PREFACE

The Roster was made possible by the hard work of many people, both past and present. We would like to extend our appreciation to all of the contributors and patrons.

This roster is intended to be an instrument for better communication within the industry. The roster does not advertise or endorse any product, manufacturer or representative.

The people who have shared in the success of this year's Roster are:

Alan Hasemeyer
Wayne Doane
Jack Hopkins
Nancy McBee
Andrew Meyers
Isaac Bosley
Victor Mills

Comments, corrections and constructive criticisms are welcome. Contact Jonathan Driskill, Roster Editor, at jdriskill@ameresco.com with your thoughts for improvement.

ASHRAE East Tennessee Chapter

Chartered November 5, 1964

Celebrating 50+ Years as a Chapter

CONTENTS

OBJECTIVES

ASHRAE SOCIETY

The American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) is an international organization of 55,000 persons which the exclusive purpose of advancing the arts and sciences of heating, refrigeration, air conditioning and ventilation, the allied arts and sciences, and related human factors for the benefit of the public. Since its founding in 1894, ASHRAE has helped shape the growth of the industry to which its members belong and has made many immeasurable contributions to the public good.

Through volunteer effort, ASHRAE sponsors research, develops standards for industry, publishes technical and scientific data, and organizes conferences and educational activities for both its members and others professionally concerned with refrigeration processes or with the design and maintenance of environmental conditions in buildings. In addition to activity at the Society level, ASHRAE chapters throughout the United States, Canada and overseas sponsor local programs.

LOCAL CHAPTERS

ASHRAE chapters throughout the United States and Canada offer ample opportunity for professional association at the community level. All members of the Society are eligible to join the local chapter in their area. The East Tennessee Chapter holds nine meetings a year. Through attendance at meetings and active participation on committees, members may contribute to the progress of the chapter, to the recruitment and training of future engineers, the earning of Continuing Education credits which are required by most states, and to the betterment of their community.

For specific information about the ASHRAE Society and the East Tennessee Chapter, write or call:

Nancy McBee, Chapter President
East Tennessee Chapter of ASHRAE
P.O. Box 53292
Knoxville, Tennessee 37950-3292
865-588-0607
nmcbee@trane.com

2015-2016 MEETING DATES
Local Chapter

The time and dates for this year's Chapter Meetings are as follows:

Month	Date	Location	Meeting
Sep-15	9/16/2015	Rothchild's Catering	Monthly Chapter Meeting
Oct-15	10/21/2015	Rothchild's Catering	Monthly Chapter Meeting
Nov-15	11/18/2015	Rothchild's Catering	Monthly Chapter Meeting
Dec-15	12/3/2015	The Cherokee Country Club	Annual Christmas Party
Jan-16	1/20/2016	Rothchild's Catering	Monthly Chapter Meeting
Feb-16	2/17/2016	Rothchild's Catering	Monthly Chapter Meeting
Mar-16	3/16/2016	Rothchild's Catering	Monthly Chapter Meeting
Apr-16	4/16/2016	Rothchild's Catering	Monthly Chapter Meeting
Apr-16	4/17/2016	TBD	Annual CTTC Webcast
May-16	5/18/2016	Rothchild's Catering	Monthly Chapter Meeting
		2016-2017 MEETING DATES	
Sep-16	9/21/2016	Rothchild's Catering	Monthly Chapter Meeting
Oct -16	10/19/2016	Rothchild's Catering	Monthly Chapter Meeting
Nov-16	11/16/2016	Rothchild's Catering	Monthly Chapter Meeting
Dec-16	TBD	TBD	Annual Christmas Party

Times, dates, and meeting locations may change as the year progresses. This schedule will be updated as necessary and posted on our Chapter's website at www.etnashrae.org.

2015-2016 MEETING DATES
Regional & Society

Region VII CRC 2015 – 23 - 25 July 2015

Memphis, TN

Chapter President's Elect Training and Regional Planning Meeting

May 20-21, 2016

Booker T. Washington State Park

Chattanooga, TN

Region VII CRC 2016 – 4-6 August 2016

Birmingham, AL

ASHRAE Winter Conference & International AHR Expo

January 23 - 27, 2016 - Orlando, FL

www.ashrae.org/orlando

ASHRAE Annual Meeting 2016

25 - 29 June 2016 – St Louis, MO

www.ashrae.org/stlouis

ASHRAE Winter Conference & International AHR Expo

January 28 – Feb 1, 2017 – Las Vegas, NV

ASHRAE Annual Meeting 2017

24 - 28 June 2017 – Long Beach, CA

2015-2016 SOCIETY OFFICERS

PRESIDENT

T David Underwood, P.Eng., Fellow ASHRAE,
Life Member, CPMP

PRESIDENT ELECT

Timothy G. Wentz, P.E., Fellow ASHRAE, HBDP

TREASURER

Bjame W. Olesen, Ph.D., Fellow ASHRAE, Life Member

VICE PRESIDENTS

Walid Chakroun
Charles E. Gulledge, III
Patricia Graef
James K. Vallort

SECRETARY

Jeff Littleton

DIRECTORS-AT-LARGE

Erich Binder
K. William Dean
Mark W. Fly
Daniel Int-Hout III
Julia A. Keen
Dennis Knight
Ben A. Leppard
William "Bill" F. McQuade
Mick Schwedler

SOCIETY ADDRESS

ASHRAE International Headquarters
1791 Tullie Circle, N.E.
Atlanta, Georgia 30329
Telephone: (404) 636-8400
Fax: (404) 321-5478

Web Site
www.ashrae.org

REGION VII OFFICERS & ADVISORY COMMITTEE 2015-2016

REGION VII OFFICERS

REGIONAL POSITION	2015/2016	EMAIL
Director and Regional Chair	Larry Fisher	lfisherky@gmail.com
Assistant Regional Chair	Walter Law	wlaw@icthomasson.com
Regional Members Council Rep	Walter Law	wlaw@icthomasson.com
Region VII Treasurer	Edward A. Dusch	edlmc@bellsouth.net
RVC Research Promotion	John Sealy	jsealy@utk.edu
RVC CTTC	Michael Cooper	mcooper@mccgroup.com
RVC Student Activities	Rueben Nichols	rvnichol@southernco.com
RVC Membership Promotion	Carrie Kelty	ckelty@cmtaegrs.com
RVC Grassroots Government Activities	Chad Moore	cmoore@ergms.com
Regional Historian	Drew Godfrey	bdgodfrey@trane.com
YEA Regional Coordinator	Andrew Meyers	andymubb@gmail.com
Nominating Member	Ken Peet	kcpeet1@gmail.com
Nominating Alternate	Chris Gray	cmgray@southernco.com
2016 CRC Co- Chair	Greg Hamaker	ghamaker@adcoboiler.com
2016 CRC Co- Chair	Chris Gray	cmgray@southernco.com
Electronic Communications	Karen Thrasher	kay@townsend-engineering.com
Webmaster	Karen Thrasher	kay@townsend-engineering.com

Region VII Web Site
http://www.ashraeregion7.org

2013-2014 EAST TENNESSEE CHAPTER
BOARD OF GOVERNORS

President ..... Nancy McBee
Immediate Past President ..... Jack Hopkins
President Elect / CTTC Co-Chair ..... Jeff Delong
Vice President ..... Andrew Myers
Treasurer ..... Andrew Myers
Secretary ..... Anne Jacoby
Member-at-Large ..... John Sealy
Member-at-Large ..... Van Baxter
Member-at-Large ..... Scott Hacker
Member-at-Large ..... Andrew Bosse
Member-at-Large ..... Bob Vlastos

COMMITTEES

Chapter's Regional Delegate ..... Nancy McBee
Chapter's Regional Alternate ..... Jeff Delong
Student Activities ..... Scott Hacker
Historian ..... Alan Hasemeyer
Honors and Awards ..... Jeff Gibson
Membership ..... Isaac Bosley
Chapter Technology Transfer Committee / Programs ..... Ken Stuckwish
Research Promotion ..... Wayne Doane
YEA ..... Andrew Bossee
Government Action ..... Doug law
Roster ..... Jonathan Driskill
Reception ..... Anne Jacoby & Andrew Myers
Golf Tournament ..... Tom Pace
Calling Committee ..... Anne Jacoby
East Tennessee Chapter Website ..... Jack Hopkins

East Tennessee Chapter Website
http://www.etnashrae.org

CHAPTER PAST PRESIDENTS

Bernie H. Marvet (deceased)	1964-65
Robert H. Forde (deceased)	1965-66
Robert E. Vandiver	1966-67
Robert L. Crawford	1967-68
Joe Bailey (deceased)	1968-69
Charles F. Sexton, Jr. (deceased)	1969-70
Walter L. Montgomery (deceased)	1970-71
H. Fred Gale	1971-72
Philip J. Breman	1972-73
Earl T. Graham	1973-74
Ernest E. (Ernie) Choat (deceased)	1974-75
Gordon N. Rome	1975-76
Wayne O. Rose (Retired)	1976-77
Idus T. Littleton (deceased)	1977-78
Paul E. Jorden	1978-79
John E. Jones (deceased)	1979-80
Richard M. (Dick) Kelso	1980-81
James H. Corley (deceased)	1981-82
I. Wayne Doane	1982-83
John K. Sealy	1983-84
Thomas W. (Tom) Pace	1984-85
Ned W. (Chuck) Belt, Jr.	1985-86
Ronald L. Shelton	1986-87
Alice R. Belt	1987-88
Don Gwyn (deceased)	1988-89
Phillip B. Newby	1989-90
Kirk A. Wilson	1990-91
Thomas M. (Tom) Ferguson	1991-92
Robert D. (Bob) Wetter	1992-93
Eddie Edwards	1993-94
Steve P. Sturgeon	1994-95
Walter W. Law, Jr	1995-96

