ASHRAE Toronto Chapter

SEPTEMBER GAZETTE| *Our 98th year!*

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VIEWPOINT

We as an industry have historically been slow to adapt to new technologies. We take comfort in reusing technologies which have worked in the past for new projects. When faced with adversity, we work hard to get out of our comfort zone and find to implement technologies, which we have historically viewed as excess of what currently needs. Due to Covid19, we are now more aware of personal space, physical contact and ensure we are doing our best to keep ourselves and others safe.

We now find ourselves in a world trying to minimize the physical contact with others. Non- Touch technologies have been around for some time. They have been viewed as an excess, and too expensive. But we find ourselves looking into implementing and retrofitting them into our buildings. There are some technologies which use a proximity sensor to activate buttons, some elevator companies are now introducing systems where you use a virtual pad to select floors. Apps to open/close doors, wayfinding technologies to ensure we all move in one direction inside an office environment. This is a brave new world, we are finding ourselves in.

Technology has given us the ability to assemble buildings like never before. We are building bigger, smarter and better. We are integrating a multitude of building systems into one common pane of glass, allowing visibility into the HVAC, Security, Lighting and Access Control. All of this is to improve occupant engagement, giving tenants the ability to customize their workspace to meet their individual needs. Giving them the flexibility to organize and maximize their space.

We must become better at adapting change. Technologies change occur very rapidly, and we must learn to become better and looking and applying some of them. We must become better stewards of the built

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environments, there will be a day when Humidity control on floor levels will become a requirement, not just CO2, Temperature.

The volunteers which make up ASHRAE, has been working to better our built environment. We are building standards and doing research for the betterment of human comfort.

Thank you,

Antonio Figueiredo

Past President
ASHRAE Toronto Chapter

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EXPERT PANEL - JUNE 1st

How Does COVID-19 Impact Future Building Operation and Design?

Panelists: Kyle Hasenkox, Luke Leung, Max Sherman, Michael P. Sheerin

Moderator: Abhishek Khurana

As we continue to face the current COVID-19 pandemic, it is necessary to discuss the various changes that COVID-19 has had on our lives and how to safely design and operate buildings during any pandemic. ASHRAE Toronto's June Webinar assembled a group of panelists comprised of four industry experts that focus on four different building types: 1) Hospital, 2) School, 3) Commercial, and 4) Residential. The panel was an open format discussion, where the moderator Abhishek Khurana guided the discussion through important topics concerning each building type. A couple major topics discussed by the panel included building ventilation, tips and tricks for navigating available technical resources, changes to indoor setpoints, controlling airflow, and the importance of humidification. The goal of this panel is to help attendees gain increased confidence in their building design and operation projects.

Panelists

Panelists

Luke Leung
PE, LEED Fellow, P.Eng
Director
Skidmore, Owings & Merrill LLP

Luke is a LEED Fellow; Chair of ASHRAE COVID19 task force on Commercial Buildings, upcoming Vice Chair of "Environmental Health Committee" ASHRAE; Former Board of Directors for USGBC, Illinois; Former Chairman of ASHRAE Technical Committee on "Tall Buildings"; ASHRAE Distinguished Lecturer; Industry Advisory Board for IN2 start-up incubator program with National Renewable Energy Laboratory. He is the wide firm Director of the Sustainability Engineering Studio for Skidmore, Owings and Merrill LLP

Max Sherman

FASHRAE, FISIAQ

Max Sherman is a retired Staff Senior Scientist from the Lawrence Berkeley National Laboratory as well as an Honorary Professor at the University of Nottingham. He has served on ASHRAE's Board of Directors, was the first chair of the Residential Buildings Committee and SSPC 62.2—Society's residential ventilation standard. He is a Holladay Distinguished Fellow, an Exceptional Service awardee and currently serves as the Residential Team lead on ASHRAE's Epidemic Task Force.

Michael P. Sheerin

Pe, LEED AP, Chief Executive Officer

TLC Engineering Solutions

Michael Sheerin, PE LEED AP serves as Chief Executive Officer and Chairman of TLC Engineering Solutions, Inc., a national top 20, full-service consulting engineering firm headquartered in Orlando, Florida with nearly 400 staff in 14 offices across the USA. TLC provides MEP/Structural/Technology & Energy/Cx services for architects and owners seeking high performance building design and operation. TLC is a Zweig Best Places to Work and Hot List firm winner, and the only JUST labeled organization in Florida. Mr. Sheerin is the Chair of ASHRAE Standard 170 Ventilation of Health Care Facilities and has been involved in the standard since its inception, and is the Chair of ASHRAE Standard 189.3 Design, Construction and Operation of Sustainable, High Performance Health Care Facilities.

Kyle HasenKox

Principle, Senior Project Manager

Rocky Point Engineering

Kyle Hasenkox attended the University of Victoria and has worked in the mechanical building services industry since 1998, with various consulting firms in the Victoria area. He has been involved with ASHRAE on the chapter and regional levels and is also a member of several Technical Committees including 9.7- Educational Facilities (Current Chair,) Standard 100- Energy Efficiency in Existing Buildings, 7.5- Smart Building Systems and many others. He focuses on practical, implementable solutions to address issues in the institutional sector. He enjoys the challenge that existing facilities present and is always trying to find new ways to improve building performance.

Moderator

Abhishek Khurana

Chief Executive Officer

Voyager Buildings

Abhishek Khurana is the CEO of Voyager Buildings, a BAS Contracting firm based in Toronto. Abhishek has extensive experience in New Construction Installations and Existing Building Retrofits. He is also a big advocate of leveraging Artificial Intelligence (AI) alongside Automation Systems to reduce a building's carbon footprint and operational costs. Over the years, Abhishek has also held various roles at ASHRAE Toronto and is currently the Vice President of the Chapter.

What is the ASHRAE Epidemic Task Force (ETF)?

