

# THE LONG ISLAND SOUNDER

February 2009



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

www.ashraeli.org

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

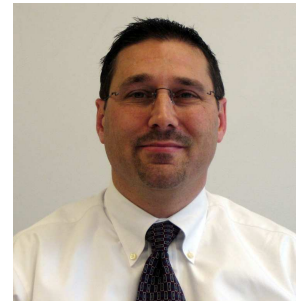
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## President's Message

Greetings fellow Ashrae members and business colleagues! As we enter the second month of the New Year, we are all a part of history with the inauguration of the first African American President of the United States. President Obama's inauguration speech was very inspirational and motivating for the American people, we are hopeful that this new administration will overcome the numerous challenges facing us today.

Speaking with developers, building owners, engineers and contractors, the construction industry seems to be slowing down considerably. They attribute that directly to the financial institutions, who are not lending money so generously for new or construction renovation projects and bonding requirements have become very difficult to fulfill. As anticipated, the economic turn-down has resulted in job loss throughout our industry. It is our duty and allegiance to the engineering and construction profession to put our heads together and find incentives to stimulate business. We, as Americans, must remain strong and maintain a positive healthy attitude.



I am happy to report that our chapter remains strong, our attendance is well maintained and has even increased. We had near 50 people at our January meeting and

accordingly have several new Long Island chapter members within the past few months. As always, I thank all of our members and guests who attend our monthly meetings, and especially recognize our past presidents this month for their leadership and commitment to the chapter. They are: Evans Lizardos (1978), Ron Kilcarr (1993), Gerald Griliches (1994), Alan Georke (1998), Ray Schmitt (2001) and John Nally (2006).

January's technical speaker, Mr. Ken Sewell of Emerson Network Power/Liebert, presented a fantastic overview and discussion of high density cooling for Data Centers. The development of this cooling system is well underway and surely proof positive that advancement and adaptation to the ever changing world of technology is captured. I would like to thank Ken for his presentation and for sharing his vast knowledge of high density cooling with us.

This month, we welcome SMACNA Long Island to our meeting, and as always, we are pleased to have this group of professionals join us. Our guest speaker will be Ashrae Distinguished Lecturer, Mr. E. Mitchell Swann, PE, LEED AP, who will speak to us about the

## CHAPTER MONTHLY MEETING

<b>DATE:</b>	<b>Tuesday, February 10, 2009</b>
<b>TIME:</b>	6:00 PM - Cocktails/Dinner 7:00 PM - Dinner Presentation 8:45 PM - Conclusion
<b>LOCATION:</b>	Westbury Manor South Side of Jericho Tpke. 25 Westbury, NY 11590
<b>FEES:</b>	
Members -	\$35.00
Guest -	\$40.00
Student -	\$15.00

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

Cont'd on Page 3

## Long Island Chapter Officers & Committees

### ASHRAE 2008/2009 OFFICERS

POSITION	NAME	PHONE	FAX	EMAIL
President	<b>Steven Friedman, HFDP</b>	212.695.1000	212.695.1299	sfriedman@lilker.com
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Vice President	<b>Nancy Román</b>	516.568.6509	516.568.6586	nroman@adehvac.com
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Treasurer	<b>Brian Simkins</b>	203.261.8100	203.261.1981	bsimkins@accuspecinc.com
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Board of Governors	<b>Janeth Costa</b>	631.242.8787	631.242.7084	jcosta@apollohvac.com
Board of Governors	<b>Peter Gerazounis, P.E. LEED AP</b>	212.643.9055	212.643.0503	peter.gerazounis@mgepc.net

### ASHRAE 2008/2009 COMMITTEES

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## President Message (Cont'd.)

design/build requirements of sustainable buildings. It is also student activities night, we encourage all engineering students to attend. This will greatly benefit students as they learn and understand what is now happening within the industry to consider the environment. Ashrae Research is a necessity within our industry, please bring a tax deductible check to the meeting to show your support or donate directly on-line, our funds worldwide are very short and your continued generosity is greatly appreciated.

I look forward to seeing everyone at our meeting. Thank you for your continued support of the Long Island Chapter.

**Steven Friedman, HFDP**  
**President - Long Island Chapter**

## Chapter Monthly Meeting - Program for 2008/2009

<b>September 9, 2008</b> * At Westbury Manor - 1 PDH  Dinner Presentation - DDC Controls <b>MEMBERSHIP PROMOTION NIGHT</b>	<b>February 2009</b> <b>NATIONAL ENGINEERS WEEK DINNER</b>
<b>October 14, 2008</b> * At Westbury Manor - 1 PDH  Dinner Presentation - Condensing Boiler Design <b>STUDENT ACTIVITIES NIGHT</b>	<b>March 10, 2009</b> * At Westbury Manor - 1 PDH Dinner Presentation - Dedicated Outdoor Air Systems/ Energy Recovery <b>RESOURCE PROMOTION NIGHT</b>
<b>November 18, 2008</b> * At Westbury Manor - 1 PDH  Dinner Presentation - Design/Build of LEED Projects <b>ASHRAE DISTINGUISHED LECTURER</b> <b>DR. TOM LAWRENCE, PH.D., P.E., LEED-AP</b> <b>RESOURCE PROMOTION</b>	<b>April 14, 2009</b> <b>FIELD TRIP - Blue Point Brewery</b>
<b>December 16, 2008</b>  Holiday Party - Westbury Manor	<b>May 4, 2009</b> * Cherry Valley Club, Garden City, NY <b>ANNUAL GOLF OUTING</b>
<b>January 13, 2009</b> * At Westbury Manor - 1 PDH  Dinner Presentation - Cooling High Density Heat Loads in Data Centers <b>MEMBERSHIP PROMOTION NIGHT</b>	<b>May 12, 2009</b> Dinner Presentation - TBD <b>REFRIGERATION NIGHT</b>
<b>January 24-28, 2009</b>  ASHRAE Winter Meeting - Chicago, IL	<b>June 9, 2009</b> * At Westbury Manor <b>PAST PRESIDENTS &amp; OFFICER INSTALLATION</b>
<b>February 10, 2009</b> * At Westbury Manor <b>JOINT MEETING WITH SMACNA</b> Dinner Presentation - Design Build - Executing the Project <b>ASHRAE DISTINGUISHED LECTURER</b> <b>E. MITCHELL SWANN, P.E., LEED AP</b> <b>STUDENT ACTIVITIES NIGHT</b>	<b>June 2009 - TBD</b> ASHRAE Annual Meeting