CHAPTER PAST PRESIDENTS

(Continued)

Jack S. Hopkins..... 1996-97
Joel J. Goldberger 1997-98
Suzanne K. (Marquis) McCarter..... 1998-99
Wendell H. Moore 1999-00
Steven S. Ferguson..... 2000-01
Myron T. Carter 2001-02
David L. Kaminsky..... 2002-03
Heather L. Buckberry..... 2003-04
Jonathan G. Crye..... 2004-05
Alan T. Hasemeyer 2005-06
W. Ken Seaman 2006-07
Greg A. Farmer 2007-08
Jeff R. Gibson 2008-09
Jonathan Driskill 2009-10
Jonathan Driskill 2010-11
Phil Newby 2011-12
Phil Newby 2012-13
Bill Jacoby 2013-14
Jack S. Hopkins..... 2014-15

PAST PRESIDENTS from other CHAPTERS

Donald B. Heffron – Miami (deceased)..... 1966-67
Jade Culbertson - Evansville..... 2001-02

ORGANIZATIONAL HISTORY
of the
EAST TENNESSEE ASHRAE CHAPTER
KNOXVILLE, TENNESSEE

Original Issue: September 20, 1988, by Ron Shelton
Revision 1: Five Year Update, April 25, 1994, by Kirk Wilson
Revision 2: Ten Year Update, August 7, 2001, by Heather Buckberry
Revision 3: Annual Updates, beginning July 1, 2003

The accompanying material represents a combined first submittal, two 5-year updates and annual updates of the organizational history of the East Tennessee ASHRAE Chapter. The chapter meets in Knoxville, Tennessee and forms a part of Region VII of the ASHRAE Society. This narrative discusses the formation of the local chapter and is based on the original meeting minutes, newspaper notices, and interviews with charter members and chapter members. The 5-year updates were based on material in the chapter archives. Special thanks go to Jack Hopkins and David Kaminsky for their help in preparing the 10-year update (Revision 2).

To prevent loss of information, it was determined to begin updating the Roster annually. Starting with this Roster, updates will include through the just completed ASHRAE fiscal year. Special thanks also to Heather Buckberry for already gathering information for the Annual Updates. (Revision 3).

Organizational Meeting

The initial chapter organizational meeting was held at Regas Restaurant, 318 Gay Street, Knoxville, Tennessee on March 11, 1964, with 42 individuals in attendance. The meeting was chaired by Mr. Frank Vaughn of the Birmingham, Alabama Chapter. Burt Lomas, Regional Director, explained the purpose of ASHRAE and answered questions from the audience. A proposed slate of Chapter officers was then submitted to Mr. Lomas and Mr. Vaughn as follows:

President..... Bernard H. Marvet, Tennessee Valley Authority
lst Vice President ..... Walter L. Montgomery, Consulting Engineer
2nd Vice President ..... Robert H. Forde, Union Carbide

Treasurer ..... Robert L. Crawford, Leopold and Orr
Secretary ..... Robert E. Vandiver, Johnson Service Co.
Board Member ..... Ernest Hall, Knoxville Refrigeration Co.
Board Member ..... Joe Bailey, Manufacturer's Representative
Board Member ..... Gene Brakebill, Robert Shaw Controls Co.

Bob Dowd motioned that this slate of officers be accepted, which was seconded by Tom Watson. The vote was unanimous to elect this slate. President Marvet made a brief acceptance speech calling for enthusiasm and cooperation among the group and announced that an April meeting would be planned by the new Board of Governors. The Treasurer reported a surplus of $19.37 from money received that evening to pay for the cost of the dinner.

A Board meeting was held immediately following. It was decided that the next meeting night would be at Regas Restaurant, April 9th, and that Ed Cook of Dunham-Bush, Hartford, Connecticut would be invited to speak. The regular meeting night was established as the second Thursday of each month, and it was decided that postcards would be sent as reminders to the members and meeting announcements would be sent to the newspapers.

Subsequent Meetings

Meetings of the newly formed Chapter were continued on a regular basis, excepting two summer months, in April, May, June, September, and October of 1964. Ed Cook of Dunham-Bush spoke on low temperature refrigeration in April. The membership formerly adopted the name of East Tennessee Chapter of ASHRAE and President Marvet reported that over 50 individuals had made application. The Board of Directors began to draft the Chapter By-laws.

The May meeting was held at the Admiral Benbow Restaurant with 36 in attendance. President Marvet presented the final By-Laws for Chapter approval. Mr. Bill Whitman motioned, Mr. Charles Sexton, Sr. seconded, and the members voted unanimously to accept the Bylaws. Mr. E.J. Lambrecht of Kewanee Boilers made a presentation on boiler applications.

The June meeting was also held at the Admiral Benbow Inn with a presentation on cooling towers. President Marvet indicated that

membership applications and the $12.50 fee had to be in the Secretary's hands by the end of June to make the cutoff point for Charter membership. Committee assignments were discussed and a September meeting date was established.

The September meeting was held at the Holiday Inn on Chapman Highway with 40 members present. President Marvet announced that the Charter Presentation meeting would be November 5th at Deanne Hill Country Club, with spouses and friends invited. The final approved By-Laws were distributed and Mr. C.A. Spears, Trane Co., made a technical presentation on Absorption Refrigeration Systems.

The October meeting was held at the Holiday Inn with Mr. Henry Saye, Cutler-Hammer Inc., presenting a program on the Application of Motor Controls. Membership Chairman Ernest Hall reported that 59 individuals had paid membership fees and would be considered as Charter Members. Visitors Walter Bishop, Lennis Thomas, Lynn West, and Paul Burn were introduced.

Presentation of the Charter

A Charter Night Banquet was held at the Deane Hill Country Club, Knoxville, Tennessee. In attendance were the ASHRAE Society President Mr. John Dube; Society President-Elect Mr. Jim May; Society Executive Secretary Mr. Andrew Boggs, III; and Region VII Director Mr. Burt Lomas, Jr. Also attending were Mr. Frank Vaughn of the Birmingham, Alabama Chapter and Mr. Don Nichols and Mr. Ed Kennedy of the Middle Tennessee Chapter.

Following the social hour and invocation by Secretary Vandiver, the members and guests enjoyed a filet mignon dinner. The introduction of the head table was made by Program Chairman Charles Guthrey, and Mr. Burt Lomas was introduced as the Master of Ceremonies. Following remarks by Mr. Jim May, Mr. John Dube gave the principal address discussing the organization and future of the ASHRAE Society. A formal presentation of the Charter was conducted by Mr. Dube with Bernie Marvet accepting on behalf of the Chapter.

Mr. Lomas then performed the formal induction of the East Tennessee Chapter officers for the 1964 - 1965 fiscal year and presented to President Marvet a walnut gavel with a brass inscribed plate denoting the date of the official chartering of the East Tennessee Chapter. Mr. Marvet made a brief acceptance speech acknowledging the many telegrams of congratulation from ASHRAE chapters all over the United States and Canada. In particular, he cited the Chapter's indebtedness to Frank Vaughn and Bert Lomas for their substantial efforts in helping the Chapter to organize and to receive their Charter. Mr. Marvet challenged the membership to maintain their enthusiasm and to work hard toward achieving a solid basis for future growth.

Five Year Update (1989-1994)

The Chapter held its 25th anniversary meeting in January 1990. Society President David Butler was the speaker and he presented certificates to 57 charter members and 25 past presidents. Twelve of the twenty-five past presidents were charter members.

Two chapter members, Don Heffron and Bob Slusher, were awarded Life Memberships in 1989 and two other chapter members, Ernie Choat (1989) and Dick Kelso (1992), were awarded the ASHRAE Fellow designation. Fifteen Chapter members have Life Memberships and three are Fellows. Chapter membership was at 264 in 1989 with 236 assigned members and 17 students.

The Chapter Historian, Ron Shelton, was extremely active in preparing the original chapter history paper, a history of the Tennessee Theater, and two picture board displays showing charter members and 25th anniversary highlights. The Gold Ribbon Award for History was first received in 1989 and continued through each of the 4 succeeding years.

East Tennessee Chapter was the host for the 1991 Region VII Chapters Regional Conference (CRC) in Gatlinburg, Tennessee. The Park Vista Hotel provided the backdrop for a wonderful and productive time in the Smoky Mountains. Society President-Elect Dick Charles sent a thank-you letter to the Chapter saying "...the CRC was excellent." The Chapter members that participated in the CRC planning deemed the hard work as a "rewarding experience".

1993 was the 10th consecutive year for receipt of the Star award. The awards banner is overflowing and we will proceed to our second banner in 1994. The Chapter continues to advance with strong leadership and local support with the April 1994 membership showing 217 members and 38 students for a total of 255.

