RP-1312 until August 31, 2009. It was seconded by Carol Lomonaco.

Discussion: a few people present asked if 12 months was sufficient time or does the project need more than a year. Barry asked why August 31, 2009 was the deadline. Carol answered it gives the contractor two physical (face-to-face) ASHRAE meetings: Chicago and Louisville.

Vote: 6-0-0 CNV. Motion approved.

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Carol Lomonaco, the Research Chair after July 1, 2008, has the action item to email RAC about the extension for RP-1312.

b. 1274-RP: Field Performance Assessment of Package Equipment to Quantify Benefits of Proper Service (Todd Rossi, PMSC Chair).

Todd Rossi was unable to attend the meeting. However, Keith Temple was present to report on the project at the research subcommittee meeting.

Keith reported that it will take approximately three weeks to review the 1274-RP FINAL report. The final report was sent out for review a few days before the Salt Lake City meeting via email. There were some new comments by PMS and comments for the final report at the NYC ASHRAE meeting still yet to be fully addressed in the few weeks. The PMS will approve the report before August 31, 2008. Then the PMS will send the report to TC7.5 for final approval.

Steve Blanc commented that here were some new comments by PMS from Saturday, June 21, 2008 and comments for the final report at the NYC ASHRAE meeting still yet to be fully addressed.

Original date of completion was July 31, 2008. A “no cost extension” vote until the August 31, 2008 would not be required for just a one month extension according to Mike Vaughn per Mike Brambley.

c. 1486-RP Fault Detection and Diagnostics for Centrifugal Chillers-Phase III: Online-Time Implementation. Srinivas Katipamula is the acting PMS chair.

University of Nebraska is the contractor. Haorong Li is the PI.

Srinivas reported that this project started May 2008---only one month ago. The first PMS meeting was at this meeting---the Salt Lake City meeting. The project is expected to run for 24 months.

Also, Srinivas requested that the contractor submit Task 1 and Task 2 before they proceed with Chiller data and the rest of the project. There is a TC member from TC8.2 Centrifugal Machines involved and may have some chiller data. Haorong Li is looking for chiller test data from chiller manufacturers. Also, a request will be made by Srinivas for a RAC representative to attend the next PMS meeting in Chicago, Jan. 2009.

Carol also reported that Patrick Hughes requested that the PMS roster for 1486-RP be sent to MORTS ASAP. Srinivas has the action item to send the PMS roster to MORTS ASAP.

Lastly, John House requested during the meeting for help for a new research project RP-1390 Short-Term Curtailment of HVAC Loads in Buildings. John stated that they are in need of a few more people for the Project Monitoring Subcommittee Committee. If anyone from TC 7.4 has knowledge or experience with EnergyPlus, or knows anyone that has knowledge or experience in strategies for demand response. Contact John House immediately.

Mike said the PMS meetings are open. You can attend and listen in to the meetings. Just ask the chair when the PMS meetings will be.

## Program Subcommittee Report – Carol Lomonaco

Program Chair, Carol Lomonaco, discussed the following items:

### I. Salt Lake City, UT TC 7.5 Program

Seminar 27, Monday, June 23, 2008 8:00am-9:30am, SLPCC Ballroom D  
*“Exchanging Information Between EMCS and FDD Tools for Better Building Performance: Challenges and Lessons Learned”*  
Chair: John House  
Attendance: 75 to 100

Carol thought that the seminar was well received. The major comment after the seminar is the need for a standard for how vendors structure the trend data. Reinhardt’s suggestion for a new guideline was briefly discussed.

### II. Need to Select Program for Chicago, IL – Wtr Meeting, Jan. 2009

Background Info for Chicago: ASHRAE’s theme is Sustainable Urban Design. The theme seeks to elicit papers and programs that present the latest developments in sustainability as applied to systems and equipment, application of their use in different types of buildings and, especially, the impact on urban settings. The technical program seeks to bring together engineers, architects, contractors and students to address sustainable design from all perspectives.

Topics for papers and programs include:

Energy conservation

Indoor environmental quality

Application of ASHRAE guidelines to achieve high-performing sustainable results

International sustainability efforts

Other HVAC&R topics of interest

Seminar

*Aggregators Panel*

Lead: Rich Hackner, Chicago, IL (3 or 4 speakers)

Seminar

*Will Wireless Controls Save Me Money? (Why would an owner want wireless controls?)*

Lead: Carol Lomonaco, Chicago, IL (4 speakers)

Seminar

*ZigBee*

Lead: Carlos Haiad

(This seminar was mentioned in the Wireless subcommittee meeting and not on the list of program at the main meeting at SLC.)

Seminar

*Measurements of Actual Wireless Systems in Buildings*

Chair: Bill Healy

Action Item: Needs to ask people to speak.

Seminar

*Issues in "Real Wireless Network Applications, Part II"*

Chair: Carol Lomonaco

Seminar

*What's "Real" And What's "Hype" in Wireless Control Networks?*

Lead: Mike Brambley

Seminar

*Understanding Your Electric Utility's Meter Mumbo Jumbo Programs*

Lead: Carlos Haiad

Forum/Seminar

*"How First Responders Can Access Building Systems"*

Lead: Bill Healy

Seminar

*FDD...Fault Detection and Diagnostics...But What About Correction?*

Lead: Srinivas Katipamula

Forum

*"So Why Settle for Faulty Behavior on Control Networks?"*

Lead: Cliff Federspiel

Seminar

*"Zigbee"*

Lead: Carlos Haiad

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Motion: To Approve for the ASHRAE Chicago 2009 Winter Meeting program in June 2008 as Priority=1, “Aggregators Energy Panel”, (Seminar, Chair: Rich Hackner), and Priority=2 “Will Wireless Controls Save Me Money?” (Seminar, Chair: Carol Lomonaco) for TC 7.5.  
Moved by: Carol Lomonaco and seconded by Bill Healy.

Discussion. Do you have enough speakers? Carol answered that they are already lined up for the two, yes 4 each

Vote: 5-0-0; CNV. Motion approved.

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Mike Brambley made a comment after the vote, if we really have 4 speakers. Mike suggested trimming the number of speakers for each from 4 to 3 speakers. The program is due Friday, August 8, 2008.

Bill Healy pointed out there is a suggestion for a seminar on “ZigBee” for sometime in the near future. Carol will be add this seminar to the SLC minutes for future seminars.