The Epidemic Task Force is a group that was put together made up of experts in different areas. Volunteers were contacted from different technical committees to research and provide information about the role of the built environment on handling the spread of COVID-19. The task force looks beyond just health care buildings and helps understand how other building types are being affected. One of the main objectives of this task force is to provide information as it becomes available, and to also obtain information from around the globe from locations such as Europe, China and Hong Kong. The task force consists of about a dozen volunteers who lead individual teams that focus on creating technical content. The charge of the task force is not just to do something very quickly during the current COVID-19 pandemic, but to help ASHRAE build a plan on facing any future possible pandemics.

How should buildings that are partially occupied, and closed, operate?

As the situation continues to evolve there are still various unknows that need to be faced, with regards to operating buildings that are partially occupied and closed. To ensure the safety of occupants in various building types, a more organized approach needs to be taken when opening a space. The panellist suggests the use of checklist that can be visited a week or two before the opening of a building to ensure all systems are running properly. They emphasise the need of discussion on how to best allocate funding to mitigate resources. The key to increasing the security in the workplace, schools, and multi residential buildings is eliminating or reducing the source generation. This means that occupants must wear cloth masks where social distancing measures can not be put in place and minimizing the amount of people that can be in the space. A good general practice for commercial buildings is to better control the relative humidity of the space. Typically, a RH range of 40%-60% is general a good practice, however for viruses the RH range should be between 50%-70%. However, 40-60% is the optimal range considering a holistic spectrum of contaminants and microbial, e.g baseline for mold growth in a building is 60% RH. Other practices such as increasing filtration, using MERV 13 or higher filters, increasing the outside air intake and applying UVC light to sanitize can help increase the security of the space. For the residential sector, where homeowners and occupants that are not infected and would like to prevent being infected, the task force has released guidelines that occupants can use in their home right away to help minimize the risk. The guidelines cover topics such as: retrofits that can be implemented to reduce the risk at home, how to protect occupants that are more sensitive, and how to properly isolate infected family members. Multi-family buildings can be a bit more complicated, and the task force is working on guidelines to help owners, operator, and mangers of apartment buildings reduce the spread from unit to unit.

What to do with buildings that are opening?

As more buildings begin to open, it is important for owners, operators, and managers to ensure that their HVAC system follows ASHRAE standards 55, and are maintaining their RH between 40%-60%. The panelist recommends an increase in ventilation, if it does not post major penalty on energy, which can come from outside air, HEPA air, or UV treated air. The idea is to utilize air that can be reasonably sure not to be contaminated. To increase the security of schools, it is important to develop different strategies for various age groups and their behaviours and also to acknowledge that age groups below 5th grade will more likely to come in contact with touch surfaces due to their height. Therefore, any area under 4ft should be treated as a touch surface and thoroughly cleaned. When looking at commercial spaces, Luke recommends identifying the various paths of transmission in

the space. Special attention was drawn to the restroom areas and their ability to resuspend particles which may include the virus. To deal with this issue it is highly suggested to place lids on existing toilets to help prevent the resuspension of harmful virus and bacteria, as well as keeping the washroom exhaust on continuously when occupied. To properly prepare for a reopening of any building, a holistic approach for the facility must be developed to effectively manage administration, PPE resources, and engineering. Michael explains how management of people within the building can help reduce the spread of the virus. Assigning designated areas to care for patients that have been infected, applying proper social distancing rules, and limiting the amount of people in a space can reduce the spread of the virus. This also allows better management of PPE resources, and allocates them to the personal that spend a greater amount of their time in high risk zones.

UV intensity and how it can be used to kill the viruses

As employees and students return to their typical facilities a large emphasis needs to be placed on disinfecting high traffic touch surfaces. One option discussed by the panel was the application of UV disinfecting technology, to sanitize surface areas such as doorknobs, tables and commonly used equipment. Currently this technology has only been used in the medical field to sterilize equipment and operation rooms. Some air handlers have been fitted with UV treating tech, to help disinfect any air brought into or recirculating in the building, however some studies show that aerosolized viruses might move to fast through the air handler to allow for proper sterilization of the air.

How to ensure the safety of residents and staff in retirement communities?

A difficult challenge during the Covid-19 pandemic has been the management of retirement homes. Due to the nature of these facilities, staff members are forced to have various social interactions between residents, other staff members, and different facilities. This creates an issue, as highly populated areas can easily spread the virus. To minimize the risk in retirement home communities the panelist suggest that the administration teams better arrange the scheduling of their staff. Although it can be difficult, limiting social interactions between staff members is essential. This will decrease the amount of possible transmission pathways. Its also important to implement social distancing rules and ensuring that no high traffic areas are created. In common room areas where social distancing might not be possible, it is essential to erect social distancing barriers that will help keep staff and residents safe.

How to design Passive Homes/NetZero homes for future pandemics?

Typically, a passive or net-zero home is designed with well low ventilation and low exhaust, to help reduce the energy consumption of the home. How ever these conditions are not ideal during an epidemic. To keep the environment safe, more filtration and ventilation is needed to ensure that clean air is available to the residents. The panelist suggest that developers build these homes with the option to carry out higher energy requirements such as increased filtration, more frequent air changes, and even UV sterilization. Although these systems can increase the energy usage of a passive home, they don't need to be running continuously. By designing homes with the ability to carry out these functions when necessary, the safety of the residents is reassured.

How to ensure social distancing measures in construction elevators

and on site?

A current issue being faced in the construction industry is the increase in construction time because of social distancing measures. Lack of space and need to reach deadlines can also force workers to work in proximity which further increases risk of spreading the virus. To properly protect their employees and enforce social distancing measures, construction sites need to develop and apply new techniques that can help reduce the number of employees necessary on site. Minimizing onsite staffing through preassembled systems, can help prevent the development of high traffic areas on site. It is also necessary to be more flexible with hours of operation. This would allow teams to enter at various shift times through out the day, rather than having one large group operate at the same shift. A particular problem that was discussed by the panel was the safety of employees and contractors as they use the service elevators on site. A small closed enclosure such as an elevator presents many concerns when dealing with paths of transmissions. To prevent increase risk in elevators the panelist suggest the following rules:

1) Use of personal mask while inside the elevator
2) Prevent talking inside the elevator
3) Thoroughly disinfecting the elevator

How will Covid-19 affect the design of buildings moving forward, and how can we future-proof buildings against airborne diseases?