**August 2009 - Chapter Regional Conference Region I**

## PAOE POINTS FOR 2008/2009

Chapter Members	Membership Promotion	Student Activities	Research Promotion	History	Chapter Operations	CTTC	Chapter PAOE Totals
297	385	705	490	450	1,045	700	3,775

## February Program

### You are cordially invited to our February 2009 Joint Meeting with SMACNA LI



#### Dinner Presentation

#### *“Design Build – Executing the Project ”*

*Presented by*

**E. Mitchell Swann, P.E., LEED AP**  
Principal and Partner  
MDC Systems, LLC

**ASHRAE DISTINGUISHED LECTURER**



<b>DATE:</b>	<b>TUESDAY, FEBRUARY 10, 2009</b>		
<b>Time:</b>	6:00 PM – Cocktails and Hors D'oeuvres 7:00 PM – Dinner Presentation 8:45 PM – Conclusion	<b>Fee:</b>	\$ 35.00 Member \$ 40.00 Guest \$ 15.00 Student
<b>Location:</b>	<b>WESTBURY MANOR</b> (516) 333-7117 Jericho Tpke (South Side), 3/10 of mile east from Glen Cove Rd., Nassau County, NY. <b>Directions are posted at @ <a href="http://www.ashraeli.org">www.ashraeli.org</a>.</b>		
<b>Presentation:</b>	The growing popularity of design-build provides businesses with a unique opportunity to re-position their firms in a changing marketplace. With these opportunities come unique challenges. For many firms, the D-B role is a new one which results in changes in their 'custom and practice' and requires a shift in focus in order to execute projects smoothly. This segment will address some of the ideas, issues and concerns that arise in the D/B execution model which differs from traditional design or construction and which differ for the owner as well. Scope, quality, cost and schedule control are key items which will be addressed in the program. The value of 'selling' the service is only maintained if there is value in the delivery as well. <b>This seminar will earn professional engineers 1 PDH.</b>		
<b>About our Speaker:</b>	<b>E. Mitchell Swann, P.E., LEED AP, Distinguished Lecturer</b> - Mr. Swann has over 20 years of extensive experience on both domestic and international projects in the areas of management consulting and problem solving, engineering design, project and construction management, forensic engineering and construction claims analysis. Mr. Swann's career includes the analysis, evaluation and design of complex systems across a wide range of industries and buildings types including commercial, institutional and industrial facilities, hospitals laboratories, pharmaceutical manufacturing, microelectronic operations and data centers. Mr. Swann has chaired technical committee within national and international organizations and been a contributing author and editor for a number of technical publications and journals. He is a frequent speaker both nationally and internationally and is a listed member of the speakers' bureau in the Distinguished Lecturer program of ASHRAE. He has presented on Green Building issues in Abu Dhabi, Dubai, Delhi, Detroit, Chicago, Seattle, New York City, Indianapolis, Kansas City, Virginia and Delaware. He is a contributing author to the ASHRAE "Green Guide – The Design, Construction and Operation of Sustainable Buildings" and co-author of the ASHRAE Survival Guide to Design/Build Project Execution.		

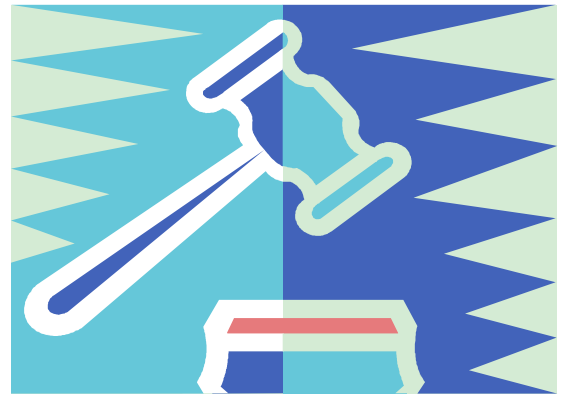
CHAPTER MAY NOT ACT FOR SOCIETY

An International Organization

## BOG Meeting Minutes

A meeting of the Board of Governors was held on Tuesday January 13, 2009 at the Westbury Manor. Present at the meeting were Steven Friedman, Steven Giammona, John Nally, Carolyn Arote, Brian Simkins, Janeth Costa and Andrew Manos. President Steven Friedman called the meeting into session at 5:02:

**Programs-** Steven Giammona discussed future programs are all lined up for the year. February will be the joint meeting with SMACNA, and there will be another Distinguished Lecturer. We discussed changing Mays meeting to be on alternative energy. Steve is looking into a potential meeting with National Grid/LIPA.



**Resource Promotion-** Janeth Costa has a total of 490 PAOE points already and is more than half way to the goal. We also have a total of \$2,045 collected towards our year end goal.

**Historian-** John Nally is trying to do new things for his article in the newsletter. He has a total of 450 PAOE points so far for the year.

**Webmaster-** Nancy Roman has brought on a new person to take over the website. The website is up to date and it was discussed on updating the website to make it easier to navigate.

**Treasurer-** Brian Simkins said we have been paid in full for last years ads in the newsletter. He has to invoice now for this year's ads so that we can be paid before the year is over. We had a lapse in billing 1 year and we are trying to get back on schedule, where the invoicing and payment is due before September starts. Taxes have been completed and filed by our accountant.

**Membership –** Carolyn Arote stated that she has 250 PAOE points so far this year. She does a monthly e-mail/phone call campaign for all the delinquents members to catch up on their dues.

**Student Activities-** Brian Simkins has a total of 705 PAOE points. Applications for the \$1000 scholarship will be made available online.