## **Handbook Report – John House**

The Handbook subcommittee met on Monday, June 23, 2008 afternoon. All of TC 7.5 subcommittee chairs reported on their efforts to revolve content for the Handbook. John discussed the items from his subcommittee meeting.

a. Fault Detection and Diagnostics Subcommittee Handbook Efforts:

We have two authors identified for Fault Detection and Diagnosis. Vern Smith is the lead author and Haorong Li is going to help.

The contribution is proposed for Chapter 38 Operations and Maintenance in the Applications Handbook. We have some material in there now and we will propose a new outline for additional material. Then the draft will be presented to Jin Wen the TC 7.5 Fault Detection and Diagnostics Subcommittee Chair and John House.

Mike Brambley stated that he offered TC 7.3 an outline or the new organization that we would like to use. Mike asked if he could forward the material that he has and John House agreed it is okay to forward the new outline to them.

b. Wireless Applications

Bill Healy is the lead author. Bob Old will assist Bill Healy. There is a new section in the chapter in Computer Applications that TC 1.5 is in charge of and some emerging technology. Also, TC 1.4 has material on wireless applications. The initial drafts will be completed by November 1, 2008.

c. Building Utility Interface

Rich Hackner was not at the Salt Lake City Meeting. Rich volunteered to be the lead author. Steve Blanc has agreed to help him. The first action is identifying the new material to be put in the handbook. An outline will then be formed.

Mike Brambley commented he attended TC 1.5 Handbook subcommittee meeting on Monday, June 23, 2008, TC 1.5 did not emerging technologies at all. They told Mike the cycle for getting it all done is 18 months from now. But they also said that we can update the electronic version of the handbook every year. And if we wanted to, we (TC7.5) could generate a section to go enter in the electronic version of the handbook.

John still wanted meet the November 1, 2008 deadline.

Srinivas commented on TC 7.4's Handbook progress on Chapter 41. Mike asked that Srinivas take an action item to send Mike Brambley an email about that after the meeting.

Also, Srinivas said that Michael Kintner-Meyer suggested some material for Chapter 41 on Building/Utility Interface. Mike asked John if we had TC 7.6's agreement yet to add content to their chapter. John said no- not yet. So Mike needs to talk with Moncef and TC 7.6 after this meeting.

### **Web – Mike Galler for Natascha Castro**

Mike reported that ASHRAE website including the TC7.5 website has had some trouble. ASHRAE has upgraded the servers and everything is okay now. Also, if you have any files to post, please send them to Natascha to post.

Mike Brambley asked everyone in the room to introduce themselves.

### **Old Business – Mike Brambley**

-Four (4) Action Items from NYC's ASHRAE meeting:

a. *Action Item 1:* Mike to check with ASHRAE if Carlos Haiad could put on a technical gathering announcement that specifically states in announcement that ASHRAE TC members will attend and participate.

*Action Item 1 Completed:* Mike did obtain approval and got specific wording for Carlos. Mike sent the response by email to Carlos. But the email did not make it to Carlos' email inbox. The technical gathering did not get schedule. Mike did not hear any grocery store refrigeration research technical discussion at the FDD discussions at this meeting. Mike suggested that Haorong talk with Carlos. The meeting has not yet been scheduled by Carlos. Carlos stated is to have TC 7.5 physically be there engaging in conversation with other attendees from the grocery store or quick pickup stores industry.

b. *Action Item 2:* Program Liaisons would like feedback from the TCs. Mike stated that it is a mute point since there is no longer.

*Action Item 2 Dropped:* This action item no longer applies because after the Salt Lake City 2008 Annual ASHRAE meeting, there will no longer have Program Liaisons. CEC is now is now responsible for program with 50% input coming from TCs.

c. *Action Item 3:* Carol Lomonaco draft a MVE draft RTAR "Wireless Communications for Validated Environments" for SLC meeting.

*Action Item 3 Completed:* It was revised and distributed at the TC 7.5 Research Subcommittee Meeting on Monday, June 23, 2008. Carol also TC 9.10 Laboratory Systems meeting on Tuesday, June 24, 2008. Also, Carol went to the TC 9.9 to discuss support for the RTAR "Wireless Communications for Validated Environments" with TC 9.9's Research Subcommittee chair, Robin Steinbrecher.

d. *Action Item 4:* Carol Lomonaco will keep a list of future TC 7.5 Corresponding Members (CMs).

*Action Item 4 Completed:* Carol passed around the list to sign-up to be TC 7.5 Corresponding Members. Rosters will be updated and turned into ASHRAE for new CMs appointed in January 2009 (the annual cycle). Those new appointees will become CMs on July 1, 2008.

-Mike asked any Liaisons present at main meeting from other TCs to report. Jim Gartner is not here as some liaisons. TC 7.9 Dave Bornside is not at this ASHRAE meeting. No one else was from TC 7.9. Mike asked about other liaisons present. Charity commented on items of interest from TC1.4 program for Chicago, Research; several projects, lots of RTARS, WSs and lots of research ideas. All of the mentioned items should be on TC 1.4's website.

Xiaohui Zhou from TC 1.5 will reported on future programs that they will sponsor on Smart Sensors. Also, TC 1.5 is working on RP-1451. A seminar for Chicago on smart sensor will be submitted by TC 7.5. Mike asked if they would TC 7.5 to request co-sponsorship the chair which is Mike Brambley until June 30, 2008 and Peng Xu after July 1, 2008.

**New Business:**

- Roster changes have been discussed. The “proposed” roster for the merger of TC 7.5 and TC 7.4 will also be posted on TC 7.5’s website.
- The meeting times for TC 7.5 for Chicago Winter January 2009 will be posted on our website.

**Adjourn**

Motion: Move to adjourn the main TC 7.5 meeting by Steve Blanc, and was seconded by Bill Healey. Adjourned at 5:45pm.

