**ASHRAE TC 4.10 - Indoor Environmental Modeling; Main Committee Meeting – Toronto**

**2:30 pm – 4:30 pm (Eastern Time), Monday, June 27, 2022, Sheraton, Maple West**

**Hybrid (In-person and Zoom Meeting)**

**MEETING Minutes**

SCOPE: TC 4.10 is concerned with the developing methods and procedures for predicting indoor environmental conditions including airflow, air quality and thermal environment.

1. Call to order by the TC Chair, James Lo, at 2:30 PM ET
2. The TC chair reminded all the participants about the ASHRAE’s code of ethics at 2:31 PM ET
3. James Lo mentioned the unfortunate and sad news for Charlie who passed away, so sudden. Charlie Lin has been with us more than a decade ago and serves the TC as the research chair. Jim Van Gilder and Mark Seymour worked closely over the course of RP-1675. Jim mentioned a few words about Charlie’s contribution to the RP. Jim mentioned Charlie's patience and hard work to make sure the RP was a success. We never extended the budget, just the timeline. Jim mentioned how any research project should follow this RP as an example. This RP was a very collaborative experience. There is no immediate service. There will be an obituary that Beichao Hu, Charlie’s PhD student, will inform us. We will certainly miss him in this TC. TC plans to have a chance for donation, flowers, or do something. James will tell us on Basecamp.
4. The TC chair welcomed the participants and asked them to introduce themselves at 2:37 ET.
5. Roll call by Duncan Phyfe and James Lo at 2:47 PM ET.
   * Voting members[[1]](#footnote-1) are:

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| **Name** | **Present** | **Name** | **Present** |
| Mike Koupriyanov | X | Chao-Hsin Lin | x |
| Mohammad Heidarinejad | X | Charlie Lin |  |
| Donghyun Rim |  | Jim Van Gilder | X |
| Duncan Phyfe | X | James Lo | X |
| John Zhai |  | Malcolm Cook1 |  |
| Yang-Seon Kim | x | Mo Hosni |  |
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* + Officers are:
    - James Lo (Chair)
    - Leon Wang (Vice Chair)
    - Donghyun Rim (Secretary)
    - Duncan Phyfe (Membership)
    - Charlie Lin (Research)
    - Jim Van Gilder (Program)
    - Mohammad Heidarinejad (Handbook)
    - Stuart Dols (Webmaster)
    - Honors & Awards (Chao-Hsin Lin)
    - John Zhai (ALI)

Attendance:

* + **7 of 11** non-international voting members were present.
  + **0 of 1** international voting members were present.
  + **Quorum achieved.**
  + Non-voting officers present: Leon Wang (Vice Chair).

