

ASHRAE Ottawa Valley Chapter

Chapter Meeting #5 – 20 February 2018

Meeting Date:	20 February 2018
Location:	Centurion Conference & Event Center, 170 Colonnade Road South
Attendance:	Total: 57
	Members: 38 Guests: 16 Students: 3
Theme:	CTTC
Tour:	None
Tech Session:	None
Table Top:	The Master Group and HTS Engineering
Program:	Seismic Restraint of Mechanical Systems
Speakers:	James R. Tauby, P.E.
Prepared by:	Aaron Dobson

Social (17:30 – 18:27)

Business Session (18:27 –18:41)

- President Adam Graham welcome message, call to order.
- President Adam Graham introduced the Board of Governors and the Executive.
- Secretary Aaron Dobson introduced the 16 guests.
- Membership Promotion Chair Celine Baribeau introduced the 9 new members since last meeting. Celine mentioned there were 2 members that advanced from associate to member (Ryan Dickinson and Nick Lea).
- Adrienne Mitani talked about the Career Fair happening at Carleton University in the Fenn lounge. Large group of students attending from Carleton University, Algonquin College and Ottawa University. Adrienne will be reaching out to La Cite Collegiale and Cegep de l'Outaouais to attend. Registration for booths will be open until Friday registration on the ASHRAE OVC website. The cost is \$200 for a booth, and \$100 for sponsorship. Adrienne would like to have more booths and asked to contact her for details or on the website.
- Student Activities Chair Peter Shaw-Wood thanked Kevin Courneya for volunteering his time to help the students at Ottawa University and Carleton University for their design competition joint entry.
- YEA Chair Joe Della Valle congratulated James from Longhill for winning the axe throwing competition from the last YEA event. Joe thanked everyone who attended the event. 18 people attended the event. Joe mentioned that the ASHRAE OVC BOG selected Celine Baribeau to attend leadership weekend in Seattle. Joe mentioned there will be another YEA event for the end of March at Tailgators to play billiards.
- Adam Graham talked about the upcoming Curling Bonspiel event on March 9th at the Nepean Sportsplex. Registration is open, and spots are available. The cost is \$400 per team which includes dinner. Since 2010, a total of \$12,630 has been raised from the ASHRAE curling event which has been used towards the ASHRAE OVC scholarship and local charities that Chris Healy has initiated.
- President-Elect and Research Promotion Chair Dan Redmond gave an update on

Research Promotion. Every dollar raised in Canada, stays in Canada. For every dollar raised, 2 to 3 dollars contributed to active research. Four tickets for the March 8th Ottawa Senators game with parking pass has been donated by the Master Group.

- Adam Graham gave an update from the Winter meeting. He congratulated Jeff Clarke who has been nominated as Region 2 DRC and Daryll Boyce who has been nominated as Society President-Elect starting July.
- CTTC Chair Jacob Hough mentioned a technology award winner from the Winter meeting for Region 2. Pageau Morel in Montreal won the ASHRAE Technology Award for New Commercial Building – First Place (international) for the Mountain Equipment Co-op Head Office project in Vancouver. Jacob mentioned the local chapter is accepting applications for technology awards. The deadline is March 23rd. There are different groups for the technology awards (commercial, institutional, healthcare, industrial, public assembly and residential). Each group has a separate award for new building, existing building and retro-commissioning. If any members have a project they are proud of that shows efficiency and innovation they are asked to submit an application. Contact Jacob for more information.
- Adam Graham invited the companies to talk about their table-tops. Adam Moons from Master Group talked about their products in air diffusion and distribution technologies. Richard Levesque from HTS talked about new lines for seismic restraints.

Business Session Finished at 6:41pm

Dinner (18:41 – 19:40)

- Dinner served at 6:41pm
- Dinner was Garden Salad for starter. Chicken parmigiana with potatoes, carrots and asparagus for main and black forest cake for dessert

Evening Program (19:40- 10:58)

- Evening program started at 7:40pm
- Dan Redmond invited the guest speaker James Tauby to draw the winning raffle ticket. Winner of the Ottawa Senators tickets was Chris Frauley. Dan Redmond mentioned that \$600 was raised for ASHRAE research promotion thanks to the Master Group. Dan mentioned that \$16,500 has been raised for the research promotion campaign which is 58% percent complete.
- Adam Graham introduced the speaker James Tauby. James Tauby is an ASHRAE Distinguished Lecturer and topic for the evening is Seismic Restraint of Mechanical Systems.
- James Tauby mentioned he will be showing a lot of photographs from equipment that has gone through earthquakes and what the fixes are.
- As part of the Distinguished Lecturer Event Summary Critique, ASHRAE is looking for the members to complete an online survey of the speaker's presentation.
- James mentioned that ASHRAE is looking for volunteers and help at every level. Advice is to be the Secretary of a technical committee as a good way to start. The Secretary position usually evolves to membership chair, vice-chair and eventually chair of the technical committee.
- James gave an overview of the presentation in which he will be talking about mechanical systems, building codes, specifications, housekeeping pads, types of bracing, testing and showing videos of shaker table testing.