## **Appendices**

- A. Call to Meeting and Agenda
- B. Scope and Organization
- C. Fault Detection and Diagnostics Subcommittee Meeting
- D. Wireless Applications Subcommittee Meeting
- E. Building Utility Interface Subcommittee Meeting
- F. Research Subcommittee Meeting
- G. Handbook Subcommittee Meeting Minutes
- H. Program Notes
- I. 1274-RP PMSC Notes
- J. 1312-RP PMSC Notes
- K. List of Subcommittee and Committee Attendees

## Appendix A.

### Call to Meeting and Agenda ASHRAE TC 7.5 Smart Building Systems 2008 Annual Meeting Salt Lake City, Utah

**Date:** Tuesday, June 24, 2008  
**Time:** 3:30 - 6:00 p.m.

1. Roll Call and Introductions
2. TC 7.5 Scope

*Scope: TC 7.5 is concerned with the performance and interactions of smart building systems (SBS), the impact of smart systems on the total building performance, methods for achieving more intelligent control and operation of building processes, **including supervisory control strategies and the optimization of dynamic building components and systems**, interactions of smart buildings with utilities, and documentation of the benefits of smart buildings and smart building systems as they relate to energy consumption, cost of operation, maintenance, occupant comfort, building commissioning, operations, and impact of the SBS on utilities and natural resources.*
3. Approval of New York Minutes
4. Announcements
5. Liaison Reports
6. Fault Detection and Diagnosis Subcommittee (Haorong Li for Jin Wen)
7. Wireless Applications Subcommittee (Bill Healy)
8. Building/Utility Interface Subcommittee (Rich Hackner)
9. Research (Carol Lomonaco for Peng Xu)
  - Report on 1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)
  - Report on 1312-RP "Tools for Evaluating Fault Detection and Diagnostic Methods for Air-Handling Units" (Phil Haves – PMSC Chair)
  - New research
10. Program (Carol Lomonaco)
  - Proposed Plan for Chicago
11. Handbook (John House)
12. Web Page (Natascha Castro)
13. Old Business
  - Potential Merger with TC 7.4 Building Operation Dynamics

- Other old business

#### 14. New Business

- Roster changes for 2007-2008
- Other New Business

#### 15. Adjournment

## **Appendix B.**

### **TC 7.5, Smart Building Systems Scope and Organization Revised July 1, 2001**

#### **Overall Committee Scope**

The Technical Committee on Smart Building Systems (SBS), TC 7.5, is concerned with the development and evaluation of technologies that could enable the widespread application of smart building systems. “Smart” buildings should take advantage of automation, communications, and data analysis technologies in order to operate in the most cost-effective manner. This implies integration of building services such as HVAC, fire, security, and transportation; the automation of many of the operation and maintenance functions traditionally performed by humans; and the interaction with outside service providers such as utilities, energy providers, and aggregators. Currently, three subcommittees form the backbone of the TC’s activities: fault detection and diagnostics, wireless applications, and building/utility interface.

## Appendix C.

### TC 7.5 FDD Subcommittee Meeting 2008 Salt Lake City, Utah Sunday, June 22, 2008 3:00-4:00 pm

The meeting convened at approximately 3:05 p.m. chaired by Haorong Li

1. The sign-up sheet was circulated and copies of the agenda were circulated. The first order of business was to review the agenda and make a change: change from 25 minutes to 20 minutes for Update/Discussion of RTARs and from 10 minutes to 15 minutes for Handbook Chapters.
2. Update/Discussion of RTARs: The second order of business was Update/Discussion of RTARs. Li asked Steve Blanc, the champion of the “A Building Systems Emulation Tool for Building Operators”, to talk about this RTAR. Steve Blanc said this RTAR was approved in New York’s meeting and has been submitted. Mike suggested that Steve Blanc send the last version of the RTAR to Mike and Carol who will determine whether the RTAR is submitted or not. If not, they will submit it in Fall. Li represented Jin Wen to lead the discussion about the second RTAR – FDD for Heating Systems. Jin made three major changes based on the comments she collected so far: 1) limit the scope to hydronic heating systems and exclude steam systems; 2) include more details for the Task section; and 3) leave Phase I only for literature and survey study and use Phase II for method assessment. However, she has not talked to other relevant TCs about this RTAR yet. Jin wanted the committee to comment on the survey scope session. Is the survey scope too much or too limited? Bill Healy asked whether the hydronic systems were residential systems or not. Carol asked whether VAV reheating systems are included. Mike commented that the members of this committee were not supposed to have this kind of expertise to comment on her question and suggested that she would get the answers by talking to other relevant TCs.
3. New research ideas: The third order of business was to discuss new research ideas. Li proposed the idea of “Automated Field Sensors Calibration for Real World FDD”. Katipamula commented that this was an old idea and the TC once tried to pursue this idea but nobody volunteered to lead the writing of the RTAR back then. Members of the committee agreed that this is a very important issue for commercializing AFDD. Zhou mentioned that some researchers were developing this kind of technology for problematic sensors such CO2 sensor. Bill Healy asked what was the selling point for this idea to be an ASHRAE research project. Mike Brambley said the research niche could be methodology of calibration. Reddy added that data fusion could be such a research methodology for calibration. Mike Brambley suggested an action on this idea. Li agreed to write the RTAR and Vance Payne, Vern Smith and Katipamula volunteered to help with the writing of the RTAR. Li proposed another new research idea – Plug and Play FDD Using Existing

Measurements Onboard the Equipment. Again, Katipamula commented that the committee tried to pursue this idea before but nobody was committed to write the RTAR. Reddy commented that we might study the work done by continuous commissioning folks and check what were needed to take it to the next step. No actions on this item. In the Research subcommittee meeting, Li agreed to write the RTAR.

4. Program: The fourth order of business was to discuss the Program. Li asked Carol Lomonaco to lead this discussion. The committee discussed about the Seminar in Chicago – “FDD, What About Corrections.” Carol asked for at least one more speaker to make the seminar happen. Li agreed to speak.
5. Relevant Handbook Chapters: Li asked John House to lead the discussion but John left for TC 1.4 to get some inputs for the Handbook and left the materials for Mike Brambley to talk about this. Mike Brambley mentioned the inputs from Jim Braun and asked two volunteers to update the current materials in the Handbook Chapter 38. Li and Vern Smith volunteered to do so. Mike commented that this task is very ambitious and suggested that the writers got the first shot as soon as possible so that it can be circulated for review.
6. Adjourned at 3:57 pm.

