ASHRAE Fort Worth Chapter

The Therm

FORT WORTH

January 14, 2013: Vol. 55, No. 05

Produced by: Tony Finch
Chapter Newsletter Editor/ Chairman

The Therm, is a monthly Newsletter for chapter members and HVAC&R professionals alike, that provides information about the Fort Worth Chapter of ASHRAE.

President's Message

Happy New Year!

I hope and trust many of you enjoyed a great new year and look forward to creating one.

To begin the year we are excited to welcome: a 25 year HVAC veteran: Bill England to teach us how to "Master Variable Flow". We are fortunate enough that Bill has offered to teach a technical seminar in the morning (from 8-11 at the petroleum club), as well.

At the end of this month, we have a great opportunity to connect with ASHRAE when the ASHRAE / AHR Show arrives in Dallas. Hopefully, everyone is looking to attend and participate in some way.

This year both the Dallas and Fort Worth chapters have continued their support of the North Texas Future Cities competition which will be held in the coming weeks at UTA. Both chapters have donated money to be used for special awards celebrating unique designs of Future Cities.

Next month we look forward to a seminar on how to lay out VRF systems while keeping installation in mind.

We hope to see everyone at our next meeting.

Take care,

Daniel C. Merkel
Fort Worth Chapter of ASHRAE – President

Next Chapter Meeting

Jan 16, 2013

8:00 A.M.
Achieving Total Flow Control In Hydronic Systems

11:30 A.M.
Mastering Variable Flow

Carter::Burgess Plaza
777 Main St.
40th Floor
Fort Worth, TX

Click here for map.

December Program – December 19, 2012

CLICK HERE TO CONTRIBUTE!

3 Hour Seminar

Date: January 16, 2013
Time: 8:00 a.m. – 11:00 a.m.
Location: Carter Burgess Plaza Petroleum Club – 40th Floor
Downtown Fort Worth, 777 Main St., Fort Worth, TX 76102
Topic: Achieving Total Flow Control in Hydronic Systems
Cost: $10 per person and only $5 per person if you attend the luncheon meeting as well. Student members are allowed to attend for free. Breakfast pastries, juice, and coffee will be provided.

Luncheon Meeting

Date: January 16, 2013
Time: 11:30 a.m. – 1:00 p.m.
Location: Carter Burgess Plaza Petroleum Club – 40th Floor
Downtown Fort Worth, 777 Main St., Fort Worth, TX 76102
Topic: Mastering Variable Flow
Cost: $25 which includes lunch and dessert.

Speaker Info:

Bill England
Hydronic Training Manager
Flow Design, Inc.
469-487-9813 (M)
www.flowdesign.com
An **IMI** Company

Speaker Bio:

Bill England is the 'National Hydronics Training Manager' for Flow Design Inc., a manufacturer that provides Hydronic HVAC Automatic and Manual Balancing Valves, Pre-assembled Coil Piping Hookups, Differential Pressure Controllers, Piping Components & Accessories as well as Hydronic Knowledge and Systems Support through training and seminars.

He has been active in the HVAC industry for over 25 years, specifically concentrating on hydronic flow control for over 18 years. He has conducted engineering seminars for various organizations such as NEBB and ASHRAE on many subjects including hydronic balancing and pressure independent systems.

Bill is a graduate of Drexel University in Philadelphia with a Bachelors in Electrical Engineering and an MBA from the University of Baltimore. He is an active member of ASHRAE.

December Meeting Minutes – Board of Governors

Call to Order by Tony Finch at 10:40 am

Members in attendance – Tony Finch, Keith Woodlee, Bill Lueg, Jay Sullivan, Richard Watters, David Muzzy, Clif Upham, Ian Bost, Richard Long, Cody Pace

President

- Volunteering for the annual ASHRAE meeting in January is full
- The Chapter will donate $100 for the Future Cities completion
  - JS made a motion to approve the donation, RL 2nd, motion passes

Officer Reports

President-Elect (Finch)