**Chapter Technology Transfer (CTTC)-** Andrew Manos reported all is on track and all the appropriate paper work is being done.

There being no further business to come before the meeting, the meeting was adjourned at 5:52.

**Andy Manos, LEED AP**  
**Chapter Secretary**



## History - It's Quiz Time Again

Listed below are ten questions relating to a specific year and event of our chapter. See how many you can answer by matching them up. No peaking at the answers. Good luck.

### Questions

Our chapter has hosted four CRC summer conferences. When was the second conference held?

- A. 1970      B. 1987      C. 1989**

In this year our chapter held it's silver anniversary dinner dance celebration.

- A. 1968      B. 1983      C. 1994**

A motion to allow paid advertising in the monthly bulletin was made and approved in this year.

- A. 1977      B. 1979      C. 1981**

A mailing list of the members of our chapter was first created in this year.

- A. 1958      B. 1962      C. 1967**

What year did Evans Lizardos serve as president of our chapter?

- A. 1969      B. 1978      C. 1984**

The front cover of the ASHRAE Journal featured an aerial view picture of the Grumman cogeneration plant in this year.

- A. 1986      B. 1988      C. 1991**

Our chapter celebrated the ASHRAE Centennial with historical displays and presentations, during an April dinner meeting at the Maine Main Inn this year.

- A. 1959      B. 1987      C. 1995**

What year did Claudio Darras become the president of our chapter?

- A. 2004      B. 1998      C. 1986**

Abe Rubenstein won the Region 1 golden ribbon award for history in this year.

- A. 1977      B. 1983      C. 1988**

Our chapter first started meeting at the Westbury Manor in this year.

- A. 1999      B. 2001      C. 2003**

***Bring a completed copy of this quiz with your name on it to the February dinner meeting and you will be entered in a drawing for a free dinner at the March meeting. (Answers located on Page 10)***

See you at the next meeting.

***John Nally***  
***Chapter Historian***



## Research Promotion

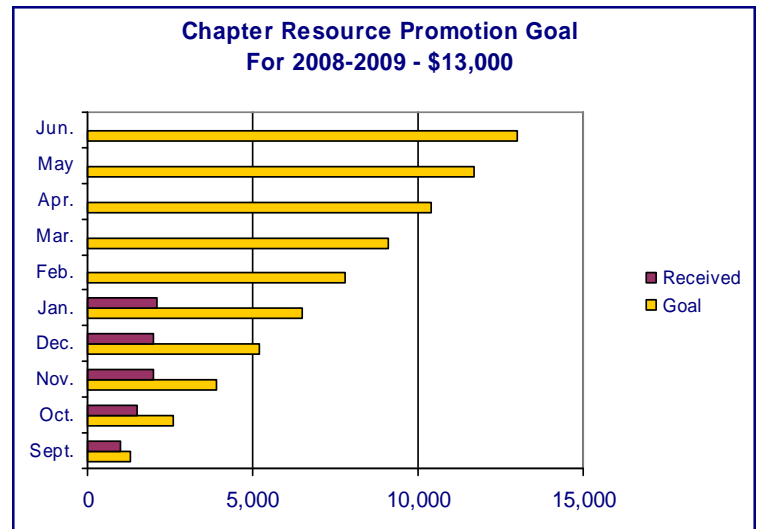
I want to start off by saying 'Thank you' to all of you who have already contributed to Ashrae research this year.

As of this past month, we have collected only \$2,100.00 towards our Research Promotion target goal of \$13,000.00 for this year. I am hoping to see all our past contributors and new supporters help us reach our goal. Please help support Ashrae in any way possible.

Contributions can be made in three ways:

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

Janeth Costa  
Ashrae Research Promotion Chair  
c/o Apollo HVAC Corp.  
225 North Fehr Way  
Bay Shore, NY 11706



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

3) You can contribute directly on-line. [www.ashrae.org](http://www.ashrae.org)

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

Thank you again for all your support!

**Janeth Costa**  
**Resource Promotion Chair**

## Membership

A reminder please to those who are delinquent with your Society and Chapter dues, please send off your payment at your earliest convenience. Don't let your membership lapse.

We are having a good year with new member recruitment. We have a total of over 10 new members for this year alone. We are hoping to get some YEA members, which is strictly any member under the age of 30. Please help us to get some new young members, as they are the future of our society. If you would like to help with recruitment please come and see me...you can join the committee.

See you at our next meeting.

**Carolyn Arote**  
**Membership Chairman**

## CTTC

### Selecting CO<sub>2</sub> Criteria for Outdoor Air Monitoring

The operation of buildings is as, or is more important than, the original design in maintaining a healthy indoor environment and energy efficiency. A number of certification programs and standards specify the use of ventilation system performance monitoring. Monitoring is to be done either based on CO<sub>2</sub> concentrations in the occupied space or actual measurement of outdoor airflow, depending on the space design occupancy and ventilation type (mechanical or natural). For example, outdoor air delivery monitoring is a credit option for new construction, existing buildings and the core and shell LEED programs from the U.S. Green Building Council.

The current standards or program descriptions do not provide detailed guidance for determining what concentration of CO<sub>2</sub> should be considered the maximum concentration. The LEED-EB (for existing buildings) credit mentions CO<sub>2</sub> concentrations 15% above that expected to occur with a corresponding minimum outdoor airflow rate required by ANSI/ASHRAE Standard 62.1-2007, *Ventilation for Acceptable Indoor Air Quality*, but does not list what the actual CO<sub>2</sub> concentrations are. LEED-NC, version 2.2, (new construction) offers a credit (EQ Credit 1) for monitoring of CO<sub>2</sub> concentrations in mechanically ventilated densely occupied ( $\geq 25$  people per 1,000 ft<sup>2</sup>) spaces, and in all naturally ventilated spaces. Again, no specific maximum CO<sub>2</sub> concentrations are provided. The California Title 24 *2008 Building Energy Efficiency Standards* specifies a maximum CO<sub>2</sub> concentration of 600 ppm above ambient as a “one size fits all” criteria for spaces using demand ventilation controls. However, this only applies to California because it has its own ventilation standard, which is not based on Standard 62.1.