## **Appendix D.**

### **TC 7.5 Wireless Applications Subcommittee 2008 Salt Lake City, Utah Sunday, June 22, 2008 4:00-5:00pm**

Meeting called to order at 4:00 pm

#### **Research**

- Bill Healy discussed a draft RTAR entitled “Development of Guidelines for Use of Wireless Technologies in Buildings.” This RTAR was initially presented at the New York City meeting. The responses at that meeting indicated that we needed to better specify who the end user of the work would be. Through discussion, it appears that the end user of such research would be the consulting engineers and design/build people who specify such systems in buildings. Bill will modify the RTAR to ensure that the RTAR is aimed at the correct audience.
- Carol Lomonaco discussed a new idea entitled “Wireless Control for Mission Critical Environments such as Pharmaceutical Manufacturers.” A pre-draft RTAR was circulated to the committee. The focus of this research project would be to address issues in the use of wireless in facilities that have critical requirements and cannot deal with reliability problems. The result would be guidelines for those interested in using wireless in critical facilities. A discussion ensued on whether or not a research project that aims to develop a guideline is appropriate. For example, ASHRAE may want to create a guideline committee to write such a guideline. It is thought that a guideline research project could develop the information that could later be used by a guideline committee to develop the guideline. A suggestion was made that we have a forum to discuss this topic. A question was raised as to why we need to limit the critical facilities to pharmaceuticals. Questions were also raised as to whether there were other TC’s related to healthcare or pharmaceutical facilities that may be interested in this RTAR. Carol indicated that she would contact any of those TC’s and potentially expand the RTAR to include a more broad cross-section of facilities.

No other research ideas were proposed.

#### **Program**

- Issues in Real Wireless Networks Part II  
We received good feedback from the Part I presented in New York City. Carol has 3 new speakers lined up.
- Measurements of Wireless in Buildings  
Bill Healy did not line up speakers yet for this one. He would like to keep it on

the list of potential programs, possibly for Louisville.

Carol submitted a number of potential programs

- Location Guidelines for installing low power wireless networks.  
What constitutes an ideal wireless location and what should be avoided?
- ZigBee Checkout  
How to validate that a ZigBee wireless network is installed and working properly? What information should a building owner request to be confident that the wireless network is reliable?  
A suggestion was made to broaden the topic to simply ZigBee issues; we could get speakers from the ZigBee alliance. Carlos will chair this session.
- Will wireless controls save me money?  
What variables need to be assessed to determine if wireless controls can save money?  
What are the true installation costs, what training is needed to install wireless, what are the operational costs?  
Discussion regarding whether it is a technical problem or a business problem.  
Are there enough installations to give case studies, both ones that have saved money and some that may not have saved money?  
A suggestion was made that we change the title to something like “Why would an owner want wireless controls?” Find a vendor, an owner with good experiences, an owner with poor experiences
- Powering wireless sensors using energy harvested from the HVAC system. Methods that can be used to power wireless sensors using solar, vibration, and/or temperature energy incumbent in the building.

Based on interest and volunteers, we will move forward with the following for Chicago:

ZigBee (chaired by Carlos Haiad)

Why would an owner choose wireless control....will it save money? (chaired by Carol Lomonaco)

### **Handbook**

The subcommittee would like to add some information about the use of wireless in buildings. The plan is to add about 1 page of content to an existing chapter. John House reported that TC 1.4, in their chapter in the Fundamentals Handbook, thought that they had included information on wireless networks, but it did not make it into the final version of the handbook. Considering that our contribution may include more than simply wireless control networks, it is thought that our material would fit better in another chapter.

Mike Brambley is scheduled to discuss handbook with TC 1.5, Computer Applications. There is a section on emerging applications that could hold the information on wireless.

Bill Healy prepared an outline of potential material and presented it to the subcommittee. Mike Brambley indicated that he had authored a book chapter on wireless and may be able to contribute material for the handbook section. Bob Old volunteered to assist with the writing. Bill Healy will lead the writing.

Meeting adjourned at 4:55

## Appendix E.

### TC 7.5 Building/Utility Interface Subcommittee Meeting 2008 Salt Lake City, Utah Sunday, June 22, 2008 5:00-6:00pm

	Minutes
Introductions	5
Discuss RTARs in Progress	5
<ul style="list-style-type: none"><li>Residential (Jin Wen) Updates? Jin Wen (JW) was not here. Status and Benefits of DR programs for residential buildings. Has not as yet been submitted. In progress. Approved by 7.5???</li><li>Commercial (Rich Hackner) Status? RTAR 1543 must have work statement by 5/2010. Title is DR Optimization protocol and Integrated training. Is there an approved RTAR copy floating around...Is RP 1390 too close to this RTAR? We need to check for overlap... Rich Hackner should provide the subcommittee (contact Jon House) with a comparison.</li></ul>	
New research ideas	20
Possible Topics	
<ul style="list-style-type: none"><li>BACnet is considering a standard interface/protocol for messaging between utility and the buildings (for DR) ---David Holmburg Does this need further research to define? What should the building communicate back to the utility, what information and how? What is communicated and what the format of the upper layers to provide data?</li><li>Building Load Communication with utilities (real time/future) further define this. <b>Utilities will be providing meter data through AMI, communication</b></li><li>Distributed generation control <b>BACnet UA protocol</b></li><li>Distributed storage control -- much larger anticipatory element, larger time horizons, define the breadth of storage (heating, electric storage, et.al.)</li><li>Does LEED force other meter and interface stuff on customers (credit for metering)</li><li></li></ul>	
Handbook Material	10
See next page	
Is this a new chapter? Where should this go? Applications – TC 7.6 systems energy utilization (load profiles) Mike Brambley will coordinate with lead authors – what can we realistically do short term and long term. Short term, try to get content out there and work to developing a unique chapter later. Need to ID all relevant chapters where this would be applicable. Applications are due a year from now. Chapter 35 is the one to start with. Begin writing outline for content to be added . Contact 7.6 handbook and Chair for coordination. Rich to be the lead...Carlos and I will help, Mike Bobker works with the Chapter, might help...	
Future Subcommittee agenda	5

- Seminar: Smart Grid Technology and You...What a Building Owner Needs to Know
  - Possible speakers contacted: Cooper Power Systems, Comverge, PNNL (Don Hammerstrom), and Enernoc. All have indicated in participating if we put together a program for Chicago. Chair: Rich Hackner
  - Information from buildings to first responders (Carol has the notes on this)  
Honeywell is willing to speak (Homberg) United Tech Research Center (House)

TC 7.5 Building/Utility Interface  
Handbook Section Draft Outline  
(For discussion only)  
Salt Lake City Summer 2008 meeting

Steve Blanc presiding

Chapter: ????

