

ASHRAE TC 2.6 Sound and Vibration Control

Main Committee Meeting Minutes

2:30 PM – 4:30 PM PST Monday January 31, 2022

Winter Conference

1. **Call to order** (Saenz-Acosta) Meeting was called to order by Karina Saenz-Acosta at approx. 2:39PM (PST)
2. **Introduction of those present** (Saenz-Acosta)
 - 2.1. Karina welcomed new members and visitors and google doc sign in sheet was distributed in chat.
3. **Confirmation of current voting members**
 - 3.1. 9 members present (+1 arrived late, during Programs SC) out of 11 voting members
4. **Review and approval of the minutes** (Saenz-Acosta)
 - 4.1. Matthew Golden motioned to approve last meeting minutes and Curt Eichelberger seconded the motion. Notes were approved unanimously.
5. **Secretary's report** (Bauch)
 - 5.1. Paul Bauch shared status of membership with the committee including attendance records for the monthly meetings. Generally 20-25 people are in regular attendance. 50 total unique members have been recorded attending the TC meetings over the last year.
6. **TC Chair's meeting report** (Saenz-Acosta)
 - 6.1. Karina Saenz-Acosta notified the committee members of new online Roster changes, asking attendees to check their membership on TC 2.6 by visiting our website:
<https://tc0206.ashraetcs.org/membership.php>
7. **ASHRAE Liaison**
 - 7.1. Section Head – Not present
 - 7.2. Research – Not present
 - 7.3. Publications – Not present
8. **Chair's announcements and correspondence** (Saenz-Acosta)
 - 8.1. Karina Saenz-Acosta provided the current status of officers as indicated below.
 - 8.1.1. 2021-2022 Chair, Karina Saenz-Acosta
 - 8.1.2. 2021-2022 Vice Chair, Jeremy Stockman
 - 8.1.3. 2021-2022 Secretary, Paul Bauch
9. **Subcommittee reports (written reports available on Basecamp)**
 - 9.1. **Research Subcommittee** - Greg Meeuwsen delivered the Research subcommittee meeting report.
 - 9.1.1. Work Statements/RTAR's/URP's
 - 9.1.1.1. RP 1707 - Annoyance Thresholds of Tones in Noise as Related to Building Services Equipment.
 - 9.1.1.2. RP 1852 - Develop performance metric, criteria, and process to measure and predict of speech privacy in High Performance Buildings
 - Requesting 6-mo no cost extension. Pandemic driven delays due to survey conditions and people working in the building. (New completion date - October 2023)
 - 9 out of 9 Members present voted to approve no cost extension (Voted Yes – Bauch, Eichelberger, Golden, Hassler, Keith, Laforgia, Saenz-Acosta, Stockmans, Wise)
(Not Present – Shafer, Wowk)
 - 9.1.1.3. RTAR 1919 - The Effects of Duct Size and Aspect Ratio on Flow Noise in Elbows