- Winter Party will not take place this year because ASHRAE is in Dallas
- ASHRAE YEA will consider hosting a happy hour during the conference for member in attendance. JS will look for places, will host from 4-6 for any interested parties

Secretary (Sullivan)

- Roster will be complete by January meeting
- Sponsorship letters will go out the week of 12/31/12
- The chapter will make 25 hard copies, 11 for Golden Gavel and 14 for any other members interested

Treasurer (Upham)

- $240 was sent to the national chapter for UTA student members

BOG At-Large (Watters, Maryak, Muzzy, Long)

- The chapter will attend a joint meeting in March with Association of Energy Engineers somewhere on TCU campus
- The March presenter may need to be rescheduled

Committee Chairman Reports

CTTC (Schroeder)

- Nothing to report

Historian (Brunkenhoefer)

- Nothing to report

Honors & Awards (Akers)

- Nothing to report

Membership Promotion (Woodlee)

- We will host a MP meeting with free lunch for any bringing guests
- KW will also take suggestions from anyone who knows of any other event that may help boost membership

Refrigeration (Lueg)

- There are no Distinguished Lecturer's available for the refrigeration presentation
- We will research a potential refrigeration site visit for the spring
- Any interested refrigeration vendors will be contacted to help on the committee. JS will ask Joe Baerksi if any IR refrigeration folks would be interested.
- A refrigeration tab was added to the website

Research Promotion (Watters)

- Nothing to report

Special Events (Rath)

- There are 2 outstanding checks from the golf tournament.
- We are looking at options for the spring tournament – Timarron, again? Tribute?

December Meeting Minutes – Board of Governors (cont.)

Student Activities (Bost)

- Future Cities donation was made.
- Dan Merkel will judge the competition
- Nick Schroeder gave students a tour of the lab building at UTA

Webmaster (Pace)

- Refrigeration tab will be added to the website

Government Affairs (Merkel/Long)

- The committee met with the Better Buildings Challenge people at a public event at Lockheed.
- Lockheed and City of Fort Worth signed the initiative and a press release was created

Outreach (Harris)

- Contact has been made with the AEE. See above.

Old Business

- A membership promotion will be held in the spring. Date TBD depending on AEE joint meeting date

New Business

- Nothing to report.

Closing - Motion to close – JS, 2nd - CP

December Meeting Minutes – General Business

Call to Order – Self introductions

- 43 members in attendance

Old Business

- Roster Sponsorship spots are still available. Look for an email near Jan 1.

New Business

- Approve Meeting Minutes for last month – Akers motion, Muzzy 2nd, approved

Program

- Introduce Speaker

Speaker Info.

Christian Hagensen, MBA
National Sales Manager

Christian has been associated with the ENEVEX group of companies since 1998.

He has worked in most facets of the company, including administration, as a manufacturer's representative, and now as part of the management team. He has worked as a sales representative for United Energy Products in Crofton, MD - a manufacturer's representative of venting systems and boilers - and started ENERVEX's branch office in Chicago, which he turned into a major player in Chicagoland.

Christian has extensive experience working with owners, architects, engineers, and contractors in the design and construction of buildings, both domestically and internationally. He has been an active member for both the national chapters of ASHRAE and the USGBC, as well as the local chapters in Chicago, IL.

Christian holds a BA in Management from Georgia State University and an MBA degree from DePaul University, Chicago, with concentrations in Entrepreneurship and Strategy, Execution, & Valuation.

December Meeting Minutes – General Business (cont.(

Presentation Outline

1. Understand the benefit of Demand Controlled Ventilation systems to promote low-energy installations.
2. Introduce comprehensive exhaust and venting systems solutions to meet the owners and architects' demand to building aesthetics, safety and efficient use of space.
3. Introduce energy saving calculations based on certified field studies allowing for LEED qualifying points.
4. Introduce an approved and listed system for a single venting system that accommodates multiple fireplaces in multi-story apartments and condominiums.
5. Show how DCV systems can enhance property value through space savings and energy savings**.**

Closing

- Next meeting is January in the same location.
- Please fill out speaker evaluation forms.

