# ASHRAE MEETING MINUTEs
# Summer (Annual) Conference - Kansas City, MO

# TRG4.IAQP
# Indoor Air Quality Procedure Development

| | | | |
|---|---|---|---|
| Day: | Sunday | Location: | Kansas City Convention Center (KCCC) |
| Date: | 23 June 2019 | Tower: | not applicable |
| Time: | 10:30 - 12:00 | Room: | KCCC, Rm. 213 |

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1. Call to Order (10:30). Introduction of guests and members

2. Roster:
   - (Voting) Members (15) - Marwa Zaatari, Nick Agopian, Charlene Bayer, Robert Burkhead, Barney Burroughs, Jim Dennison, Elliot Horner, Gemma Kerr, Chang-Seo Lee, Chris Muller, Jeff Roseberry, Charlie Seyffer, Scott Sherwood, Erica Stewart, Scott Williams
   - Corresponding Members (3) - William Chadwick, Henry Greist, Brian Hafendorfer
   - Provisional Corresponding Members (16) - Kevin Bowe, Nick Clements, Clifford Cooper, Mohammad Daoud, Nilesh Deshpande, Kautuk Dikshit, Liju Eapen, Chris Hsieh, Adil Inam, Rajendera Kapoor, Mitesh Kumar, Luke Leung, Stephany Mason, Joel McKellar, Dhwani Mehta, Catherine Thibaud

3. Membership Present - Voting Members Present (Quorum Present?)

   Members Present (11): Marwa Zaatari, Nick Agopian, Charlene Bayer, Jim Dennison, Elliot Horner, Gemma Kerr, Jeff Roseberry, Charlie Seyffer, Scott Sherwood, Erica Stewart, Scott Williams
   Members Absent (4): Bob Burkhead, Barney Burroughs, Chang-Seo Lee, Chris Muller

   Relevant Comments Regarding Voting Members:
   1. Nick Agopian (Vice-Chair) will extend his voting for another year, after which he will roll-up to be Chair and not vote.
   2. There will be 6 Voting members rolling off after Kansas City – Charlene Bayer, Barney Burroughs, Chris Muller, Jeff Roseberry, and Scott Sherwood. Erica Stewart is retiring and will not be Voting Member (after Kansas City).
   3. There will be 3 members that will become Voting Members - Chris Hsieh, Caitlin Naske, and Richard Fox.

   Relevant Comments Regarding Non-Voting Members:
   1. Corresponding member William Chadwick desired to terminate his membership.

Voting Members Present: 11 (of 15) (as reflected in the Roll-Call)
Quorum Present?: Yes
[Motions: 1/2 x 15 ~ 8 members needed to be present for a Quorum)
A Quorum to conduct business meetings is established when the number of voting members present is four (4) or exceeds 1/2 of the number of total voting members of the committee, whichever is larger.]

| TRG4 Leadership | Current (2-yr/4-Meeting term) | after 7/1/2020 |
|---|---|---|
| Chair | Marwa Zaatari | Nick Agopian |
| Vice-Chair | Nick Agopian | Dean Tompkins |
| Secretary | Dean Tompkins | in-development |

Corresponding Members present in the Meeting (0)

Provisional Corresponding Members present in the Meeting (6) - Caitlin Naske, Victoria Binz, Joe Pessa, Gerald Kettler, Michael Sherber, Gourish Sirdeshpande,

Guests present in the Meeting (17) – Dean Tompkins, Pawel Wargocki, Jon Rasala, Michael Orcutt, Sama Pakhimi, Richard Fox, Alan Rosenberg, Violeta Tayeh, Bruce McDonald, Dennis Wessel, Dan Mason, Randy Reed, Mitta Dean, Ed Light, John Randtke, David Heidel, Michael Deru

## Ethics Statement (10:40) (and silence cell phones)

- The Chair (Marwa Zaatari) read the Ethics Statement aloud:

> *"Commitment to the ASHRAE Code of Ethics – In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, and we shall avoid all real or perceived conflicts of interests."*

*(See full Code of Ethics: https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics.)*

## Sponsored Research Statement (10:42)

- The Chair (Marwa Zaatari) stated that:
  - a TRG cannot formally sponsor research.