Decisions must be made regarding the balance between having adequate outdoor air ventilation to the occupied space while still considering the energy requirements needed to condition that ventilation air. Section 6.4.3.8 in ANSI/ASHRAE/IESNA Standard 90.1-2007, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, describes the allowances for dynamic reset of outdoor air ventilation for densely occupied spaces. *ASHRAE Journal* has published many articles during the past decade that deal with outdoor airflow control (demand-controlled ventilation or DCV) using CO<sub>2</sub>. These include discussions on demand-control ventilation design guidelines, applying supply air CO<sub>2</sub> control, retrofitting CO<sub>2</sub> control in existing buildings, the potential sustainability benefits for CO<sub>2</sub> DCV, and the risk versus rewards involved. Various options beyond occupancy sensing using CO<sub>2</sub> are possible as well for outdoor airflow rate control and dynamic reset.

The existence of differing criteria, or the lack of guidance on the exact criteria to use for determining the upper limit of CO<sub>2</sub> in a monitoring program or for a DCV system can lead to confusion. It is generally thought of as the responsibility of the design engineer to define the upper allowed limit. However, this may not always be done. In an existing building, the building operator may be forced to make a decision on what is the highest acceptable concentration of CO<sub>2</sub>.

This article is intended to provide overall guidance and direction on what should be considered a too high concentration of CO<sub>2</sub> in a given space undergoing a CO<sub>2</sub>-based outdoor air monitoring program. The results also can be used to help determine the upper control limit for a system using DCV. The guidance is built upon the fundamental concepts described in key ASHRAE documents, such as Standard 62.1, the corresponding *User's Manual* and the *ASHRAE Handbooks*, with added engineering judgment to focus on the key aspects needed for a CO<sub>2</sub>-based outdoor air monitoring program.

### Indoor Air Quality Monitoring Options

The two most common options used for monitoring indoor air quality of a space are the direct measurement of the total outdoor airflow and the monitoring of CO<sub>2</sub> concentrations. The direct measurement of outdoor airflow may appear to be conceptually straightforward, but its application in practice can be technically difficult with issues such as low intake airflow velocities, flow through exhaust dampers, or measuring low differentials in velocity pressures.

CO<sub>2</sub> monitoring is commonly used as an indirect indication of indoor air quality problems due to insufficient outdoor air ventilation rate, but it certainly is not without the potential for error and misinterpretation. One reason is that it neglects



## CTTC (Cont'd. from Page 8)

pollutants not associated with occupants, such as off-gassing from building materials and furnishings, making it only an indirect method of determining adequate ventilation.

### Key Issues With CO<sub>2</sub> Monitoring, Equipment and Systems

When developing a CO<sub>2</sub>-based outdoor air monitoring program, a number of issues need to be considered. These include how and where to measure the CO<sub>2</sub> concentrations; what type of sensing system to use; the required accuracy level of the sensor(s); calibration requirements for whatever devices are chosen; and whether to base the evaluation on absolute concentrations of CO<sub>2</sub> or on the differential with respect to the ambient air. The type of ventilation system being used can influence these choices.

A CO<sub>2</sub> sensor need not be located within the zone itself; rather a system could be chosen that draws samples of air from the zones at the required locations and uses a central monitoring sampler to determine CO<sub>2</sub> levels. While locating the CO<sub>2</sub> sensor directly in the zone usually works sufficiently for the purposes of CO<sub>2</sub> monitoring, using a centralized sampling system may be more accurate, especially if the monitoring is based on comparing CO<sub>2</sub> concentrations, such as breathing zone levels compared to the outdoor air.

Another consideration is the CO<sub>2</sub> sensor accuracy level and if it is sufficient for use in zone monitoring. Typical cut sheet accuracies range between 50 and 100 ppm at 2,000 ppm. At the lower range of 50 ppm, consider the concentration error for two sensors (zone and outside air) in a space designed for 15 cfm per person (with a corresponding 700 ppm differential between zone and outside air). This net 100 ppm potential error is roughly equivalent to an error in outdoor airflow monitoring of  $\pm 2$  cfm of outdoor air per person. If sensors with 75 ppm accuracy were used in the same situation, the equivalent to error in outdoor airflow monitoring would be  $\pm 3$  cfm. Advances in CO<sub>2</sub> sensor technology over the past decade now allow for less frequent recalibration, e.g., once every five years. Some devices also are advertised to conduct self-calibration, but this technique is still relatively new.

Questions can be legitimately raised as to whether a space can ever be assumed to be fully mixed, and at steady-state with respect to CO<sub>2</sub> concentration. Whether or not the space can be considered fully mixed is related to the zone air-distribution effectiveness. Values for this can be found in Standard 62.1-2007, Table 6-2. Under constant occupancy conditions, the time needed for a building or room to reach equilibrium is a function of the air change rate (assuming the occupancy, ventilation rate and outdoor concentration remain steady as well). A time period with stable occupancy and ventilation rate equal to three times the room time constant is required for room CO<sub>2</sub> concentrations to reach 95% of their steady-state value. In a room with a low air change rate, it may take up to 12 hours of constant conditions for true equilibrium conditions to be reached. Persily specified the following criterion for a building to be considered in equilibrium:

$$|\Delta C| \leq \frac{324 \times 10^6 G}{V}$$

(1)

Where

The conversion constant ( $324 \times 10^6$ ) is based on SI units with:

$\Delta C$  = change in indoor-outdoor concentration in one hour,  $\text{mg}/\text{m}^3 \cdot \text{h}$

$G$  = CO<sub>2</sub> generation rate in the zone, L/s

$V$  = Volume of the zone, L

Cont'd on Page 10

## CTTC (Cont'd. from Page 9)

For example, consider a typical K – 12 school classroom with assumed default occupancy of 35 persons per 1,000 ft<sup>2</sup> and a total CO<sub>2</sub> generation rate of 0.38 cfm based on the data shown in Figure C-2 of Standard 62.1-2007. Assuming a room ceiling height of 9 ft, the resulting typical room volume is 30,000 ft<sup>3</sup>. Using this equation, the room could be considered in equilibrium if the change in CO<sub>2</sub> concentration was less than 108 ppm by volume over a one-hour period.