Treasurer's Report – Clif Upham

STARTING BALANCE DATE	12/1/2012
NEW BALANCE DATE	12/26/2012

Treasurer's Report	*Clif Upham*	
Financial Data:		
Starting Balance (12/1/12):		**$ 13,592.28**
Deposits:		
12/4/2012 - Johnson Controls ASHRAE Golf Tournament Fee	$	650.00
12/20/2012 - Deposit from Square for December Luncheon	$	145.86
12/21/2012 - Deposit from December Luncheon Fees	$	675.00
Subtotal:	**$**	**1,470.86**
Payments:		
12/19/12 - Check #5305 to ASHRAE for UTA Student Memberships	$	240.00
12/19/12 - Check #5306 to Future Cities for Design Competition	$	100.00
12/19/12 - Check #5307 to Petroleum Club of Fort Worth for December Luncheon	$	902.67
12/19/12 - Check #5308 to Petroleum Club of Fort Worth for October Parking	$	107.50
12/19/12 - Check #5309 to ASHRAE for UTA Student Memberships		$40.00
Subtotal:	**$**	**1,390.17**
New Balance as of 12/26/12:		**$ 13,672.97**

HVAC Design: Level I — Essentials Training Coming to the AHR Expo

HVAC Design: Level I—Essentials

ASHRAE's *HVAC Design: Level I — Essentials* training provides intensive, practical education ideal for recent technology or engineering school graduates, engineers new to the HVAC field, those who need a refresher in new technologies, and facility managers, sales representatives and others who need to gain an understanding of HVAC systems.

In three days, gain practical skills and knowledge in designing, installing and maintaining HVAC systems that can be put to immediate use. The training provides real-world examples of HVAC systems, including calculations of heating and cooling loads, ventilation and diffuser selection using the newly renovated ASHRAE Headquarters building as a living lab. Engineered drawings of the ASHRAE Headquarters renovations will be incorporated to expose attendees to plan reading and a graphical understanding of system design.

Training Topics:

- Fundamentals
- Heating/Cooling Load Calculation
- System Selections
- Common System and Components
- Cooling System
- Basic Design of Hydronic Systems
- Basic Design of Air Systems
- Control/BAS Commissioning
- Sustainable Design
- Project Management and Other Soft Skills
- Introduction to Technical Sales

Register here

HVAC Design: Level I — Essentials

When: January 30–February 1, 2013

Where: Crowne Plaza Dallas Market Center 7050 Stemmons Fwy, Dallas, TX 75247

Cost:$1,239 (ASHRAE Member: $989)

Company Discount: Enroll 3 or more participants from the same company at the same time and save.

BONUS! FREE copy of The Green Standard and User's Manual. A $200 value.

Is Moisture an Unwanted "Occupant" In Your Building? ASHRAE Seminar Shares How to Remove it.

No designer wants to see the unwelcome guests of mold and mildew show up in their building. Guidance on how to prevent moisture that causes their appearance is offered in several sessions at ASHRAE's 2013 Winter Conference in Dallas.

"Sooner or later, HVAC professionals throughout Texas and the Gulf Coast come up against the problem of preventing or getting rid of mold," Lew Harriman, a speaker at the Conference and author of ASHRAE's "ASHRAE Guide for Buildings in Hot and Humid Climates," said. "In June 2012, the ASHRAE Board of Directors approved a totally revised and updated Position Document on Indoor Mold and Dampness in Buildings. The Dallas Conference includes a comprehensive briefing on what ASHRAE experts have found to be the HVAC-related causes of mold in buildings, and what owners, contractors and designers can do to prevent the problem."

The 2013 Winter Conference takes place Jan. 26-30 at the Sheraton Dallas. To register and for complete Conference information, visit www.ashrae.org/dallas. The International Air-Conditioning, Heating, Refrigerating Expo, held in conjunction with the Winter Conference, will run Jan. 28-30. The Expo, www.ahrexpo.com, is held at the Dallas Convention Center.

