THE LONG ISLAND SOUNDER

March 2010

ASHRAE Long Island Chapter, Region 1...*Founded in 1957*

www.ashraeli.org

American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

Inside this issue:

President's Message

Attendees at last month's meeting had the pleasure of hearing from Ronald Wilkinson, P.E., LEED AP, senior commissioning engineer at AKF Engineers. Mr. Wilkinson explained the benefits of existing building commissioning over energy audits. While energy audits provide a quick fix, the results are short term. Commissioning existing systems, however, involves developing a program to optimize the operation of the equipment and systems to meet the current building operating plan—which yields the capability to save energy for many years.

This month, we will hear from Dennis Dietz of American ALDES Ventilation Corp. Mr. Dietz will fly up from his home base in Florida to deliver a presentation on indoor air quality in midrise and tall apartment buildings. New building and mechanical codes provide opportunities to reduce heating and cooling costs dramatically in both new and existing buildings. Taking advantage of these new code requirements requires special emphasis on the central exhaust and supply duct systems, with attention to duct leakage and the impact of stack effect on the performance on these systems through the seasons. Mr. Dietz will address airflow balancing techniques that limit the impact of stack effect and wind pressures on ventilation ducts.

CHAPTER MONTHLY MEETING

DATE:	**Tuesday, March 9, 2010**
TIME:	6:00 PM - Cocktails/Dinner 7:00 PM - Dinner Presentation 8:45 PM - Conclusion
LOCATION:	Westbury Manor South Side of Jericho Tpke. 25 Westbury, NY 11590
FEES: Members - Guest - Student -	 $35.00 $40.00 $15.00

Reservations requested, but not required.
Call (516) 333-7117

Makeup air strategies will be discussed, such as supply of conditioned air to the corridor or directly to the individual apartments. Window fresh air inlets are of increasing interest to architects and designers, but need careful consideration in their application.

the stack effect for exhaust systems. American ALDES takes a system approach to ventilation to resolve indoor air quality issues and improve energy efficiency. Mr. Harrell will walk us through environmentally friendly ventilation products and systems aimed at builders seeking LEED project credit.

Please keep in mind that our meeting on March 9 will also serve as our second Resource Promotion Night of the year. Resource Promotion last fall was very successful, and we expect to match or even exceed that success this time around. I'd like to thank Resource and Promotion Chairman Andrew Manos, LEED AP, for keeping ASHRAE's overall

Continued on Pg. 4

Long Island Chapter Officers & Committees

ASHRAE 2009/2010 OFFICERS

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Board of Governors	**Steven Friedman, P.E., HFDP, LEED AP**	212.695.1000	212.695.1299	sfriedman@lilker.com

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Reception & Attendance	**Anita Singh, LEED AP**	516.827.4900	516.827.4920	abs@cameronengineering.com
PR & Engineering Joint Council of LI	**Peter Gerazounis, P.E. LEED AP**	212.643.9055	212.643.0503	peter.gerazounis@mgepc.net
Golf Outing	**Peter Gerazounis, P.E., LEED AP** **Steven Friedman, P.E., HFDP, LEED AP**	212.643.9055 212.695.1000	212.643.0503 212.695.1299	peter.gerazounis@mgepc.net sfriedman@lilker.com

Chapter Monthly Meeting - Program for 2009/2010

September 15, 2009 * At Westbury Manor - **1 PDH** Dinner Presentation - Chilled Beam Systems **MEMBERSHIP PROMOTION NIGHT**	**February 2010** **NATIONAL ENGINEERS WEEK DINNER**
October 20, 2009 * *At Westbury Manor* - **1 PDH** Dinner Presentation - Going Green-Reducing Emissions and Improving Fuel Efficiency in Commercial and Industrial Boiler Applications **STUDENT ACTIVITIES NIGHT**	**March 9, 2010** * *At Westbury Manor* Dinner Presentation - Stack Effect **RESOURCE PROMOTION NIGHT**
November 10, 2009 * *At Westbury Manor* - **1.5 PDH** Dinner Presentation - Introduction to LEED NC Building Commissioning **JOINT MEETING WITH USBGC** **RESOURCE PROMOTION** **MEMBERSHIP PROMOTION NIGHT**	**April 13, 2010** **FIELD TRIP - TBD**
December 8, 2009 Holiday Party - Westbury Manor	**May 3, 2010** * *Cherry Valley Club, Garden City, NY* **ANNUAL GOLF OUTING**
January 12, 2010 * *At Westbury Manor* Dinner Presentation - Interpretation of HVAC Systems Test/Balancing Procedures and Reported Data	**May 11, 2010** * *At Westbury Manor* Dinner Presentation - Refrigeration **REFRIGERATION NIGHT** **ASHRAE DISTINGUISHED LECTURER**
February 9, 2010 * *At Westbury Manor* Dinner Presentation - Energy Audits & New ASHRAE Standards **STUDENT ACTIVITIES NIGHT** **ASHRAE DISTINGUISHED LECTURER**	**June 8, 2010** * *At Westbury Manor* **PAST PRESIDENTS & OFFICER INSTALLATION**
February 2010 ASHRAE Winter Meeting	**June 8, 2009** ASHRAE Annual Meeting **PAS PRESIDNETS NIGHT**
August 2009 - Chapter Regional Conference Region I	

PAOE POINTS FOR 2009/2010

Chapter Members	Membership Promotion	Student Activities	Research Promotion	History	Chapter Operations	CTTC	Chapter PAOE Totals
301	700	980	425	50	530	150	2,835

President's Message (Cont'd from Page 1)

mission in mind: to serve humanity and promote a sustainable world. As we all know, the way we do that is through research, and thus resources. Please contact Andrew at 631-592-2660 or amanos@emtec-engineers.com with any questions.

We have good news on two fronts regarding an upcoming event sponsored by the Long Island Chapter of ASHRAE: Those who attend the Professional Energy Code Seminar for ANSI/ASHRAE/ IESNA Standard 90.1-2004 will receive 6.5 PDH credits. Secondly, the deadline for registration has been extended. This one-day seminar will be held on Tuesday, March 23, from 8:30 a.m. to 5:00 p.m. at A.D.E. Systems Inc., 19 Wilbur Street, Lynbrook, NY. As this newsletter went to press, there were 15 people registered. Capacity is 50 attendees, so don't delay your registration. Please visit this link for registration information: http://www.ashraeli.org/Forms/ASHRAE%20Seminar%20March%202010.pdf.

If you take a look outside, it may seem difficult to believe that we'll soon be able to drop our snow shovels and pick up our golf clubs, but it's true. The 10th Annual LI ASHRAE Golf Outing is approaching quickly. The event is scheduled for Monday, May 3, at the Cherry Valley Club in Garden City. The outing kicks off with brunch at 11:00 a.m., shotgun start golf at 12:30 p.m., followed by a 5:30 p.m. post-golf cocktail hour and 6:30 p.m. dinner reception. Please note, this event fills up fast, and there is a two foursome limit per company. Checks must be in by April 17, no exceptions. Please visit this link for more information: http://www.ashraeli.org/Forms/ashrae%20golf%20outing%202010.pdf. Thank you to co-chairs Steven Friedman, HFDP (212-695-1000, sfriedman@lilker.com), and Peter Gerazounis, P.E., LEED AP (212-695-129, peter.gerazounis@mgepc.net), for organizing this event.

I look forward to seeing you at our March 9 meeting and at our upcoming special events.

Steven Giammona, P.E., LEED AP
President - Long Island Chapter

March Program

You are cordially invited to our March 2010 Meeting…

Dinner Presentation

"Stack Effect"

Presented by

Dr. Dennis R. Dietz
American ALDES Ventilation Corporation
Bradenton, FL

Attendees Will Earn 1 PDH!