## General Remarks to the Meeting Attendees (10:43)

- The Chair (Marwa Zaatari) stated that:
  - the Chair has no power to admit or deny an individual's membership to the TRG,
  - the TRG4 was developed to provide technical insight/guidance to the Research and Education Subcommittee of SSPC 62.1, though to date (23 June 2019), the TRG4 has not provided guidance to the SSPC 62.1,
  - Three things are sought to be admitted for Voting Membership:
    - attendance and participation at the Meetings/Conferences,
    - be present for any/all Voting activities, and
    - volunteer and perform work that supports the TRG4, and
  - Basecamp and the TRG4.IAQP website are sources for information for the TRG4.

4. Approval of Meeting Minutes (10:45) from Winter Meeting (Atlanta, GA)

Actionable Task(s): Formal Vote
Motion to: Approve the Atlanta (13-January-2019) Meeting Minutes of the TRG4
Motion by: Erica
2nd-ed by: Charlene
Discussion: none

Voting Tally:
For: 10; Against: 0; Abstain: 1; Absent: 4 Total: 15
Motion: Passed [10 > 8 (= 1/2 x 15)]

5. Group Discussions (10:50)

The Chair (Marwa) had the attendees divide into their 4 groups. Table below describes the 4 groups.

| Task Force 1 - Lead - Dean Tompkins | Task Force 2 - Lead - Jim Dennison | Task Force 3 - Lead - Marwa Zaatari | Task Force 4 - Lead - Scott Sherwood |
|---|---|---|---|
| Identify 145.2 efficiency test compound for each VOC listed in the Table 1 below. | Discuss $PM_{2.5}$ and ultrafine testing/limit. | Identify TRG4.IAQP Content (Docs, Graphics, Videos, etc.) and the Methods to successfully disseminate that Content for Education/Edification of the IAQP Method of Std. 62.1 | Manufacturers Identify a means of communicate to Equipment Manufacturers |

| Present in Kansas City, MO | |
|---|---|
| Task Group #: | 1 |
| Title: | Standard 145.2 test compound |
| Activity: | Identify the appropriate challenge-gas species for each gas listed in Table 1 below. |

| Individual | Organization | Email |
|---|---|---|
| Charlene Bayer | Hygieia Sciences | charlene.bayer@gmail.com |
| Gemma Kerr | Canada | gkashrae@magma.ca |
| Erica Stewart | Kaiser Permanente | erica.stewart@kp.org |
| Pawel Wargocki | Denmark Tech University | paw@byg.dtu.dk |
| Bob Miller | Top Products | Bob.Miller@TopProductInnovations.com |
| Richard Fox | Honeywell | rfox1956@gmail.com |
| Dean Tompkins (Group 1 Lead) | Dean Tompkins Group | deantompkins45@gmail.com |
| Dan Mason | Bioclimatic | dmason@bioclimatic.com |

Group 1 Lead (Dean Tompkins) Report: Activity in Kansas City as reported by Dean Tompkins for Task Group 1 (Standard 145.2 Test Compounds) includes:

- Group 1 Tasks Accomplished since Winter Meeting (Atlanta, GA):
  - Created an EXCEL-based Spreadsheet consisting of compounds from:
    - ASHRAE Standard 145.2-2016 (Table 6.1), and
    - DA-68 (Addenda aa – the Design Compounds in the *proposed* SSPC 62.1-2019).
  - Spreadsheet consisted of:
    - relevant thermophysical properties (e.g., molecular weight, boiling point, dipole moment, among others),
    - presence of the compound in the BASE Study (U.S. EPA Study from 1990s),
    - vapor pressure (water vapor density), and
    - Antoine Equation properties.
  - Plot(s) were created of the boiling point versus molecular weight for the purpose of identifying the potential for clustering of these compounds within particular chemical families. Little to no apparent clustering was identified – See the Appendix herein.
  - Identified select compounds within chemical families that are preferred based on favorable properties and/or suitability for 145.1 testing

- Action Items
  - Will continue further development of the Spreadsheet.
  - Will initiate an electronic tool to ease the book-keeping effort so that all TRG4 members can have access to the observations made by Group 1.