The technical program features more than 200 sessions addressing energy conservation; facility management: operations, technology and energy improvements; large building design; standards, guidelines and codes; HVAC&R systems and equipment; HVAC&R fundamentals and applications; and refrigeration. The full Technical Program offers the opportunity to earn a year's worth of PDHs, NY PDHs, AIA LUs and LEED AP credits and runs Jan. 27-30.

A seminar, Diagnosing and Fixing Building Moisture Problems – Case Histories from Hot and Humid Climates, takes place 8-9:30 .m. Sunday, Jan. 27.

Moisture and humidity problems are often a complex mixture of decisions made by different professionals at different times about HVAC systems, architecture and building operations. Untangling the causes of problems and planning solutions requires understanding of the typical interactions between the building and its HVAC systems plus an appreciation of the practical aspects of operating buildings with limited budgets.

Case histories presented in this seminar can help building owners and facility managers avoid classic moisture problems and solve them when they occur.

Speakers and presentations are:
•Diagnosing and Fixing a Major Mold Growth Problem in a Health Clinic, Lew Harriman, Mason Grant, Portsmouth, N.H.
•The Unintended Consequences of the New International Green Construction Code on HVAC and Mold Problems in Humid Climates, George Dubose, Liberty Building Forensics Group, Zellwood, Fla.
•Sources and Solutions of Classic Moisture Problems—Lessons Learned in Hot and Humid Climates, Raoul A. Webb, P.E., ENVIRON International Corp., Tampa, Fla.

A seminar, "Moisture Control in Commissioning of New and Existing Buildings," takes place 11 a.m.-12:30 p.m., Sunday, Jan. 27. Moisture control in the commissioning process is based on project requirements for moisture problem avoidance, building assessment, field testing, and building science. This seminar focuses on the interaction of building systems that affect moisture in buildings and demonstrates important lessons learned by use of case studies.
•Providing Moisture Control Solutions in Building Commissioning, Donald Snell and George Dubose, Liberty Building Forensics Group, Zellwood, Fla.
•The Art and Science of Building Enclosure Commissioning, Fiona Aldous, Wiss, Janney, Elstner Associates, Inc., Irving, Texas.

A seminar, ASHRAE Position on Limiting Indoor Mold and Dampness in Buildings, Unvented Combustion Devices and Indoor Air Quality: Review of Three Recently Published ASHRAE Position Documents, takes place from 11 a.m.-12:30 p.m., Wednesday, Jan. 30.

The seminar reviews three recently published Position Documents from ASHRAE, including "Limiting Indoor Mold and Dampness in Buildings." The paper describes 64 specific decisions that have been observed to either minimize or increase the risks associated with indoor moisture accumulation.
•The Revised ASHRAE Position Document on Limiting Indoor Mold and Dampness in Buildings, Lew Harriman, Mason Grant, Portsmouth, N.H.
•ASHRAE Position Document on Unvented Combustion Devices, Paul W. Francisco, University of Illinois, Champaign, Ill.
•ASHRAE Position Document on Indoor Air Quality, Chandra Sekhar, Singapore.

Chiller Efficiency Improvements Proposed for Standard 90.1

Chiller efficiencies for air and water cooled chillers would be boosted to more than 20 percent under a proposed addendum to the ASHRAE/IES energy standard.

Proposed addendum ch to ANSI/ASHRAE/IES Standard 90.1-2010, Energy Standard for Buildings Except Low-Rise Residential Buildings, changes the requirements for air and water cooled chillers as defined in section 6.4.2.1 and the efficiency requirements listed in table 6.8.1C. This change is a continuation of the efficiency improvements that were implemented in 2010 by further improving the efficiency requirements, according to Dick Lord, a member of the committee who developed the proposal through a working team of the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) chiller section.

Addendum ch is open for public review from Nov. 30, 2012-Jan. 14, 2013. For more information, visit www.ashrae.org/publicreviews.

In 2010, a Path B was added to the standard for part load intensive water cooled chillers. Proposed addendum ch would expand Path B by adding requirements to include air cooled chillers. Also as part of this change, efforts were made to bring the efficiency requirements for water cooled positive displacement and centrifugal chillers together while considering the available technology, and to chillers to be applied at other application conditions where one technology may better suited than the other. If approved, the new efficiency requirements would go into effect on Jan. 1, 2015.