Some areas are more obvious in terms of how they can be better fitted to deal with future pandemics, such as nursing stations, and other hospital facilities. However, a lot more thought is necessary in the treatment of transfer air. This is particularly important in school settings, were air is supplied to classrooms and transferred out to hallways and then returned. This method may potentially create contaminated areas in high traffic zones. Some suggestions made by the panelist is to increase the amount of outside air intake, increase the number of air changes in the space, and utilize DOAS with increased filtration. From a standpoint of healthcare facilities, the development acuity adaptable rooms will be necessary to deal with increased space needs during any pandemic. Acuity adaptable rooms are rooms that are structured as typical patient rooms, but are fitted with the infrastructure to be converted into an ICU.

Summary of Junes Webinar by:

Andy Valencia
Electronic Communications and Gazette Committee

PRESIDENTIAL ADDRESS - WEBINAR MEETING - MAY 4

Building for People and Performance. Achieving Operational Excellence

Darryl K. Boyce, P. Eng., 2019-2020 ASHRAE President

On 4 May 2020, Darryl K. Boyce, 2019-2020 ASHRAE president, gave a presentation online on the topic of "Building for People and Performance. Achieving Operational Excellence." Darryl first started working as HVAC Mechanical Systems Designer at University of Alberta where he came to know about ASHRAE. He had the motivation to achieve operational excellence of the buildings which are being built. Since becoming

president, he has travelled to many countries with focus on global engagement towards the goal of building for people and performance. He has received overwhelming positive response to his efforts.

Building for operational performance is a worldwide problem. Achieving operational performance is not only important for designers, but also for humans who live or interact with the building, and climate change. The following examples show the difference between designed energy consumption and emissions vs operational energy consumption and emissions.

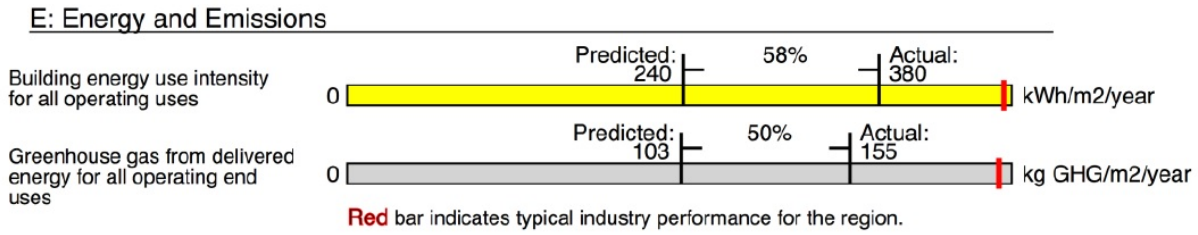

Figure 1. Alice Turner Branch Library, Saskatoon, Saskatchewan, Canada; Darryl Boyce, May 2020

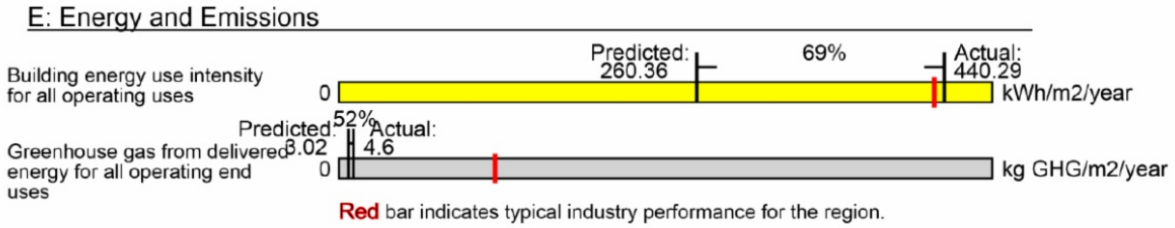

Figure 2. Robin Center - Red River College, Winnipeg, Manitoba, Canada; Darryl Boyce, May 2020

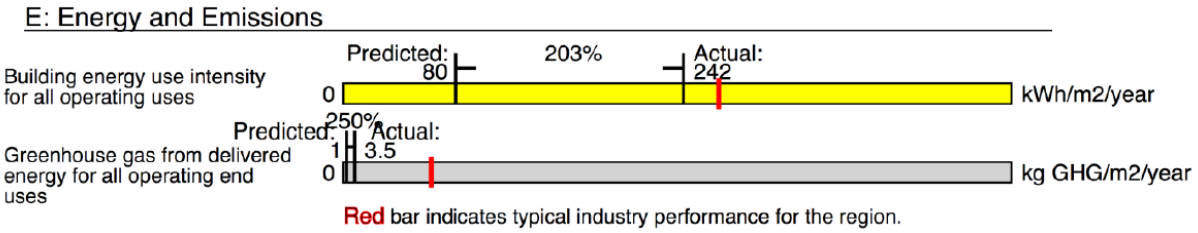

Figure 3: Surrey District Education Center, Surrey, British Columbia, Canada; Darryl Boyce, May 2020

There are 3 main reasons why great designs do not always deliver great operations.

1. The designers are not always focused on the operability of the design during design process.
2. Buildings are getting more complex.
3. Operators are being overwhelmed and are lagging in terms of skills.

Furthermore, the reasons for buildings to fall short are,

1. Being feature packed but not always functional.

2. Too complex control system for building management to manage.
3. Insufficient commissioning. Study found a correlation between performance and level of commissioning.

SOLUTIONS

It is necessary to develop a guide in order to assist in the achievement of operational excellence. This guide will provide building owners, managers, and designers the guidance they need to understand operational and maintenance need of the buildings.

