ASHRAE Toronto Chapter

JANUARY GAZETTE | *Our 98th year!*

January 2020- Vol 67, Issue 2

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VIEWPOINT

At our ASHRAE Toronto dinner meeting in January, during our regular historical vignette "On the Shoulders of Giants" I spoke about the publication Heating and Ventilation Magazine[1]. This magazine was a monthly publication that existed in the late 19th and early 20th century as a journal concerned with the matters related to, as you may have guessed, Heating and Ventilation. This journal served as a forum for engineers and businesses to share their experiences with projects, products, and new methods and technologies.

I was introduced to this journal in the course of my research into Hugh Barron, William Mackay, and Louis Hart who would create The American Society of Heating and Ventilation Engineers. This society would eventually go on to become ASHRAE.
In going through this publication, I was in awe of how much the engineers of their day knew about the science of heating and ventilation, but also how much they were learning, and the knowledge they freely shared with others. There was a sense of community and connection, as well as a spirit of discovery. They had to experiment and discover or invent much of what we take for granted today. It was well known that ventilation was important, and laws were emerging to protect the public health. H&V was key in providing industry professionals with word of the new laws and standards, as well as methodologies and techniques for exhausting "vitiated air"[2].

While comparing the state of the industry in that day to our own it is easy to feel like there are no discoveries or contributions to be made, instead, we're just re-using the tools created by those who

came before us. One could be forgiven for feeling this way, but it is not the case. Every day there are new discoveries that advance the arts and sciences of HVAC+R, and you can be part of it!
There are many gaps in our current knowledge base that are demanding to be filled, and the only requirements to do so are an inquisitive mind and a motivated spirit. By being part of ASHRAE you are among more than 57,000 people worldwide who are contributing to the cause. ASHRAEs technical committees are at the forefront arranging for research projects and publishing these findings for use worldwide.

The work that these committees do goes beyond just comfort and efficiency. Indoor air quality is drastically underappreciated as to the effects on health. According to the World Health Organization 3.8 Million people die prematurely[3] each year due to household air pollution caused by indoor cooking using solid fuels or kerosene.

I'm a member of TC 5.10 - Kitchen Ventilation[4] and we are concerned with the health, safety, and sustainability of commercial kitchens, as well as expanding in scope to residential kitchen ventilation. The work on this committee affects hundreds of thousands of people world-wide who work in commercial food preparation as well as improving the indoor air quality and safety in the home. The other technical committee I sit on is TC 2.2 - Plant and Animal Environment[5], one direction our TC is exploring is food security and how indoor plant growing or animal farming can allow for increased food access in developing nations and inhospitable environments.

These committees are just two of many, and the excellent work done by them permeates throughout the industry. All you need to do is show up. Even if you don't know if you want to join, you are more than welcome to sit in on a session. All are welcome, and the more diverse the knowledge and experience that can be contributed, the better. You don't have to be an engineer to participate. Suppliers, operators, owners, contractors, technicians, and academics are all welcome. The most important thing is that all perspectives and experiences are included. It doesn't matter how well we update the standards if the manufacturers can't meet them, the contractors can't install them, or the owners can't see why they should pay for them. We need everyone to participate so no one is left behind.

It is my hope that you continue to find these history vignettes educational and inspirational, but my greater wish is to motivate you into participation. You already took the first steps, you showed up to the meeting, or read this article. But you can do more! You can give your time and expertise. You can shape your industry, and you can improve living conditions for millions of people across the globe.

Everyone has something to offer. Everyone has something to contribute. You just need to participate.

Niss Feiner, C.Tech, CHD
Delta-T Designs

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[1]Google Books - https://tinyurl.com/heating-ventilation
[2] 1. Air in which the oxygen content has been reduced.2. Air that is not fresh (https://www.oxfordreference.com)
[3] https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health
[4] http://tc0510.ashraetcs.org/
[5] https://tc0202.ashraetcs.org/

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ASHRAE Toronto Chapter thanks the following companies for their support of the Gazette!

SEPTEMBER DINNER PRESENTATION SUMMARY

Why Buildings Matter: The Role of ASHRAE 90.1 and the Future of Building Performance

R. Christopher Mathis, Mathis Consulting Company

September's dinner meeting focused on the discussion on why buildings matter, and the role of ASHRAE 90.1, as well as the future of building performance. To further

expand on this topic, we had the pleasure of having R. Christopher Mathis, of Mathis Consulting Company, as our distinguished lecturer. Mr. Mathis has had over 35 years of experience as a building scientist and has been an ASHRAE member for over 30 years.

In the US alone, buildings make up about 39.4% of the total energy used yearly. While other sectors such as transportation and industry make up 29% and 31.6% respectively. The energy that is utilized for buildings can further be subdivided between residential areas and commercial areas. Residential areas have made up 20.7% of the energy used by buildings, while commercial spaces make up 18.7% of the energy usage. In Canada we are not much further behind, the total energy usage for buildings makes up about 21%. Energy consumption in the states and Canada has continued to increase over the past couple of years, and the question of where our energy will come from in the future is becoming a very important topic.