**Subcommittee objectives:**

The subcommittee will explore and develop ideas and research work statements to improve the building and utility interactions (and more specifically the electric grid). The research will focus on developing enabling technologies for seamless interaction of smart building components and utilities and other building services. An important aspect of this work is to identify the information that is necessary to support smart building technologies, and to identify the requirements of communication protocols to support the exchange of this information between different building services, between buildings and utilities, between multiple buildings, with outside service providers.

The importance of a stable and reliable electric power grid to life and the economy in the 21<sup>st</sup> century has been underscored by two major events over the last decade: a major black out on the east coast of North America and wildly varying electricity prices in California during an attempt at restructuring the electricity marketplace. In response to these events many organization (DOE, EPRI, and CEC) have started research activities to find ways to modernize the grid. However, there are significant gaps in the research activities, especially as they relate to buildings. Since buildings consume over 70% of the electric in the U.S., they have to part of the solution to modernize the grid. ASHRAE has traditionally developed technologies, standards, and guidelines for buildings. Therefore, this subcommittee can play a major role in continuing this effort.

**Handbook Review**

John House and Rich led a brief discussion on what may need to be included in handbook chapters regarding utility/building interface. John will coordinate the review with volunteer help including Rich Hackner, Bob Old, Steve Blanc, Carlos Haiid, and Glenn Remington

**Draft Outline:**

*Comment: This was a combination “brain” and “research” dump to paper. Recognize that there will be a lot of potential for overlap with other sections of the handbooks, and, as such, it will be up to the authors of the sections to reference existing handbook sections, as appropriate, and repeat certain items, as necessary, to make the section readable/understandable without excessive “flipping” to other areas of the handbooks. Objective: Make it as stand-alone as possible without unnecessary duplication.*

Brief History of current grid and operational characteristics (buildings context) (*Rich – I am not clear on this, are you talking about how the grid operates? How does*

*the context affect this? How does the grid affect the building operation?)*

Comparison of utility system load profiles with typical building load profiles. *Compare the different types of load profiles (daily and yearly) for system, transmission, distribution, circuit, building, building circuits, connect how one level relates to the next)*

Utility demand response strategies defined (peak shaving, valley filling, etc.) *focus on the strategies as they relate to utility loads vs. discussing programs...*

Utility rate options and ~~strategies~~ programs defined *should this relate to utility strategies or customer segments (Comm, Industrial, Ag, Residential, Large (1MW+, medium, small)*

Modern Grid Strategy

What is it?

National Energy technology Laboratory

Energy Independence and Security Act of 2007

Basic structure ----Enterprise System----Wide Area Network----Home Area Network

Why is it necessary?

Objectives

Enable active participation by consumers

Accommodate all generation/storage options

Enable new products, services and markets

Operate resiliently against attack and natural disasters

How will it affect/impact:

Building design

Building/utility interconnections

Control capabilities

Technology selection

Appliance/equipment two-way communication

Smart Meters

Grid-friendly appliances

Integration of renewables

Distributed generation

Operation

Localized demand response (reference other handbook sections on control options)

Firm demand response

Continual vs. intermittent demand response

Utility initiated vs. building initiated demand response/control

Power interruptions

Power restoration

Building environmental impacts

Carbon footprint

Greenhouse gas impacts

Glossary of Terms

## **Appendix F.**

### **TC 7.5 Research Subcommittee Meeting 2008 Salt Lake City, Utah Monday, June 23, 2008 2:00-3:00 pm**

The meeting convened at 2:00 p.m. chaired by Carol Lomonaco for Peng Xu. Peng was not able to attend the Salt Lake City meeting.

Also, Haorong Li will be reporting for Jin Wen (Fault Detection and Diagnosis Subcommittee), and Steve Blanc will be reporting for Rich Hackner (Building/Utility Interface Subcommittee) because neither Jin nor Rich could attend the Salt Lake City ASHRAE meeting.

1. The first order of business was to review the agenda and revise if necessary. Copies of the agenda were distributed, after which Carol asked if there were any proposals for revisions. The sign-in sheet for the meeting was also distributed. Carol wants to discuss the scheduled time for the Research subcommittee for Chicago Winter meeting and beyond at the end.

2. Announcements:

a. Carol mentioned that she is chairing this meeting because Peng could not attend this meeting.

b. Carol attended the Research Subcommittee Chairs' Breakfast on Monday, June 23, 2008. There is a newly revised ASHRAE Research Manual available and may be downloaded from:

[http://www.ashrae.org/docLib/20080201\\_RESMANUAL.W08.doc](http://www.ashrae.org/docLib/20080201_RESMANUAL.W08.doc)

c. Patrick Hughes, Section 7 Research Liaison will be rolling off on June 30, 2008 and Past President of ASHRAE George Jackins will be the new Section 7 Research Liaison beginning July 1, 2008.

3. PMSC Reports on Research Projects: The third order of business was review of the status of the ongoing research projects, reports of which follow.

a. 1274-RP: Field Performance Assessment of Package Equipment to Quantify Benefits of Proper Service (Todd Rossi, PMSC Chair). Todd Rossi was unable to attend the meeting. However, Keith Temple was present to report on the project.

Keith reported that it will take approximately three weeks to review the 1274-RP report. The final report was sent out for review a few days before the Salt Lake City meeting via email. There were some new comments by PMS and comments for the final report at the NYC ASHRAE meeting still yet to address in the few weeks. The PMS will approve before August 1, 2008. Then the PMS will send the

report to TC 7.5 for final approval. Original date of completion was July 31, 2008. A “no cost extension” until the August 31, 2008 would not be required for just a one month extension according to Mike Vaughn per Mike Brambley.

b. 1486-RP Fault Detection and Diagnostics for Centrifugal Chillers-Phase III: Online-Time Implementation. Srinivas Katipamula is the acting PMS chair. University of Nebraska is the contractor. Haorong is the PI.

Srinivas reported that this project started May 2008---only one month ago. The first PMS meeting was at this meeting. The project is expected to run for 24 months.

Also, Srinivas requested that the contractor submit Task 1 and Task 2 before they proceed with Chiller data and the rest of the project. There is a TC member from TC8.2 Centrifugal Machines. Haorong Li is looking for chiller test data. Also, a request will be made by Srinivas for a RAC representative to attend the next PMS meeting in Chicago, Jan. 2009.

Carol also reported that Patrick Hughes requested that the PMS roster for 1486-RP be sent to MORTS ASAP. Srinivas has the action item to send the PMS roster to MORTS ASAP.

c. 1312-RP: Tools for Evaluating FDD Methods for AHUs. Drexel University is the contractor. Phil Haves is the PMS chair.