Most notable in 1994 is the chartering of a student branch at the University of Tennessee, Knoxville. After 10 years of frustration, the ASHRAE chapter has penetrated the barriers and formed a 38 member student branch which is meeting on campus during lunch on the same days as our regular Chapter meetings. Our eventual success can be attributed to the perseverance of many people including Jack Hopkins, Kirk Wilson, Dick Kelso, and Eddie Edwards. It is now evident that the study branch fulfills a student need for an avenue of contact with their future job market as well as giving them an insight into "practical engineering". The students are most appreciative of the time that Chapter members spend helping them with projects and on scheduling programs for their meetings. We can only hope that our momentum is maintained and the student branch helps to produce a future work force skilled in technical problem solving.

Ten Year Update (1994-1999)

The 1994 - 1995 year was both a Centennial year for ASHRAE and a 30 year anniversary for the East Tennessee Chapter. The occasions were celebrated at the annual 'Past-Presidents' meeting in November. Society President Billy Manning and his wife Shirley attended the meeting which was highlighted with Mr. Manning's presentation of the University of Tennessee student branch charter to the first student branch president, Julie Harse. The historical display at the meeting sported the first showing of a multimedia interactive video that contained photos, news clips, and flyers from significant chapter events over the past 30 years. VHS tapes of the 30 minute video were also available for purchase.

1995-1996 was another banner year for the chapter's Research Promotion effort. Chairman David Kaminsky led the effort which realized nearly $13,000! For his efforts, David was later nominated for the "William J. Collins, Jr. ASHRAE Research Promotion Award". The nomination itself was quite an honor, as only one nominee can be put forward by each region

for this Society level award. At the CRC banquet, our chapter members received several awards for both their work during the 1995-1996 year and for their long term efforts for ASHRAE. Our award winners included: Alice Belt and Ron Shelton - Regional Award of Merit; Kirk Wilson - Gold Ribbon Award of Merit, Chapter Historian; Walter Law - Presidential Award of Excellence; David Kaminsky - High Five Award, Research Promotion.

The 1996-1997 year started off with a great turnout for the chapter golf tournament. Over $2,600 was raised for the UT Student Scholarship Fund. The October meeting was "Hockey Night" and included a presentation on the vintage refrigeration system used to heat and cool the Civic Coliseum and to create the ice for the hockey rink. After the presentation, members stayed to watch the Knoxville Cherokees play Roanoke. Bob Schowalter of TVA was selected as a Second Place Winner of an ASHRAE Technology Award in Category I - Commercial Buildings. This was for Bob's application of a heat pump water heater in a commercial laundry. Bob's project was later featured in the ASHRAE Journal. Myron Carter and Sam Shore worked extensively with the UT Student chapter and Dr. Stan Johnson's HVAC class. In January, our chapter was fortunate enough to host an ASHRAE Distinguished Lecturer - Ms. Eileen Duignan-Woods. The annual holiday party was a great success, with special entertainment by the Halls High School Madrigal Singers. The chapter also hosted an afternoon seminar on Desiccant Cooling and Dehumidification. In May, the chapter also helped sponsor (with York International) a tour of the newest chiller plant at Eastman Chemical's office building in Kingsport, Tennessee. Chapter Research Promotion donations were outstanding, with over $13,000 being raised.

Our 1997-1998 chapter year commenced on a high note, as the chapter received several awards at the CRC in Memphis. These included: High Honor Roll for PAOE, the Star Award with Special Citation, High Five in Research Promotion, and the Gold Ribbon for History. The chapter also learned that it would be hosting the 2002 CRC. Another very successful chapter golf tournament was staged in September as well. In November, the chapter co-hosted a live telecast on gas driven cooling systems with United Cities Gas. Bob Schowalter gave a presentation at the January meeting on his award winning design for a heat pump water heater. The student chapter members made a presentation at the chapter meeting in

April on their senior design project. Also, Dr. Stan Johnson received a $4,600 grant from the ASHRAE Undergraduate Senior Project Grant Program. In May, the chapter sponsored a tour of the ammonia refrigeration plant at the Mayfield Dairy operations in Athens, Tennessee.

The 1998-1999 chapter year began with receipt of several awards at the CRC in Baton Rouge, Louisiana. The chapter received the PAOE Star Award with Honors and Special Citation, and the Gold Ribbon for History. In September, the chapter hosted a seminar on Water Treatment. The golf tournament proceeds added another $1,500 to the student scholarship fund. In October, the chapter co-sponsored a tour of the Precision Boiler factory with Wade & Associates and the local chapter of ASPE. In November, the chapter co-sponsored two seminars with TVA on Hydro-Thermal Energy. The chapter also welcomed Region VII Director and Regional Chair (DRC) Roger Buckmaster to the November chapter meeting. In February, the chapter had a joint meeting with the new ASPE chapter. This was also the chapter's first experiment with a luncheon meeting format. In May the chapter had a tour of the chiller plant at the First American Bank Building in downtown Knoxville. To top off the year the final meeting of the year was a social event and was a luau!

Annual Updates (1999-2015)

The 1999-2000 chapter year started with participation in the CRC hosted by the New Orleans chapter. The chapter was second in PAOE points in the region due to all the hard work of the 1998-1999 board members. The chapter golf tournament netted more than $2,000 for the scholarship fund. Our chapter was able to award the first ASHRAE scholarship to UT student Aaron Barbe. Due to declining evening attendance, the chapter board members voted to hold several luncheon meetings for the year. This was a welcome change for many members and did seem to increase attendance. In the spring, the chapter learned that three long-standing members had received Society awards. Dick Kelso received the Distinguished Service Award, Don Heffron received the Distinguished Fifty-Year Member Award, and Gordon Rome was awarded the status of Life Member. In April the student chapter made a presentation on their design project. Research Promotion donations were excellent again, with more than $11,555 raised for the year. This was enough to garner a ranking of second at the CRC meeting. The chapter also had 23 members

engaged in society level activities which were the highest of any chapter in the region.

The 2000-2001 chapter year started with participation in the CRC hosted by the Nashville chapter. The year included a diverse chapter schedule with meeting topics including The Chunnel. A seminar on fume hoods was offered prior to the March meeting. In June the chapter co-sponsored a seminar with TVA and Knoxville Utilities Board on ground source heat pumps. More than half of the chapter meetings were held as luncheons to better accommodate members' schedules. Research Promotion donations were excellent again, with $12,450 raised for the year.

The 2001-2002 chapter year started with participation in the CRC hosted by the Bluegrass (Lexington) chapter. The chapter PAOE points for the year were high enough to rank the chapter fourth of sixteen chapters in Region VII due to the hard work of the 2000-2001 board members. Awards included PAOE, Chapter Operations Highest Points Level 2, Gold Ribbon for History Award and Chapter History Highest Points Level 2. Remarkably, Research Promotion donations were exactly the same as the previous year, with $12,450 raised for the year. This dollar amount is even more impressive, since the CRC committee concurrently ran a fund raiser to help support the 2002 CRC (which our Chapter hosted). The CRC group raised over $14,000. CRC Co-chairs Steve Sturgeon, Walter Law and John Sealy organized the committees needed in preparation of our Chapter hosting the 2002 CRC. In response to the September 11 tragedy, the chapter donated $500.00 to the "Freedom Engine", a fire engine that was purchased by East Tennessee to replace one of the NYFD engines that was destroyed on 9/11.

The 2002-2003 chapter year started with our chapter hosting the 2002 CRC at the Marriot Hotel in downtown Knoxville. We were honored to have ASHRAE Society President Dr. Don Colliver present at the CRC. Carolyn Kettering, ASHRAE staff representative, commented at the post-CRC briefing that this was the best CRC she had attended in her seventeen years of attending CRC's. Again, the chapter ranked fourth out of fourteen chapters (two of the smallest chapters in the region dissolved last year). Awards included PAOE + (1) Special Citation, Research Promotion Full Circle, Research Promotion Highest Points Level 2, Research Promotion Chuck Koptis Award, Gold Ribbon for History Award, Chapter History

Highest Points Level 2, Regional Historian Award (second year in a row), and Membership Promotion Highest Points Level 2. Resource Promotion (formerly called Research Promotion) donations were excellent, with $14,663 raised for the year (a new chapter record). Meeting attendance was up for the second year in a row due to the excellent programs that were provided. The year began with Wayne Doane, in full United Arabic Emirates dress, speaking about his experience in being the field representative for the mechanical installation at a military base that "does not exist". The year ended with Dr William (Bill) Snyder, former University of Tennessee Chancellor, present a program on the Tennessee Theatre: Past, Present and Future. In the middle of everything, our chapter had one of the best, if not the best, attended Christmas gatherings. The guest speaker was Sam Venable, with the Knoxville News-Sentinel, and his program was "Christmas in Appalachia" or "A Redneck Christmas". Van Baxter (ORNL) received the Distinguished Service Award at the Annual Meeting in Hawaii. This year saw the retirement of Charlie Sexton. We also mourned the loss of Walter Lee Montgomery, who passed away in February 2003, and Chuck Thresher, who passed away in April 2003.