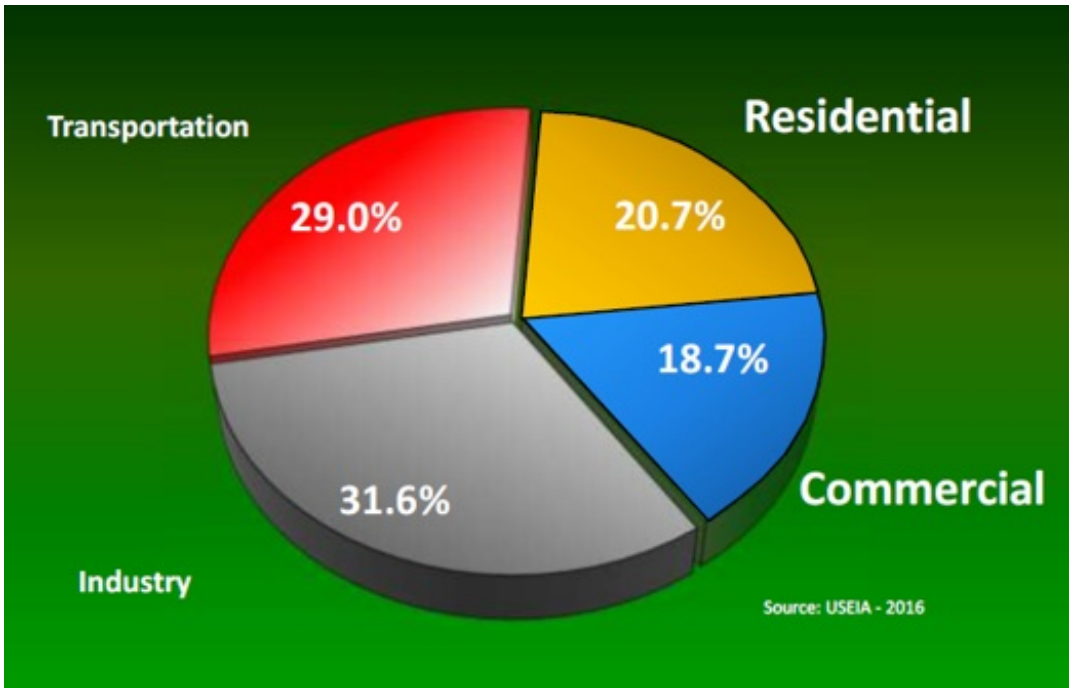

Figure 1: Total Energy Usage Breakdown

Over 3 quarters of the energy that we use is created from finite resources, making them an unsustainable model. About 81% of the total energy production produced in the US came from fossil fuel sources such as petroleum, natural gas, and coal. Nuclear and Renewable energies make up about 9% and 10% of the total energy production in the US respectively. Our distinguished lecture Mr. Mathis identifies the need of diversification in energy and power sources, to rely less on finite resources. This is a growing issue, as more communities expand and integrate technology such as AC units, heating systems, more appliances and other such equipment the energy usage will further increase. With increasing population, higher demand for energy during specific times will cause greater strain on the energy industry.