In practice, most spaces do not remain steady in occupancy and airflow for long enough time periods to reach full steady-state equilibrium of CO<sub>2</sub> concentration. However, for simple and indirect checking of outdoor airflow per person, it is not necessary for a space to be in complete equilibrium for the values measured to give at least a good indication of the current apparent rate of outdoor airflow with respect to occupancy. Related to that, Lawrence and Braun showed that a steady-state analysis was sufficient for evaluating a building for potential CO<sub>2</sub>-based DCV retrofits. When considering decisions that are broader in nature, such as “is this concentration of CO<sub>2</sub> too high,” which implies that the rate of outdoor airflow reaching the breathing zone is too low for the occupancy, then simplifying assumptions can be made.

We must keep in mind that the actual purpose of CO<sub>2</sub> monitoring is to provide an indication of the level of bioeffluents in the space, which is what we are trying to control using ventilation. Taylor indicated, in the sidebar titled “Assumptions of Steady-State Conditions,” that the generation of bioeffluents should closely mimic the rate of generation of CO<sub>2</sub> since both are generated at a rate related to the number of people in the space and their activity level.

### Determining Expected CO<sub>2</sub> Concentrations

Standard 62.1-2007 specifies minimum outdoor air ventilation rates in the breathing zone based on the zone occupancy category. Table 6-1 in this standard provides the required values per person and per floor area for the different occupancy types, and also includes a default value for the net combined ventilation rate per person using default occupancy values. Expressed as the flow rate per person, the default combined values can range widely, from 5 cfm per person to 25 or more cfm. Thus, the “normal” expected CO<sub>2</sub> concentration at the design outdoor airflow rate and occupancy could vary widely as well, even at steady-state conditions, and a simple single CO<sub>2</sub> concentration above ambient conditions would not apply universally to all occupancy space categories.

The *ASHRAE Journal* article by Taylor and the *62.1 User's Manual*, Appendix A provide a good technical review of the calculations involved with determining required outdoor ventilation airflow and the resulting steady-state CO<sub>2</sub> concentrations for single-zone systems. While those articles provide a good derivation of the equations involved, the following is a brief summary of how steady-state room CO<sub>2</sub> concentration can be calculated from an overall mass balance of CO<sub>2</sub> into and out from the space.

$$C_R = C_{OA} + \frac{\text{Rate of CO}_2 \text{ generation}}{\text{Rate of CO}_2 \text{ removal}}$$

(2)

The rate of CO<sub>2</sub> generation and removal can be expressed on a ‘per person’ basis. The rate of CO<sub>2</sub> generation is based on the activity level (*m*, or metabolic rate).

$$\text{Rate of CO}_2 \text{ generation per person} = 0.0084 \text{ cfm} \times m$$

(3)

The rate of CO<sub>2</sub> removal is a function of the outdoor air ventilation rate being supplied to the breathing zone. Standard 62.1-2007 specifies that the outdoor ventilation air required is computed based on a component for the occupants, as well as for the building area, or:

Cont'd on Page 11

**CTTC (Cont'd. from Page 10)**

$$V_{bz} = R_p P_z + R_a A_z$$

(4)

Where

 $R_p$  = ventilation rate per person $P_z$  = number of people in the zone $R_a$  = ventilation rate per building unit area $A_z$  = building area

The combined outdoor ventilation air rate per person to the breathing zone can be found by dividing *Equation 4* by the number of occupants. The amount of ventilation air to the breathing zone ( $V_{bz}$ ) is determined based on the outdoor air rate supplied to the zone ( $V_{oz}$ ) and the zone air distribution effectiveness ( $E_z$ ), as shown by *Equation 5*.

$$V_{oz} = \frac{V_{bz}}{E_z}$$

(5)

Using the CO<sub>2</sub> generation rate per person and the combined outdoor ventilation air rate per person, the steady-state room CO<sub>2</sub> concentration (in ppm) that will occur in the breathing zone at design occupancy and assuming the minimum outdoor ventilation air is provided can be determined by *Equation 6*.

$$C_R = C_{OA} + \frac{0.0084 (\text{cfm/person}) \times 10^6 \cdot E_z \cdot m}{R_p + \frac{R_a A_z}{P_z}}$$

(6)

This is the equivalent to the *Equation 13* in the article by Taylor. As an example, consider a typical museum gallery. *Table 6-1* of *Standard 62.1-2007* defines the default occupancy of 40 people per 1,000 ft<sup>2</sup>, and a default combined outdoor air rate of 9 cfm/person delivered to the breathing zone. Assuming an ambient CO<sub>2</sub> concentration of 400 ppm, a zone air-distribution effectiveness of 1.0 and an activity level ( $m$ ) of 1.5, the corresponding room CO<sub>2</sub> concentration would be:

$$C_R = 400 \text{ ppm} + \frac{0.0084 (\text{cfm/person}) \times 10^6 \times 1 \times 1.5}{9 (\text{cfm/person})} = 1,880 \text{ ppm}$$

(7)

## CTTC (Cont'd. from Page 11)

Table 1: Computed and Recommended CO<sub>2</sub> Concentrations for Outdoor Airflow Monitoring or DCV Upper Control Limit