| Present in Kansas City, MO | |
|---|---|
| Task Group #: | 2 |
| Title: | PM2.5/Ultrafine |
| Activity: | Discuss/Develop PM 2.5 and ultrafine testing/limit. |

| Individual | Organization | Email |
|---|---|---|
| Elliott Horner | UL Env & Sustainability | elliott.horner@ul.com |
| Jim Dennison (Group 2 Lead) | Century | jim@centuryenvironmental.com |
| Charlie Seyffer | Camfil | charlie.seyffer@camfil.com |
| Richard Fox | Honeywell | rfox1956@gmail.com |

Group 2 Lead (Jim Dennison) Report: Activity in Kansas City as reported by Jim Dennison for Task Group 2 (PM2.5 & Ultrafine Particles) includes:

- General Comments
  - Stated that PM2.5 proposed change is 12 μg/m3.

- Action Items
  - Will identify the methods appropriate for detection of PM2.5 via a literature search
  - Will develop a White Paper to report on the information found regarding the appropriate methods for detection of PM2.5.

| Present in Kansas City, MO | |
|---|---|
| Task Group #: | 3 |
| Title: | IAQP dissemination |
| Activity: | Identify TRG4.IAQP content (docs, graphics, videos, etc.) and the methods to successfully disseminate that content for education/edification of the IAQP Method of Std. 62.1 |

| Individual | Organization | Email |
|---|---|---|
| Marwa Zaatari (Group 3 Lead) | enVerid | mzaatari@enVerid.com |
| Alan Rosenberg | Top Product Innovations | alan.rosenberg@topproductinnovations.com |
| Scott Williams | Williams Build. Sys. Engr. PC | Scott.Williams@WbsEngr.com |
| Chris Hsieh | TRANE | chsieh@trane.com |
| Michael Deru | NREL | michael.deru@nrel.gov |
| Nick Agopian | RenewAire | nagopian@renewaire.com |

Group 3 Lead (Marwa Zaatari) Report: Activity in Kansas City as reported by Marwa Zaatari for Task Group 3 (IAQP dissemination) includes:

- Action Items
  - Will reach out to the Chairman of SSPC 62.1 regarding the IAQP calculator.
  - Check the existing SSPC 62.1 General Educational presentation.
  - Check the status of the SSPC 62.1 User's Manual with the intent to provide feedback regarding IAQP.
  - Assemble existing IAQP calculators including efficiency use of different compounds.

| Present in Kansas City, MO | |
|---|---|
| Task Group #: | 4 |
| Title: | Manufacturers |
| Activity: | In development |

| Individual | Organization | Email |
|---|---|---|
| Gerald Kettler | Std 202, 189.1, USGBC | gjkettler@air-engineer.com |
| Nick Hurst | USEPA | hurst.nicholas@epa.gov |
| Joe Pessa | Dynamic AQS | jpessa@dynamicaqs.com |
| Randy Reed | NEC | randy@norbryhn.com |
| David Heidel | UVDI | david.heidel@uvdi.com |
| Jeffrey Roseberry | ProMark Associates | jeffr@promarkassociates.com |
| Gourish Sirdeshpande | Armstrong World Ind. | gsirdeshpande@armstrong.com |
| Michael Sherber | Plasma Air | msherber@plasma-air.com |
| Ed Light | Building Dynamics | elight@building-dynamics.com |
| Michael Orcutt | Cosatron | michael.orcutt@cosatron.com |
| Scott Sherwood (Group Lead) | EcoCare Corp. | ImproveYourAir@gmail.com |

Group 4 Lead (Scott Sherwood) Report: Activity in Kansas City as reported by Scott Sherwood for Task Group 4 (Manufacturers) includes:

- General Comments
  - Any method of air cleaning should be permitted; these technologies include electronic air cleaning devices (EACDs) and coating(s) manufacturers.
  - Technology definitions are applicable to the specific technology involved.
  - Testing techniques need to include multi-pass testing.

- Akin to Action Items regarding Testing Approaches
  - Single pass and multiple pass results need to be compared: laboratory testing and field testing.
  - ISO Standard 16000-23 (Formaldehyde) and 16000-24 (VOCs) referenced a continuous stream of air passing through a chamber wherein one measures the contaminants that are returning from the chamber. If one conducts a test over a period of time, then one may be able to assess the longevity of the technology.
  - There are additional testing technologies that can be applied. Note that field testing is difficult based on the variables in the field.
  - New York City Department of Environmental Protection (NYC DEP) "Air Working Group" is currently regulating air contamination from kitchen exhaust. Scott Sherwood is the technical expert for this group due to his experience and understanding of Kitchen Exhaust Pollution Control Units.