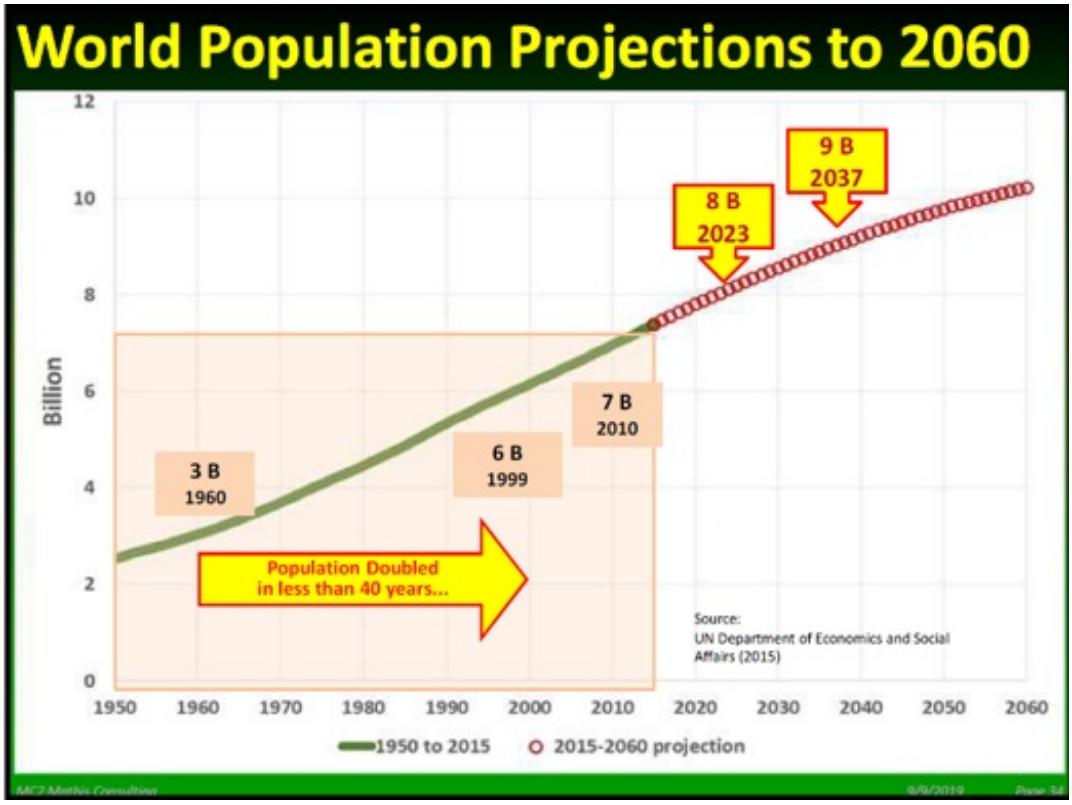

Figure 2: World Bank Population Projection Chart

In order to combat the increasing energy demands, Mr. Mathis argues that better regulations, laws, and codes are necessary to create a push that will increase environmental awareness when designing and constructing new buildings and large-scale retrofits. Currently major code revisions have only been in response to natural disasters, but a more proactive approach needs to be taken in order to prevent climate change related disasters.

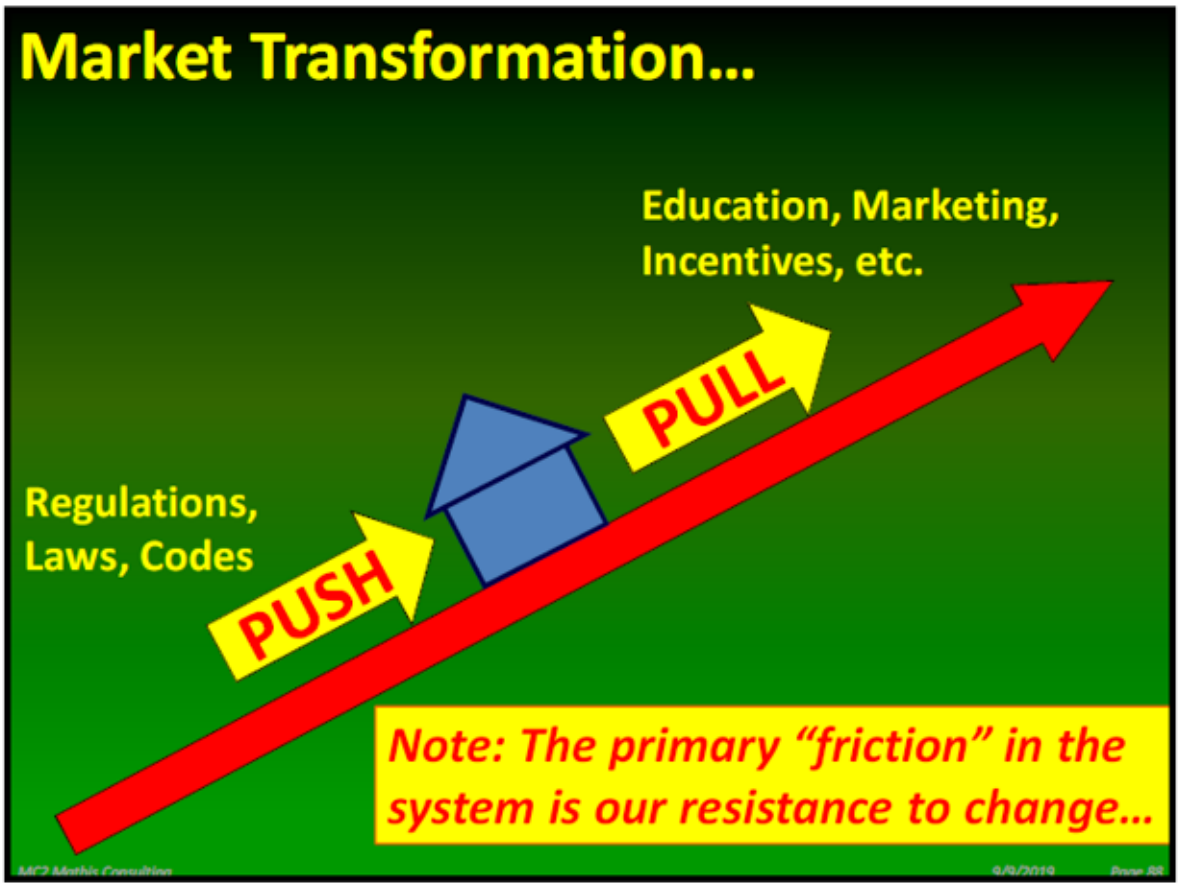

Figure 3: Market Transformation of Building Codes and Standards

The ASHRAE 90.1 standard is a great tool in designing buildings that meet the minimum energy efficiency for commercial buildings, high-rise residential, and semi-conditioned buildings. 90.1 is on continuous maintenance, which means that every 3 years it is updated. In recent editions of the 90.1 standard, building envelope and reduction of uncontrolled air leakage has become a greater focus in the design process. Through stricter control of the indoor environment, energy can be more efficiently used in correctly conditioning the spaces.

As we continue to live in an ever-developing world, it is important for knowledgeable building industry professionals to lead in the innovation of more environmentally friendly living spaces. Continue to apply environmental trends that consider human expectation trends, population, water, and power. Push for codes and standards that demand more efficient energy requirements to be considered.