The proposed efficiency requirements in addendum ch increase annual energy savings to 23.1 percent vs. Standard 90.1-2004 and 8.3 percent vs. Standard 90.1-2010. In 2010, the overall weighted average savings resulted in a 16.2 percent improvement in chiller annualized energy use vs. Standard 90.1-2004.

Lord noted the average payback was calculated at 6.3 years, given some units that exceed the scalar limits. Chiller manufacturers are aware of this and know that redesign and cost reduction will be required, but do support the proposal, he said. Lord also noted that we are reaching maximum technological limits at a component level and that in the future the industry will have to look at the full HVAC system for further improvements. AHRI is in the process of forming a new working group to address systems approaches for efficiency improvements and will work closely with Standard 90.1.

In addition, improvements also were made to the requirements to clarify their use. AHRI has recently updated the AHRI 550/590 rating standard that is used for the rating of chillers and its certification program. As part of this effort, AHRI developed a hard metric standard with slightly different rating conditions than the inch pound (I-P) ratings and have released it as AHRI 551/591. For the International System of Units (SI) rating, the change was reflected in the ratings as well as revising the reference to the AHRI rating standard to include AHRI 551/591.

The Standard 90.1 committee also opted to exclude chillers when the leaving condensing temperatures are greater than 115F from the equipment efficiency requirements of Table 6.8.1C. This proposed clarification stems from the fact that high-lift, heat reclaim chiller applications often use a different compressor and sometimes a different refrigerant. The intention of using heat reclaim chillers is to increase system efficiency, but the effect on overall system efficiency cannot be assessed at standard cooling design conditions, Lord said. AHRI is developing rating requirements, test procedures and certification for heat reclaim chillers as well as heat pump chillers.

Also open for public comment from Nov. 30-Jan. 14 is addendum aq that makes minor changes to improve clarity and to address issues identified in sections 6.5.1.3.a and 6.5.3.2.1.

In addition, 15 proposed addenda also are open for public review from Nov. 30 until Dec. 30. They are:
•Addendum bs reduces occupancy threshold for demand controlled ventilation from greater than 40 people per 1000 ft2 to equal to or greater than 25 people per 1000 ft2 with exemptions for certain occupancies.
•Addendum ca requires that vestibule heating be locked out when outside air is above 45F, the same temperature that lockout of freeze protection or ice melting systems is required in section 6.4.3.8.
•Addendum cb to removes the 10,000 cfm threshold for optimum start and adds a threshold for systems controlled by DDC. The addendum also expands the requirement beyond air-based systems so that convectors and radiant systems would be included.
•Addendum cc adds minimum efficiencies for both axial and centrifugal fan evaporative condensers with R-507A as the test fluid to Table 6.8.1G.
•Addendum cd clarifies what to do with piping system accessories that are not in series with the piping circuit that do not have the same heat losses/gains and pressure drop
•Addendum ce establishes package single zone systems as the baseline HVAC system type for all retail occupancies of two stories and less.
•Addendum cf enables the establishment of a window-to-wall ration for retail strip mall buildings.
•Addendum ck requires the use of dual maximum control for variable air volume zone control when the building has DDC controls.

Chiller Efficiency Improvements Proposed for Standard 90.1 (cont.)

•Addendum cl updates the IEER values for air-cooled and water-cooled air conditioners and heat pumps above 65,000 Btu/h. Depending on the cooling capacity and product classes, the new IEERs are between 7 and 13 percent better than the values they are replacing. The new IEERs will become effective on Jan. 1, 2016. Note the IEER is a new metric that was developed by AHRI and first implemented in the 2010 standard and is a better representation of the annualized refrigeration system energy use of a typical commercial packaged air conditioner.
•Addendum cn allows laboratory designs that incorporate strategies to reduce peak airflows and minimum unoccupied airflows to document energy savings associated with reduced outside air volumes.
•Addendum co modifies the Lighting Power Densities in Table 9.5.1 to match the recommended light levels in the 10th Edition of the IES Lighting Handbook.
•Addendum cp corrects a value in table 5-5 for steel joist floors.
•Addendum cr modifies Table 9.6.1 to correct the required light levels for hospital corridors, assisted living dining spaces and retail sales spaces.
•Addendum an allows the option to use energy rates either from actual local rates or EIA state data, where approved by the building official when using Appendix C.
•Addendum ar corrects the definitions for walk-in coolers and walk-in freezers.