DATE:	**TUESDAY, MARCH 9, 2010**		
Time:	6:00 PM – Cocktails and Hors D'ouevres 7:00 PM – Dinner Presentation 8:45 PM – Conclusion	**Fee:**	$ 35.00 Member $ 40.00 Guest $ 15.00 Student
Location:	**WESTBURY MANOR** (516) 333-7117 Jericho Tpke (South Side), 3/10 of mile east from Glen Cove Rd., Nassau County, NY. **Directions are posted at @ www.ashraeli.org.**		
Presentation:	This month's presentation will cover ventilation for indoor air quality in mid-rise and tall apartment buildings. New building and mechanical codes are providing opportunities to reduce heating and cooling costs dramatically in both new and existing buildings. Taking advantage of these new code requirements requires special emphasis on the central exhaust and supply duct systems, with attention to duct leakage and the impact of stack effect on the performance on these systems through the seasons. Airflow balancing techniques that limit the impact of stack effect and wind pressures on the ventilation ducting will be discussed. Advanced methods of duct sealing will be addressed. The impact of leakage between floors and between apartments will be addressed, including need to "compartmentalize" the buildings in new construction. Makeup air strategies will be discussed, such as supply of conditioned air to the corridor or directly to the individual apartments. Window fresh air inlets are of increasing interest to architects and designers, but need careful consideration in their application.		
About our Speaker:	**Dr. Dennis R. Dietz -** is a native of Pennsylvania, with B.S., M.S., and Ph.D. degrees from Penn State University in Physics, with additional course work in Environmental Sciences from Univ. of Texas, Dallas, and Architecture from Pasadena City College, Pasadena, CA. He was a faculty member of Ambassador College in Texas and Pasadena during the 1970s, and Wisconsin Indianhead Technical Institute in Wisconsin from 1980 to 1984. He operated his own contracting and consulting business in energy efficient construction and design in Hayward, Wisconsin, prior to becoming the technical manager and Engineering Vice-President for American ALDES Ventilation Corporation in Sarasota, Florida in 1987 Dennis is an active member of ASHRAE, with interest in Standard 62 development for residential single family as well as multifamily buildings. He has been a speaker at a number conferences and workshops on ventilation and indoor air quality, including the Energy Efficient Builders Association meetings, BTECC, Florida, Wisconsin and NY state energy office workshops.		

Board of Governors Meeting Minutes

On Tuesday, February 9th, 2010, a meeting of the Board of Governors was held at the Westbury Manor. Attendees were: Steven Giammona, Steven Friedman, Carolyn Arote, Brian Simkins, Andy Manos, Richard Rosner and Tom Fields. President Steven Giammona called the meeting into session at 5:06pm.

GENERAL ITEMS: We discussed making sure that everyone has gotten reimbursed for the CRC trip. Steve also stressed the importance of updating PAOE points monthly.

RESOURCE PROMOTION: Andy Manos stated that we currently have more than expected in Resource Promotion monies. We still have a long way to go, but in March he plans to begin calling campaign. He believes we will make the target.

PROGRAMS: No changes.

HISTORIAN: Carolyn Arote has to update the PAOE points.

WEBMASTER: Janeth Costa was unable to attend the meeting, but Anthony (our webmaster) came to the meeting and showed us the preliminary look/outline of the 'new website'. All board members were in agreement and hope to unveil it to the chapter soon. PAOE points are to be updated monthly for web.

TREASURER: Andy Manos gave the board a financial update on Savings/MM accounts.

MEMBERSHIP: Richard Rosner said he has gotten several upgrades for the month. PAOE points are to be updated monthly for membership promotion.

STUDENT ACTIVITIES: Tom Fields continues to solicit new student members and encourage them to attend our meetings. PAOE points are to be updated monthly for student activities.

CHAPTER TECHNOLOGY TRANSFER (CTTC): Brian Simkins continues to hand out the evaluation forms at every meeting. PAOE points are to be updated monthly for CTTC.

OPEN BOARD DISCUSSION:

1. The group briefly mentioned that there will be a meeting between several board members and Paul Parker of SMACNA to discuss reinstating next year's joint meeting. We discussed possible topics that would be of value to both groups.
2. The date & time for golf outing event has been booked. We will discuss in March how we plan to move forward in booking the foursomes and donations. We need to look at Sponsorship to help cover the increasing cost of the event. Cherry Valley did not get our check, so Brian said he is going to cancel it and send out a new one.

Having discussed all open issues, the meeting was adjourned at 5:50pm.

Janeth Costa
Chapter Secretary, 2009-2010

Research Promotion

I would like to thank all the companies who have participated in the annual 2010 Product Directory of Manufacturers and their Representatives.

The Product Directory has been prepared as a service to all its members and as a service to the local HVAC industry. It will be will be made available to all ASHRAE and non-ASHRAE members at no-cost and can be obtained from our monthly meetings or directly from our web-site.

The Directory is intended to provide better communications between manufacturers and their sales representatives; engineers who specify products; contractors who purchase and install the equipment; and other interested parties. Product Directory listings are not limited to ASHRAE members and the listings are not to be considered as advertising or endorsement by ASHRAE of any product, manufacturer or representative.

This year's overall resource promotion goal is $2,001,900 with over 75 research projects on board. Our chapter is expected to raise approximately $12,881 towards the overall goal of which we have already raised $11,455. I am hoping I can count on the continued support of all of our past contributors who have generously supported us over the years. I also look forward to gaining the support of new contributors this coming year. Please help support ASHRAE in any way you can.

I would also like to say 'thank you' to all the contributors listed below whom have already donated to ASHRAE this year:

INDIVIDUALS

Mr Andrew E Manos
Mr Andrew J Garda
Mr Arthur A Huebner
Mr Brian C Simkins
Ms Carolyn Arote
Mr Christopher M Schwarz
Mr Donald E Ross
Mr Fred H Weber
Ms Janeth Costa
Mr Jerome T Norris
Mr Jerome A Silecchia
Mr John D Nally
Mr Michael Gerazounis, PE, LEED AP
Mr Michael O'Rourke
Ms Nancy Roman
Mr Patrick J Lama
Mr Raymond O Combs
Mr Raymond G Schmitt
Mr Richard L Rosner, PE
Mr Ronald J Kilcarr, PE
Mr Steven D Friedman, PE,HFDP,LEED AP
Mr Steven R Giammona, PE
Mr Thomas Fields, PE
Mr William L Mahon

COMPANIES

Accuspec Inc
A D E Systems Inc
Albert Weiss Air Conditioning Products
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Catan Equipment Sales
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Rathe Associates
RPG Associates
Siemens Building Technologies Inc
SRS Enterprises Inc
Taco Inc
Technical Air Systems Incorporated
Tower Enterprises of NY & NJ
Trane
Viessmann
Wales Darby Incorporated
Wallace Eannace Associates

Continued on Pg. 8

Research Promotion (Cont'd. from Page 6)

CONTRIBUTIONS CAN BE MADE IN THE FOLLOWING WAYS:

1) You can mail your checks, made out to ASHRAE Resource Promotion, to:

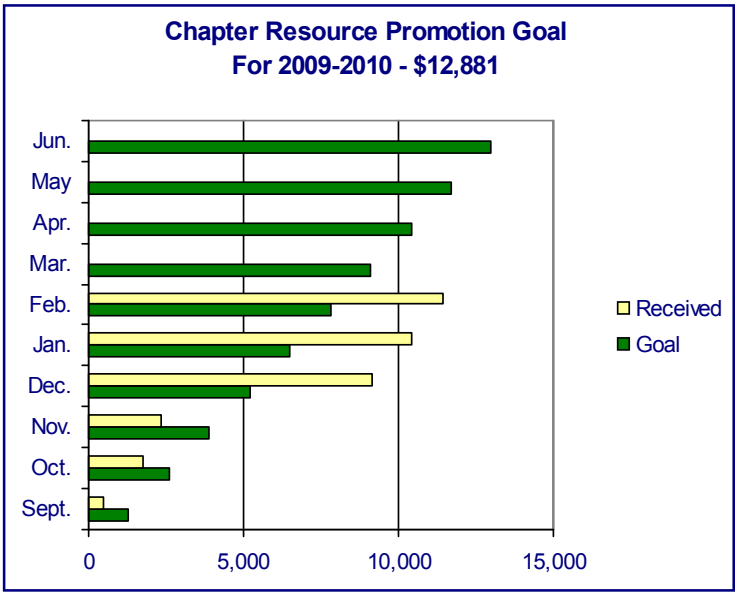
Andrew Manos
ASHRAE Research Promotion Chair
c/o Emtec Consulting Engineers
3555 Veterans Memorial Highway
Ronkonkoma, NY 11779

2) You can bring your check to any of the meetings and give it to me. I will mail it into headquarters.