Summary by Andy Valencia

Electronic Communications and Gazette Committee

OCTOBER DINNER PRESENTATION SUMMARY

Seneca Center for Innovation, Technology, and Entrepreneurship Building Design

Erich Hoyle, Alex Du, Amy Su,

& Smith + Andersen

Ranjan Bhattacharya, Dean, Faculty of Applied Science and Engineering Technology at Seneca College

Laurel Schollen, Vice President Academic at Seneca College

October's dinner meeting focused on introducing students in the ASHRAE Society, to some of the work that Mechanical, Electrical, and IT consultants must accomplish in order to properly and efficiently design and construct an institutional building space. To help further explore this topic our guest speakers: Erich and Alex, mechanical consultants from Smith and Anderson, Amy, an energy modeling specialist for Footprint, and Ranjan and Laurel, discuss the various task that were accomplished in the development of the Seneca Center for Innovation, Technology and Entrepreneurship (CITE). The new CITE building exemplifies Seneca College's commitment to environmental sustainability, reduction to their carbon footprint and greenhouse gas emissions through their target of obtain a LEED Gold certification.

The role of mechanical, electrical, and IT consultants is to develop the designs of the major infrastructures that are required to properly operate a building, as well as to develop an energy model forecast for the spaces found within the building. The results of their work are the creation of engineering drawings, which the contractors will utilize as plans to begin construction. Consultants are also responsible for coordinating between clients, in this case Seneca, the architects and other consultants to properly determine what systems should be put in place. The CITE building targeted a LEED Gold Certification, a third-party certification process focused on sustainable and energy efficiency in building design and construction. The guest speakers focus on presenting solutions for achieving energy and atmosphere requirements, indoor environmental quality, and water efficiency.

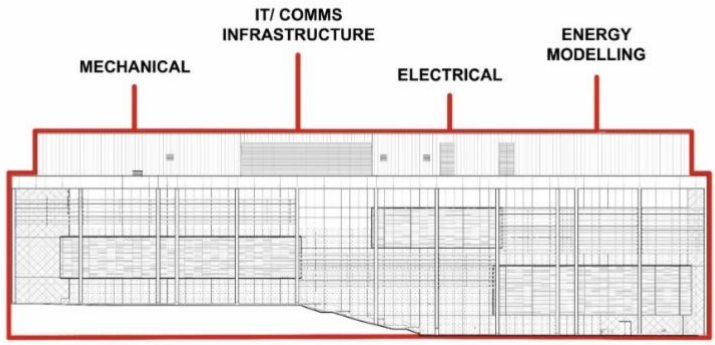

Figure1: Seneca CITE Layout

To achieve the energy targets that were placed for the CITE building, to achieve a LEED Gold Certification, various solutions must be applied to the mechanical,

electrical, and architectural design. Strategies and equipment such as heat recovery methods, magnetic bearing chiller technology, condensing boiler technology and water reuse strategies can be applied to mechanical systems such as: ventilation system, chiller plants, boiler plants, and domestic water systems, as energy reduction solutions.

The ventilation system that was installed in the Seneca CITE building utilizes a Dedicated Outdoor Air System (DOAS) as it reduces duct sizes, superior controllability, less outdoor air requirements, and improved energy efficiency, when compared to the more common Variable Air Volume (VAV) systems installed in Toronto. To properly understand the advantages of DOAS system over the VAV systems, understanding of ASHRAE 62.1 outside air requirements is needed. ASHRAE 62.1 mandates specific outdoor air volumes on a per person and per square foot basis depending on a space type. It is important to note that individual zones will have different Outdoor Air Volume requirements. Air handling units in the VAV systems have only one outdoor air intake, and as a minimum must provide enough Outdoor Air (OA) percentage to satisfy the most demanding zone. This can lead to over ventilation of zones with lower OA percentages. This additional OA still needs to be conditioned and results in increased energy requirements. The challenges of implementing a DOAS system include the increased capital cost, more piping distribution, frequent equipment maintenance and noise attenuation. However, implementation of the DOAS reduce the total outdoor air volume requirements by up to 40% depending on the application resulting in substantial energy savings; it also reduces size of distribution ductwork by approximately half the size, and allows for more ceiling space