Standard for High Performance Green Health Care Facilities Open for Public Review

A prescription for the design, construction and operation of high performance health care facilities would be provided through a proposed standard from ASHRAE and the American Society for Healthcare Engineering (ASHE).

ASHRAE/ASHE Standard 189.3P, Standard for the Design, Construction and Operation of Sustainable High-Performance Health Care Facilities is open for public comment from Dec. 7, 2012-Jan. 21, 2013. Visit www.ashrae.org/publicreviews for more information.

“Healthcare facilities are often the largest and most energy intensive buildings in a community,” Standard 189.3 committee chair Michael Sheerin said. “In today’s competitive and regulated market, these facilities are challenged to provide capital for increasingly complex new buildings that meet sustainability objectives as they experience decreasing finances for life-sustaining services. In addition, health care facilities are home to services that require energy use for patient safety.”

Proposed Standard 189.3 would help facilities in meeting those multiple needs by providing the procedures, methods and documentation requirements for the design, construction and operation of high performance sustainable health care buildings. It would apply to patient care areas and related support areas within health care facilities, including hospitals, nursing homes and licensed outpatient facilities.

The standard covers key topical areas of site sustainability, water use efficiency, energy efficiency, indoor environmental quality and the building’s impact on the atmosphere, materials and resources. Additionally the standard has a special section to address the emissions, effluents and pollution that is commonly discharged from these facilities.

Proposed Standard 189.3 provides guidance to achieve improved energy efficiency for the selection of materials and furnishings and for utilizing green facility operating processes.

The standard builds upon the guidance for creating high performance buildings addressed in a parallel standard, ANSI/ASHRAE/USGBC/IES Standard 189.1, Standard for the Design of High-Performance, Green Buildings Except Low-Rise Residential Buildings, while accommodating the unique factors that impact health care facilities.

Specific ventilation requirements for health care facilities are addressed in ANSI/ASHRAE/ASHE Standard 170, Ventilation of Health Care Facilities.

ASHRAE Seeks Input on Revision to Data Centers in 90.1 Energy Standard Scope

Addendum cs to ANSI/ASHRAE/IES Standard 90.1-2010, Energy Standard for Buildings Except Low-Rise Residential Buildings, is open for advisory public review from Jan. 4-Feb. 3, 2013. The addendum proposes changes to definitions for computer rooms and data centers in Standard 90.1 to create a distinction between facilities covered by 90.1 and those which are intended to be under the scope of ASHRAE Standard 90.4P, Energy Standard for Data Centers and Telecommunications Buildings, proposed by ASHRAE in late 2012.

The definition proposed for computer rooms more closely aligns with ASHRAE Standard 100, Energy Efficiency in Existing Buildings, and the U.S. Energy Information Administration's Commercial Building Energy Consumption Survey (CBECS). In addition, the definition is consistent with Uptime Institutes' "Tier Standard: Topology" and the Telecommunications Industry Association ANSI/TIA-942 class rating for low-risk Tier I data centers. High risk data centers such as those designed as Tier II or greater per ANSI/TIA942 or ones with mechanical cooling system redundancy are expected to be covered by the 90.4P standard now under development.

Steve Skalko, chair of the Standard 90.1 committee, said with the development of Standard 90.4P feedback is needed from the industry to clarify the scope and definitions of each standard. Energy conservation requirements for high risk data centers, initially covered by Standard 90.1-2010, are expected to be detailed in the 90.4P standard. Computer rooms, which can include low-risk data centers, would remain under the scope of Standard 90.1.