3) You can contribute via paypal from the ASHRAE LONG ISLAND web site just click on the donate button.

4) You can contribute directly on-line. www.ashrae.org

**** Please make sure your accredit your contribution to the LONG ISLAND CHAPTER 006 ****



Thank you again for all your support!

Andrew Manos, LEED AP
Resource Promotion Chair

Nicholas Couture, LEEP AP
Vice Chair

ASHRAE Product Directory

The ASHRAE Long Island Chapter's
Product Directory
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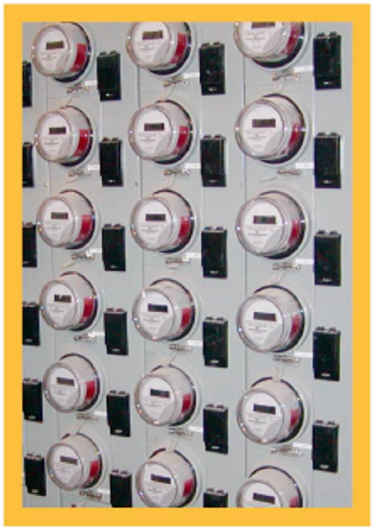
Now available at chapter meetings or
online at www.ashraeli.org

CTTC

Multifamily Buildings
Controlling Stack Effect-Driven Airflows

The author is a proponent of the individual buildings and individual services and systems school. The most elegant argument for compartmentalization of apartment buildings comes from Handegord.1 Stack effect-driven airflows in tall buildings compromise smoke control and fire safety, adversely affect indoor air quality and comfort as well as increase operating costs for space conditioning energy (*Figure 1*). By isolating the units from each other and from corridors, shafts, elevators and stairwells, stack effect-driven interior airflows can be controlled (*Figures 2* and *3*).

To achieve compartmentalization unit airtightness should meet a minimum resistance or air permeance of 2 L/(s· m2) at 75 Pa (0.4 cfm/ft2 at 0.30 in. w.g.), which is the recommended minimum resistance of enclosure air barrier systems.2 This level of unit airtightness is necessary to control stack effect air pressures and limit airflow from adjacent units and cross contamination. Additionally, elevators should be located in vestibules, lobbies and other “airlocks” thereby isolating them from corridors. Unit doors should be weather-stripped.



Photograph 1: Individual metering of services. Rational behavior is encouraged when all services are metered and billed separately.

By isolating the units from each other and from corridors, shafts, elevators and stairwells, stack effect-driven interior airflows can be controlled.

Photograph 2: Individual gas metering. Gas for space heating and domestic hot water is metered separately to each unit.

Continued on Pg. 11

CTTC (Continued from Pg. 10)

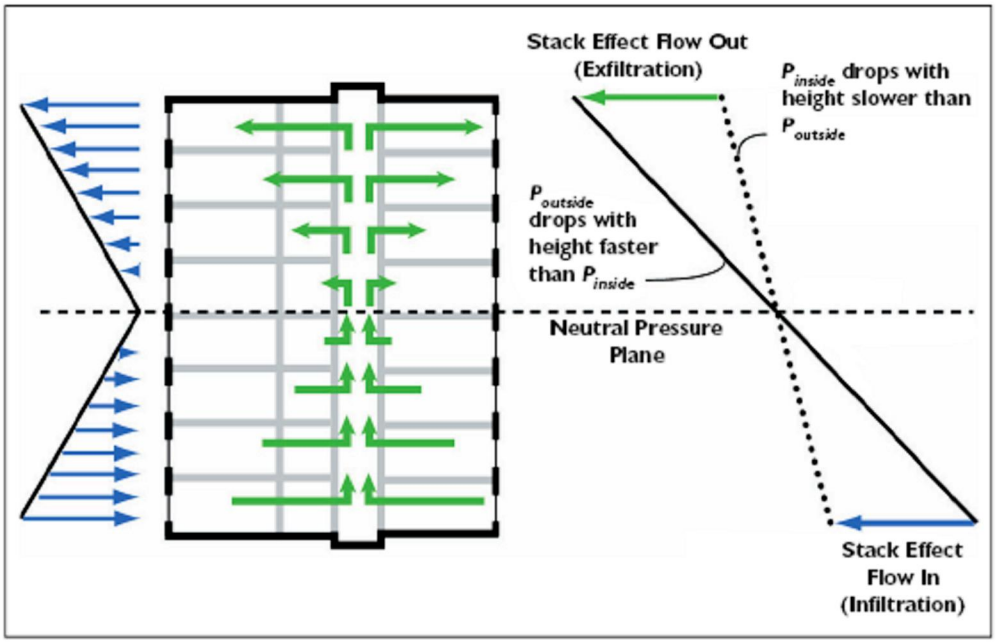


Figure 1: Stack effect. Interior airflows in tall buildings compromise smoke control, fire safety, indoor air quality, comfort and energy use.

Distributed Ventilation

Applying the compartmentalization principle further, ventilation is provided to each individual unit across exterior walls, not across interior pressure boundaries such as floors. Under the compartmentalization principle, ventilation is provided by ventilation systems unique to each unit rather than by central systems (*Figure 4*).

In practice rooftop central exhaust systems are difficult and arguably impossible to balance and typically defeat measures to control the stack effect through compartmentalization. Balance is complicated due to the additive effect of the stack pressures to the fan pressures in the exhaust system duct risers. Since stack pressures vary with temperature, the flows in the exhaust systems also vary with temperature. The use of constant airflow regulators (devices that maintain constant airflow across variations in air pressure) can mitigate this effect somewhat, but are rarely used and require extremely high pressures within ducts to effectively operate. Apartments on upper levels tend to be overventilated during cold weather since they are closer to the fans and are most subject to the stack pressure. Shafts acting as exhaust chases or containing exhaust ducts are difficult to seal effectively and significantly complicate fire and smoke control due to the development of complex three dimensional airflow pathways and interstitial pressure fields.3 Ventilation shaft construction typically is linked to mold and is the subject of frequent litigation due to these airflow pathways and the gypsum board used to construct the fire separations.3

Central systems are further limited as most installations do not allow individual unit control—the central fans are controlled by building management and are typically on all of the time or off all of the time. Units are either all ventilated or all not ventilated (resulting in overventilation in many units and significantly higher energy consumption) or underventilation in many units resulting in contaminant buildup and other complaints.

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CTTC (Continued from Pg. 11)

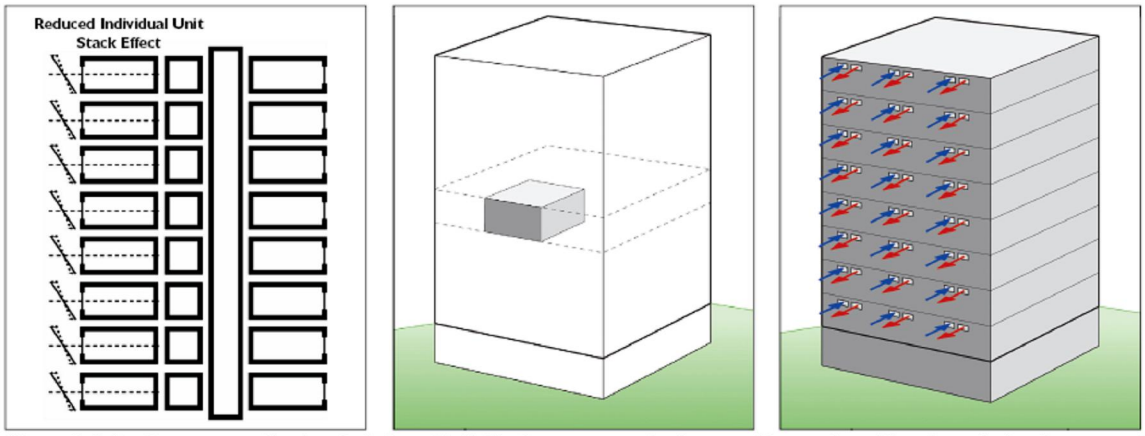


Figure 2 (left): Compartmentalization. Isolation of individual apartment units from corridors and corridors from shafts, elevators and stairwells reduces stack effect-driven interior airflows. Figure 3 (center): Unit airtightness. Each unit is isolated from adjacent units and from the exterior by an air-barrier system of minimum recommended resistance or air permeance of 2.00 L/(s·m^2) at 75 Pa. The interunit separation must also meet the specific fire resistance rating requirement for the given separation. Figure 4 (right): Distributed ventilation. Individual unit ventilation provided across exterior walls not across interior pressure boundaries such as floors.