Occupancy Category	Default Values Combined Outdoor Air Rate Per Person		Assumed Activity Level	CO <sub>2</sub> Generation	Actual Steady-State Concentration	Monitoring Program Concentration (Alarm Level)	DCV Upper Control Limit Concentration (Caution Level)	LEED-EB IEQ Credit 1 Concentration
	cfm	L/s	(met)*	(cfm per person)	(ppm)†	(ppm)†	(ppm)†‡	(ppm)†‡
<b>Correctional Facilities</b>								
Cell	10	4.9	0.8	0.007	1,072	1,200	965	1,233
Dayroom	7	3.5	1.2	0.010	1,840	2,000	1,656	2,116
Guard Stations	9	4.5	1	0.008	1,333	1,500	1,200	1,533
Booking/Waiting	9	4.4	1	0.008	1,333	1,500	1,200	1,533
<b>Educational Facilities</b>								
Day Care (Through Age 4)	17	8.6	1.5	0.013	1,141	1,300	1,027	1,312
Day Care Sickroom	17	8.6	0.8	0.007	795	900	716	915
Classrooms (Age 5–8)	15	7.4	1	0.008	960	1,100	864	1,104
Classrooms (Age 9+)	13	6.7	1	0.008	1,046	1,200	942	1,203
Lecture Classroom	8	4.3	1	0.008	1,450	1,600	1,305	1,668
Lecture Hall (Fixed Seats)	8	4	1	0.008	1,450	1,600	1,305	1,668
Art Classroom	19	9.5	1.2	0.010	931	1,100	837	1,070
Science Laboratories	17	8.6	1.2	0.010	993	1,100	894	1,142
University/College Lab	17	8.6	1.2	0.010	993	1,100	894	1,142
Wood/Metal Shop	19	9.5	2	0.017	1,284	1,400	1,156	1,477
Computer Lab	15	7.4	1.2	0.010	1,072	1,200	965	1,233
Media Center	15	7.4	1.2	0.010	1,072	1,200	965	1,233
Music/Theater/Dance	12	5.9	2	0.017	1,800	1,900	1,620	2,070
Multiuse Assembly	8	4.1	1.5	0.013	1,975	2,100	1,778	2,271
<b>Food and Beverage Service</b>								
Restaurant Dining Rooms	10	5.1	1.4	0.012	1,576	1,700	1,418	1,812
Cafeteria/Fast-Food Dining	9	4.7	1.4	0.012	1,707	1,900	1,536	1,963
Bars, Cocktail Lounges	9	4.7	1.4	0.012	1,707	1,900	1,536	1,963
<b>General</b>								
Break Rooms	10	5.1	1.2	0.010	1,408	1,600	1,267	1,619
Coffee Stations	11	5.5	1.2	0.010	1,316	1,500	1,185	1,514
Conference/Meeting	6	3.1	1	0.008	1,800	1,900	1,620	2,070

Cont'd on Page 13



## CTTC (Cont'd. from Page 12)

Table 1: Computed and Recommended CO <sub>2</sub> Concentrations for Outdoor Airflow Monitoring or DCV Upper Control Limit (Cont.)								
	Default Values Combined Outdoor Air Rate Per Person		Assumed Activity Level	CO <sub>2</sub> Generation	Actual Steady-State Concentration	Monitoring Program Concentration (Alarm Level)	DCV Upper Control Limit Concentration (Caution Level)	LEED-EB IEQ Credit 1 Concentration
Occupancy Category	cfm	L/s	(met)*	(cfm per person)	(ppm) <sup>†</sup>	(ppm) <sup>†</sup>	(ppm) <sup>†‡</sup>	(ppm) <sup>†§</sup>
<b>Hotels, Motels, Resorts, Dormitories</b>								
Bedroom/Living Area	11	5.5	0.8	0.007	1,011	1,200	910	1,163
Barracks Sleeping Areas	8	4	0.8	0.007	1,240	1,400	1,116	1,426
Laundry Rooms, Central	17	8.5	2	0.017	1,388	1,500	1,249	1,596
Laundry Within Dwelling	17	8.5	1.4	0.012	1,092	1,200	983	1,256
Lobbies/Prefunction	10	4.8	1.5	0.013	1,660	1,800	1,494	1,909
Multipurpose Assembly	6	2.8	1.5	0.013	2,500	2,600	2,250	2,875
<b>Office Buildings</b>								
Office Space	17	8.5	1.2	0.010	993	1,100	894	1,142
Reception Areas	7	3.5	1.2	0.010	1,840	2,000	1,656	2,116
Telephone/Data Entry	6	3	1.2	0.010	2,080	2,200	1,872	2,392
Main Entry/Lobbies	11	5.5	1.5	0.013	1,545	1,700	1,391	1,777
<b>Miscellaneous Spaces</b>								
Bank Vaults/Safe Deposit	17	8.5	1	0.008	894	1,000	805	1,028
Computer (Not Printing)	20	10	1	0.008	820	1,000	738	943
Pharmacy (Preparation Area)	23	11.5	1.4	0.012	911	1,100	820	1,048
Photo Studios	17	8.5	1.4	0.012	1,092	1,200	983	1,256
Transportation Waiting	8	4.1	1	0.008	1,450	1,600	1,305	1,668
<b>Public Assembly Spaces</b>								
Auditorium Seating Area	5	2.7	1	0.008	2,080	2,200	1,872	2,392
Place of Religious Worship	6	2.8	1.2	0.010	2,080	2,200	1,872	2,392
Courtrooms	6	2.9	1.2	0.010	2,080	2,200	1,872	2,392
Legislative Chambers	6	3.1	1.2	0.010	2,080	2,200	1,872	2,392
Libraries	17	8.5	1	0.008	894	1,000	805	1,028
Lobbies	5	2.7	1.5	0.013	2,920	3,100	2,628	3,358
Museums (Children's)	11	5.3	1.5	0.013	1,545	1,500	1,391	1,777
Museum/Galleries	9	4.6	1.5	0.013	1,800	1,700	1,620	2,070

Cont'd on Page 14

## CTTC (Cont'd. from Page 13)

Table 1: Computed and Recommended CO<sub>2</sub> Concentrations for Outdoor Airflow Monitoring or DCV Upper Control Limit (Cont.)