The new guide will expand on lessons learned and other information from organizations around the world. For example, "Design guide for operational excellence" by GSA, "Maintenance Engineering and Management" by CIBSE guide M, "Soft Landings Framework 2018" by BSRIA, are among many guides which will be incorporated into the new guide.

Figure 4. Darryl Boyce, May 2020

The building operations team needs to be included all the way through the design and not only at the end of the design. Design should also reflect the capabilities of the people who will be operating the building.

Developing effective turnover and orientation training process, understanding what life is like after the building is handed over, designing the building for the occupant operators who will be interacting with the building automation system, evaluation of design system for their environmental quality are among the things that are required to be done.

For achieving operational excellence, ASHRAE members can "Learn, Engage, and Act".

LEARN

Having travelled across the world, Darryl had the opportunity to learn about the challenges, opportunities, and strides being made by various organizations in achieving operational excellence. For example, region XIV CRC Greece has been working with Greek Navy to improve the operations of land based and marine based assets by evaluating the effectiveness of current systems and recommending the cost-effective ways to upgrade the systems. As a result, Greek Navy managed to cut their cost by 50% to upgrade the system through this collaboration.

Figure 5. Darryl Boyce, May 2020

More resources on building operational excellence are available on ASHRAE resource page and is actively updated with more resources. Furthermore, message of operational excellence is shared through social media.

ENGAGE

With the focus on achieving operational excellence in mind, ASHRAE engages with many other organizations such as American Chemistry Council, APPA, IFMA, NEBB, NIST, Smart Cities Council, and UN Environment.

On January 10th, 2020, the renovation of ASHRAE global headquarters started in Atlanta, GA. The design, construction, and transition to operation will be fully documented which will serve as a learning process for ASHRAE members and the industry. The process is also being documented by BOMA research committee as a case study in repositioning existing buildings.

Figure 6. Darryl Boyce, May 2020

In the past year, multidisciplinary task group of Effective Building Operations was formed. This group will coordinate activities of multiple technical committees, task groups, technical resource groups, and other stake holders in training and tools to support the operation of buildings to enhance the indoor environment and use energy effectively. The responsibility of the group includes developing a training process template for the owners, develop a set of desired metrics/KPIs for building owners, establish a strategy for the co-sponsorship of ASHRAE programs and educational materials, and implementation of ASHRAE research projects into tools of ASHRAE members and interested parties, etc.

Our engagement with other stakeholders does not stop there. We need to be engaging with building operators not only at the society level but also at the chapter level. Developing educational and training programs to reduce the gap between design, construction, and operations team and meeting at least once a year to discuss and understand operational challenges are among the things which needs to be worked upon.

ACT

In order to achieve operational excellence, ASHRAE is engaged in wide variety of activities. The activities are focused on the building environment of the future. The activities involve developing practical and usable knowledge to prepare resilient buildings and communities which will adapt to adverse events and threats such as natural disaster, climate change, accidents, diseases like COVID-19, act of terrorism, etc. This initiative from ASHRAE will get members in the industry access to new research results, standards, guidelines, programs, and practical tools for resilient design.

The focus is also on the indoor environmental quality. The goal is to leverage the vast knowledge ASHRAE has generated in the areas of air quality, lighting, thermal comfort, and acoustics to create a comprehensive approach in creating high performance indoor environment.

We will need to act differently in the future. We need to follow the principle outlined in new

guidelines designing for effective building operations once it is released. We need to add computer assisted building operation, enhancements in design program and we need to effectively transfer design concepts to the operations team. We also need to learn, apply Well Building fundamental principles to the design. That ensures the steps that we take to achieve operational excellence, key effective operational performance, and enhance the operator experience.

In 2008, ASHRAE released ASHRAE vision 2020, Producing net zero energy buildings. This vision is helped by ASHRAE's new global headquarters in Atlanta, GA. This will showcase that ASHRAE is committed to their vision of healthy and sustainable environment for us.

Figure 7. Darryl Boyce, May 2020

The new building is solely funded by the sale of current building, donor contributions, and transfer of reserves. This will be a net-zero energy ready building and will showcase latest HVAC&R technology and equipment. The move is expected to be in October 2020.

The goal of our project was to renovate 1970's building into a high performance, net-zero energy ready building in a cost-effective method that can be replicated in the industry.

The final design looks like this:

BUILDING ENVELOPE

- Continuous Exterior Wall Insulation: R-17 assembly
- Window Replacement: U-0.40 assembly| SHGC-0.52 | 30-40% WWR
- 4" New Roof Insulation: R-35 assembly
- 1' Exterior Solar Shades on East, West, and South Facades
- Continuous Air Barrier: 0.11 CFM/ft² façade @ 75pa.

LIGHTING AND PLUG LOADS

- OPR Lighting: 0.66 W/ft² | OPR Equipment: 0.66 W/ ft²

HVAC SYSTEM TYPE (SD Phase Option 2A)

- Hydronic zone terminal units served by air-to-water heat pumps generating chilled

water and heating hot water (Avg. COP: 4.0).
- Dedicated Outdoor Air System (DOAS) with enthalpy heat recovery (80% efficient), Demand Controlled Ventilation operation (DCV).