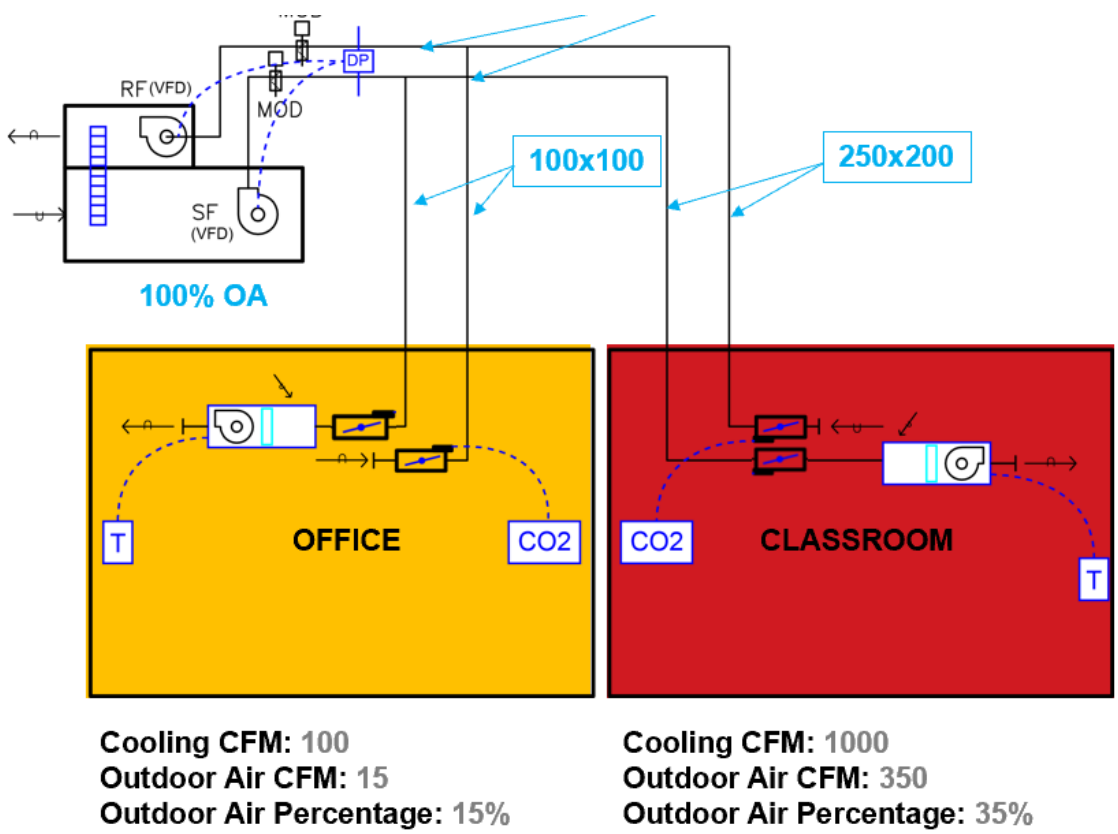

Figure 2: DOAS schematic

Once the OA volume requirements have been reduced, pre-treatment of incoming air

can be more efficiently carried out through the application of Enthalpy Recovery Wheels (ERW) and dual core heat recovery systems. ERW can be used on all OA units to transfer latent and sensible energy from exhaust air to the OA. During winters in Toronto, -20 degrees Celsius air can be brought up to 10 degrees Celsius before any additional conditioning is done to the air. Dual core heat recovery is alternate method of heat recovery that was implemented in the machine shop areas of the CITE building. This system is made up of 2 energy cores, special damper sections, and supply and exhaust fans. The advantages of a dual core heat recovery unit are: no frosting under normal operation and down to extremely cold temperatures, high latent energy recovery, low maintenance as it is self cleaning, low cross leakage rate (1-3%), and industry leading efficiency (80-90 % effectiveness).

The Seneca CITE building utilizes chillers and cooling towers to provide cooling applications to the building. The chillers and cooling towers work in conjunction to generate chilled water which runs to serve cooling coils at the AHU's to cool supply air, and additional room-side cooling at each FCU. Chillers function on the principles of the refrigeration cycle. This is the process where a liquid refrigerant evaporates and absorbs energy through chilled water stream. This chilled water is then supplied to the building to cool it.

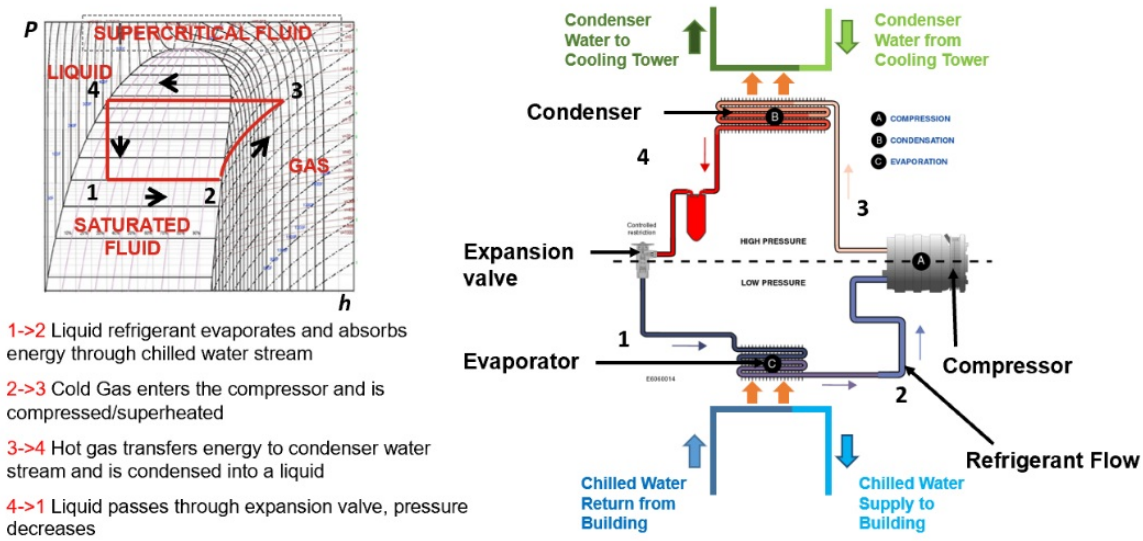

Figure 3: Ideal Refrigeration Cycle

It is important to note that this is representation of an ideal refrigeration cycle, which does not occur in real life due to factors such as friction and loses over time such as wear and tear. For this reason, it is important to select the right type of compressors to maximize the efficiency of the system. The two main compressor types focused in this lecture are positive displacement compressors and centrifugal compressors. Positive displacement compressor such as: reciprocating, screw and scroll physically compress the refrigerant into a smaller space. Centrifugal compressors generate centrifugal force, kinetic energy, which results in a velocity pressure increase to compress the refrigerant.