Occupancy Category	Default Values Combined Outdoor Air Rate Per Person		Assumed Activity Level	CO <sub>2</sub> Generation	Actual Steady-State Concentration	Monitoring Program Concentration (Alarm Level)	DCV Upper Control Limit Concentration (Caution Level)	LEED-EB IEQ Credit 1 Concentration
	cfm	L/s	(met)*	(cfm per person)	(ppm) <sup>†</sup>	(ppm) <sup>†</sup>	(ppm) <sup>†‡</sup>	(ppm) <sup>†§</sup>
<b>Retail</b>								
Sales (Except Below)	16	7.8	1.5	0.013	1,188	1,300	1,069	1,366
Mall Common Areas	9	4.6	1.5	0.013	1,800	1,900	1,620	2,070
Barbershop	10	5	1.2	0.010	1,408	1,600	1,267	1,619
Beauty and Nail Salons	25	12.4	1.2	0.010	803	900	723	924
Pet Shops (Animal Areas)	26	12.8	1.2	0.010	788	900	709	906
Supermarket	15	7.6	1.5	0.013	1,240	1,400	1,116	1,426
Coin-operated Laundries	11	5.3	1.4	0.012	1,469	1,600	1,322	1,689
<b>Sports and Entertainment</b>								
Spectator Areas	8	4	1.5	0.013	1,975	2,100	1,778	2,271
Disco/Dance Floors	21	10.3	3	0.025	1,600	1,700	1,440	1,840
Health Clubs/Aerobics Room	22	10.8	4	0.034	1,927	2,100	1,735	2,216
Health Clubs/Weight Room	26	13	3	0.025	1,369	1,500	1,232	1,575
Bowling Alley (Seating)	13	6.5	1.5	0.013	1,369	1,500	1,232	1,575
Gambling Casinos	9	4.6	1.2	0.010	1,520	1,700	1,368	1,748
Game Arcades	17	8.3	1.2	0.010	993	1,100	894	1,142
Stages, Studios	11	5.4	1.5	0.013	1,545	1,700	1,391	1,777

\*From 62.1 2007 User's Manual or taken directly or estimated from 2005 ASHRAE Handbook—Fundamentals, Chapter 8, Table 4. <sup>†</sup>Assumes 400 ppm ambient.  
<sup>‡</sup>Steady-state concentration -10%. <sup>§</sup>Steady-state concentration +15%.

CO<sub>2</sub> Concentration Difference Criteria for OA Monitoring

Starting with the expected steady-state concentration of CO<sub>2</sub> for any given space, we can develop values that would be useful in a CO<sub>2</sub> monitoring program. It may be desirable for a building or system operator to have two sets of CO<sub>2</sub> concentrations. One value would be to use as a *caution point*, warning that the concentrations are approaching the generally expected maximum. A second, and higher, concentration would be the level used as an *alarm point* signifying a situation where something was wrong. The alarm point would be expected to be used as an upper limit as part of a CO<sub>2</sub> monitoring program, while the caution point might be used as an upper setpoint limit used in a CO<sub>2</sub>-based DCV system. Overall, four sets of values are derived and presented here, with each being useful for different situations.

Cont'd on Page 15



## CTTC (Cont'd. from Page 14)

**1. Actual expected maximum steady-state CO<sub>2</sub> concentration.** This is the value computed based on the combined outdoor air ventilation rate per person (as defined in Table 6-1 of Standard 62.1-2007) and the expected metabolic rate for the occupants in that space, as defined in either Appendix A of the *62.1 User's Manual* or estimated using Table 4 in Chapter 8 of the *2005 ASHRAE Handbook—Fundamentals* as a guide.

**2. Upper limit for a CO<sub>2</sub> monitoring program (alarm point).** This value is the critical “action level” for CO<sub>2</sub> concentration in the space that would trigger action or at least be recorded as an incident in the monitoring program. The values proposed here are based on the expected maximum steady-state CO<sub>2</sub> concentrations (Situation 1) rounded upward to allow for sensor error and to give concentrations in “hundreds of ppm” for simplicity.

**3. Upper limit for CO<sub>2</sub>-based DCV (caution point).** This is the upper limit used in the control system algorithm that adjusts outdoor ventilation airflow based on measured CO<sub>2</sub> concentrations. The values proposed here are based on the expected maximum steady-state CO<sub>2</sub> concentrations (Situation 1) minus 10% to allow for control system response times, sensor inaccuracy, etc. Finding the right minimum CO<sub>2</sub> concentration to begin damper position movement can be tricky, but the damper is opened gradually as CO<sub>2</sub> values rise toward the maximum concentration setpoint, at which the outdoor air damper would be at the maximum open position.

**4. Upper limit for a building undergoing LEED-EB monitoring.** This is the maximum value allowable in a space if a building were trying to obtain the LEED-EB program IEQ Credit 1. The values proposed here are based on the expected maximum steady-state CO<sub>2</sub> concentrations (Situation 1) +15%, as specified in the LEED-EB credit description. (The discussion below compares the results of the LEED-EB values and the alarm point concentrations.)

These four different sets of values are summarized in *Table 1*, and are based on the assumption that the ambient concentration is 400 ppm, there is a zone air-distribution effectiveness of 1.0, and the zone is at design occupancy and is provided with the minimum outdoor air ventilation rate. The table is organized using the various occupancy categories listed in Table 6-1 of Standard 62.1-2007.

### Discussion

The three columns on the right side of *Table 1* summarize the key recommendations and purpose of this article. The primary purpose is to present proposed room CO<sub>2</sub> concentrations for use in a CO<sub>2</sub> monitoring program. These values are presented as an aid to a building operator, manager or systems designer responsible for developing a CO<sub>2</sub> monitoring program, or, alternatively, in determining control limits for a CO<sub>2</sub>-based DCV system. The concentration criteria allow for a potential sensor error in the range of 50 ppm to 75 ppm. When conducting CO<sub>2</sub> monitoring for the space, if the room concentration exceeds the amount recommended in *Table 1* for that particular occupancy type, then this would indicate a potential problem with the system that must be investigated.

It is interesting to compare the recommended CO<sub>2</sub> monitoring program concentration limits (the action level) presented to the concentrations that are a set 15% above the steady-state values (the LEED-EB criteria for IEQ Credit 1). These concentrations are the same, with differences due to rounding to the nearest hundreds of ppm concentration for the recommended CO<sub>2</sub> monitoring program action levels.

The results presented here also can be applied to CO<sub>2</sub>-based DCV systems. The upper limit of the control algorithm is recommended to be the steady-state room concentrations minus 10%, and these values are given in the second from right column in *Table 1*. The DCV control should have as an alarm point the concentrations listed as the CO<sub>2</sub> monitoring program action levels.