Distributed Heating, Cooling and Domestic Hot Water

The compartmentalization principle also can be extended to heating, cooling and domestic hot water. Unit space heating is provided by sealed combustion gas furnaces and water heaters located in each individual unit (*Photographs 3* and *4*) that are vented either upward or downward through small diameter plastic ducts. Exhaust gases and combustion air are provided by separate ducts that follow parallel paths (*Figures 5* and *6*). Most systems can be routed upward or downward four to five floors.

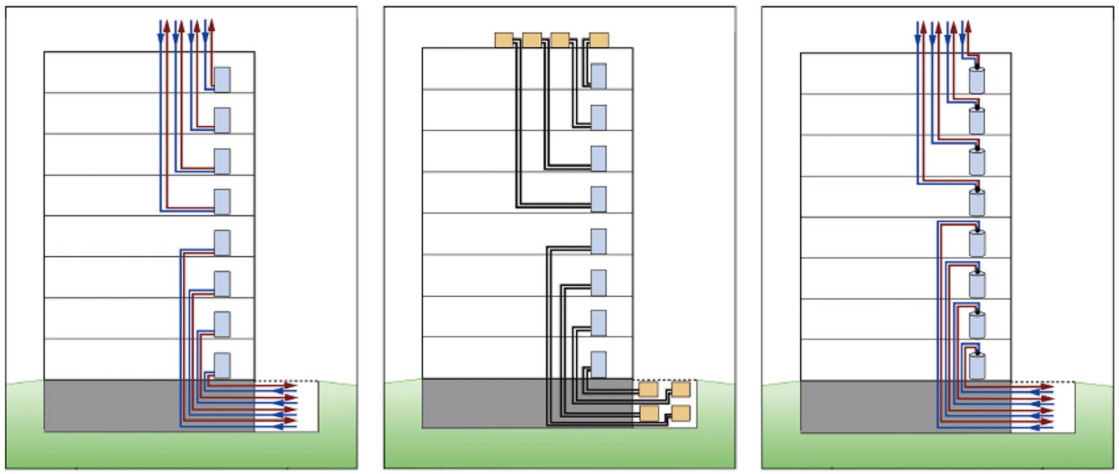


Figure 5 (left): Gas furnace venting. Sealed combustion furnaces (two pipe systems—exhaust gases out and combustion air in) are vented to roof or down to dry well ("pit" with screen). Vent runs can extend up or down up to 100 ft. Figure 6 (center): Gas water heater venting. Sealed combustion domestic hot water heaters (two pipe systems—exhaust gases out and combustion air in) are vented to roof or down to dry well ("pit" with screen). Vent runs can extend up or down up 100 ft. Figure 7 (right): Air conditioners or heat pump configuration. Individual units are located on roof or in drywell ("pit" with screen).

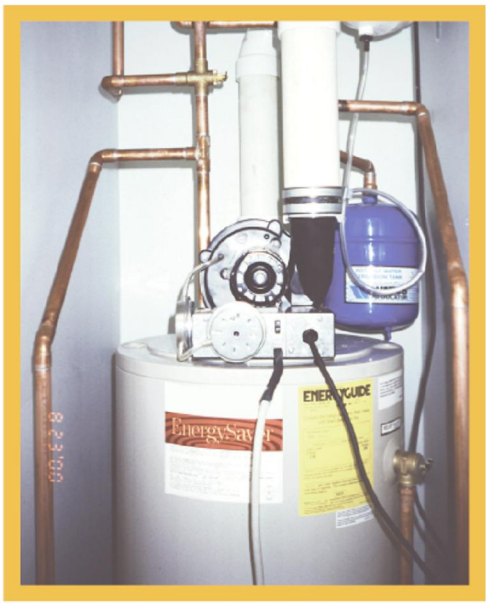
Continued on Pg. 13

CTTC (Continued from Pg. 12)

Air conditioning is provided in a similar manner with individual exterior units located on roofs or at ground level in dry wells or in parking garages (*Figure 7*). Combined heating and cooling with heat pumps is executed in the same manner. Rooftop penetrations are collected and located in "doghouses" minimizing penetrations. All cable, duct and pipes are run through walls of doghouses (*Photograph 5*). The doghouse lids are removable, allowing for access. The distributed heating, cooling and domestic hot water components are arguably easier to service, and lower in cost to maintain by less skilled personnel than central systems. Problems with systems are limited to individual units rather than many units or entire buildings. Distributed systems are also less expensive to install in many regions.

Photograph 3: Space heating. Sealed combustion gas furnace provides space heating.

Photograph 4: Domestic hot water. Sealed combustion gas water heater provides domestic hot water.



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CTTC (Continued from Pg. 13)

Photograph 5: Services located on roof. Rooftop penetrations are collected and located in "dog-houses"—all cable, duct and pipes are run through walls of "doghouses."

This cost argument is supported on a per project basis on multifamily developments as the free market operates and developers adopt these approaches due to first cost reasons. Developers rarely select systems because they perform better, are more energy efficient, are safer or provide better indoor air quality. Developers select systems because they are cheaper. More of these systems are being adopted and displacing standard approaches principally for cost reasons.

Central systems for heating, cooling and domestic hot water are not conducive to energy conservation since they do not encourage rational individual behavior unless individual metering is provided. It is the author's experience that individual systems are the easiest to individually meter (*Photographs 1* and *2*).

In hot, humid climates, part-load humidity control is almost impossible to control with central systems in apartment or condominium construction unless preconditioned makeup air or ventilation air is supplied to corridors through rooftop units.

This begs the question whether makeup air and ventilation air can be supplied to individual apartments through corridor leakage or door undercuts. Most fire codes do not allow this approach (although in reading the codes it is not always clear) and require fully ducted supply with smoke dampers. In the distributed conditioning approach, individual dehumidifiers are provided in each unit, typically in the air-handling closet
(*Photograph 6*).

Individual apartment units in essence are treated identically to single-family detached houses with respect to heating, cooling and domestic hot water down to the types of equipment used. Since these systems are, for all practical purposes, residential systems, they can be installed by less skilled residential contractors, which is also an attractive feature to developers since more subcontractors are capable of both installation and service.

Continued on Pg. 15

CTTC (Continued from Pg. 14)

Photograph 6: Part-load humidity control. Individual dehumidifiers are provided in each unit—typically in the air-handling closet—to handle part load humidity in hot, humid climates.

Ventilation System Configurations

Ventilation of individual apartment units or condominium units using the compartmentalization approach should be provided according to ANSI/ASHRAE Standard 62.2, *Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings*. In the author's opinion, the title of the standard is misleading and limiting. The author believes that the standard should also apply to apartments and condominiums regardless of height (low-rise or mid-rise or high-rise).

The author's preferred system configuration is presented in *Figure 8*. An outside air duct is directly connected to the return side of an air-handling unit. An inline motorized damper and the air-handler blower is controlled by a programmable thermostat or other device to ensure minimum ventilation and prevent overventilation. Exhaust air is vented directly to the exterior from the kitchen and bath via an intermittently operated fan (or fans) controlled by the occupants. The author prefers that the exhaust fan (or fans) are controlled by a switch with an integral timer that shuts off the exhaust fan (or fans) after a preset time (e.g., 10 minutes), which is a practice common in the hotel and hospitality industry.