The 2003-2004 once again began with the annual CRC (this time in Louisville) and the presentation of awards for the previous year's efforts. The chapter received many awards, and most notably the David Levine award for the best chapter in region 7. Walter Law received the Chuck Koptis award for Research Promotion and Jon Crye received the Regional Historian Award. For the 2003-2004 year, the chapter held nine regular meetings, with eight of those being technical sessions and one social event. Regular chapter meetings included presentations on subjects such as "LEED for Engineers", "Stratification", and "Energy Savings and Performance Contracting". Dick Kelso gave a special presentation on the new ASHRAE Standard 154. In October the chapter held another successful golf tournament thanks to the efforts of Ken Seaman, Alan Hasemeyer, Joe Thomas and other volunteers. The annual December holiday gathering was once again an opportunity to honor past chapter Presidents. Sadly, past President and chapter co-founder Bob Forde passed away shortly before this gathering. Historian David Kaminsky prepared an article for the chapter's February newsletter that highlighted Bob Forde's career and contributions to our chapter. The chapter also made a contribution to the ASHRAE Resource Promotion fund in his

honor. In February the chapter once again was a silver level co-sponsor of the annual TSPE "All Engineer's Banquet". The banquet was once again held at the foundry, with Dr. William Bass speaking about the Body Farm. Later in the spring the chapter also co-sponsored with ASPE the seminar at the PHCC trade show. In April the chapter, along with Trane and TVA, sponsored an ASHRAE satellite broadcast on the topic of homeland security. Many members of BOMA were also in attendance at the satellite broadcast. Once again the chapter had a year full of well-attended, varied activities.

The 2004-2005 year was to begin like every other year with the annual CRC scheduled to be held in Mobile, Alabama. However, it just so happened that Hurricane Ivan decided to be the first to attend. As the opening day approached, there was a flurry of e-mails going back and forth asking if we were going to have the CRC or not. Our Society President (who lives in Chicago) felt we should go ahead and have it. He felt that less people would attend a rescheduled meeting. This prompted various responses including one who quipped that "Fewer people would attend at a future date than in the eye of a hurricane?!", and another stated "You do not get many hurricanes in Illinois, do you?". Needless to say since Ivan came directly over Mobile, it was postponed. A shortened and condensed CRC was eventually held in Nashville. The chapter was fortunate to receive several awards including the Honor Roll for the President's Award of Excellence (PAOE) and the Gold Ribbon for History. This year nine regular meetings were held including seven technical programs and two social programs. The technical programs included two Distinguished Lecturers. The first was Maralynne Flehner who's topic was "The ASHRAE Member's Survival Guide - Risk Management 101". The second was Dan In-Hout who spoke on "Demand Controlled Ventilation, VAV Boxes and Indoor Air Quality". The annual Christmas Party featured Charlie Daniels, cartoonist for the Knoxville News Sentinel. The March meeting was a joint meeting with the local chapter of the US Green Building Council and Society Treasurer Terry Townsend was our speaker. An additional joint meeting with the ASPE chapter was held in conjunction with the PHCC trade show and the chapter along with Trane and TVA hosted a satellite broadcast on Mold Prevention. The year finished with the annual Resource Promotion campaign which was led by David Kaminsky and was one of our most successful campaigns. Overall

the year was successful with increased meeting attendance and interesting and fun meetings.

The 2005-2006 was a year of strategic growth. It was "strategic" in that several new faces emerged as part of the leadership team. First time board members included John Buchanan, Victor Mills, and Greg Farmer. New members chairing / assisting committees were Jon Driskill, Al Bedinger, Victor Mills, and Nancy McBee. There was a general spirit among the members of wanting to help make the chapter even better next year. As is typical, the year started with a great CRC, this time in Chattanooga. There were about 13 chapter members who attended; making it one of the best attended non-Knoxville CRC's ever. As usual, our chapter was well represented in the number of awards received. Meeting highlights included: December - Christmas party with Phil Campbell (Son of Archie Campbell) and Pianist Beverly Kerr; March - Joint meeting with USGBC; April - Satellite Broadcast on Sustainable Buildings, another joint meeting with USGBC. Art Hallstrom, the Regional Vice Chair, joined us for one of our board meeting. The chapter mourned the losses of Wayne Doane's mother, and Harry Wade's son, David. The annual ASHRAE Golf Tournament was renewed, and was a big success at Avalon. (Speaking of sports..... After a rather slow UT football season, Bruce Pearl came on board as the new Men's Basketball Coach. The team had an awesome season!)

Also in the "awesome" category, the John Sealy led Research Promotion team, netted in excess of $18,600 to set a new chapter record. This figure was 135% of the chapter goal. The chapter membership responded very positively as is the norm. In terms of contributions per member, East Tennessee is the region's flagship chapter, and 2nd place isn't even close! Fantastic job team, we thank all of you for your efforts. John's varsity team members were Wayne Doane, Chuck Belt, Myron Carter, David Kaminsky, Walter Law, and Jon Crye. On a regional note, Walter Law was the Regional Research Promotion Vice Chair. 2005-2006 was a very positive year for the chapter, and set the ground work for another solid year under the leadership of Pres Elect Ken Seaman.

The 2007-2008 Chapter year began with the CRC held in Huntsville, Alabama. Our Chapter was well represented claiming the second over all in the PAOE point total. John Sealy and the Research Promotions

Committee received recognition at the CRC and directly from ASHRAE for his outstanding research promotions performance. In addition to John's awards, our chapter was recognized in almost every category. I think our most impressive characteristic is the level of giving on a per member basis. Our per-member average contribution to the research fund is 1st or 2nd in the entire society. Again, our Roster was well received, and the society has awarded additional PAOE points this year for the outstanding effort of the Roster Committee. The golf tournament was a great success raising $3,000 for Research. Our lunch programs provided a wide variety of opportunities.

The 2008-2009 Chapter year got off to a great start at the CRC held in Memphis, TN. The Chapter won many awards including PAOE – Honor Roll, Research Promotion Full Circle & The Presidential Award of Excellence. Along with these awards Jonathan Driskill won the Chapter Program Star Award for exceptional performance in programs. Walter Law won The Regional Award of Merit for his service over time to Region VII. Walter also was presented a certificate of appreciation for being RVC for RP the last three years. Steve Sturgeon also received a certificate of appreciation for his service as research promotion chair. The chapter even won the prestigious Flying Eagle Award for the most chapter members traveling the greatest distance. This was the first time our chapter has won this award! Many of our chapter members spent memorable and fun evenings on Beale Street and even toured Graceland, the home of Elvis Presley! This year saw Chapter meeting attendance grow significantly with several great speakers and due to the efforts of the board and most notably Victor Mills and the launching of the chapters first fully electronic newsletter and notification email system. The chapter once again participated in Engineering Day at UT with more than 600 students from over 30 High Schools attending. The annual golf classic was held at Avalon on October 24th and raised significant funding for the student scholarship fund & ASHRAE Research Promotion. This years Christmas dinner was a huge success. The well attended party included many past Presidents and all were entertained by Bradley Hasemeyer and his standup routine straight out of Hollywoood. The chapter also participated in ASHRAE's satellite broadcast/webcast on April 22nd. This years webcast topic was 'Clean, Lean & Green' – IAQ for Sustainable Buildings. Once again the chapter had a great year full of great speakers, well attended meetings, awards & fun for all participants.

Our 2009 – 2010 Chapter year began with the annual Chapter Regional Conference (CRC) hosted by the Mobile Chapter, 31 Jul – 1 Aug at the renovated "Living Room of Mobile" – The Battle House Hotel. This year's CRC may not have been one of the most heavily attended but those who did had a great experience in Mobile. The Battle House Hotel had gone empty and locked its doors on 1 Oct 1974. A renovation and restoration of the hotel was undertaken in 2002 and completed in May 2007. In addition to the original hotel, a handful of floors in the neighboring 30+ story office tower were used to provide additional hotel rooms. A wonderful facility to use for the CRC. Due to our limited number of CRC attendees we were not able to hang onto the noted "Eagle Award" but we did come close. We made up for loosing the award by causing a bit of a stir when it came to locating the award prior to the CRC. Apparently our winning it last year at the Memphis CRC caught so many off guard that they didn't remember we had it this year. Folks were starting to get just a little anxious when Jeff Gibson let it be known he would have it at Mobile. Much relief had by all. Our Chapter was recognized at CRC with a certificate for Star Award Special Citation for having the second highest number of Presidential Award of Excellence Points in the Region. Our Research Promotion team was recognized for their efforts in our annual Research Promotion Campaign – A record Dollar amount, $20,313, plus a Full Circle Chevron, and a High Five Chevron. There was a sad note to this year's CRC. A key member of the Mobile CRC planning team, Claire Alger-Young, tragically fell victim to a fatal act of domestic violence. Her employer and Co-workers established a memorial fund in Claire's name with the funds to support Penelope House, a place of refuge for battered women in Mobile. On behalf of the Chapter a donation of $250 was sent to the memorial fund.

Our annual Chapter Golf Tournament was held on 22 October, once again at the Avalon Golf Course. We had a great turnout and perfect weather, sunny, light breeze, and mild temperatures. We raised over $1,800 for ASHRAE Research. We continued holding our monthly chapter meetings at Rothchild's Catering in West Knoxville. With every meeting featuring a buffet. Our annual Christmas Party and Past President's Recognition was a wonderful evening with over sixty in attendance at Dara's Garden in South Knoxville. The highlight of our evening was the entertainment provided by the group Three on a String from Birmingham, Alabama.