Srinivas discussed in great detail the issues with a numerical error found in one of the models, including the coil model. A plan has been devised to get to the root of the problem. Thus it was discussed to request a no-cost extension for 6 months.

+++++

Motion: Steve Blanc made a motion that the request for a no cost extension for RP-1312 until August 31, 2009. It was seconded by Carol Lomonaco.

Discussion: a few people present asked if 6 months was sufficient time or does the project need a year.

Vote: 6-0-0 CNV, Motion approved.

+++++

Carol Lomonaco has the action item to email RAC about the extension for RP-1312.

Phil stated that the PMS will meet on Tuesday, June 24, 2008 from 8:00am to 9:30am which is after the TC7.5 Research Subcommittee meeting but before the TC7.5 main meeting that takes place on Tuesday afternoon. Phil will give a full report at the TC7.5 main meeting. Lastly, Phil mentioned that a no cost extension would be requested.

4. The fourth order of business was to briefly review the key RTAR and work statements

by the topical subcommittees.

a. Fault Detection and Diagnosis (Haorong Li).

Haorong reported for FDD. The RTAR for Heating System FDD. Three new RTARs ideas were discussed:

Automated Field Sensor Calibration for Real World FDD  
(Action Item: Haorong to write up first draft of RTAR)

Another one by Haorong (Action Item: Haorong to write up first draft of RTAR for Chicago Winter Mtg.)

FDD- Human Factors and Man Machine Interface (suggested by Michael Bobker from CUNY). Reinhard will help. (Action Item: Michael Bobker to write up first draft of RTAR, Reinhard to help.)

b. Wireless Applications (Bill Healy)

The RTAR “Development of Guidelines for Use of Wireless Technologies in Buildings” discussed in NYC. Bill did receive a few comments but was not 100% ready yet to put out another draft of the RTAR. We would review it again for Chicago Winter Meeting.

Carol passed around the first draft of “Wireless Communications for Validated Environments” RTAR (filename on server MVE RTAR.doc). She requested that members review it for the Chicago meeting. Comments could be sent to Carol between now and the Chicago Meeting. TC 9.9 Mission Critical Facilities and TC 9.10 Laboratory Systems will be contacted by Carol on Tuesday to see if they are interested in co-sponsoring this RTAR.

c. Building/Utility Interface (Steve Blanc)

The status of RTAR of (filename ResidentialDR.doc) stuff was not known.

“RTAR-1543 Demand Response Optimization Protocol and Integrated Training” was approved and a WS needs to be submitted by May 2010. There was a question about overlap of content and intent with another RTAR, specifically RTAR-1390. Steve will discuss this with Rich and others. It will be clarified by the Chicago Winter meeting. Action Item for Rich at Chicago to review and report on any overlap to the TC7.5 Research subcommittee.

5. TC 7.5 Research New Ideas and New Topics:

Reinhard Seidl spoke about Seminar 27 “Exchanging Information Between EMCS and FDD Tools for Better Building Performance: Challenges and Lessons Learned” and how many individuals were interested after today’s seminar in developing an ASHRAE guide line for a standard approach to data exchange. Would a new Guideline Project Committee (GPC) be the proper vehicle to get this standard going or would a Standing Standard Project Committee (SSPC) like SSPC 135 BACnet be the appropriate avenue? Reinhard and Carol will pursue help from Clare Ramspeck. It was also suggested that Reinhard talk to Dave Holmberg (because Dave is a member of SSPC 135).

It was requested during the meeting for Reinhard to share again were to find RTAR-1502. RTAR-1502 was also referenced at the end of Seminar 27 on Monday morning. The website was given as:

[www.teddownloads.com/Dashboard](http://www.teddownloads.com/Dashboard)

6. Carol then read over the Research Plan for TC7.5 that was listed in the draft NYC Minutes that was distributed to everyone before the SLC meeting. Carol proposed keeping the list as is but remove FDD for Chiller Diagnosis because it is now 1486-RP.

Proposed Priority	Project	Lead Person
Priority =1	“1543-RTAR Demand Response Optimization Protocol and Integrated Training”	Rich Hackner
Priority =2	Reduce Simultaneous Heating and Cooling	Peng Xu
Priority =3	“1511-RTAR “What if” Emulation Tool for Training and Strategizing on Building Operations”	Steve Blanc

There were no comments or objections to the proposed priority of TC 7.5’s Research Plan and Carol will prepare this list for TC 7.5 Main Meeting.

7. The date and time for TC 7.5 Research Subcommittee Chicago Winter Meeting was discussed. It was agreed upon in the meeting that TC 7.5 Research Subcommittee would take place on Monday, January 26, 2009, from 4:30pm to 6:00pm.

Action Item: Carol will send Peng Xu an email by Friday, June 27, 2008 to schedule’s TC7.5 Research Subcommittee on Monday, January 26, 2009, from 4:30pm to 6:00pm (ASHRAE Chicago Winter Meeting).

8. Adjourned at 3:00 p.m.

## **Appendix G.**

### **TC 7.5 Handbook Meeting 2008 Salt Lake City, Utah Monday, June 22, 2008 3:00-3:30 pm John House**

The 2007 edition of the ASHRAE Handbook – HVAC Applications includes material pertaining to fault detection and diagnosis (FDD) in Chapter 38 Operations and Maintenance Management. The material covers the following:

- Findings from the analysis of service records for rooftop units and chillers that quantified the frequency of various types of faults and their associated costs;
- Results from limited field studies of FDD methods applied to air-handling units and VAV boxes; and
- A description of studies that assessed the benefits of detecting and diagnosing equipment faults.

The following outline has been proposed as a long-term vision for handbook content related to FDD:

- I. Types and Frequency of Occurrence of Faults for HVAC: this could be organized occurring to type of equipment (AHUs, chillers, packaged AC)
- II. Benefits of Automated Fault Detection and Diagnoses (primarily case studies of performance improvements and cost savings)
- III. General Approaches for Automated FDD (general structure for algorithms, types of approaches, advantages and disadvantages of different approaches)
- IV. Decision Making (how to use outputs from AFDD and economic information to make decisions about service)
- V. Evaluating the Performance of AFDD Products (performance indices for AFDD methods, standard methods of assessment)
- VI. State-of-the-Art (an assessment of where we are and where might go with AFDD products)

Chapter 40 Building Energy Monitoring of the Applications Handbook has a section titled “Building Diagnostics” that is focused on identifying faults based on building energy use. It is important that TC 7.5 work with TC 7.6 Systems Energy Utilization (the TC responsible for Chapter. 40) to ensure that the information provided by the two TCs is consistent.