    - Local Law Number 38 for the year 2015 amends Title 24 of the Administrative Code of the City of New York by adding a new Section 24-149.5, which

provides that cooking stoves used at food service establishments shall be equipped with an emission control device for odors, smoke and particulates that meets the requirements of rules established by the department."

- Testing can be EPA Method 5, Appendix A-3 to 40 CFR Part 60, or EPA Method 202, Appendix M to 40 CFR Part 51, for particulate matter Field testing.

Additional Comments during Task Group Presentations (11:45)

- Ed Light:
  Desired that a CO2 committee (Task Group) be formed.

- Charlie Seyffer:
  Task Group 4 allows manufacturers of any type of air cleaner to be included in the IAQP.

- Gemma Kerr:
  The SCOPE of 145.2 needs to be developed/modified/ to allow for electronic air cleaner users to allow for their study.

6. Design Compounds (approved on/by TRG4.IAQP to date)
   acetaldehyde, toluene, ozone, PM 2.5

Design Compounds from DA-68 of SSPC 62.1: Table 1a.
Adopt the convention of refering to design compounds, PM2.5, and their design targets, as DA-68 has done.

**Table 6.3.2.1 Design compounds, PM2.5, and their design targets**

| Compound or PM2.5 | Cognizant Authority | Design Target | Notes |
|---|---|---|---|
| Acetaldehyde | Cal EPA CREL (June 2016) | 140 ug/m³ | |
| Acetone | AgBB LCI | 1,200 ug/m³ | |
| Benzene | Cal EPA CREL (June 2016) | 3 ug/m³ (1) | A |
| Dichloromethane | Cal EPA CREL (June 2016) | 400 ug/m³ | |
| Formaldehyde | Cal EPA CREL (2004) | 33 ug/m³ | |
| Naphthalene | Cal EPA CREL (June 2016) | 9 ug/m³ | |
| Phenol | AgBB LCI | 10 ug/m³ (1) | A |
| Tetrachloroethylene | Cal EPA CREL (June 2016) | 35 ug/m³ (1) | A |
| Toluene | Cal EPA CREL (June 2016) | 300 ug/m³ | |
| 1,1,1-trichloroethane | Cal EPA CREL (June 2016) | 1000 ug/m³ | |
| Xylene, total | AgBB LCI | 500 ug/m³ | |
| Carbon dioxide | | 1100 ppm or equivalent to VRP (2) | B |
| Carbon monoxide | USEPA NAAQS | 9 ppm | |
| PM2.5 | USEPA NAAQS (annual mean) | 12 ug/m³ (3) | C |
| Ozone | USEPA NAAQS | 70 ppb | |
| Ammonia | Cal EPA CREL (June 2016) | 200 ug/m³ (4) | D |

A. Benzene, phenol, and tetrachloroethylene shall not be included in the mixture calculation for upper respiratory tract irritation, eye irritation, and CNS depression as they are not expected to cause these principal effects at the design target.
B. The design target for carbon dioxide is 1100 ppm or the equivalent steady state concentration calculated using the ventilation rate calculated using the Ventilation Rate Procedure, whichever is higher. Appendix D contains requirements for how to calculate the $CO_2$ equivalent steady state concentration.
C. Outside the U.S., if the outdoor concentrations of carbon monoxide, PM2.5, or ozone exceed the Design Target, the limit is equal to the applicable ambient air standards for the region where the project is located if one exists
D. Ammonia shall be included only for spaces that include non-human animals.

Table 1b. (current) Design Compounds (DA-68)

**Table 6.3.2.2. Mixtures of compounds**

| Upper Respiratory Tract Irritation | Eye Irritation | Central Nervous System |
|---|---|---|
| acetaldehyde | acetaldehyde | acetone |
| acetone | acetone | dichloromethane |
| xylene, total | xylene, total | xylene, total |
| ozone | ozone | 1,1,1-trichloroethane |
| | formaldehyde | toluene |

Source: ACGIH, 2017 (See Informative Appendix J, Informative References).