Some may remember them from the Huntsville CRC in 2008. A wonderful and most enjoyable evening.
The chapter supported the TAPHCC by having our April meeting at the Knoxville Expo Center in conjunction with annual TAPHCC convention and exhibition. Several members attended the expo both as visitors and exhibitors. The annual ASHRAE CTTC program was broadcast as a webcast only this year on the topic of "Right from the Start" – Commissioning for High Performing Buildings." Our Student Activities Committee saw activity not only at UT with the UT Student Section working on their proposal for the 2011 Solar Decathlon but several K-12 visits and attempts to connect with the Knox County Schools HVAC Technology programs to offer the support of our chapter and its members. In addition, a special committee was assembled to look into awarding a scholarship using the funds that have been set aside for such a purpose. An application was developed and advertised but only one candidate applied but was deemed unqualified. Will rethink and maybe try again. Our chapter year was saddened by the sudden loss of friend and member James Corley who died of a sudden heart attack in March 2010. Overall we had a wonderful chapter year, with well attended programs and informative speakers.

Our 2010 – 2011 Chapter year began with the annual Chapter Regional Conference (CRC) hosted by the New Orleans Chapter, 5– 8 Aug at the Royal Sonesta Hotel on Bourbon Street. The hotel was well located for one to be able to walk and easily experience many of the highlights New Orleans has to offer. Bourbon Street is a beehive of activity after dark that has to be seen to be believed. Our chapter garnered the usual awards for Research Promotion - Full Circle, etc. A wonderful slate of programs was experienced by all during our society year. Highlights of other Chapter Activities: Our annual Golf Tournament was held in October in East Knox County at the River Islands Course off Midway Road. Our Annual Past President's December Recognition Event was held at Holston Hills Country Club with San Venable entertaining us with his stories of East Tennessee. This event almost didn't happen as Knoxville experienced a "Snow" event that day. Our Chapter was honored to host a visit from Tennessee Valley Chapter's Ms. Kay Thrasher in her position as a Society Delegate-At-Large. Thanks to the efforts of our own Jack Hopkins our Chapter hosted a booth at the annual Knox County Schools Career Day Fair held at the Expo Center off Merchant's

Road. Our booth had a "Rap" Video produced by ASHRAE Society and exhibited some 3-D computer models created by Jack for a contract he had. Our chapter also provided a sponsorship check to the UTK "Living Light" Solar Decathalon Team to help them obtain the resources they need to complete the project and present it in Washington DC on the National Mall. Our May program was a non-technical yet an entertaining and inspirational topic as we heard from Maryville resident, businesswoman, Vallie Collins as she related her experience as a passenger on US Airways Flight 1549 which managed to land safely in the Hudson River after a bird strike disabled the engines.

Our 2011 – 2012 Chapter year began with the annual Chapter Regional Conference (CRC) hosted by the Bluegrass Chapter, Lexington, KY 18-20 Aug at the Lexington Downtown Hilton Hotel. Our annual December Past President's Recognition Dinner was held at Rothchild's Catering with social hour music provided by Judy Russell from Special Notes and the evening's entertainment by Country Comedian Phil Campbell. A major highlight of this chapter year was the establishment of the Tri-Cities Section, sponsored ansd supported by the East Tennessee Chapter. Their inaugural meeting as an officially recognized Section of ASHRAE Society was held on 10 January 2012 at Giuseppe's Italian Restaurant located at 2539 East Stone Drive, Kingsport, TN 37660 from noon to 1:30pm. Mr. Jeff Gatlin, Director and Regional Chair, Region VII, installed the officers and presented them with their charter. Chapter President Phil Newby and Chapter Treasurer Jack Hopkins were in attendance as well. Our Chapter Board was honored with a visit by Society President Ron Jarnigan on his way to attend a meeting of the new "Tri-Cities" Section 19 March 2012. This year also saw us begin the planning for our chapter to host the 2012 Chapter Regional Conference.

Our 2012 – 2013 Chapter year began with the annual Chapter Regional Conference (CRC) hosted by the East Tennessee Chapter, 23-25 Aug 2012 at the Knoxville Marriott. Declared the "Best and Most Smoothly Run CRC ever experienced…" by all ASHRAE Staff in Attendance. Our CRC was enjoyed by all who attended. Many thanks to Walter Law and John Sealy who co-chaired the event along with Phil Newby, Chapter President, who was able to resurrect the database used at the 2002 CRC we hosted to aid in planning and execution of the 2012 CRC. Thanks too to the rest of the CRC Planning Committee and the additional

chapter members and spouses who volunteered their time to help plan and execute the extremely successful event. Because we hosted the annual CRC and solicited sponsors we did not want to burden our usual roster advertisers and golf tournament donors with yet another request for contributions so we opted to not publish a roster or hold a golf tournament this year. Our annual December Past President's Recognition Dinner was held at Rothchild's Catering with a program provided by Eddie Mannis, Chairman of HonorAir Knoxville. HonorAir Knoxville's goal is to fly as many East Tennessee World War II and Korean War veterans as possible to Washington D.C. to see the memorials built in their honor. It was a heart touching presentation.

2013-2014

During the summer of 2013, Bill Jacoby assumed leadership of our chapter and promptly established a leadership plan for the future of our chapter. Gathering interested parties together, it was not long before every officer and committee chair had been filled, something that had not been accomplished in several years.

One of the immediate benefits was a re-establishment of the Student Chapter at the University of Tennessee. Under the leadership of co-chairs Scott Hacker and Andrew Bosse, both recent college graduates themselves, UT students not only attended meetings, but they established officers and a structure that would prove to be sustainable for the future.

Our Christmas party was a great highlight, Bob Lewis of the Make-A-Wish Foundation. This great organization sponsors "wishes," often trips, for terminally ill children. Bob spoke to us about several inspirational examples, and offered a multi-media presentation for all to view. Our chapter offered, and Mr. Lewis accepted, a generous contribution to the local Make-A-Wish East Tennessee organization. Thanks to Tom Pace, Anne Jacoby, and others, this event held at the Orangery Restaurant, was well attended and especially elegant in nature.

Our leadership improvement was proved by recognition at CRC in New Orleans. Our chapter was second in PAOE points, only 13 points behind first place! George Jacoby, Bill's father accepted multiple awards for him. Others were recognized as well, including first place awards for

Nancy McBee (membership), Wayne Doane (research), and Scott Hacker and Andrew Bosse (student activities).

As a final celebration, a lake party was held at the home of Tom Werkema. Tom's home had recently been awarded a Society Technology Award Water sports, good food, and the Tennessee - Oregon football game highlighted a great day of fellowship for the Chapter.

2014-2015

November 2014 was a special time for our chapter, as we celebrated our 50th Anniversary! Bill Jacoby chaired our anniversary committee, which arranged a elegant gala at the Cherokee Country Club. Over 110 people attended the event, including charter member Wayne Rose and many other retired members. We were privileged to have Society President Tom Phoenix and Regional Chair Larry Fisher present, both of whom gave tributes to our Chapter. A retrospective video was prepared by Alan Hasemeyer and Jack Hopkins; it featured many of our chapter members young and old, along with photographs from each decade of our fifty years.

The December meeting featured Knoxville Mayor Madeline Rogero as the speaker. Specifically, Mayor Rogero spoke about sustainability activities in the City as well as energy initiatives that were underway.

Our meetings throughout the year were outstanding, as we were treated to three ASHRAE distinguished lecturers during the year as well as several other outstanding presenters. Programs chair Nancy McBee served our chapter well, and she was recognized at CRC later in the year with a society award for program excellence.

Two technical events stood out during the year. Chapter President Jack Hopkins held a "Principal's Breakfast" in February, during which local consulting engineers were invited to socialize and discuss current events together. Topics included everything from ASHRAE Standards to the menu at monthly meetings. In March, our chapter helped co-sponsor a luncheon and afternoon technical seminar with the local US Green Building Council chapter, and others, on Energy Codes. Several speakers and panelists participated and the event was attended by over 100 people.

The ASHRAE year was celebrated in Memphis at CRC; our chapter brought back first place awards for membership (Andrew Meyers), student activities (Scott Hacker), programs (Nancy McBee), and history (Alan Hasemeyer). Certificate of Excellence in Research: Full Circle, High Five, and Endowment Chevron (Wayne Doane. Presidential Award of Excellence Star Award Special Citation and Outstanding Historical Display. The East Tennessee Chapter was also awarded the David Levine award for most outstanding chapter in Region VII; that award was accepted by chapter president Jack Hopkins. East Tennessee also came home with the Region 7 Flying Eagle and Eaglet Awards for most participation and miles traveled by Chapter Members and lowest CO2 Emissions while traveling.

2014-2015 ASHRAE RESEARCH FUND CONTRIBUTORS HONOR ROLL OF INVESTORS

Each year, ASHRAE sponsors basic and applied research in many diverse fields to further the HVAC industry. The monies for this research come from concerned individuals and firms dedicated to continuing excellence. Our chapter takes pride in recognizing those who have contributed to this effort from our area over the past year.