HYDRONIC ZONE TERMINAL UNITS

- Radiant Ceiling Panels (Offices)
- Sensible Fan Terminal Units or Fan Coil Units (Conference & Training)

ADDITIONAL MEASURES

- Ceiling fans
- Operable windows provided for resilience

Summary by Eshan Patil

Website & Gazette Committee, ASHRAE Toronto Chapter

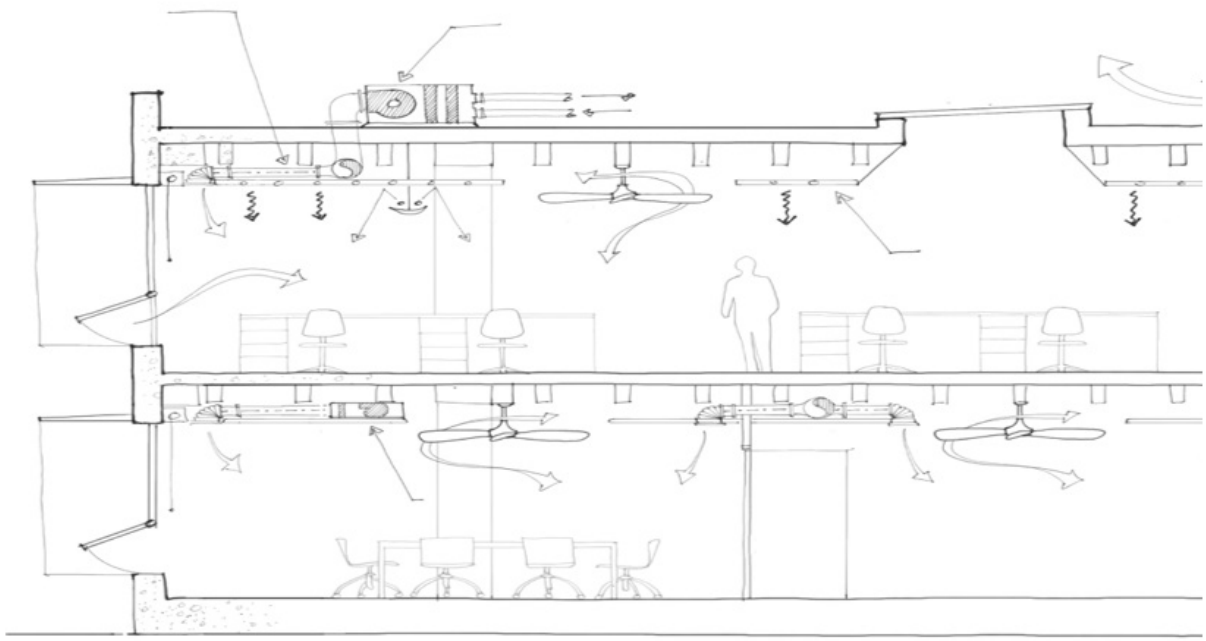

Figure 8. Darryl Boyce, May 2020

WEBINAR PANEL APRIL 18 - STUDENT ACTIVITIES / YEA

So, You Design the AC System

A Dialogue on HVAC Career Path and Trends Across Borders

Panelists: Mark Maguire, Brad Tully, Chan Jian CEN

Moderators: Karen Ethriveerasingham, Noreshvarman Manisagar, Rex Shiyau

The April 2020 webinar panel focuses on providing valuable information to the student and

young professional members of ASHRAE. Our panelist will help inform our members on the opportunities within the HVAC industry across Canada, USA, and Malaysia. Each panelist will represent their individual regions and discuss trends, challenges and most importantly help students prepare themselves for a career in the HVAC field.

Panelists

Mark Maguire
Pe, LEED AP BD+C, BEMP, GCP

Mark is responsible for the conceptualization and design of HVAC systems pharmaceutical and institutional research labs. As part of the conceptualizat process, Mark integrates sustainable and innovative practices into the design evaluates alternative HVAC systems through lifecycle costing, using ene modeling and installation cost as inputs.

Mark has a BSME from Drexel University and a MS in Energy Management and Policy from the Univer of Pennsylvania, has been with Jacobs Engineering for 32 years and is currently the head of the mechar engineering group in the Philadelphia office.

Brad Tully
P. Eng.

Brad Tully has been with Price industries for over 16 years and is currently the Vice President of Sales and Engineering at SolutionAir. Brad is responsible for the sales and products developed at SolutionsAir. Including the development and launch of the indoor horticulture unit specifically designed to maximize product yield and quality.

Prior to Brad joining the SolutionAir team, Brad was the R&D Manager at Price Industries where he built the PRCN and oversaw the development of numerus new air distribution products and collaborated on joint research and publications with numerus universities and organizations around the world. Brad graduated from University of Manitoba with a B.S in Mechanical Engineering.

Chan Jian Wen
C.Eng, ATD, GBIF, M.IMechE

Jian Wen has been involved in the Data Center Industry for over 15 years, with vast experience in various unique HVAC designs and applications for critical infrastructure. He helped accelerate the adaptation of scalable modular technology, optimized and implemented prefabricated modules, high density or super-computer, and green certification, as well as consultation engagement for large scale data centers with predictable performance and cost analysis.

He's Accredited Tier Designer by Uptime Institute, and currently is Vice President of Field Services for Schneider Electric Malaysia, integrating data center life-cycle services as part of operational excellence. Jian Wen graduated from University of Tenaga Nasional with a Bachelor of Mechanical Engineering.

First to be interviewed by the moderator Rex Shiyau, was Mr. Jian Wen. As a HVAC engineer in the Data Center industry, Mr. Jian Wen offers his knowledge and experience on how to navigate this career path in HVAC engineering.

What is the role of an HVAC engineer in the DATA center Field?

When designing an HVAC system for a data center, it is important to remember that the only real customer is the IT equipment. Unlike conventional HVAC systems design for commercial and residential buildings, data center HVAC design focuses on delivering cooling solutions to IT equipment that evolves quickly, typically with in every 5 years. This is a challenge in itself as most HVAC systems are designed with a life cycle of about 10-15 years. To deal with this issue, a data center HVAC designer must develop an adaptable system, that can be easy updated to handle any new IT equipment and learn to optimize the system for different configurations of the equipment.

What kind of requirements does a student need to prepare to enroll in this industry?

Mr. Jian Wen suggest that the first step to become a data center HVAC designer is to become involved with ASHRAE as a member. Currently ASHRAE has become the de facto standard for the design and development of HVAC in data centers. In order to properly understand the requirements of data center HVAC designing, students can look into technical committee 90.9 for detailed information on how to set the environment for data processing systems.
The next panelist to be interviewed was Mark Maguire. Mr. Maguire shares his expertise and knowledge in the field of HVAC design for systems in the pharmaceutical and institutional research labs.