1. Approval of Phoenix virtual meeting minutes
   * Ducan Phyfe moved a motion to approve the Las Vegas minutes and Jim Van Gilder seconded the motion.
   * The motion passed by (7-0-0) votes.
   * **Minutes approved** at 2:49 PM ET.
2. Updated from the Liaisons: (Section head)
   * The Section 4 Head, Vance Payne from NIST joined remotely.
   * Nothing to add at the moment. He wanted to ensure the chair and vice chair attended the breakfast, and they have received the handout. TAC wants to make sure there are at least one interim meeting (even a short meeting should be fine – to make sure things get done between the meetings).
   * This is his last meeting for him. We will have a new section head for the next ASHRAE meeting ([TCStaff@ashrae.net](mailto:TCStaff@ashrae.net)) for any questions.
   * TAC got funding to automate rostering (automated reporting). Hopefully in less than a year we will be able to do the roster online and automated (less than 5 minutes). He hoped that would get done. The activity was the most difficult one before.
   * He will be happy to answer any questions. (The TC members had no questions for him).
3. Announcements and reports (James Lo)
   * Chair’s Breakfast (James Lo)
     + There is a change in MOP starting July 1, 2022, to formally list functional groups – one key differentiation is membership. Originally the chair should’ve been an ASHRAE member only. All the voting members, Chair, Vice Chair, and Secretary have to be an ASHRAE member with this change.
     + There is a solicitation to help with the Ventilation Conference (2025). The original one was supposed to be in 2021 (got pushed back to 2022 before this conference). Duncan Phyfe is involved in the conference.
     + Duncan mentioned the ASHRAE took this conference about four years ago (ran it like a normal ASHRAE conference). 55 in person (76 speakers) – 130 in person. 30 online (20 virtual presenters). A little bit repetitive for the COVID especially for the ETF and other researchers. Similar to the other ASHRAE conferences. Same system for the presentations and everything else (TC 9.2 – will be running that one and Duncan Phyfe will be the incoming chair).
     + The main thing is that all the functional groups should have a mission’s statement and vision. We do not exactly have one. We will discuss it in the new business. We have a mission statement though
     + ASHRAE is pushing (a lot of issues with the hybrid meetings – bad microphone) – invest in equipment. They are still thinking of the solution (portable equipment).
     + There is a Besecamp thread for how to run effective hybrid meetings).
4. Membership (Duncan Phyfe) - started at 3:00 ET and finished at 3:11 ET
   * Three members are rolling off as of July 31 (Mike, Jim, Chao, Duncan Phyfe, and unfortunately Charlie). Mohammad Heidarinejad mentioned in the previous meeting minutes we had Duncan Phyfe as rolling off. The chair will look into this.
   * Members that are rolling on include Chao Ding. Himanshou Sharma, Wangda Zuo, Leon Wang.
   * The plan is to have 8-9 voting members (2 rolling on rolling off each time). The new plan works better rather than rolling on/off four members every two years.
   * James asked CMs who have been part of the committee in the past year to let the TC chair know about their interest to become a VM. He also encouraged new members to stay around for a few years and become voting members. If you are interested in any of the position, please let us know
   * Jim had a question about how to handle research moving forward. James will be an interim research chair till we roll on a new person.
   * There was a question about what’s the difference between PCM and CM. The system regularly flags you to become a CM on July 1. The determination happens in February. Interested audience in PCM can apply online (Join TC 4.10).
   * There is no end date for CM. We are about to start a policy (no attendance in 3 years and do not hear in our follow up and we will drop the membership).
   * Downsizing to less voting members – would that look bad to TAC? ASHRAE always has valued the committee’s contribution not based on the voting members. We need to make sure to reflect that as intentional effort.
5. Machine Learning subcommittee (James Lo) – Started 3:11 PM ET and ended 3:20 PM ET
   * We receive a good amount of inquiry for this new session, and it was well attended.
   * We agreed to start a literature review (Target journals: BUILT or ENB). If any TC members are interested, they should contact Gabe/James. The plan is to have a draft for the Atlanta meeting.
   * The second effort is to focus on how to obtain data. We can potentially create a benchmark and share data for the ML training (e.g., similar to Image Net that people use to differentiate between cat and dog). We would like to have a benchmark data for indoor environmental modeling. Anyone is interested, please let James know. James is currently leading that. We asked if there is any volunteer.
   * There is an interest from TC 1.13 (optimization) – Dave Yashar (past RAC chair – Farhad Omer the incoming TC chair) to collaborate on this. They recommend using optimization for ML and work with them. We can use their TC resource. That’s definitely welcomed (Mohammad signed up to Liaison for this TC 1.13)
6. Research –(James Lo) - started at 3:21 PM ET and finished at 3:53 PM ET
   * From the research breakfast:
     + RAC’s operating budget is $1.8 million (smaller than 2.5 annual average)
     + There are 8 projects to bid in July / August (six of 8 were in the pipeline before COVID). There are not a lot of new projects being approved. For example, GIA for graduate and NIA they are still suspended (unfortunately). They may resume a year from now.
     + Expect to award 8 per year
     + ASHRAE now has a specific research strategic vision (6 themes).
     + There are new requirements for WS. When one put a budget for a WS, the suggestion is to break everything and explain it instead of saying the amount in the WS list everything (the RAC will have an idea to evaluate)
     + People who review WS and RTAR are not expert in the field. It is recommended to avoid going too deep too fast. The RAC members will not understand it.
     + There was a question about having a form that researchers could use For example, when you submit and RTAR and you can defend it. They did not like it. Liasson record the details.
     + There was a question about the timeline of the project gets funded. There was a question about the how the student could get involved and continue working on the RTAR.
   * James encouraged TC members to join the research meeting to generate ideas
   * PMS Chair for RP-1675 summarized the final steps for the approval of this RP. The project is completed. There is a requirement to publish a final paper, so the final payment could get paid. Mark and Jim will work Charlie’s student to make sure they can assist in anyway. The report is accepted. Jim has reached out to Beichao to offer his and Mark’s help with the paper and getting the payment.