$1000 and Above

Ameresco Federal Solutions
East Tennessee Chapter of ASHRAE
Walter Law
John Sealy

$500 to $999

The Trane Company – Knoxville
Hobbs and Associates
McMahan Mechanical
Andrew Myers
Rome Eddleman & Associates Inc. – Knoxville
Rovanco Piping Systems

$250 and Above

Barge Waggoner Sumner and Cannon
Breeding Insulation – Knoxville
Coastal Supply – Knoxville
CH2M Hill
Del-Air Mechanical Contractors
David Dugger
Engert Plumbing & Heating
Engineering Services Group
Facility System Consultants
Ferguson Equipment - Knoxville
James Garner
Hodge Associates
I C Thomasson Assoc
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Gordon Rome
Ryan Roose
Keith Rotan
W Ken Seaman
Ronald Shelton
Steven Sturgeon
Joe Thomas
Thomas Werkema
Jonathan Yeager

Many Thanks to all donors who helped the East Tennessee Chapter exceed it's Research Promotion Fundraising Goal of $19,500 by contributing enough for us to deliver $23,870 in 2015.

Research Projects:

The following is a list of some of last year's projects funded by the research promotion efforts. Over $465,118 in Research Funds are being used by firms and Institutions within Region VII. For a complete listing of funded research projects go to https://www.ashrae.org/standards-research--technology/research

1196-RP
DEVELOP SOFTWARE TO CALCULATE THE APPLICATION SEASONAL EFFICIENCY OF COMMERCIAL SPACE HEATING BOILER SYSTEMS BASED ON ASHRAE STANDARD 155P

Boilers are estimated to account for 42% of space heating energy use in the commercial and multifamily sectors in the U.S. Significant energy savings could be achieved in commercial and multifamily buildings by optimizing the selection of commercial boiler systems in new buildings and at the time of boiler replacement. Currently, however, commercial boilers and all other types of commercial heating equipment are rated only in terms of steady-state efficiency at full load, which does not provide a meaningful indication of relative operating costs.

The objective of this research project is to develop user-friendly windows-based software will greatly accelerate adoption of seasonal efficiency analysis for commercial boiler systems. A significant obstacle to the use of any new standard is the learning curve for users to become familiar with the new terminology and inputs and learn how to do the computations. With this software, the level of effort required of new users of the standard will be dramatically reduced, and can be focused on the more important tasks of evaluating outputs and developing an intuitive sense of the factors that affect the seasonal efficiency of commercial boiler systems.

1284-RP
DEVELOP A STANDARD FOR TESTING AND STATING THE EFFICIENCY OF INDUSTRIAL PULSE CLEANED DUST COLLECTORS

Blue Heaven Technologies, LLC – Louisville KY

Although ASHRAE Standard 52 and RP-671 deal with test methods for evaluation of general ventilation air cleaners, their particulate loading rates are so low that they are not practical to evaluate industrial air cleaning equipment. Further, these test methods do not take into account the automatic cleaning methods that are usually in industrial air cleaners to keep a steady pressure drop,

yet the cleaning action can result in increased emissions. As a result, there is a great need for a performance test procedure that addresses the higher particulate loading, and the wide variety of particulate contaminant types to permit measurement and reporting of the mass emissions and fractional collection of efficiency of industrial air cleaning devices.

1383-RP
DEVELOP A RADIANT SYSTEM MODULE FOR THE SIMULATION AND ANALYSIS OF SPACES AND SYSTEMS

The proposed module will provide the basic algorithm and equations to accurately model whole building radiant energy as it affects comfort, demand for HVAC, and energy use. The module will be demonstrated by coding it as part of a publicly available building energy simulation model (e.g., TRNSYS, DOE-2, EnergyPlus).

This Research Project was completed in March 2014 – A Final Report is available for purchase from ASHRAE .org.

1408-RP
THE EFFECT OF LINING LENGTH ON THE INSERTION LOSS OF ACOUSTICAL DUCT LINER IN SHEET METAL DUCTWORK

The incremental sound attenuation values (expressed in dB/ft and dB/m) for acoustically lined ductwork that are in the ASHRAE Applications Handbook are based on tests conducted on a very small sample of duct sizes, and are misleading in that they permit the assumption that the liner attenuation is linearly proportional to duct length. The proposed research will help TC 2.6 modify the incremental attenuation values to show how they depend on duct length so that air distribution system designers can minimize the use of acoustical duct liner while achieving the necessary noise reduction that it provides.

1455-RP
ADVANCED CONTROL SEQUENCES FOR HVAC SYSTEMS – PHASE I AIR DISTRIBUTION AND TERMINAL SYSTEMS

This research project is intended to be the first of two phases: Phase I: Air Distribution and Terminal Systems and Phase II: Central Plants and Hydronic Systems. This first phase will include developing comprehensive optimized control sequences for the following common air distribution and terminal subsystems: Generic thermal zones, Single zone systems, Variable air volume terminal units, and Variable air volume systems.

Logic diagrams will be developed for the sequences so that the logic is not vague, as is inherent in any written sequence. Sequences will be tested and debugged using simulation. Future research projects will be implemented to test the sequences in real buildings.

Once the research project is complete, the sequences and flow diagrams will be proposed as appendices to Guideline 13 via the addenda process. This will allow them to be publicly reviewed. Including the sequences in Guideline 13 will also allow them to be maintained over time, such as fixing bugs and incorporating new energy saving or diagnostic sequences via addenda, and also provides a good way for them to be disseminated − control sequences and control specifications go hand in hand.

This Research Project was completed in November 2014 – A Final Report is available for purchase from ASHRAE .org.

1467-RP
BALANCING LATENT HEAT LOAD BETWEEN DISPLAY CASES AND STORE COMFORT COOLING

Supermarket energy costs for heating, cooling, dehumidification, and refrigeration are a major store operating cost and often exceed store profits. While most of this cost is associated with maintaining refrigerated conditions for products, much is also spent to maintain suitable environmental conditions in the supermarket sales area. Each of these requirements is inexorably linked to the other. Failure to control store temperature and humidity can cause excessive energy consumption by refrigeration equipment and hamper product marketing due to frost build-up on frozen products and fogging of display cases. Conversely, most of the energy used to operate the refrigeration equipment serves to reduce the building cooling and dehumidification requirements.

The overall objective of this project is to provide a comprehensive assessment of the potential for energy savings in supermarkets by optimized design and operation of the combined HVAC and refrigeration systems. The assessment will include the effects of climate, space temperature and humidity set-point controls, HVAC system type and characteristics, and the design and operation of the refrigerated cases. Furthermore, the project will address the overall layout of HVAC and refrigeration system components in supermarkets, including HVAC zoning, the location of supply and return air, and the overall air distribution patterns in the supermarket.

1478-RP
MEASURING AIR-TIGHTNESS OF MID- AND HIGH-RISE NON-RESIDENTIAL BUILDINGS

The results from this project will be able to help ASHRAE members (including HVAC designers, IAQ consultants, researchers and other professionals) to better design healthy and energy-efficient mid- and high-rise non-residential buildings by better understanding the as-built performance of building envelope materials and designs eventually helping to take the guess work out of the effects of envelope infiltration on system sizing and building design.

In addition, the ASHRAE Presidential Ad Hoc Homeland Security Committee specifically recommended research on test methods for determining building tightness and collection of data on building tightness in its May 2006 memo on CBR Strategies and Information/Methods Gaps. That memo further recommends research on design methods based on building tightness and expected pressures and methods for monitoring and controlling building pressurization, which are expected to be pursued as a separate follow-up project.

This Research Project was completed in September 2014 – A Final Report is available for purchase from ASHRAE .org.

1515-RP
THERMAL AND AIR QUALITY ACCEPTABILITY IN BUILDINGS THAT REDUCE ENERGY BY REDUCING MINIMUM AIRFLOW FROM OVERHEAD DIFFUSERS

Simulations show that reducing zone minimums in a typical office building from 30% to 20% can save \$100/k ft^2-yr in fan, cooling, and reheat energy (approximately a 10% reduction in total energy use). Multiplied across the millions of square feet of commercial space served by VAV boxes, the potential economic and environmental benefits are substantial. Savings can be achieved in new construction and in existing buildings through low cost control system re-programming. The opportunity for savings in existing buildings with minimal financial investments is a particularly exciting application for this work.
Because this study will involve observations across a range of supply air volumes and temperatures, the study will have an additional benefit of providing ASHRAE with detailed information about local thermal discomfort in actual occupied buildings. This can be used to validate some of the local discomfort provisions in Standard 55, which are at present based solely on laboratory studies.

The research could also have far reaching implications in terms of getting changes made to the ASHRAE Handbook, to manufacturers' literature and to the way

engineers calculate minimum flow rates. It will also support proposed changes in Standards 90.1, 62.1 and 55**.**

This Research Project was completed in January 2014 – A Final Report is available for purchase from ASHRAE .org.

1517-RP

VALIDATION OF A LOW-ORDER ACOUSTIC MODEL OF BOILERS AND ITS APPLICATION FOR DIAGNOSING COMBUSTION DRIVEN OSCILLATIONS

Secat, Inc. – Lexington, KY

During the development of higher efficiency, lower emission boilers, tonal noise can be an unacceptable problem. This is caused by oscillations of the flame which result in pressure oscillations in the combustion chamber that are radiated as noise. This occurs whenever the pressure oscillations feed back on the flame, via the mixture supply system, in such a manner that the flame oscillations increase. The interaction of the boiler, burner, and flame is so complex that breaking the circle is best accomplished with the help of a computer model.