Dryers should be vented directly to the exterior (*Figure 10*). A better approach, in the author's opinion, is the use of condensing dryers that require no exterior vent. The water removed from the clothes is condensed and drained. No exhaust to the exterior occurs. This approach has obvious advantages with respect to makeup air (none is needed), and thus provides huge benefits in hot, humid climates from latent load perspectives and negative pressures, not to mention the benefits in cold climates arising from heat reclaim. In a hot, humid climate, a 94 L/s (200 cfm) exhaust flow results in approximately a 3.5 kW (1 ton) load. During part-load periods, the 94 L/s (200 cfm) exhaust is almost entirely a latent load dramatically skewing the sensible to latent ratio. Finally, there is one less hole in the building enclosure to worry about.

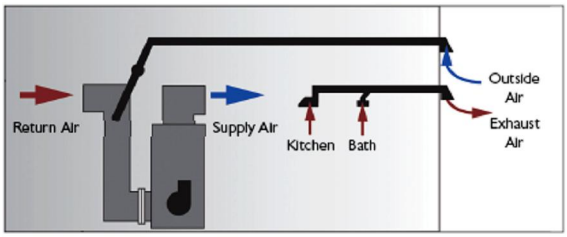
Not all apartment or condominium units are designed and constructed with air-handling units. Many units have electric heat and no air conditioning, particularly in the Pacific Northwest. Others have through-wall packaged heat pumps that provide heating and cooling. *Figures 11* and *12* illustrate the compartmentalization approach for such units.

Exhaust is provided by continuously operating exhaust fan with outside air (makeup air) provided by an outside air duct. In the author's opinion, this is not the best approach as it relies on induced infiltration. The air exhausted will be replaced by infiltration air through the duct. In the author's experience this approach works best with effective compartmentalization (unit air tightness should meet a minimum resistance or air permeance of 2 L/(s·m2) at 75 Pa (0.4 cfm/ft2 at 0.30 in. w.g.), thereby limiting air drawn from neighboring units and the corridor, thusly favoring the outside air duct as a source of makeup air.

Continued on Pg. 16

CTTC (Continued from Pg. 15)

A better approach is presented in *Figure 13* where both supply and air exhaust is provided by a heat exchange ventilator. The installed cost of this approach is significantly more than the approaches described in *Figures 11* and *12*. However, the approach has the benefits of lower operating costs (particularly extreme climates such as severe cold and hot, humid climates) and not relying on induced infiltration.



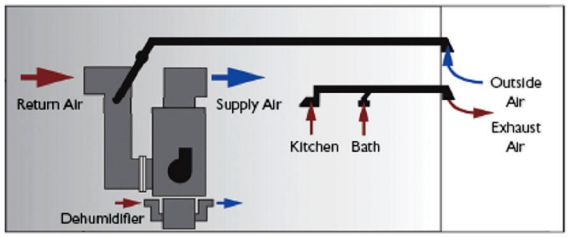
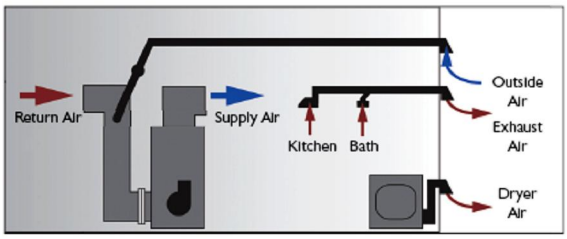


Figure 8 (left): Outside air to air handler. Motorized damper in line with outside air duct connected to return side of air handler. Damper and air handler controlled by programmable thermostat or other controller. Kitchen and bath fans controlled intermittently by occupant. Figure 9 (right): Dehumidifier with air handler. Dehumidifier added to control part load humidity in hot humid climates.



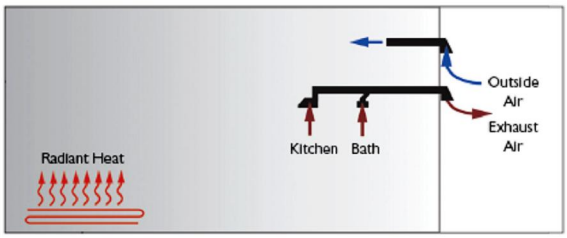
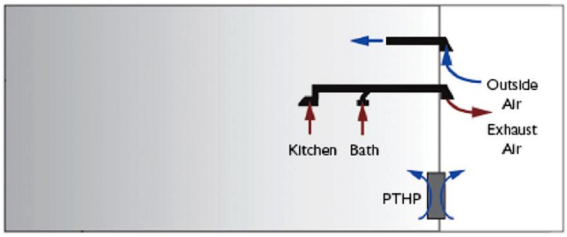


Figure 10 (left): Dryer. Dryer vented directly to exterior. Ventless condensing dryers are preferred. Figure 11 (right): Exhaust with outside air duct. Not the best approach as it relies on "induced infiltration." The air exhausted will be replaced by infiltration air through the duct. Works best with effective compartmentalization (unit air tightness should meet a minimum resistance or air permeance of 2 L/(s·m²) at 75 Pa).



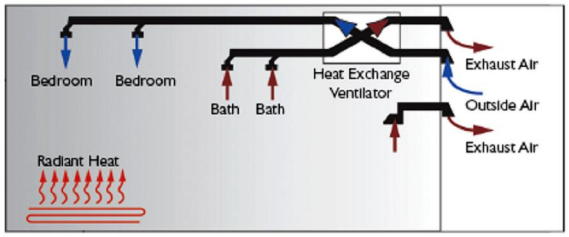


Figure 12 (left): Exhaust with outside air duct. Packaged terminal heat pump (PTHP). Similar to Figure 11, but with air conditioning added via packaged heat pump. Figure 13 (right): Heat exchange ventilator. Expensive to install, economical to operate.

Summary

Compartmentalization of the building enclosure and apartment and condominium units to control stack effect-driven interior airflows can be extended to ventilation systems and systems for heating, cooling and domestic hot water. The approach results in distributed systems that allow for individual unit control, service, replacement and metering. The approach arguably results in buildings that are safer from a smoke and fi re perspective, more energy efficient, more comfortable and more durable with better indoor air quality.

Brian Simkins
CTTC

Article In: ASHRAE Journal, December 2005. Please see article for all references and credits.
By Joseph W. Lstiburek, Ph.D., P.Eng., Fellow ASHRAE

CTTC - *Programs for Albuquerque and Beyond*

So, do you have an innovative project or an absolute disaster that you have worked on?

Do you want to have your ASHRAE conference fees waived? If you give a presentation at the conference, you go for free! Here is how it works…

Technical Program

Preliminary program submissions include energy efficient design and operation of data centers, central chilled water plant innovations, and latest research on refrigeration system and components and design applications for sustainable buildings.

Submission Types

Technical Papers: Require double-blind review, approved by three reviewers, maximum length: 30 pages.

Conference Papers: Abstract undergoes review for acceptance or rejection. Papers due 3 months after notification of abstract acceptance. Require single-blind review, approved by two reviewers, maximum length: 8 pages.

Seminar: Submit abstract for presentation w/ chair and 2-4 speakers, each speak approximately 20 minutes.

Forum: One moderator, no presentation, 60-minute open discussion.

Tracks

Track 1: What Is Sustainable Anyway? This track will discuss Sustainability and its overall affect on our environment as it pertains to all facets of energy consumption in the near term and the long term on new and existing building stock. How do present energy efficient standards compare to the proposed 189 and what is the additional cost? How will this affect us physically and financially? What are the short term and long term goals and benefits of sustainability? Are there simple and low cost intermediate steps as we progress? What can we do as ASHRAE members and how will other professions be affected? What will decisions by other professions (i.e., architects) have on our progress and ability to reach our goals? Case studies? How will IAQ be affected? What can be done to conserve water, sewer and electric uses in buildings?