- Everything that James will be talking about is in ASHRAE Seismic Restraint Manual RP-812 (second edition). The first edition came out in 1999. Second edition came out in 2015. 100 pages of information, documentation and design work was added from the first edition to second edition. It is part of United States building code and various other building codes as a reference document around world. Australia and New Zealand uses this guide for seismic.
- Specifications “the engineers most important tool”
 - The most important way to ensure that a project in a seismic area is constructed as planned
 - Requires a properly prepared set of construction documents (drawings and specifications), detailed review, approval of shop drawings and field enforcement
 - Seismic restraint systems should be looked at as an engineered system, not a selection of hardware
 - The complete load path from the equipment to the structure must be taken into account by the seismic restraint system.
- Connection types – Steel to Steel connections with bolts
 - Bolts should be designed to handle the appropriate shear and vertical forces
 - Bolts should be a minimum of class 4.8 or ASTM – A-307 quality
- James reviewed a picture of what happens if you do not have good connections. A picture of a cooling tower support that had tack welded connections was displayed showing the failure during an earthquake (Northridge Earthquake from 1994).
- Connection types – Steel to Concrete with Post Installed Anchors
 - Post installed anchors include wedge, undercut, and adhesive anchors
 - Anchors must have been tested to the guideline for European Technical Approval of Metal Anchors for use in concrete ETAG-001 or American Concrete Institute’s ACI-355.2 to insure seismic capability
- Connection types – Steel to Wood
 - Welding
 - Steel to Wood using lag bolts
 - Lag bolts must be designed in accordance with the National Design Specification for Wood Construction
- Housekeeping Pads
 - Called Plynth’s or Plinth’s in parts of the world
 - The most overlooked portion of equipment installation is the housekeeping pads
 - They provide load transfer between the equipment anchorage and the structure of the building
 - Housekeeping pads need to be reinforced and attached to the structural slab
- James showed a picture of a housekeeping pad failure at a hospital during an earthquake. The housekeeping pad shattered like a piece of glass. Other resulting damage after the housekeeping pad failing is the mechanical equipment connections break causing water from the building plumbing system to empty causing considerable damage. 70% of the monetary damage was from mechanical failure problems after the earthquake.
- Suspended piping
 - All piping types require seismic bracing
 - Pipe ductility helps decide the seismic performance of the pipe system

- Weak links are at equipment and valve connections
- $F_p = 0.4 a_p S_d s I_p / R_p [1 + 2(z/h)] W_p$
- Steel and copper piping with welded or brazed joints are extremely ductile and perform well. $R_p = 9.0$
- Steel and copper piping with threaded, bonded, compression or grooved joints do not perform as well as welded or brazed joints. $R_p = 4.5$
- Cast iron, plastic or glass piping joints do not perform well. $R_p = 3.0$
- James looked at different pipe bracing types – cable restraints and rigid brace. Cable restraints are used for vibration isolation and rigid for non-isolated. You can use cable restraints for non-isolated. Cable restraints are less expensive and need to be mounted in 2 places.
- Rigid Pipe Bracing
 - Rigid bracing adds a downward vertical force that adds to the gravity load and tries to pull the hanger rod out of the above structure
 - This does not happen on tension only cable bracing
- Cable Pipe Bracing
 - Cable brace systems use galvanized aircraft cable
 - Can be used for both vibration isolated and non-vibration isolated systems
 - Caution must be taken with hot water or steam systems, cables can be installed slack for the anticipated thermal movements
 - Work in tension only
- James went through pictures of pipe bracing and the effects of the bracing and pipe after the earthquake. There is a lot of movement of pipe during the earthquake. Pictures of hangers damaging the pipe, hangers moving from its original position and the pipe damaging the hangers.
- Duct Bracing
 - All ductwork types (rectangular, round and oval) require seismic bracing depending on the size
 - Ductwork may be braced with either rigid or cable bracing
 - Ductwork that is vibration isolated must use cable bracing
- Suspended Equipment
 - All suspended equipment requires seismic bracing depending on the size
 - Equipment may be braced with either rigid or cable bracing
 - Equipment that is vibration isolated must use cable bracing
- Floor Mounted Equipment
 - Equipment must be attached to the structure
 - Equipment can be bolted down to the structure
 - Equipment can be held in position with seismic snubbers
- James went through pictures of floor mounted equipment anchors failing during an earthquake
- ASHRAE Standard 171-2017 Method of Testing for Rating Seismic and Wind Restraints will show up in the US building code during the 2024 cycle.
- James played 3 videos on ASHRAE testing RP-1323 using a shaker testing table on 2 pieces of equipment donated to ASHRAE. This determines what is the best seismic restraint ASHRAE could come up with. Look at how thick is the rubber, how hard is the rubber and the air gap for the rubber for the vibration isolators. ASHRAE made a mock up restraint and put it through the testing.
- James went through different reference guides pertaining to seismic

- Questions – 5 questions asked
- President Adam Graham thanking speaker and presenting gift (commemorative coin) to James Tauby from ASHRAE Ottawa Valley Chapter
- President Adam Graham reminding members and guest to fill out evaluation form
- President Adam Graham saying thank you and reminding that next meeting is March 20th, 2018 at the Centurion Conference Centre.

Meeting adjourned 8:58