## Appendix H.

### TC 7.5 Program Notes 2008 Salt Lake City, Utah Sunday, June 22, 2008

Program Chair, Carol Lomonaco, discussed the following items:

#### I. Salt Lake City, UT TC 7.5 Program

Seminar 27, Monday, June 23, 2008 8:00am-9:30am, SLPCC Ballroom D  
*“Exchanging Information Between EMCS and FDD Tools for Better Building Performance: Challenges and Lessons Learned”*

Chair: John House

Attendance: 75 to 100

#### II. Need to Select Program for Chicago, IL – Wtr Meeting, Jan. 2009

**Background Info for Chicago:** ASHRAE’s theme is Sustainable Urban Design. The theme seeks to elicit papers and programs that present the latest developments in sustainability as applied to systems and equipment, application of their use in different types of buildings and, especially, the impact on urban settings. The technical program seeks to bring together engineers, architects, contractors and students to address sustainable design from all perspectives.

Topics for papers and programs include:

Energy conservation

Indoor environmental quality

Application of ASHRAE guidelines to achieve high-performing sustainable results

International sustainability efforts

Other HVAC&R topics of interest

Seminar

*Aggregators Panel*

Lead: Rich Hackner, Chicago, IL (3 or 4 speakers)

Seminar

*Will Wireless Controls Save Me Money? (Why would an owner want wireless controls?)*

Lead: Carol Lomonaco, Chicago, IL (4 speakers)

Seminar

*Measurements of Actual Wireless Systems in Buildings*

Chair: Bill Healy

Action Item: Needs to ask people to speak.

Seminar

*Issues in “Real Wireless Network Applications, Part II”*

Chair: Carol Lomonaco

Seminar

*What's "Real" And What's "Hype" in Wireless Control Networks?*

Lead: Mike Brambley

Seminar

*Understanding Your Electric Utility's Meter Mumbo Jumbo Programs*

Lead: Carlos Haiad

Forum/Seminar

*"How First Responders Can Access Building Systems"*

Lead: Bill Healy

Seminar

*FDD...Fault Detection and Diagnostics...But What About Correction?*

Lead: Srinivas Katipamula

Forum

*"So Why Settle for Faulty Behavior on Control Networks?"*

Lead: Cliff Federspiel

## Appendix I.

### 1274-RP PMSC Meeting Minutes ASHRAE TRP-1274 2008 Salt Lake City, Utah Saturday, June 21, 2008

**Contractor:**

Dan Mort – ADM Associates

**PMS Members Present:**

Steve Blanc – PG&E

Michael Brambley – PNNL

Ken Peet – LSE Engineering

Keith Temple – FDSI

**Guests Present:**

Piotr Domanski – NIST

John House – Johnson Controls

**PMS Members Absent:**

Todd Rossi – PMS Chair

Chris Scruton - CEC

Jim Braun – Purdue University

Pantelis Hatzikazakis – Lennox Industries

1. Prior to the meeting the contractor distributed the following documents by e-mail:
  - a. Draft final report with outstanding items dated June 18, 2008.
  - b. Final report dated June 19, 2008
  - c. Measurement Excel file dated June 19, 2008
  - d. Draft technical paper dated June 19, 2008.
2. Because of the late date in which the report was received, the PMS members did not have sufficient time before the meeting to review the report.
3. There was a discussion of the listing of manufacturer names and model numbers for the units evaluated. Keith Temple will check with ASHRAE on any policy; however, it is anticipated that database to be submitted will not include this data.
4. There was a discussion of the current project end date. Nobody knew the official date and John House agreed to check with ASHRAE. *Note: Michael Brambley confirmed at the TC 7.5 meeting that there would not be an issue with completing the project by the end of August.*
5. The PMS agreed that the final report needs to include the literature search (can be an appendix) and the data (electronic format preferred). The data needs to be clearly identified including data labels consistent with the report and units of measure.

6. There was a discussion of the efficiency analysis and data presentation. The PMS agree that the analysis should include a comparison of the relative efficiency (normalized efficiency based on data divided by the manufacturer's indicated value) before and after the repairs.
7. Keith Temple indicated that the economizer results presented in Section 4.5 should include data on why 43 of the 78 economizers were deemed "not working" based on the evaluation criteria.
8. Keith Temple identified the following items from the NYC meeting minutes that did not appear to be addressed in the report: minute items 3c, 4b, 4c, 6d, and 10. (Several of these items are partially addressed in the report.)
9. Keith Temple identified the following items from the NYC meeting minutes that need clarification: 6a and 9. *The following clarification is based on discussion with Todd Rossi after the PMS meeting:*
  - a. *Item 6a. The summary of the report results, in the Conclusion or elsewhere, should outline the process used to obtain the results (field test protocol, data evaluation and diagnostic protocol, selection of units for service, service protocol, etc.). The body of the report should describe this process in detail.*
  - b. *Item 9. The report should describe the range of operating (driving) conditions (outdoor air dry-bulb temperature, return air dry-bulb temperature, and return air wet-bulb temperature) over which the tests were conducted. Two plots are suggested with a data point for each test: OAT vs RWB and RDB vs RWB.*
10. The PMS agreed that the system diagnosis should be revised to include changes associated with superheat evaluation for non-TxV systems when the target value is 5°F or less. This is currently discussed in section 4.2 (page 4-5) of the report but not incorporated into the data presentation (e.g., Figure 4-3). This will reduce the total number of units identified with high charge. Some units that received service will likely be deemed to have been mis-diagnosed and received the incorrect service.
11. The PMS agreed on the following schedule for completion of the project by the end of August:
  - a. July 14 – Comments from PMS members due to PMS chair
  - b. August 4 – Revised report from contractor with responses to comments
  - c. August 11 – Final review of report by PMS and approval by PMS based on all comments being addressed.
  - d. Before August 29 - Vote by TC to accept final report based recommendation from PMS.