Track 2: Energy Facts and Simulation Track As building design criteria changes to include sustainability and energy use, it is important that consideration be given to building energy use simulation methods. This track is intended to include topics that address this particular issue including but not limited to: current and future tools for modeling energy use, the importance of building energy simulation, the influence and incorporation of energy models on the design process, the accuracy of energy use models, etc. This track will also explore the use of an energy model as a tool to provide energy savings opportunities.

Track 3: Ventilation Systems Ventilation system design and maintenance is a wide-ranging topic. In this track, the objective is to address topics which are in significant interest at the present time, related to ventilation systems; starting with what's new in ASHRAE Standard 62.1-2010, discussion of what indoor contaminants should be controlled in occupied spaces, operation and maintenance of ventilation systems and specialized ventilation system requirements for applications such as dry climates, hot, humid climates and variable air volume systems.

CTTC - *Programs for Albuquerque and Beyond*

Track 4: Refrigeration for the Future Track submissions are requested which address the need for cost effective and affordable advanced materials, components, refrigeration cycles, and system designs to improve energy efficiency of future refrigeration systems. In particular, submissions that address the energy consumption of entire systems throughout the entire operating regime to reduce annual energy consumption of the complete refrigeration system are requested. Furthermore, submissions that address the reduction of performance losses in the field due to installation deficiencies, operational effects and long-term degradation are sought.

Track 5: Central Plant Systems This track will highlight presentations and case studies of energy efficient central heating and cooling plants. For this track, the definition of central plant includes plants serving single buildings and plants serving campus style groups of buildings. Plant sizes could range from very small to very large. Submissions should include discussions of both successes and challenges. Case studies of innovative central plant design are encouraged.

Track 6: BIM/CAD/Paper and Pencils

Track 7: Energy Conservation vs. New Generation In the United States, buildings consume over 40% of energy produced and contribute to over a third of our CO_2 emissions. Current projections anticipate U.S. energy demands to increase by more than one-third by 2030, with electricity demand rising by more than 40 percent. As we continue to see a trend toward “net-zero” energy buildings, the debate continues as to what is the most effective method to curtail CO_2 emissions and global climate change. While some experts have stated that improving energy efficiency in our buildings is one of the most constructive, cost-effective ways to address the challenges of high energy prices, energy security and independence, and global climate change, others experts predict that implementing new generations technologies such as solar and wind, in conjunction with smart grid technology, will reduce our dependence on fossil fuels, thus reducing CO_2 emissions, and improving energy security. The series of sessions in this track illustrate the benefits of improved efficiency technologies verses new generation technologies and how the technologies promote net-zero energy buildings and contribute to lower CO_2 emissions.

Track 8: Living with HVAC&R Systems System designs can be advanced and efficient, but they are only as good as the actual operation after installation and start up. Uptime and simplicity often outweigh energy saving operation, even in green buildings. The series of sessions in this track will focus on the maintainability and optimization of installed systems. Potential topics include energy saving retro-fits, continuous commissioning, operations and maintenance and design with operability in mind.

Track 9: High Efficiency HVAC Systems As buildings are required to exceed ASHRAE Standard 90.1 by 30 percent or more and to meet LEED certification requirements, engineers are designing highly efficient HVAC systems. In addition to meeting ASHRAE's sustainability and net-zero energy goals, HVAC systems will have to be more energy efficient than previously designed. The series of sessions in this track illustrate ideas and designs for HVAC systems and their applications to various building types. New high performance building technology will be presented, integration approaches presented, and commissioning and operating strategies recommended.

Track 10: Professional Skills

Track 11: Data Center and High Density Cooling Data centers are very high energy facilities containing significant amounts of equipment gain in the space. What are the “state of the art” conditioning techniques and what is being done to minimize the HVAC energy use in these facilities. This track will explore energy savings opportunities associated with space conditions, cooling scenarios, cooling medium production and delivery.

Track 12: Unassigned

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Deadlines

Technical Papers: Due for review on April 9, 2010. Present at Las Vegas (January 2011). See LV tracks below. **Conference Papers:** Submit abstract online by April 9, 2010. Present at Las Vegas (January 2011). See LV tracks below. **Seminar:** Submit abstract with title for individual presentation by January 30, 2010, to Sarah Maston (smaston@rdkengineers.com). Also submit short biography. I will put submissions together with a chair and multiple speakers. Also email me if you are interested in chairing a presentation.

Forum: Submit forum online.
For Technical or Conference Papers, tracks for the Las Vegas Winter Meeting are below:
- Track 1 Impact of Code Requirements on the work of an ASHRAE Member
- Track 2 Integrated Design Process
- Track 3 Low Energy Hospitality Design
- Track 4 Is that Ammonia in your Refrigeration (or What Else Is New in Low-GWP/ODP)?
- Track 5 “Greening” of the Industrial Base
- Track 6 Real Cost of Zero Energy Buildings
- Track 7 Impact of ASHRAE Standards on the Contractor Industry
- Track 8 Professional Skills

Links

Albuquerque Technical Program Information: http://www.ashrae.org/events/page/2539
Papers and Programs Information: http://www.ashrae.org/events/page/1756

Membership

It Pays To Attend Your Monthly ASHRAE Meeting

By Dennis Altstaetter

I joined ASHRAE in May of 1999 and was active in the National Capital Chapter of ASHRAE until my family and I moved to Wilmington, NC in June of 2005. In November of 2007, when my employer transferred me to the Raleigh area, I started attending the monthly meetings of the Triangle ASHRAE chapter held on the campus of NCSU. At this time I felt very secure in my job and planned on one day retiring from the company I had been with for over 10 years. After all, I was working for a very large manufacturer of HVAC equipment. After going through a difficult winter and experiencing a slow economy, my former employer went through a major work force reduction and I was laid off on March 23, 2009.

I started sending out resumes right away and did not receive any real leads. I had decided that since things were so slow it might take several months to find a new job. The next ASHRAE meeting came around and was to be held on Wednesday, April 8th. I was trying to reduce our nonessential expenses so that we could conserve our money and had talked myself out of going to the April meeting. My wife had other ideas and she urged me to attend the upcoming meeting. I printed several copies of my resume and got into my car. The current chapter president was Mr. Kent Woodard and the topic that night was absorption chillers. There was a small crowd there that night so after going through the food line I sat down at a table with someone that I had never seen before at one of our meetings. We started talking and he asked who I worked for so I pulled out a resume and told him that I had just been laid off. This person was Darren Shipman, Vice President of Adams Companies, Inc. His boss, Mr. Chris Adams, had told him to attend this meeting and find someone to hire for the Raleigh area. They had just acquired North Carolina for several of their commercial heating and cooling products and they needed someone to call on mechanical design engineers. I told him that was exactly what I had been doing with my former employer and we continued to talk during dinner.

After the meeting was over, we went out in the vestibule and I had my first real job interview since I had been laid off. Things went well and we talked for about one hour. The next day, Thursday, Darren checked with several of my references and received good reports from everyone. That afternoon I received a call from Darren Shipman and Chris Adams. After speaking with them for awhile, they made me an offer to work with them. On the following day, Friday I called them and accepted their offer. I was unemployed for less than 3 weeks and now had a new career with a growing company.

My future is now brighter than ever and I am still working with design engineers, assisting them with my products. I know that I have heard through the years that it pays to belong to ASHRAE. I would like to take it one step further. It pays to regularly attend your local ASHRAE meetings. No one knows what their future holds and there is no place like your local chapter meetings and events to network and meet people.

Thanks Triangle ASHRAE Chapter and all its officers for having regular monthly meetings.

Pictured above (L-R): Kent Woodard (2008 - 2009 Triangle Chapter President), Dennis Altstaetter.

I thought this article was worth repeating to show the benefits of being an ASHRAE member. Thank you Dennis for letting us reprint your article.