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| **Projects** | **PMS** | **Title** | **Status** |
| 1675-RP | Jim VanGilder, Mark Seymour, John Groenewold, (Greg), Wangda Zuo | Guidance for CFD Modeling of Data Centers | * Need to publish final paper for final payment * PMS reaches out to Baichao to help. |

* + There are two old WS (WS 1744). We decided to drop this one since it has been about 6 to 8 years that anyone worked on it. Unless someone is admen, we are going to drop it.
  + WS-1827: We want to reach out to Ray and Jamie. Ray mentioned that he heard that TC 9.3 agreed to co-sponsor it. That was the reason to hold it up. James will reach out to Jamie for further information. If no one is going to lead that, we will drop this one too.

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| **WSs** | **Author(s)** | **Title** | **Status** |
| 1744 | Malcolm Cook, James Lo, Duncan Phyfe**,** Mike Koupriyanov,  **Duncan Phillips** | Guidelines for Accurate CFD Modeling of Natural Ventilation | * Drop |
| 1827 | James Bennet,  Mike Koupriyanov,  Duncan Phyfe,  **Brian Krafthefer** (Ray H.). | Particle Inhalation Modeling of Aircraft Cabins as Sparse Non-uniform Spaces Phase I | * Reach out to Ray and Jamie * Potential to drop |

* RTAR:
  + 1828: James will talk with Jamie. James asked about the interest. TC 5.2 insists that this work has been done. There was a question about how to define flex data (mechanical or it helps to improve the pressure drop) or why should we do the CFD rather than the measurement.
  + 1908: Shichao puts this together. He is no longer with the committee. He is more active in TC 2.1. We decided to drop this one.
  + There are a couple of new ideas
    - Anthony put together the data driven idea. Although there are a few interests we are dropping this one as well.
    - ML benchmark case is another new idea. We are looking for a new leader. If you are interested, please let James know
    - Jim and Mark are interested in the compact model. They talk about the experience in RP-1009. An extension that works and our new RP could be included. We run to the same thing when we work on the data center. If we are looking at the literature, there is no discussion about the momentum source. This topic sems very important. Detailed CFD could be used to make a compact model and leverage CFD for most of it. Jim will work on a draft WS. Jim thinks December is realistic.

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| **RTAR** | **Author(s)** | **Title** | **Status** |
| 1828 | (Chao-Hsin Lin),  Charlie Lin,  Chun Chen  Jamie B. | Flow Characteristics of Installed Flex *Ducts* | * 5.2 rejection * Ask Jamie, but might be dropped |
| 1908 | Shichao Liu, Hui Zhang,  Leon Wang, | A Simplified CFD Modeling Method to Assess Thermal Environment and Air Quality in Buildings with Ceiling Fans | * drop |
| New | Leon Wang,  Donghyun Rim,  **Himanshu Sharma,**  (Anthony Fontanini) | Constructing Surrogate and Reduced Order Models for Stratified Flows | * drop |
| New | Tentative- James Lo  Mark, Jim, Mohammad | ML Data quality, quantity, benchmark cases for IEQ models. Co-sponsorship 5.6? | * Looking for lead * RTAR draft for Atlanta |
| New | Jim VanGilder, Mark Seymour, Mohammad Heidarinejad, Duncan Phillips, Duncan Phyfe | Resistance by compact model, momentum model for directional devices; CFD and experiments | * Jim to start by emails * RTAR draft for Atlanta |