The cooling towers used in the CITE building are utilized as heat sinks for the heat extracted from the condenser. Induced draft cooling towers, further extend the efficiency of the cooling towers. This system works by inducing air flow by means of a fan and openings in the bottom of the cooling tower. As air rises through the cooling tower, it comes into contact with hot water which is dispersed down through spray

nozzles. Some of the water will evaporate, creating a cooling effect. This cooled water is then sent back to the chiller condenser to be reused.

To provide heating to the CITE building, natural gas-fired boilers and heated water loops were utilized through the building to serve air handling units, and perimeter heaters at each floor. The types of boilers that were considered for this project were Condensing and Non-Condensing boilers. The major difference in these two systems is the condensing boilers ability to recover and use the heat from the created flue gases. This is achieved by allowing the flue gases to change condensate on the surface of the heat exchangers. Once heat has been extracted the liquid condensate is drained into a waste pipe. Use of the condensing boilers has a much greater efficiency (up to 99%), in comparison to the non-condensing boilers (up to 87%). The condensing boilers do carry a high initial cost, and the added parts means more there are more maintenance requirements. However, the higher efficiency of the condensing boiler creates additional energy savings, and much lower long-term operation costs.

The energy modeling process is used to quantify the energy measures and can typically start as early as the pre-schematic phase. During this phase the various concepts obtained from the architect, can be compared to determine the most efficient design and layout by comparing the mass, orientation, window to wall ratio, and building envelope. During the design phase, more information will become available from the architects. At a minimum the consultants need to ensure that local energy code is met. During this stage consultants must also look for various ways to meet their sustainability goals, in this case it would be achieving a LEED Gold certification. By introducing various energy conservation measures, consultants can pick the best strategies that work best for the region and type of building they are designing. During the construction phase, consultants will need to validate and adjust the models to reflect the as built installations and ensure that no drastic changes occur with respect to the model.

To achieve the energy parameters that were placed for the CITE building, a combination of high-performance panel wall and roofs were installed, these range in R values of R25 R26. High performance glazing with a U factor of 0.32 was also used, and the façade shading was placed along the south facing side of the building. These tools help reduce the energy consumption needed to properly condition the interior of the building by making use of passive heating and cooling techniques. In the interior LED lights with occupancy sensors and daylighting sensors, help reduce the use of lighting when no one is in the rooms or when enough daylight is present to properly lit the space.

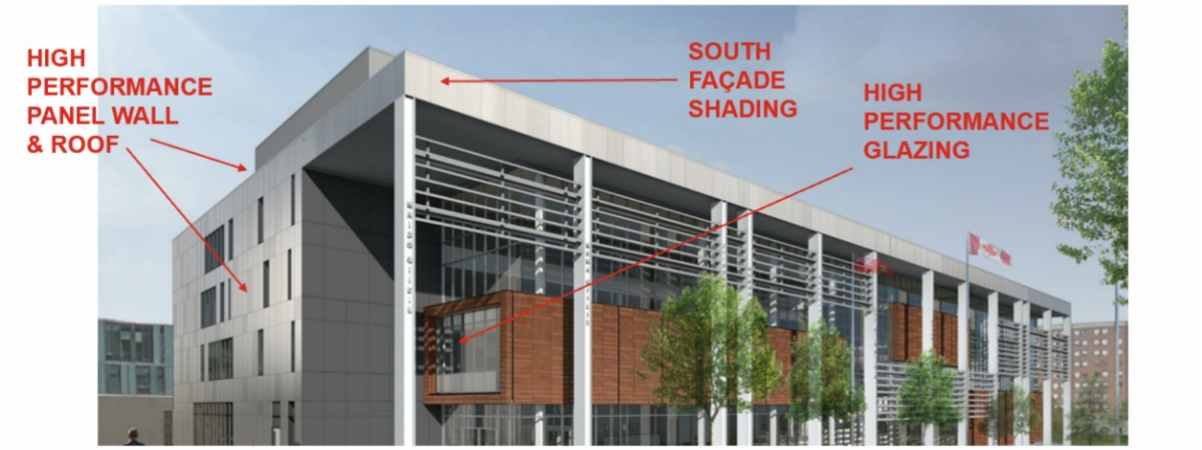

Figure 4: CITE building, Seneca College

Overall the energy parameters set by the LEED Gold standard were achieved through the application of the before mentioned strategies. This resulted in the CITE building having a reduction of 35% in the utility cost and reduced the greenhouse emissions of the building by 40 %.