What are some of the different laboratories types that you have encountered during your career?

Mr. Maguire has worked on various laboratory types including teaching labs, research labs, pharmaceutical labs, and specialized labs that handle biohazardous materials. A major portion of his career has been designing labs for large pharmaceutical firms. These firms are very business oriented and require laboratories that can ease the development of new medical products to sell in the market. Because of this the design of HVAC in a lab, focuses on optimization for the products being developed as well as how to decrease energy consumption of the HVAC system.

What are some of the challenges faced as HVAC designer?

A major challenge when working as a HVAC designer in the pharmaceutical and institutional industry is learning to work with various design teams. To create balance between the various teams, Mr. Maguire encourages our students to having a solid understanding of the technical components of your design. This can help clarify any issues that other teams may have with your design, specially when working with large complex systems.

How can students focus on preparing themselves for a career in pharmaceutical lab design?

To grow and excel in this industry Mr. Maguire urges students and recent graduates to continue learning and investing in themselves. Obtaining certifications from ASHRAE in areas such as health care design, building commissioning, energy modeling and other

organization certifications such as LEED, can help distinguish new employees in the job market.
Finally, the last panelist, Brad Tully, was interviewed by ASHRAE Toronto's Student Activities Chair, Kajen Ethirveerasingham. Mark shares his experience working in the development and launch of the indoor horticulture unit. This unit was specifically designed to maximize the produce yield and quality of indoor farms.

With respect to Canada, was the industry prepared to deal with the demand for indoor farming due to the legalization of cannabis?

When legalization of cannabis began, the industry had no design standards and guidelines for developing large scale indoor farming facilities. Most of the knowledge that was available for these facilities came from individuals that had created their own systems to sell cannabis prior to legalization. However, most of these individuals had no understanding of psychometrics or of basic HVAC and construction principles. One of the first challenges was identifying the heat loads released by the produce and identifying the humidity levels required by the crops to grow.

What were some of the major challenges in designing HVAC systems for indoor farms?

As a result of the lack of standards and guidelines, indoor farming specifically with cannabis had some major complications. Issues such as mold and mildew in new facilities lead to damage to the building, the crops, and even became harmful to the residents. This issue created a large expense for the owners as they had deal with repair costs, crop loses and so on. To develop better indoor farming systems, Mr. Tully encourages engineers to work along agriculturalist, to have a better understanding of the plants needs.

With the current pandemic shutting don borders, local food sources have become more important. Will indoor farming become a more important and necessary industry?

The need for indoor farming or vertical farming is becoming more evident. Currently the produce we consume in North America comes from a small section, primarily California and Mexico. Indoor farming allows locations that are not as close to obtain better quality produce, at reduced prices by eliminating the transportation cost. Currently large grocery chains have set up indoor farming systems near their stores to produce fresh herbs that are available daily, rather than having them shipped for days in a truck. Indoor farming also allows for increased food security and minimizing the risk of contamination from harmful pathogens. These indoor farming facilities tend to produce heat which can be repurposed to heat other near by facilities.

What can young engineers learn to get into this industry?

To excel in this industry, engineers need to understand how plants grow and what kind of environment they require. This will help them develop systems that are optimized for the growth of the specific produce. Being able to understand plant sciences, transpiration and nutrient uptake is necessary for the development of an indoor farming system.
The panelists were asked general questions, that would help students find success in their studies and job search during our current situation in 2020.

Due to the Covid-19 crisis, the job markets are becoming getting tougher. This can be a scary time for students to graduate and to find a job in the field they are passionate about. What advise can you offer students who are graduating during this current pandemic?

As students graduate and begin to transverse the job market, the panelist suggests students keep involved in various organizations. Becoming a member of ASHRAE or being involved in student chapters will allow them to network with industry professionals and open doors that are available just online. It is also important to find niches in the market which are still growing the pandemic. Research on industries that are being funded by the government, or even health care industries will be a in demand during this period and may provide job opportunities.

Finally, what advise would you give your younger self?

The panelists were asked to reflect on their career and think of advise that they wished was given to them when they began to work in the HVAC industry. The following is some advise they shared to the future graduates and student members of ASHRAE:

- Continue to educate yourself after graduating. Learning new skills will make you more valuable in the job market. Invest in yourself and obtain various certifications.
- Continue to be curious in the HVAC field. Look for different paths in HVAC that not typical. This will keep your career exciting and provide challenges to grow in areas you didn't know possible.
- Be a well-rounded engineer. Having a solid basis of understanding in HVAC systems can help you obtain different opportunities not only in the HVAC field.

Summary of April Webinar by:

Andy Valencia
Electronic Communications and Gazette Committee

WEBINAR MEETING APRIL 6

Bridging the Gap:
Preventing conflict between engineers and contractors

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

April 8, 2020

In April, Niss Feiner, Principal of Delta-T Designs, gave a presentation about improving the work environment and relationship between engineers and contractors on building projects. With more than 14 years of experience in the HVACR & Plumbing industry on the contracting end, and having provided mechanical design services since 2010, Mr. Feiner has a unique perspective. He has been active on both ends of the engineering/contracting relationship, and shared with us his insights on the decision-making process of both parties.

Conflict between engineers and contractors happens generally for two reasons:

1. Lack of cognitive empathy
2. Poor communication

Cognitive empathy [1] refers to the extent to which we perceive or have evidence that we have successfully guessed someone else's thoughts and feelings [1]. It differs from emotional empathy in that no emotion is involved (derives from cognitive understanding rather than feeling another person's emotion). It is the ability to recognize and appreciate someone else's perspective.