* + Updates on co-sponsorships
    - 1874: Mohammad is in the PMS (We only had one meeting so far).
    - 1748: No other actions for this one. James is going to drop this one.
  + There were a couple of new ideas
    - COVID airborne diseases
    - Standard 129 which is focused on the measurement of ventilation effectiveness. The standard is being rewritten. TC 4.10 has three voting members (Duncan Phyfe, Mike, and James). There is a proposal to include CFD for the design in this standard (TC 5.3 is approached by a lot of people during the COVID time and this is the reason to work on this new standard). If you have any contribution, please let three of us know.
    - There was a question about the outdoor airflow design. We have a chapter on outdoor modeling but TC 4.3 (Ventilation) is the responsible TC. We have no authority over that chapter since another TC owns that. Duncan Phyfe is a voting member there. Jim mentioned about Mark Symore’s presentation and the question that he received. Why and how the airflow around data centers are different than buildings. Mark mentioned the heat density for data centers are very different than buildings. The effort should come from TC 4.3 not us otherwise we are not welcomed. Stuart mentioned about the guideline as well. Maybe we want to engage the Tall Building TC too.

1. Standards/Guidelines/Handbook (Mohammad Heidarinejad) – started 4:03 PM ET and finished at 4:07 PM ET.
   * We have till the end of July to submit our Chapter 59 in the Applications Handbook. The idea is to work on new additions till July 10. Then, we will send the chapter to the TC members for review. After that the TC members will vote by ballot. Leon is working on a new example from CONTAM. Stuart is working on a coupled example. Mohammad is working on a new demand control ventilation example. Jim and Mohammad will work on adding a paragraph or two from RP-1675 for the data center example given the time constraint. Then, Mark will review the new addition.
2. Program (Jim Van Gilder) - started at 4:07 PM ET and finished at 4:22 PM ET
   * Jim summarized a summary of the approved sessions in Toronto. It was really good to have three sessions out of seven. Some TCs did not get any. This is a testament on our great work.

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| **Toronto, Summer 2022** | | | |
| **Session Type** | **Session Title** | **Session Chair** | **Speakers** |
| Seminar | Recent Advances in Data Center CFD  Sunday June 26 1:30 PM – 3:00 PM | Yang-Seon Kim | Jim VanGilder  Mark Seymour  Charlie Lin  Duncan Phillips |
| Seminar | Balancing Comfort, Energy and IAQ in Buildings: Examples from Real-world Applications  Tuesday June 28 11:00 AM – 12:30 PM | Wangda Zuo | Leon Wang  Mike Koupriyanov  Duncan Phyfe  Duncan Phillips |
| Seminar | Artificial Intelligence for Environmental Modeling  Sunday June 26 11:00 AM – 12:30 PM | Wangda Zuo | Yang-Seon Kim  Goncalo Pedro  James Lo  Wangda Zuo |

* + From the Program subcommittee meeting, we selected a few sessions for Atlanta as the following table shows:

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| **Atlanta, Winter 2023** | | | |
| **Session Type** | **Session Title** | **Session Chair** | **Speakers** |
| Seminar | Fans, Jets, and Diffusers Oh My!  Resubmit from Toronto  Track 8: Building Simulation…? | Jim VanGilder | Francesco Babich  Duncan Phyfe  Duncan Phillips |
| Seminar | Infection Control in Commercial Spaces  Resubmit from Toronto  Track 8: Building Simulation…? | Himanshu Sharma | Wangda Zuo  Leon Wang  Duncan Phillips  Long Phan |
| Seminar | Browser and cloud-based solutions to airflow modeling challenges  Resubmit from Toronto  Track 8: Building Simulation…? | Mohammad Heidarinejad | Leon Wang  Stuart Dols  Mark Seymour  Jim VanGilder |
| Seminar | Coupling modeling tools (e.g., 1D w/ 3D) for efficiency  Track 8: Building Simulation…? | James Lo | Jim VanGilder- IT Rack model (FNM+CFD)  Mark Seymour (Non-rack DC applications)  Stuart – CONTAM + EnergyPlus  Wangda Zuo (CFD/Modelica/ISAT?) |
| Seminar | Virus Risk/Infection Control and Energy Consumption  Track 8: Building Simulation…?  Co-sponsorship by 7.5, 4.7? | Wangda Zuo | Wangda Zuo  Mike Koupriyanov  Zhenlei Liu – Electric air cleaner/reducing virus count  Jialei Shen - Different ventilation strategies |

* + The submission deadline for Atlanta is August 9th.
  + Jim explained about the process of submitting sessions in response to a question.
  + We did have a good brainstorming about the future sessions in future. Jim encouraged new members to look at the conference tracks. The better we can match that would be a better acceptable chance.

1. Web site activity (Stuart Dols) - started at 4:22 PM ET and finished at 4:23 PM ET
   * Nothing to report at this time.
2. New business - started at 4:23 PM PT and ended at 4:24 PM PT
   * Given the new strategic plan, we should work on our mission statement in Atlanta or have a separate meeting online to work on them.
3. Report of relevant activities in other TCs
   * James Lo asked the TC members if they have any item to share from other TCs:
     + It would e great to beef up our collaboration with TC 5.3.
     + Wangda Zou mentioned about the ASHRAE SimBuild conference in September.
4. Honors and awards
   * Nothing to report at this time.
5. Agenda suggestions for next meeting
   * Contact James Lo if there is any new item.
6. Adjournment
   * Mike Koupriyanov moved a motion to adjourn the meeting and Duncan Phyfe seconded the motion.
   * The meeting was adjourned at 4:24 PM ET.
7. Attendance List
   * The list of attendance in the main meeting are included in the bottom:

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| **First Name** | **Last Name** | **Company** | **TC 4.10 Membership** | **ASHRAE Member** | **YEA** |
| Duncan | Phyfe | Alden | VM |  |  |
| Mohammad | Heidarinejad | IIT | VM | Yes |  |
| James | Lo | Drexel | VM |  |  |
| Dahai | Qi | Université de Sherbrooke |  |  |  |
| Chao | Ding | LBNL |  |  |  |
| Joshua | Vasudevan | Loughborough Univ |  |  |  |
| Stuart | Dols | NIST |  |  |  |
| Mike | Koupriyanov | Price Industries Ltd. | VM |  |  |
| Zhenlei | Liu | Syracuse University |  |  |  |
| Jim | VAN GILDER | Schneider Electric | VM |  |  |
| Chao-Hsin | Lin | Boeing | VM |  |  |
| Mike | Carl | RWDI |  |  |  |
| Leon | Wang | Concordia |  |  |  |
| Yang-Seon | Kim | Wichita State University | VM |  |  |
| duncan | phillips | RWDI |  |  |  |
| Himanshu | Sharma | Pacific Northwest National Laboratory |  |  |  |
| Long | Phan | Coilmaster Corp |  |  |  |
| Mehran | Salehi | Harris |  |  |  |
| Eric | Li | RWDI |  |  |  |
| Philippe | Vincent | Creaform Engineering |  |  |  |
| Cary | Faulkner | CU Boulder |  |  | x |
| Sangeetha | Kumar | UT Austin |  |  | x |
| Ray | H. | retired |  |  |  |
| Wangda | Zuo | Penn State University |  |  |  |
| Hisham | Ennarah | J2 Innovations |  |  |  |

1. [↑](#footnote-ref-1)