## CTTC (Cont'd. from Page 15)

### Potential Responses if Recommended Criteria Are Exceeded

The actual response taken if the CO<sub>2</sub> concentration difference is exceeded in a space as part of an outdoor air monitoring program can vary. The criteria given in *Table 1* would be used as the maximum allowable values above which a signal to the system operator or other response would be initiated. The actual response taken if the CO<sub>2</sub> criteria are exceeded is up to the individual building owner or operator. A local alarm or building automation system signal, or both, could be sent, or only a record could be made that this event occurred for future diagnostic purposes.

### Summary

The use of CO<sub>2</sub> monitoring as part of an overall outdoor air monitoring program is becoming more common in the operation of a modern building. To date, minimal practical guidance has been given as to what CO<sub>2</sub> concentrations would be considered the upper limit. This article presents a set of recommended maximum CO<sub>2</sub> concentration differences as a function of the design combined minimum outdoor airflow and the anticipated metabolic rate for the zone occupants that can be used as upper acceptable limits for an outdoor air monitoring fault detection program.

**Andrew Manos**

**Chapter Technologies Transfer Committee Chair**

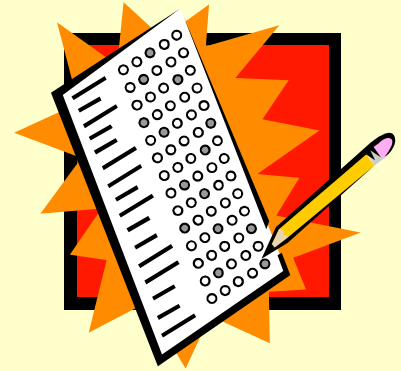
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## History Quiz Answers...

### Answers

- |             |                             |            |
|-------------|-----------------------------|------------|
| 1. C. 1989  | 2. B. 1983                  | 3. C. 1981 |
| 4. A. 1958  | 5. B. 1978                  | 6. C. 1991 |
| 7. C. 1995  | 8. A. 2004                  | 9. C. 1988 |
| 10. C. 2003 | 11. Who's paying attention? |            |



## Student Activities - February is "Student Activities Night"

**Student Activities Night** - Our next Student Activities night is this February so please help make this a successful event by inviting all engineering students to attend. I received a nice note from a young engineer Brandon Leary with Lizardos Engineering that reinforced all the efforts we put into our Student Activities and keeping students interested in Engineering as a career path. I look forward to getting Brandon more involved in Student Activities with his fresh perspective on how to better serve our members.

**Carrier Services** - It's that time of year again when students start hitting their Carrier Services offices looking for you. Please let me know if you have internships available and we will help you find candidates. This is a great opportunity for you and our young engineers to see what our industry is all about.

**The ACE Mentor Program of Greater New York** - This is a unique partnership among New York City's leading schools and universities, architects, interior designers, engineers, construction management companies, professional organizations and related corporations. Participating companies adopt a group of some 25 students for the school year, introducing them to the rewards of design and construction careers, challenging them to solve complex problems as part of a team, and making college a reality for them.

Please visit <http://www.acementor.org/610> to learn more.

**The ASHRAE Senior Undergraduate Project Grant Program** - Provides grants to engineering, technical and architectural schools worldwide with the goal of increasing student knowledge, learning and awareness of the HVAC&R industry through the design and construction of senior projects. Grants are to be used to fund equipment and supplies for senior projects and 2-year technical school projects that focus on ASHRAE-related topics. Grants may cover projects lasting from one academic term up to one year.

Please visit <http://www.ashrae.org/students/page/704> to learn more about the Grants and Scholarships that are available.

Please visit: <http://www.ashrae.org/students/> for more information on all the Student ASHRAE activities and opportunities.

**Brian Simkins - Student Activities Committee**

**Carolyn Cammalleri, LEED AP - Vice Chair**



# ASHRAE Golf Outing 2009 - Monday, May 4th, 2009



## 10<sup>th</sup> Annual LI ASHRAE GOLF OUTING Monday – May 4<sup>th</sup>, 2009



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 17, 2009 (No Exceptions)**

*Fax entire sheet or cut this half and return*

Name: \_\_\_\_\_ Company: \_\_\_\_\_  
 Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
 City, State, Zip: \_\_\_\_\_ Fax: \_\_\_\_\_

I have read and understand the Cherry Valley Rules and Regulations (Signature): \_\_\_\_\_

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 32<sup>nd</sup> Street  
 New York, NY 10001  
 Fax No.: (212) 643-0503

Golf & Meals:	\$ 300 pp x _____	= \$ _____
Reception & Dinner:	\$ 130 pp x _____	= \$ _____
Sponsor Dinner:	\$1,000 <input type="checkbox"/> Yes	= \$ _____
Sponsor Lunch:	\$ 500 <input type="checkbox"/> Yes	= \$ _____
Sponsor Reception:	\$ 500 <input type="checkbox"/> Yes	= \$ _____
Sponsor Prizes:	\$ 500 <input type="checkbox"/> Yes	= \$ _____
Sponsor Beverage Cart:	\$ 500 <input type="checkbox"/> Yes	= \$ _____
Sponsor Hole:	\$ 200 <input type="checkbox"/> Yes	= \$ _____

## ASHRAE Golf Outing 2009 - Monday, May 4th, 2009



### ***10<sup>th</sup> Annual LI ASHRAE GOLF OUTING*** ***Monday – May 4<sup>th</sup>, 2009***

**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 hors d'oeuvres 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.

## ASHRAE Golf Outing 2009 - Monday, May 4th, 2009



### ***10<sup>th</sup> Annual LI ASHRAE GOLF OUTING*** ***Monday – May 4<sup>th</sup>, 2009***

#### **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 2009 - Monday, May 4th, 2009*****10<sup>th</sup> Annual LI ASHRAE GOLF OUTING***  
***Monday – May 4<sup>th</sup>, 2009*****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.

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