Summary by Andy Valencia
Electronic Communications and Gazette Committee

NOVEMBER DINNER PRESENTATION SUMMARY

Futureproofing Commercial Buildings:

The Unification of Multiple Building Systems

Ryan Sen - November dinner presentation

November 2019, Ryan Sen from Distech Controls presented the idea of the Internet of Things (IoT) commercial buildings. Buildings that will connect various systems such as fire control, HVAC, lighting, security systems and provide autonomous management of energy consumption and climate control. Furthermore, these buildings will interface with technologies such as CCTV cameras and smartphones to automatically identify individuals and provide optimum environmental conditions to ensure productivity throughout the day. Buildings will autonomously open the parking gates, open the elevator door & select the floor, adjust the office room temperature & the lighting to ones liking before the individual reached the room, brew a cup of coffee, start the video conferencing system, generate email reminders to participants that are running late and much more. All of this will be achieved by leveraging the existing IT infrastructure, IP connectivity and cloud services.

With approximately 80 billion devices connected to the internet by 2020, the idea of the IoT buildings seems achievable in the near future. The IoT buildings have some key benefits such as interoperability, sustainability, distributed intelligence, data collection, performance and user experience. These benefits can be leveraged by implementing the following in the buildings.

Open Communication: Open communication protocols such as BACnet, Lonworks,

Modbus, EnOcean, Niagara Framework ensure interoperability between various BAS systems such as HVAC, lighting, fire alarms, elevators, and card access. Open communication allows the IoT building to elevate itself beyond mere interoperability between Vendor A's controller and Vendor B's controller.

API's & Enterprise Application: Enterprise-level applications helps in achieving interoperability between BAS and their occupants by leveraging open web services such as open REST API. Ensuring communication between the BMS and the enterprise-level application such as ERP system and Point of Sale system will provide the necessary infrastructure to build IoT buildings. These IoT buildings will have the capability to use enterprise-level applications such as lighting at a grocery store to determine an individual's location in the store and use that information to send coupons to that individual's smartphones for the products that are nearby.

Virtualization of Systems: Virtualization of systems is key to the scalability of IP based technologies in buildings. Virtualization provides the flexibility to add new systems to the existing system while utilizing the existing wiring, switches and routers. Virtualization allows various systems such as fire control, HVAC, lighting, security and other building systems to co-exist on the same physical IT infrastructure.

Enterprise-Level Management: Enterprise-level management helps IT departments control and monitor all devices on the network. This results in the minimization of traditional deployment and ownership costs of building management systems. Convergence via virtualization eliminates the requirement for managing multiple networks and greatly reduces the need for cabling and other materials, as well as the associated costs of installing, maintaining and upgrading. IT managers can have visibility and the capability to support advanced Building Automation components such as HVAC, Lighting, Shading, Access Control, CCTV and so forth. Leveraging the SNMP protocol, IT managers can utilize a centralized platform to gain visibility and management control over the vast array of devices connected to the network. Consider a scenario where an IP based VAV Box controller goes offline in the ceiling of busy office space. The IT manager, by virtue of enterprise management, will become aware of it immediately and may elect to simply go and have it replaced with a spare. The problem will be resolved before a single occupant raises a comfort issue or a work-order is generated for a BAS technician.

The Hybrid Architecture: The hybrid combination of wired IP and wireless IP on the same controller provides flexibility in both new buildings and retrofit projects. Consider a scenario where a portion of the building is wired IP in a daisy chain fashion, then you go across a large atrium via WiFi and then back on the other side as wired POE with your HVAC & Lighting Zones all talking to sensing elements via EnOcean or Bluetooth. Essentially, leveraging all of these different connectivity options, there is no building architecture that can't be met - be it across your entire building or across an entire campus of buildings.

IoT buildings will empower users and building occupants to make informed decisions based on actual analysis of all the data (big data) collected from the robust sensory network of all systems in buildings. Building operators will have access to all data points on one screen from all different systems which will result in a single unified experience. IoT buildings will leverage open web services and constant availability of the internet to provide the ability to connect and interact with any application in the building.

IoT buildings can be implemented in both new construction and retrofit projects.

Having the right people invested and communicating will help in breaking the barrier. Building the IoT building of tomorrow will require us to get the Electrical Engineers, Mechanical Designers and CTO/CIO's all in one room together. Ensuring that all three trades are represented and have the opportunity to weigh in will naturally lead to each group taking ownership and result in a successful project.

Summary by Rana Singh

PHOTOS - SEPTEMBER 2019 DINNER MEETING - R. CHRISTOPHER MATHIS

PHOTOS - OCTOBER 2019 DINNER MEETING- SENECA COLLEGE CENTRE FOR INNOVATION ,TECHNOLOGY AND ENTREPRENEURSHIP (CITE)

Erich Hoyle

Alex Du

Amy Su

PHOTOS - NOVEMBER 2019, ASHRAE TORONTO & TSMCA - 5th ANNUAL JOINT TRADE SHOW


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JOB POSTINGS

Welcome to the ASHRAE Toronto Chapter job postings section. Started in the fall of 2010, our job posting board is available to our members for industry related employment opportunities. Please contact us at support@torontoashrae.com for pricing and details. To look for a job posting, visit one of the career pages below:

1) Vibro Acoustics, a Swegon Group Company
http://careers.swegonnorthamerica.com/

2) Rycom
https://www.rycom.com/careers/

3) ESC Environmental Systems Corporation
Project Design & Sales Engineer
Critical Environments Project Designer and Administrator - Details Here

UPCOMING EVENTS

February 10th, 2020

Bridging the Gap:
Preventing conflict between engineers and contractors

Venue: Novotel North York
3 Park Home Ave, North York, ON M2N 6L3
Time: 5:30 pm - 8:30pm

Niss Feiner, C. Tech, CHD Delta-T Designs

It seems so straight forward. Engineers and Contractors are teammates with the common goal of improving a property. It doesn't matter if it's a renovation, new build, or an addition, both parties are working towards the same end. So why is there so much friction? Why is there such animosity?.