Richard Rosner, P.E.
Membership Chairman

Student Activities

February's Student Activity night was quite the successful meeting. Twelve students attended the event. Thank you to all our members for welcoming these future engineers. One of the best ways to retain this talent is through internships. I was delighted to see a former intern attend our chapter meeting last month. Should you have an opening, or wish to open a position for an intern, please contact me.

Our chapter's congratulations go out to Professor Charlie Forsberg of Hofstra University. Hofstra has been awarded an ASHRAE Senior Undergraduate Grant to fund a "Solar-Powered Gas Refrigeration Experiment" lab. This is quite an achievement for both Charlie and Hofstra, as competition for grant funds is high. Please join me in thanking Charlie for his continued efforts in educating our future engineers.

Please note that the deadline for ASHRAE Engineering Technology Scholarships is May 1st. The one-year $3,000 scholarships are available annually to full-time undergraduate Engineering Technology students. Please visit the Student Zone at www.ashrae.org/students for more information or to apply.

Many students are now receiving this newsletter. Please stay involved with the chapter activities. We will be sending applications for our local scholarships out to the heads of the local engineering programs this month, so please keep a look out for them. If you would like to receive one directly please e-mail me at t.fields@fpm-group.com.

Thomas Fields, PE, LEED AP
Student Activities Committee Chair

Charles Lesniak
Vice Chair

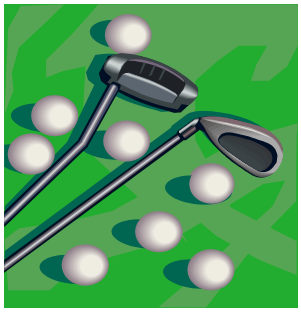
Long Island Chapter - Past Presidents

1958	H. Campbell, Jr. PE	1984	Raymond Combs
1959	Clyde Alston, PE	1985	Edward W. Hoffmann
1960	Sidney Walzer, PE	1986	Jerome T. Norris, PE
1961	Sidney Gayle	1987	Abe Rubenstein, PE
1962	William Kane	1988	Michael O'Rouke
1963	Louis Bloom	1989	Mel Deimel
1964	Milton Maxwell	1990	Robert Rabell
1965	Will Reichenback	1991	Gerald Berman
1966	Joseph Minton, PE	1992	Donald Stahl
1967	Irwin Miller	1993	Ronald Kilcarr
1968	Walter Gilroy	1994	Jerald Griliches
1969	Charles Henry	1995	Walter Stark
1970	William Wright	1996	Joe Marino
1971	Louis Lenz	1997	Norm Maxwell, PE
1972	Ronald Levine	1998	Alan Goerke, PE
1973	Henry Schulman	1999	Frank Morgigno
1974	Myron Goldberg	2000	Michael Gerazounis, PE, LEED AP
1975	John N. Haarhaus	2001	Ray Schmitt
1976	Richard K. Ennis	2002	Steven M. Stein, PE
1977	Kenneth A. Graff	2003	Andrew Braum, PE
1978	Evans Lizardos, PE	2004	Claudio Darras, P.E.
1979	Albert Edelstein	2005	Craig D. Marshall, P.E.
1980	Ralph Butler	2006	John Nally
1981	Robert Rose, PE	2007	Peter Gerazounis, PE, LEED AP
1982	Timothy Murphy, PE	2008	Steven Friedman, PE, HFDP, LEED AP
1983	Leon Taub, PE		

ASHRAE Golf Outing 2010 - Monday, May 3rd, 2010

11th Annual LI ASHRAE GOLF OUTING

Monday – May 3rd, 2010



Place:	**Cherry Valley Club**
Brunch:	**11:00 am**
Shotgun:	**12:30 pm**
Reception:	**5:30 pm**
Dinner:	**6:30 pm**

This Event fills up fast, to guarantee a spot RSVP Soon.

(2) Foursome Limit Per Company.

Proper golf attire and shoes are required. Locker room and shower privileges are included.

CHECKS MUST BE IN BY APRIL 19, 2010 (No Exceptions)

Fax entire sheet or cut this half and return

Name: _____ Company: _____

Address: _____ Phone: _____

City, State, Zip: _____ Fax: _____

Guest 1: _____ Company: _____

Guest 2: _____ Company: _____

Guest 3: _____ Company: _____

Please make check payable to:

ASHRAE – Long Island Chapter

Mail Checks To:
MG Engineering, P.C.
Attn: Peter Gerazounis, P.E. LEED AP
116 West 32nd Street
New York, NY 10001
Fax No.: (212) 643-0503

Golf & Meals:	**$ 300 pp x ____**		**= $_____**
Reception & Dinner:	**$ 130 pp x ____**		**= $_____**
Sponsor Dinner:	**$1,000**	☐ **Yes**	**= $_____**
Sponsor Lunch:	**$ 500**	☐ **Yes**	**= $_____**
Sponsor Reception:	**$ 500**	☐ **Yes**	**= $_____**
Sponsor Prizes:	**$ 500**	☐ **Yes**	**= $_____**
Sponsor Beverage Cart:	**$ 500**	☐ **Yes**	**= $_____**
Sponsor Hole:	**$ 200**	☐ **Yes**	**= $_____**

ASHRAE Golf Outing 2010 - Monday, May 3rd, 2010

11th Annual LI ASHRAE GOLF OUTING

Monday – May 3rd, 2010

Cherry Valley Club
28 Rockaway Avenue at Third Street
Garden City, NY
Telephone: (516)746-4420
Fax: (516)746-4421

Program:

11 a.m. Brunch in the Clubroom & Lounge – including Omelet station, deluxe deli board with rolls, chicken scarpiello, danish, croissants, bagels & cream cheese, sliced nova, fresh fruit and cheeses, Good Humor ice cream cart.

12:30 p.m. Shotgun Start Golf – Playing individual scores. Prizes for long drive, closest to the pins, low gross and callaway. Refreshments at the halfway house will include packaged snacks and whole fresh fruit, hot dogs, beer & soda. A snack cart will also be on the course. Carts, forecaddies, driving range, locker room and showers are all included in the price.

5:30 p.m. Following Golf - Open Bar with hot and cold horsd'ouvres in the Main Lounge. Fresh mozzarella with sun-dried tomatoes, cajun chicken, spring rolls, baby lamb chops, sesame chicken, turkey canapés, fried oysters, cheeses, fresh fruit, lobster halves, fresh clams & oysters, shrimp and crab claws.

6:30 p.m. Reception Dinner – Awards and raffle in the Main Dining Room. Carving stations of beef tenderloin & turkey breast. Chafing dishes of chicken & salmon featuring the chef's specialty, pasta station with marinara or vodka sauce, and choice of tossed or Caesar salad. Viennese dessert table following the dinner featuring pastries, fruit, cookies, assorted cakes and pies. Full beverage service throughout is included.

Women are also invited to attend and participate. There are locker room facilities available. The Cocktail hour and Dinner will also be available for those who cannot attend during the day for the golf.

Note: We are limited to 128 golfers. Openings will be filled on a first come-first serve basis. Corporate sponsorships will be available and raffle items will be welcome. Proper golf attire is a requirement for the golf course. Soft spikes are required. Please wear a jacket for the dinner.

Directions:

From the North Shore of Long Island: Take the Long Island Expressway to Exit 34 South (New Hyde Park Road Southbound), Grand Central Parkway (Northern State Parkway) to Exit 26 South (New Hyde Park Road Southbound) or Jamaica Avenue (Jericho Turnpike) Eastbound to New Hyde Park Road. Travel Southbound on New Hyde Park Road for approximately 5 to 7 miles to Stewart Avenue (You will cross over a set of railroad tracks). Take Stewart Avenue eastbound for approximately 1-1/2 miles to Cherry Valley Avenue. Travel Southbound on Cherry Valley Avenue for 1/2 mile, Cherry Valley Avenue becomes Rockaway Avenue. Continue on Rockaway Avenue and the entrance to Cherry Valley Club will be on your right.

From Local Points North: Take Old Country Road or Stewart Avenue to Franklin Avenue. Travel Southbound on Franklin Avenue to Fourth Street (just after crossing over railroad tracks). Turn right on Fourth Street and continue until it ends (Rockaway Avenue). Cross over Rockaway Avenue into the Cherry Valley Club's parking lot.