The objective of this research is to develop a procedure for quickly and efficiently modeling the acoustic behavior of gas fired heating boilers as a tool for diagnosing the cause of combustion oscillations.

ASHRAE members who would benefit immediately from the proposed research are engineers engaged in the development of high efficiency, low NOx gas fired boilers for residential and small commercial applications. It is expected that the results will also benefit engineers involved in the development of gas fired furnaces and liquid fueled boilers as the demand for lower NOx emissions from those products spreads in the near future. Together, gas and oil burning boilers and furnaces are used to heat the vast majority of homes and small commercial buildings. The ultimate beneficiaries are the owners of buildings in which better heating appliances are to be installed and sustainable low emission solutions are to be provided.

This Research Project was completed in November 2013 – A Final Report is available for purchase from ASHRAE .org.

This Project's Principal Investigator – Limin Zhou was selected by ASHRAE Society to receive the Homer Addams Award

1529-RP
FULL-FREQUENCY NUMERICAL MODELING OF SOUND TRANSMISSION IN AND RADIATION FROM LINED DUCTS

Secat, Inc. – Lexington, KY

The objective of this project is to develop procedures to enable first-principles analytical acoustic models that will ultimately unify all of the empirical data in the handbook -- as well as data from the various research projects upon which they were based -- and extend the results to a wider variety of duct element configurations and frequency ranges. The models will combine the in-duct acoustic attenuation and breakout noise components that are treated separately in the Handbook.

This will be accomplished by applying a combination of Boundary Element Analysis (BEA), Finite Element Analysis (FEA), and Statistical Energy Analysis (SEA) methods (6, 7) to the modeling of acoustical and structural (vibratory) characteristics of various duct systems. The models will employ methods developed in Ref (1), applied to the specific duct configurations of RP-1408, to develop models which include details such as the lining and structural-acoustic coupling. Using SEA techniques, the frequency range of the models will be extended, from the previously investigated "low" range below 1 kHz, to the full 10 kHz range of the test data. In all cases, interior duct Insertion Loss, duct vibration, and duct breakout (exterior) sound power simulation models will be validated against test data obtained in RP-1408.

1535-RP
A HEAT TRANSFER AND FRICTION FACTOR CORRELATION FOR LOW AIR-SIDE REYNOLDS NUMBER APPLICATIONS OF COMPACT HEAT EXCHANGERS"

The objective of this research is to develop airside heat transfer and pressure drop correlations for high performance compact heat exchangers under low air velocity conditions. ASHRAE members who design large refrigerant to air condensers, especially residential A/C and commercial rooftop applications will benefit from this work. Other ASHRAE members who design medium temp (refrigeration) and low temp (freezer) vapor compression systems will be affected, and will benefit even from the development of dry (frost-free) correlations. Automotive heat exchanger manufacturers could also benefit from this work by applying it to automotive condenser at idling conditions. Depending on the region where the automobile is sold, it could spend most of its operating life in the idle condition (i.e. at stop lights and in traffic jams). Heat exchanger manufacturers who supply OEM customers or system manufacturers will also be affected, since larger coils are needed to meet the higher efficiency ratings required in industry. It is

estimated over 50% of the society members could be aided by having such a correlation available for use in their heat exchanger design tools. If lower airflow off peak conditions begin to be regulated more closely, even more members could benefit from this work. After successful completion of the work, such correlations could be implemented by members immediately. Guidance from new convective data at these low airflows will help facilitate more efficient design of optimal louver-fin-pitch for AC system, freezer and refrigeration applications. Having these tools available will enable designers to produce more energy efficient systems and heat exchangers.

1544-RP
ESTABLISHING BENCHMARK LEVELS AND PATTERNS OF COMMERCIAL BUILDING HOT WATER USE

The information available with which designers size and lay-out hot water systems in the commercial sector is antiquated and sadly in need of updating. We also need a better understanding of how people use water in commercial and institutional buildings.

The objective of this project is to obtain measured hot water use in a sampling of significant building types that will enable Table 7 of the Service Water Heating chapter of the ASHRAE Handbook to be revised and updated. High time resolution monitoring of hot water use will enhance the understanding of the diversity (how many uses occur at the same time) of hot water uses by providing data on number, timing and duration of draws, rather than just aggregate water use over long (e.g., day, week, month) periods.

1546-RP
EXPANSION AND UPDATING OF THE AIR DIFFUSION PERFORMANCE INDEX METHOD

Validate the current Tv/L and corresponding ADPI values currently presented in the ASHRAE Handbook. Develop Tv/L and obtainable ADPI values for products not included in the currently literature but currently available in the commercial market. Evaluate the ADPI calculation methodology to recommend an ADPI calculation for spaces in heating mode, and spaces at low loads, to better correlate with the ASHRAE comfort standard. Create an updated database of ADPI values, with the revised ADPI calculation, for overhead mixing heating and cooling systems for a selected range of typical spaces (classrooms, office spaces, restaurants, supermarket, retail spaces) and air outlet types that will be used by mechanical engineers to determine the optimum diffuser selection and spacing for these spaces at today's lower loads. Update the ADPI tables and text presented in the ASHRAE Applications and Fundamentals Handbook. Determine the

values of ADPI that prove compliance to ASHRAE Standard 55's vertical temperature stratification limits, and update the ASHRAE Table.

1550-RP
THERMAL PERFORMANCE OF INSULATING COATINGS ON PIPING AND DUCTWORK

R&D Services – Cookville, TN

Thermal Insulating Coatings are sometimes used to provide thermal insulation for pipes, ducts, and tanks. These materials have been on the market for a number of years and have been defined (Hart 2006) as "a liquid or semi-liquid suitable for application to a surface in a thickness of 30 mils or less per coat, that dries or cures to form a protective finish and provide resistance to heat flow". The ASHRAE Handbook of Fundamentals (Chapter 26) currently contains no information on these coating materials. Manufacturers of these materials, who would normally provide this information, have not done so to date. The objective of this project will be to develop thermal conductivity and surface emittance data for commercially available thermal insulating coatings. The objective of this project will be to develop thermal conductivity and surface emittance data for three representative thermal insulating coating products. Testing of three representative products will give some measure of the variability between products.

This Research Project was completed in June 2013 – A Final Report is available for purchase from ASHRAE .org

1561-RP
PROCEDURES TO ADJUST OBSERVED CLIMATIC DATA FOR REGIONAL OR MESOSCALE CLIMATIC VARIATIONS

Engineers and architects will greatly benefit from the additional techniques as described above. Though we do not know what percentage of ASHRAE members are architects and engineers, the results of this project would certainly impact most design engineers who perform HVAC load and energy estimates on a routine basis in their daily work. Software for mesoscale climate modeling and its documented implementation procedures to estimate climatic information will become available and the benefits will extend well beyond the ASHRAE membership. The tool will benefit all building owners and occupants as indoor comfort will be enhanced and energy savings can be obtained from more accurate calculations.

1564-RP
MEASUREMENT OF OIL RETENTION IN THE MICROCHANNEL HEAT EXCHANGERS

This work will provide essential design data for state-of-art microchannel heat exchangers by showing how much oil is held up, causing the heat transfer performance degradation and additional pressure drops at various operating conditions. This is an excellent opportunity for ASHRAE to provide important design information that has not been clearly answered before and falls in the gap between manufacturers, designers, and installers. This work provides key information that may challenge compressor manufacturers and installers to more carefully measure how much oil to add to systems. This work may also show that over-charging a system with oil is just as bad — or worse — than over-charging a system with refrigerant. While the practice of overcharging systems may seem like a reasonable practice in the field from a durability standpoint, it may actually be a tremendous waste of oil, refrigerant, money and energy.

1581-RP
DEVELOP ALTERNATE GUIDELINES FOR UNITARY AIR CONDITIONER TEST CONFIGURATIONS WHICH CANNOT ADHERE TO ASHRAE 37/ASHRAE 116 SPECIFIED DUCT DIMENSIONS AND EXTERNAL PRESSURE TAP LOCATIONS

As HVAC indoor equipment continues to grow to meet the efficiency demands of the consumer the ability of the test lab to produce accurate and repeatable data will be strained. The current state of the art has exceeded the ability of many test lab facilities to test per the standards. Perfectly good equipment could fail audit tests as a result of not using the correct ASHRAE geometry. A high efficiency design may be rated significantly below its actual capability because the ASHRAE geometry is not adhered to by the manufacture. Both of these cases are unacceptable in a competitive market place.
The objective of this project is to experientially develop standardized geometry that will be utilized by laboratories when necessary to test unitary air-conditioning equipment in configurations that deviate from ASHRAE specified duct dimensions and external pressure tap measurement locations. This geometry will need to produce static pressure measurements that are within 5% of what standard ASHRAE duct design produces.

This Research Project was completed in October 2013 – A Final Report is available for purchase from ASHRAE .org.

1587-RP
CONTROL LOOP PERFORMANCE ASSESSMENT

University of Alabama

Fair, objective methods to evaluate loop performance will encourage new technologies (e.g. auto-tuning, fuzzy logic, model-based, model-free, neural networks, pattern recognition) to come forward and be compared to each other and to conventional PID loops on a level field. In this way ASHRAE can help move closed loop control forward without favoring any one technology.