Engineers are not contractors, and vice versa. Without understanding each party's perspective, the actions of one another are filtered through the lens of prejudice and negative emotional bias. Conflicts arise because we fail to provide allowance for each other's perspectives due to a lack of cognitive empathy.

Table 1: Comparison of the typical paths to becoming an engineer and a contractor.

Engineer (Licensed Professional Engineer P.Eng.)	**Contractor** (Licensed Journeyperson or Registered Apprentice)

• Requirements: a university undergraduate program which covers engineering related math and theory (Calculus, Fluid Dynamics, Thermodynamics etc.)
• Pass a Professional Practice Exam covering
  • Professional Engineers Ontario (PEO) as an organization
  • Canadian Law
  • Ethics
• 4 years of work experience consisting of:
  • Application of theory
  • Practical experience
  • Management of engineering
  • Communication Skills
  • Awareness of social implications of engineering
• Self-regulated profession
• Professional oath
  • Engineers in Canada take a professional oath with a duty of care to society for the work which they are responsible called the "Ritual of the Calling of an Engineer"
	• Requirements: an apprenticeship of varying length and in-class requirement depending on the trade
	• E.g. For a 313A Refrigeration and Air Conditioning Systems Mechanic
	  ○ 5 periods of training, instruction, and on-the-job experience (1800 hours each)
	  ○ 3 trade school sessions (2 months each)
	  ○ Typically achieved in 5 years
	• Demonstrate proficiency in:
	  ○ Troubleshooting AC components
	  ○ Evacuating and charging refrigeration circuits
	  ○ Verifying operating parameters
	  ○ Planning, assembling, brazing piping etc.
	• Regulated by legislative body (Ministry of Labour, Training and Skills Development)
	• Can only practice within the scope of their trade certification, regardless of how knowledgeable a person is in the topic
	  ○ E.g. JP with 313D - Residential Refrigeration Mechanic cannot work on systems larger than 5 tons, which requires a 313A - Refrigeration and Air Conditioning System Mechanic

• Understands details of the how and why of design	• Understands the how and why of implementing the design 3.

Communication [1] is the act of *conveying meaning* from one entity or group to another using *mutually understood* signs, symbols, and semiotic rules. There is nuance in each method of communication, oral, body language and written. Communication may be influenced by education, experiences, culture, mental development, and physical limitations.

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Poor Communication

The **Curse of Knowledge [1]** refers to the situation where the communicator has a clear understanding of what it is that they are trying to communicate while the recipient does not have this information and lacks the proper context and details to adequately understand the idea and intent.

Avoid the curse of knowledge by being aware that drawings are being made for an audience (bidders, builders etc.) who was not privy to the planning, calculating and drafting stage. One should do a peer-review with someone completely removed from the project. They should be able to understand the drawings, be objective and attempt to infer the intent. Any clarifications they ask for should be added to the drawings. The drawings should not leave readers confused.

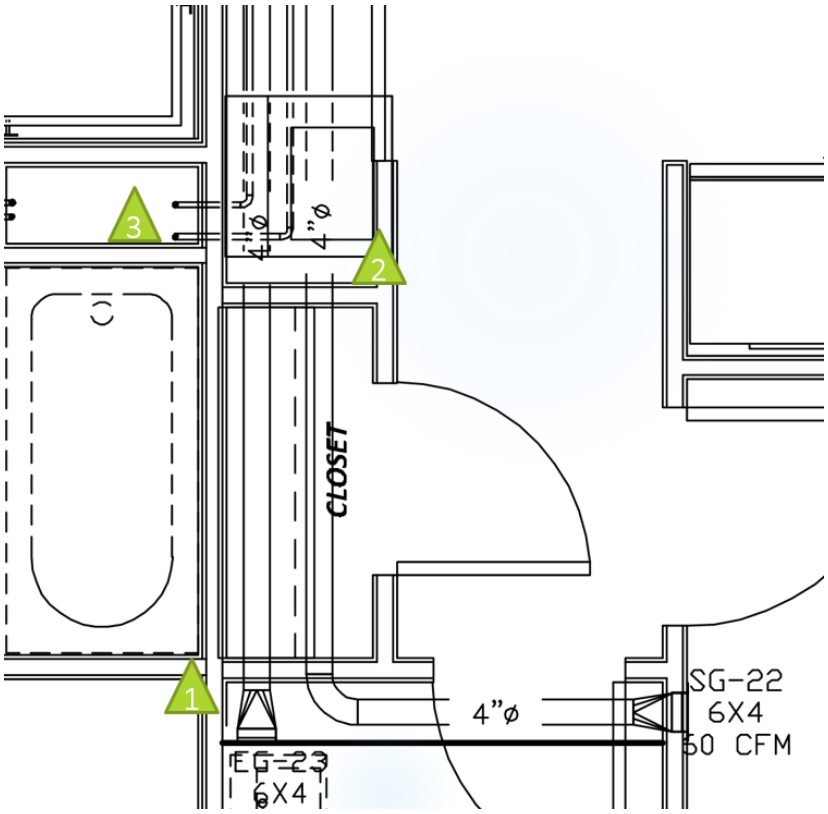


Figure 2: Some drawing mistakes to avoid

Some drawing mistakes to avoid (See Figure 2 above):

1. Same line weights make it impossible to distinguish between architectural underlay and mechanical pipes and ducts
2. Pipe and duct sizes interfering with adjacent components, causing confusion as to what is being referred to.
3. No notation given for change in elevation, forces reader to guess (pipes are going down into the basement)

The following two stories illustrate situations when conflict can arise due to a failure to

communicate intent and opinions (poor communication), as well as perspectives (lack of cognitive empathy).