"The costs and approaches used in determining appropriate HVAC applications used to achieve energy efficiency are different," he said.

Computer rooms, which by the proposed definitions include low-risk data centers, are usually associated with electronic equipment spaces that are not considered risks and therefore money is typically not spent to install levels of component and systems redundancies. Computer rooms may be ancillary functions and add loads in a larger building and often are served from the same central cooling plants.

Computer rooms are designed to provide local data processing and information storage for in-house end users and clients, which the owner has deemed very low risk. Risk choices are made to reduce total life cycle costs associated with not only system selection and operation, but potential failures, business interruptions, continuity plans and overall company specific business model features like staffing requirements, according to Skalko.

By comparison, data centers designed as Tier II or greater per ANSI/TIA942 or ones with mechanical cooling system redundancy carry more risk, he said. Industry studies indicate downtime associated with such risk can cost tens of thousands of dollars a minute, with the potential to negate both past energy savings and future business viability in a single act. The demand for data centers has grown, as the electronic equipment needs have evolved with the huge demand for data processing services and storage in the age of digital devices.

A data center has the function to support the electronic equipment that commonly provides services to outside or external clients, hence the heightened awareness of risk and risk mitigation approaches employed. Data centers can support everything from an individual enterprise all the way to hosting services on the internet and must provide maximum operational run time on a 24-7 basis. These facilities are built with multiple levels of component redundancy, providing at least an N+1 mechanical cooling capacity redundancy, if not greater, as well as operational resiliency (increased staffing hours and expertise), Skalko said.

To comment or to learn more, visit www.ashrae.org/publicreviews.

Chapter Officers and Committee Chairs

OFFICERS

President	Daniel C. Merkel	414-807-0204	daniel.merkel@mail.ashrae.org
President-Elect	Tony Finch	817-656-6076	tonyfinch@mail.ashrae.org
Secretary	Jay Sullivan	817-805-0020	jay.sullivan@mail.ashrae.org
Treasurer	Clif Upham	214-483-5000	clif.upham@engineeredair.com
Governor	David Muzzy	817-257-4928	d.muzzy@tcu.edu
Governor	Richard Watters	817-338-1277	richard.watters@mail.ashrae.org
Governor	Richard Long	817-354-2898	RLL@summitmep.com
Governor	John Maryak	817-838-7400	john.maryak@texasairsystems.com

COMMITTEE CHAIRS

Audit	Phil Farco	817-267-8651	phil_farco@mason-dallas.com
Chapter Technology Transfer	Nick Schroeder	817-272-9075	nschroeder@uta.edu
Historian	Travis Brunkenhoefer	817-793-2325	travis.brunkenhoefer@texasairsystems.com
Honors and Awards	Larry Akers	817-336-0543	lakers@fribergassociates.com
Newsletter	Tony Finch	817-656-6076	tonyfinch@mail.ashrae.org
Membership	Keith Woodless	817-416-2881	keithw@encoremechanical.com
Refrigeration	Bill Lueg	817-296-8883	wblueg@me.com
Research Promotion	Richard Watters	817-338-1277	richard.watters@mail.ashrae.org
CRC	Patty Parrish	817-791-3227	patty.parrish@us.belimo.com
Student Activities	Ian Bost	817-272-9075	ian.bost@mail.ashrae.org
Golf	David Muzzy	817-257-4928	d.muzzy@tcu.edu
Special Events	Sean Rath	817-338-1277	srath@bhbinc.com
Webmaster	Cody Pace	817-338-1277	cody.pace@mail.ashrae.org
YEA	Saul Martinez	682-521-6981	smartinez@bhbinc.com
TEGA/Grassroots	Doug Ekstrom	817-989-6588	dekstrom@purdy-mcquire.com
PR/Outreach	Mark Harris	817-626-0033	mharris@brandteng.com
Sustainability	Connie Stout	972-243-6884	connie@ct-supply.com

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Fort Worth Chapter of ASHRAE
PO Box 893
Fort Worth, TX 76101