1592-RP
CHP DESIGN GUIDE - UPDATE TO THE COGENERATION DESIGN GUIDE (1996)

The objective of this project is to update the Cogeneration Design Guide, which was written by Joe Orlando under ASHRAE Research Project 737-RP and published in 1996. The new design guide, re-titled "CHP Design Guide" will contain information on the emerging industry trends and new technologies in the CHP area and will expand on and update the materials within the current edition. This project is to be completed in three phases: (1) reviewing literature and collecting data within a wide field, including the studies made by ASHRAE TRG 4 - Sustainable Building Guidance and Metrics (SBGM) - and other committees focused on carbon emissions, building metrics, and sustainability, and making a re-collection of all such materials, complete with proper links and associative algorithms, (2) revising the manuscript and incorporating the comments from the voting members of the participating TCs and other experts in the field, and (3) reporting the results to the ASHRAE membership.

1600-RP
METHODS TO INCREASE MAXIMUM VELOCITY OF MAKEUP AIR FOR ATRIUM SMOKE CONTROL - CFD STUDY

Specifically, the proposed research would more thoroughly investigate the effects on the fire and smoke layer when makeup air is supplied below the limiting elevation of the fire, with the expectation that makeup air could be supplied in this region at velocities greater than the current limits. Design tools (equations, graphs, models, etc.) that help designers determine the effect of makeup air velocity and elevation on smoke layer height shall also be developed. If these design tools are to be accepted for use in guidelines and standards, they will need to be validated against full-scale experimental results.

The main objective of this project is to develop tools that can be used by smoke control system designers to create make-up air systems that supply air at a velocity greater than 200 fpm (1 m/s) at the supply grille while maintaining safe conditions in exit pathways within the atrium.

1606-RP
LABORATORY TESTING OF FLAT OVAL TRANSITIONS TO DETERMINE LOSS COEFFICIENTS

More reliable data and/or a large database of fitting loss coefficients will help ASHRAE members and others to better design ductwork for their clients, enabling more accurate pressure drop calculations and less safety factor. This will allow fans to be sized properly, reducing energy consumption and wasted material. It should also generate an increase in sales for the ASHRAE Duct Fitting Database.

The objective of this research is to test flat oval transition fittings to determine their total pressure loss coefficients, and update the ASHRAE Duct Fitting Database (2009). The tests are to be conducted in compliance with ANSI/ASHRAE Standard 120-2008, "Method of Testing to Determine Flow Resistance of HVAC Ducts and Fittings", except (1) the flow measuring station velocity shall not exceed 1.5 m/s (300 fpm), and (2) the entrance duct length to the test fitting shall be increased from 10 hydraulic diameters to 12 diameters.

This Research Project was completed in June 2014 – A Final Report is available for purchase from ASHRAE .org

1607-RP
DESIGN AND UTILIZATION OF THERMAL ENERGY STORAGE TO INCREASE THE ABILITY OF POWER SYSTEMS TO SUPPORT RENEWABLE ENERGY RESOURCES

The principal goals of the research are to: Identify the additional value propositions TES provides for buildings, campuses (or micro-grids), and power systems that have large penetrations of as-available renewable energy. Develop a methodology to evaluate those value propositions. Quantify the magnitude of these value propositions for selected case studies constructed using actual utility data, weather data (wind and irradiance), and building load profile data. Relate the value propositions to the design (capacity and response rate) and operating parameters and dispatch strategy of TES systems, in order to begin to formulate a TES design procedure that optimizes the operational capabilities of the TES to compensate for the as-available nature of the renewable energy resources.

1608-RP

DEVELOPMENT OF A LOAD-BASED METHOD OF TEST FOR LIGHT COMMERCIAL UNITARY HVAC

Ultimately the goal is to develop a testing and performance projection procedure for unitary HVAC equipment operating as a system with accessories or control strategies to determine the performance in terms of return air to supply air temperature and enthalpy difference vs. system energy input. This research proposal only deals with the first phase (Phase 1) of a RSP development effort, with future phases needed to develop the method for projecting annual energy use based upon testing results. The objective of this work statement is to develop and validate a preliminary method of test for unitary systems at a constant load condition using an environmental lab; resulting in a preliminary method of test. If successful, this preliminary or preliminary method of test could form the proof of concept for development of a final method of test through the ASHRAE consensus process.

1609-RP

DEFINING THE CAPABILITIES, NEEDS AND CURRENT LIMITATIONS OF BUILDING INFORMATION MODELING (BIM) IN OPERATIONS AND MAINTENANCE FOR HVAC&R

As the use of BIM technologies gains momentum across the industry, ASHRAE members, including mechanical system design engineers, product vendors, software developers, controls engineers, commissioning authorities, facility managers, researchers and academic instructors will all be impacted by BIM. ASHRAE seeks to meet the needs of ASHRAE members and the HVAC design, installation and operations_communities by "committing the resources and developing specific goals to establish comprehensive, consistent HVAC&R terminology, data dictionaries, rule sets, and schema for its Handbooks, Standards and Guidelines to support the HVAC&R and building industry" (ASHRAE 2009). Given the $10.5 billion cited as potential savings in the NIST interoperability study (Gallaher et al. 2004) improvements in interoperability are likely to have a continual and quantifiable impact across a large cross-section of ASHRAE and its partner organizations.

1616-RP
REVISE LOAD CALCULATION APPLICATIONS MANUAL (2009)

The objective of the project is to revise the Load Calculations Application Manual, 1st edition to produce a second edition. The second edition will: Incorporate results from recently completed ASHRAE research projects RP-1453, RP-1363, RP-1311 and RP-1362. Consider incorporating results from ASHRAE research projects RP-1482 and RP-1416, due to be completed in 2010 and 2011 respectively, if completed in time and if they provide relevant data for the Manual. Update the example problems to utilize floor plan and construction data for the renovated ASHRAE HQ building. Update the software spreadsheets included with the manual to incorporate the new load calculation procedures. Produce separate IP units and SI Units versions of the manual.

1629-RP

TESTING AND MODELING ENERGY PERFORMANCE OF ACTIVE CHILLED BEAM SYSTEMS

Quantifying the operational performance of active chilled beams and the resulting sensible cooling capacity is necessary to correctly design, model or implement this equipment as part of building mechanical systems. Energy modeling software packages include chilled beam models, but no published data exist that document the range of accuracy achieved for these components.

The results of the project will provide a detailed assessment of the simulation capabilities of building energy simulation programs to predict the performance of active chilled beams and the resulting system performance of net-zero energy design strategies. Recommended modeling improvements will be available for program developers to implement in their respective energy simulation programs.

1646-RP
MEASUREMENTS OF PIPE INSULATION THERMAL CONDUCTIVITY

The overall objective of the proposed research is to measure the actual thermal conductivity of pipe insulation systems at below ambient temperature in both dry non-condensing and wet condensing conditions with moisture ingress into the insulation. The specific objectives are summarized as follows: 1) To experimentally measure the actual thermal conductivity of six (6) pipe insulation systems in a range of insulation temperature at below-ambient temperature and in dry (non-condensing) conditions 2) To experimentally measure the thermal conductivity of six (6) pipe insulation systems at below ambient temperature and

in wet condensing conditions, in which moisture ingress is allowed into the pipe insulation. 3) To experimentally determine the amount of moisture absorbed in the pipe insulation systems during the wet tests. Any external jacketing systems will be removed to expose maximum surface to the ambient and accelerate the moisture ingress and absorption process in the insulation 4) To estimate the time to drip, defined as the time at which water droplets visibly drip from the wet pipe insulation onto the building floor, for the six (6) pipe insulation systems in true as-installed operating conditions 5) To provide data of the impact of moisture ingress on the thermal conductivity of pipe insulation systems and develop guidelines on how to take into account the effect of moisture ingress on the variation of thermal conductivity in true as-installed pipe insulation systems. The insulation systems will be applied to 3 inch Nominal Pipe Size (NPS) diameter with exterior surface temperature of 40°F (4.5°C). The samples of the pipe insulation systems will have dimensions from 2 ft to 4 ft (0.6 to 1.2m) in length and from 1 to 2 inches (2.5 to 5 cm) in nominal wall thickness. The thermal conductivity of the pipe insulation systems will be measured for average insulation temperature ranging from 55 to 73°F(13 to 23°C), that is, cold surface side of 40°F (4.5°C) and hot surface side from 70°F to 104°F (22 to 40°C). The thermal conductivity of the insulation will be measured in both dry and wet (condensing) conditions.

1674-RP

RESEARCH TO SUPPORT THE REVISION TO GROUND SOURCE HEAT PUMPS: DESIGN OF GEOTHERMAL SYSTEMS FOR COMMERCIAL AND INSTITUTIONAL BUILDINGS (ASHRAE, 1997)

Energy Information Services – Northport, AL

The objective of this project is to gather updated information from recent ASHRAE research, conduct research in critical areas not adequately addressed (detailed field studies and cost optimization methods), integrate revised industry standards, and identify equipment and technology advances so that the updated GSHP text will be relevant and useful to the industry. Eight existing chapters and eight appendices will be revised. A new chapter on site characterization and an appendix, "Hydro-geological primer for engineers" will be added as requested by ASHRAE Special Publications.

This Research Project was completed in January 2015