Story 1: Contractor's Perspective

- A contractor needs to provide firm price for mechanical, plumbing, and controls within 1 week for a condominium. They received poor drawings with too many crossing lines, inconsistent drawing conventions, suite plans with little to no information, and conflicting information.
- Contractors assume a large financial liability based on the bidspec process. Poor communication, drawings and specs can impede this process and significantly damage their reputation or finances.
- Contractor's responsibilities during the tender process:

    1. Review all drawings, specifications and assemble list of suppliers and subtrades
    2. Distribute tender documents to all parties above
    3. Perform material take-off to distribute suppliers
    4. Quote labour for each individual system
    5. Assemble quote, review to ensure everything is covered, fill out the appropriate tender documents
    6. Distribute documents to general contractors by the deadline in proper format

- Contractors need to understand the project well enough to quote labour and materials, but also review their suppliers' quotes. The quote provided to the general contractor based on poor drawings, such as the examples shown above, will still be contractually binding.

Story 2: Engineer's Perspective

- Contractor missed note that all wiring should be FT6 Rated in the plenum. It is required by code and is a life safety issue. Client and contractor push back due to expense for what they consider as unnecessary, but the engineer is obligated to withhold sign off until issue is rectified.
- Engineer's responsibility:
    - Adhere to their professional oath
    - Ensure the safety of building occupants and users
    - Obligated to produce designs in accordance with good engineering practices
    - Use and understand numerous codes and standard references that are also often incorporated into the building code
    - The engineer's seal can only be affixed to a document if a professional engineer deems that others can, with a high degree of confidence, depend upon its contents for the furtherance of their projects. It is an indication that the work in the sealed document were performed or supervised by a professional engineer held to high standards of knowledge, skill and ethical conduct.
    - Failure to uphold these can result in fines and loss of professional license and certifications
- Engineers have the same pressures as contractors to provide good customer service and they have the legal and ethical liability for projects

Despite the differences in perspectives, there is common ground between Engineers and Contractors. Both parties are:

- Greatly affected by circumstances which they have no control
    - Understand that both are doing their best with the information that was

available to them at the time, which is often incomplete and they both have to deal with the owner's requirements

- Most likely acting in good faith
    - Never assume malice. Beware of the biases towards each party.

- Able to do better and need to do better
    - Both parties need to make effort to understand each other's roles, improve communication, and avoid the curse of knowledge.

Engineers and contractors have different training and perspectives. For a better work environment on a project they should do the following:

1. Apply the same presumption of good faith to the other party that you would hope to receive.
2. Allow for a difference in perspective. Recall the differences between the fields of the trades and engineering, each with their own priorities shaped by their perspectives.
3. Respect each party's expertise. Do not assume incompetence. Each person has put in the time and work to become experts in their field.
4. Do not underestimate the difficulty of good communication. Recall that much of how we communicate are highly nuanced, even before the difficulties introduced by a lack of common language and experience.
5. Carefully consider what, why and how information is being communicated. Avoid the curse of knowledge. Try getting an impartial observer to interpret the meaning and revise accordingly.

Endnotes

1.Hodges & Myers (2007) - "https://pages.uoregon.edu/hodgeslab/files/Download/Hodges%20Myers_2007.pdf", The Encyclopedia of Social Psychology

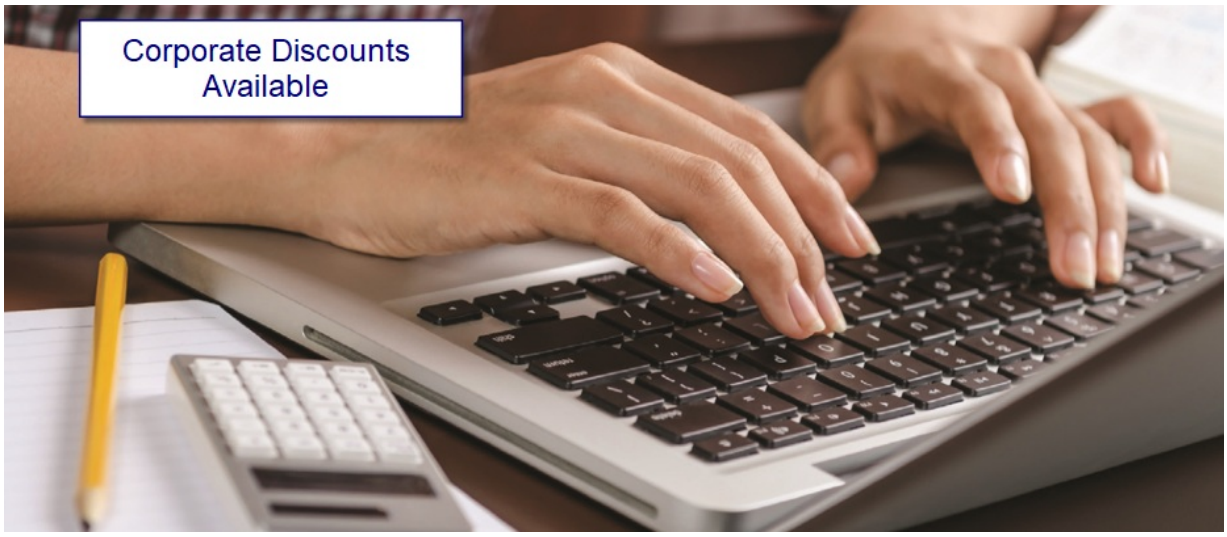
2.Professional Engineers Ontario
"https://www.peo.on.ca/licence-applications/become-professional-engineer/general-academic-requirements"
"https://www.peo.on.ca/licence-applications/become-professional-engineer/professional-practice-exam"
"https://www.peo.on.ca/licence-applications/become-professional-engineer/experience-assessment"

3.College of Trades
"https://www.collegeoftrades.ca/wp-content/uploads/Refrigeration-and-Air-Conditioning-Mechanic-313A-EN-TS3.pdf"

Summary by Kai Ye

Gazette Committee, ASHRAE Toronto Chapter

ASHRAE eLEARNING



- Building Performance (I-P), 10 PDHs
- DDC Controls (I-P), 12.5 PDHs.
- Standard 62.1: Ventilation for Acceptable Indoor Air Quality (I-P), 10.1 PDHs.

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