Register

February 12th, 2020

10th Annual Career Fair Employer Registration

Venue: Humber College
Centre for Technology Innovation
205 Humber College Blvd, Toronto
ON M9W 5L7

Time: 10:030 am - 2:00pm

With the growing market demand for new graduates and experienced professionals in the HVAC/R, Building Sciences and Green Building industry, ASHRAE Toronto will be partnering with employers across Canada to host their 10th Annual Career Fair.

Don't miss your chance to network with enthusiastic students, new graduates and seasoned professionals who have an interest and focus in your industry.

Register

For additional information visit
https://www.torontoashrae.com/page-374073

ASHRAE Upcoming Training in Toronto

Expand your understanding of the fundamental and technical aspects needed to design, maintain and operate new and existing HVAC systems.

Toronto, ON
May 18 - 20, 2020
May 21 - 22, 2020

For other cities/dates available visit
https://www.ashrae.org/professional-development/all-instructor-led-training/hvac-design-and-operations-training

Call for Entries
Toronto Chapter Competition
ASHRAE Technology Awards

Effective energy utilization is just one of several aspects of facility and building design. The ASHRAE Technology Awards program recognizes, on an international scale, successful applications of innovative design, which incorporate ASHRAE standards for effective energy management, indoor air quality, and good mechanical design.

Enter the chapter competition for a chance to compete at Regional Level. Only Regional first-place-winners can submit an application for the Society level competition.

Toronto Chapter Competition Deadline: May 2nd, 2020

For additional information contact your CTTC chair
Jamie Fine jamie.ashrae@gmail.com

New ASHRAE certification!

HVAC Designers

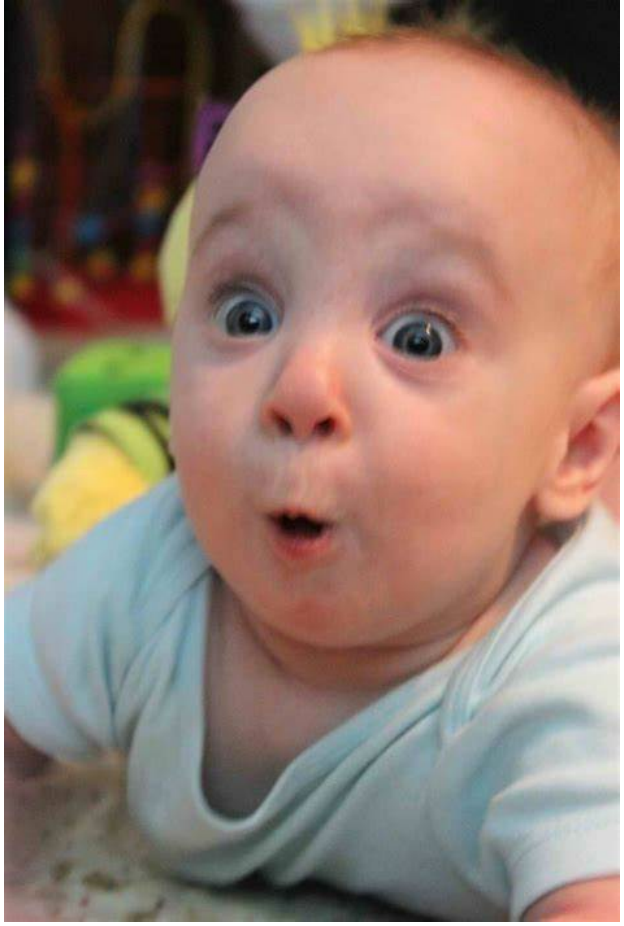
Why is earning the ASHRAE Certified HVAC Designer (CHD) credential the best way to gain a competitive edge? In a recent "Industry Need" survey, ASHRAE Member respondents who influence the HVAC Designer hiring decision had this to say:

- HVAC Designer certification is a tool to identify competent new hire prospects (74%)
- It is a worthwhile professional development goal (82%)

HVAC Designers themselves agree that earning an HVAC Designer certification would be a "worthwhile professional development goal" (75%) and "help differentiate practitioners from their peers" (70%). Earning the Certified HVAC Designer (CHD) certification will let your employer, peers and customers know that you have the knowledge, skills and abilities needed to get the job done, and position you for continued recognition and success.

For more information on this and other available certifications follow thelink below
https://www.ashrae.org/professional-development/ashrae-certification

FUNNY SECTION



"When you first heard that AHR 2020 is in Orlando!"

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Join the conversation and tweet, Facebook, or follow on LinkedIn.

We want to hear from all members of the industry and are excited to share HVAC/building system news and current chapter events.

Have some thoughts on social media content? Email: Thinusha Param