From the South Shore of Long Island: Take the Southern State Parkway to Exit 19 (Peninsula Boulevard-Hempstead/ Garden City). Travel Northbound on Peninsula Boulevard for approximately 1/2 mile to President Street. Bear left on President Street (Northbound) for approximately one mile and cross over Hempstead Turnpike. President Street will become Cathedral Avenue. Continue on Cathedral Avenue for one mile to Fourth Street. Make a left on Fourth Street (Westbound) and continue until it ends (Rockaway Avenue). Cross over Rockaway Avenue into the Cherry Valley Club's parking lot.

From Local Points South: Take Hempstead Turnpike to Franklin Avenue. Travel Northbound on Franklin Avenue to Fourth Street. Turn left on Fourth Street and continue until it ends (Rockaway Avenue). Cross over Rockaway Avenue into the Cherry Valley Club's parking lot.

11th Annual LI ASHRAE GOLF OUTING

Monday – May 3rd, 2010

Cherry Valley Club
Golf Outing Guidelines

To add the enjoyment of your day, we ask that you abide by Cherry Valley Club's basic rules of The Club, dress, golf etiquette & safety, golf carts, and care of the course.

Club Rules

1. **Smoking is not permitted in the Club House.**
2. **Cell Phones are permitted in the parking lot only. Use of Cell Phones beyond the parking lot is strictly prohibited. This includes the Golf Course.**

Dress Code

1. Jeans, designer or otherwise, are not acceptable on club property. This not only includes pants, but skirts, and cut-offs.
2. T-shirts and tank tops are not in keeping with the atmosphere of the club and as such, are not acceptable. The definition of T-shirt includes those with psychedelic coloring or suggestive printing.
3. If the Main Dining room is going to be utilized for any purpose, jackets are required.
4. Short shorts are not permitted on the golf course, practice tee or putting green by either male or female. Bermuda shorts of acceptable length are permitted. Jogging attire and denim pants are not considered proper attire for the golf course.
5. **Soft spikes** are mandatory at all times on our fine golf course. If your shoes need soft spikes, arrive early so we can change them. There is a nominal fee. There is **no** exception to this rule.

Golf Etiquette and Safety

1. Slow play shows lack of consideration for the players in your group and, more important, for the players behind you. Golf is made much more enjoyable if all players adhere to the following points in the conduct of play:

    - Minimize the time spent looking for balls by watching the flight of balls hit by everyone in your group. If a ball appears to be lost or out of bounds, hit a provisional ball before leaving the tee.
    - Signal the players behind you to play through if it becomes apparent that a ball will not easily be found and you are holding up play.
    - Don't rush addressing and striking the ball but move briskly between shots.
    - If your ball is some distance from the golf cart and the exact club selection is in doubt, take several clubs with you when you leave the cart to walk to the ball.
    - When play reaches the area of the green, park the golf cart(s) behind the green or adjacent to the next tee. Walk briskly off the rear or side of the green after putting out. Mark your score cards after your group is off the green.
    - Once a score of double par has been posted, pick up and move on to the next hole.

2. No player should play until the players in front are out of range.
3. If your ball appears headed for a player or group of players immediately shout "fore" in a loud clear voice.
4. No one should move, talk or stand close to or directly behind the ball or the hole when a player is addressing the ball or making a stroke.

ASHRAE Golf Outing 2010 - Monday, May 3rd, 2010

11th Annual LI ASHRAE GOLF OUTING

Monday – May 3rd, 2010

Cherry Valley Club

Golf Outing Guidelines (Cont'd.)

Golf Carts

1. No more than two people are to be in a cart at one time.
2. No more than 2 bags are to be carried on one golf cart.
3. Members and their guest must observe all cart directional signs and use cart paths and designated golf cart parking areas where provided.
4. Good judgment, reasonable care, and observation of club rules are expected of any member or guest when operating a golf cart. Damaged golf carts will be repaired at the responsible member's expense. Each member or guest who rents a golf cart agrees to indemnify and hold Cherry Valley Club harmless of and free from any and all damages, judgment, court costs, attorney's fees or other expenses incidental to and incurred by Cherry Valley Club which may arise from misuse of a golf cart by such member or guest.
5. Members and their Guests must keep golf carts at least 10 yards away from greens trees or traps. They should keep a reasonable distance away from soft or wet areas and they must respect directional signs.

Care of the Course

1. Before leaving a sand trap, a golfer should carefully rake and smooth over all holes and footprints made by him.
2. From tree to green, a player should ensure that any turf cut or divot displayed by him is replaced at once and pressed down, and that any damage to the putting green made by a ball is carefully repaired.
3. Golf bags should never be brought onto a green. The flagstick should be carefully handled to ensure that no damage is done to the hole or the putting green. Don't dent the green with the flagstick or by leaning on your putter.
4. In taking practice swings, players should avoid causing damage to the course by taking divots. This is particularly true on the tees and in the vicinity of the greens.
5. Only putters are to be used on the practice greens. A separate practice green adjacent the driving range is available for chipping and sand trap practice.

2010 Region I Summer Dinner - Sunday, June 27, 2010

Please join us for the 2010 Summer Region 1 dinner!

High Finance Restaurant

More info on the restaurant is available here: http://www.sandiapeakrestaurants.com/highfinance/

Please be at the Tram Lift ($13 - included in the $50 cost!) by 5:30pm. The Tram holds up to 50 and it runs about every 20 minutes.

If you wish to carpool to The Peak via a shared taxi or with your rental car, please let me know in your RSVP, & I'll put people together. Please RSVP by June 22, 2010, via the link below.

R.S.V.P. Today

Thanks!
Steve Rosen

Directions:

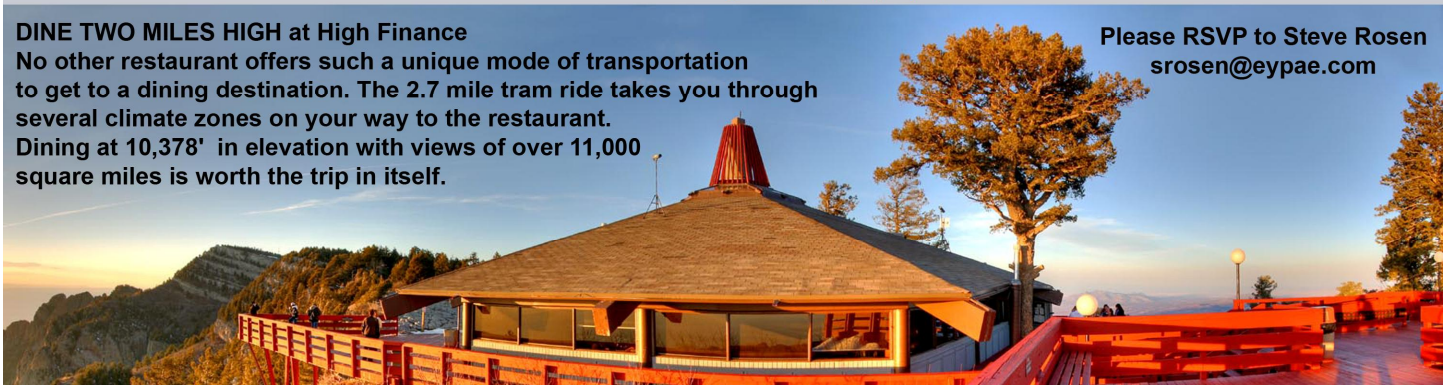
FROM I-40
Exit 167: Tramway Blvd., take Tramway Blvd.
North approximately 9 miles to Tramway Rd.
Take Tram to The Peak where High Finance is located.

FROM I-25
EXIT 234: EXIT 234 Tramway Road.
Follow Tramway Road,
East to the Sandia Peak Tramway.
Take Tram to The Peak where High Finance is located.

Region 1 Dinner

Sunday June 27, 2010 - 6:00pm

ASHRAE Summer Meeting - Albuquerque, NM



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