## **Appendix J.**

### **1312-RP Status Report Tools for Evaluating Fault Detection and Diagnostic Methods for Air-Handling Units 2008 Salt Lake City, Utah Tuesday, June 24, 2008**

**Philip Haves, PMS Chair**

The goal of the project is to develop a simulation-based testing environment for fault detection and diagnosis tools for air handling units. The contractor is Drexel University and the PI is Jin Wen. The project started in September 2005 and is due to finish in August 2008, having been granted a one year no-cost extension. A further no cost extension of six months is recommended by the PMS, in part because the PI will be on leave in August and September.

An HVACSIM+ model of one of the four zone single duct VAV systems at the Iowa Energy Center's Energy Resource Center (ERS) has been produced, based on the component models produced in 825-RP. Several component models have been adapted to represent the particular mechanical equipment and controls at the ERS.

A numerical problem has been identified that has tentatively been traced to the flow vs pressure drop relationship in the flow resistance model. The PMS Chair will work with the PI to try and resolve the problem.

Problems have been observed with the coil model (based on the results of 1194-RP). Further testing of the coil model in isolation will be performed before pursuing the matter with the model developer.

Experimental testing is largely finished; a report is expected at the end of July.

Development of a user interface and an interface to the tool under test is in hand.

It is planned to hold at least two conference calls between the PI and the PMS in the next six months.

## Appendix K.

### List of Subcommittee and Committee Attendees

FullName	Organization Name	FDD	Wireless	Building Utility	Handbook	Research	General Mtg
Agami Reddy	Drexel Univ	X					X
Alan Vinh	NIST		X	X			
Angela Lewis	Penn State						X
Anna Zhou	Taylor Engineering						
Arun Vohra	US DOE						
Barry Bridges	Sebesta Blomberg						X
Bill Healy	NIST	X	X	X	X	X	X
Bill Koran	PECI						
Brian Coffey	LBNL						
Carlos Haiad	Southern California Edison	X	X	X			X
Carol Lomonaco	Johnson Controls, Inc.	X	X	X	X	X	X
Chad Taylor	ETC Group						X
Chariti Young	ALC						X
Chris Jackson	ETC Group					X	
Chris Scruton	CEC Pier						
Christian R Taber	Trane						
Damian Ljungquist	JDL Business Services						
Daniel Choiniere	Natural resources Canada	X	X				
Dave Kahn	RMH Group						X
Dave Moser	PECI					X	
Dave Uden	Trane	X	X	X			X
David Bornside	Siemens Building Tech						

FullName	Organization Name	FDD	Wireless	Building Utility	Handbook	Research	General Mtg
David Holmberg	NIST			X			
Donald Prather	ACCA						
Elaine Hale	NREL						X
Eric Helton	IBACOS					X	
Gary Kasper	Honeywell International						
Gene Strehlow	Johnson Controls		X	X			X
Geogor Henze	Univ. of Nebraska						
George Naim	Target						
Glenn Remington	Pfizer						
Haorong Li	UNL	X	X	X	X	X	X
Hofu Wu	Calpoly						
Hwakong Cheng	Taylor Engineering						
James Butler	Cimetrics Inc.						
James Gartner	Four Seasons Environmental						
Jane Guyer	ETC Group					X	
Janice Peterson	NEEA						
Jaya Pakashs	NUS						
Jerine Ahmed	Southern California Gas Co/San Diego Gas & Electri						
Jim Braun	Purdue University					X	X
Jin Wen	Drexel University						
John House	Johnson Control, Inc.		X	X	X	X	X
John Seem	Johnson Controls, Inc.						
Jonathan Wright	Loughbrough University						
Kan Lin	Penn State						
Keith Temple	Field Diagnostic	X				X	X

FullName	Organization Name	FDD	Wireless	Building Utility	Handbook	Research	General Mtg
	Services						
Kris Subbarao	Texas A&M						
Krishnan Gawi	PNNL						
Kristin Henemeier	US Davis						
Kuei-Peng Lee	Nat'l Taipei Univ. of Tech						
Lingying Zhao	The Ohio State University						
Lisa Chen	Drexel University (Student)						
Martha Brook	California Energy Commission						
Michael Bobker	CUNY	X	X	X		X	
Michael Brambley	PNNL	X	X	X		X	X
Michael Brandemuehl	University of Colorado						X
Michael Day	ICE Energy						
Mike Galler	NIST	X			X		X
Nabil Nassif	Nevada University						
Nancy Jenkins	SCE						
Natascha Castro	NIST	X	X	X	X	X	
Peng Xu	LBNL						
Pete Secor	Shamrock Sensors						X
Peter Armstrong	MIT	X					X
Philip Haves	LBNL					X	
Piotr Domanski	NIST						
Pornsak Songkakul	Siemens Building Technologies						
Reid Hart	PECI	X				X	
Reinhard Seidl	Taylor Engineering		X	X		X	X

<b>FullName</b>	<b>Organization Name</b>	<b>FDD</b>	<b>Wireless</b>	<b>Building Utility</b>	<b>Handbook</b>	<b>Research</b>	<b>General Mtg</b>
Rich Hackner	GDS Associates						
Robert Coleman	Trane						X
Robert Old	Siemens Building Technologies, Inc.	X	X	X	X	X	X
Roger Lautz	HGA A&E						
Sam Borgson	UC Berkeley						
Sharon Dinges	Trane Global Controls & Contracting						
Shengwei Wang	The Hong Kong Polytechnic University						
Shun Li	Drexel University (Student)						
Srinivas Katipamula	PNNL	X	X	X	X	X	X
Stephen Roth	Carmel Software						
Steven Blanc	PG&E	X	X	X	X	X	X
Steven R. Szymiurski							
Tats De	Carrier	X	X			X	X
Todd Gottshall	Taylor Engineering						
Todd Rossi	Field Diagnostic Services						
Vance Payne	NIST	X					
Vernon A. Smith	Architectural Energy Corporation	X	X	X	X	X	X
Vladimir Vukovic	Penn State		X	X			
Wayne Webster	Princess Towers Inc						
Xiaohui Zhou	Iowa Energy Center	X	X				X
Xinzhi Zhao	University of Nebraska	X	X	X			
Yanda Zhang	HMG						
Yi Jiany	UTRC						

<b>FullName</b>	<b>Organization Name</b>	<b>FDD</b>	<b>Wireless</b>	<b>Building Utility</b>	<b>Handbook</b>	<b>Research</b>	<b>General Mtg</b>
Yiqua Pan	Tonghi University						
Yosuke Nishi	Yamatake Corporation						
Zheng O'Neil	UTRC						