7. New Business (11:45)

- Pawel Wargocki:
  Discussed that the IEA (International Energy Agency) has developed a new Annex – IEA EBC Annex 78: *Supplementing ventilation with gas-phase air cleaning, implementation and energy implications*. Anyone can become a member of Annex 78. Annex 78 has working groups to study the energy benefits from using gas-phase air cleaners, review of existing gas-phase cleaning air standards, among other topics. Further background is found at this link - http://annex78.iea-ebc.org/.

- 1838-RP "Emerging gas-phase electronic filtration technologies and ASHRAE 145.2 test standard":
  TC 2.3 is in the process of selecting a contractor for the 1838-RP. This is a 6-month project with deliverables that will impact electronic air cleaners, SSPC 145.2 and SSPC 62.1 Indoor Air Quality (IAQ) procedure.

8. Adjournment of the TRG4 Meeting (11:58)

Actionable Task(s): Formal Vote
Motion to: Adjourn the TRG4 Meeting
Motion by: Dean
2nd-ed by: Marwa
Discussion: none

Voting Tally:
For: 11; Against: 0; Abstain: 0; Absent: 4; Total: 15

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## Appendix

A plot of the boiling point versus molecular weight is shown in Figure A.1. The purpose of identifying the potential for clustering of these compounds within particular chemical families.

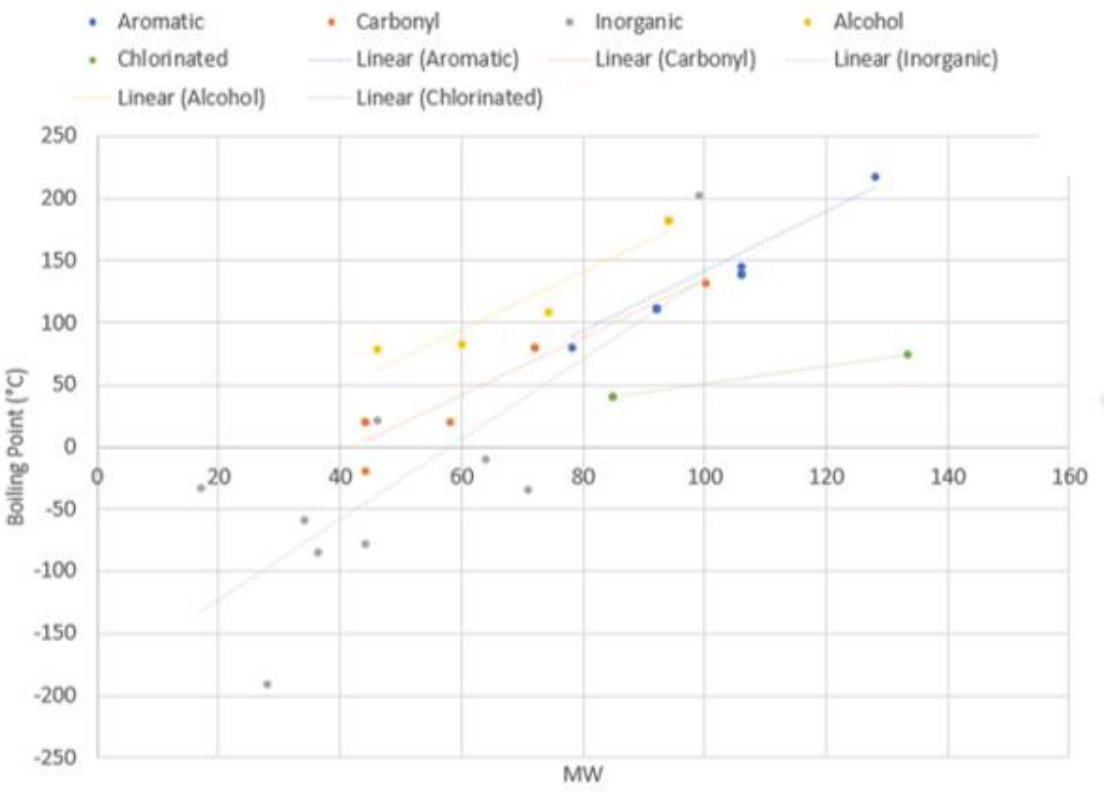


Figure A.1 Boiling point versus molecular weight as a function of class of compound.