- 9.1.1.4. RTAR-1882 - Procedure for Estimating Occupied Space Sound Levels in the Application of UFAD Air Terminals and Air Outlets
 - Work statement needs work. Curt Eichelberger will provide comments but the work involved is staggering. Will need volunteer to drive this project and complete the work statement.
- 9.1.2. Other topics discussed
 - 9.1.2.1. ASHRAE Research Strategic Plan from RAC
 - “Acoustics” appears several times in the IEQ section of the Research Strategic Plan
 - Research funding overall is less at \$1.8M for 2022.
 - URP’s will not be considered
 - ASHRAE is developing new web-based process to submit and track Research project documents.
- 9.2. **Programs Subcommittee** (Swan)
 - 9.2.1. Program Chair’s meeting report
 - 9.2.1.1. Jason Swan shared plans for next meetings:
 - Postponed How to Select and Size HVAC Fans for Optimum Acoustical Performance to summer meeting in Toronto. **[Action Item] – Paul Bauch will reach out to Rad Ganesh to confirm availability to attend Toronto. Jason and Jerry to submit seminar by Feb 17 deadline.**
 - Jason Swan to follow up with Jerry Lilly and Karl Peterman on Duct Noise Breakout seminar topic. David Herrin volunteered to do a presentation on the topic.
 - **Will try to resubmit Tunnel ventilation for Atlanta meeting (Winter 2023).**
 - Atlanta Meeting Tracks were released – TC2.6 Current Proposals **(need to reduce list down and find presenters over next couple months)**
 - Prediction v Lab v Field (Papadimos, Marks, Miller-Klien)
 - Attenuator Performance (Papadimos)
 - Acoustics issues to get you sued (Boldt, Lilly)
 - Rooftop Systems (Peterman)
 - Erik and Jerry volunteered for Acoustics seminar (TBD) for Multifamily/Residential Track
- 9.3. **Publications Subcommittee** (Wise)
 - 9.3.1. Handbook chapters
 - 9.3.1.1. Fundamentals Handbook 2021
 - Update was overlooked by staff and has not resolved our revisions.
 - Will be back to this after applications rev cycle (March 2022)
 - 9.3.1.2. Applications Handbook 2023
 - Vote will go out for revisions (non-vibration), Targeting March 3 vote.
 - Reviewers will have February to make last comments.
 - 9.3.2. Other publications
 - Joint Booklet Task Force: Clear plan to move forward. Will be folding in necessary Manufacturers’ Data book into Practical Guide.
- 9.4. **Web page** (Saenz-Acosta)
 - Karina reported on the status of the web page. Always open to suggestions.
- 9.5. **Standards Subcommittee** (Bridger)
 - 9.5.1. Updates from Other Standards Organizations
 - 9.5.1.1. AHRI (Marks/Bauch)
 - Entire Standards Staff have turned over since Orlando meeting, 2020.
 - TCoS is no longer in existence. It has been replaced by S&V Standards Sub-Committee (SSC) with 3 technical committees under it; Airside, Water/Refrigerant, Measurement & Analysis.

- More rigorous ANSI model for reviewing standards. Constant need for consensus body members.
- 9.5.1.2. AMCA (Brooks) – None present to report
- 9.5.1.3. ANSI (Reuter) – None present to report
- 9.5.1.4. ASTM E33 (Lilly/Shaffer)
Low Freq and High Freq impact to various main standards.
Restructuring standards to become more streamlined. Find commonly referenced material that covers multiple standards.
- 9.5.1.5. ISO (Golden)
Absorption standards – discussion around normalization and limiting coefficients to 1.0.
New music practice room standard (published?)
3382 – Revisions to Part 2 including additional metrics and a general review of the standard.
Update for Open office acoustics approved and published.

9.6. **Standing Subcommittees** [10 minutes]

9.6.1. Vibration Isolation (Miller-Klein)

Erik shared current direction for the vibration isolation section and table. Seeking to simplify table and making it more informative than prescriptive. Updates will be made in phases to prevent a major overhaul.

9.7. **Operations Subcommittee** (Saenz-Acosta) [15 minutes]

9.7.1. Honors and awards - None

9.7.2. Long range planning

9.7.3. Membership

9.7.3.1. Rolling off: Reginald Keith, Steve Wise, Curtis Eichelberger, Roman Wowk, Karina Saenz-Acosta

9.7.3.2. Rolling on: TBD by Executive Committee

9.7.4. Liaisons (Saenz-Acosta)

9.7.4.1. ASHRAE TC 2.1 Physiology and Human Environment (Eichelberger)

Curt shared some updated for 2.1. They have a lot of research for air quality, but little or none relating to acoustics

9.7.4.2. ASHRAE TC 2.7 Seismic, Wind and Flood Resistant Design (Waters)

Meets tomorrow, Feb. 1 from 1-5 in Vegas (hybrid, mostly virtual).

9.7.4.3. ASHRAE TC 5.1 Fan Design and Application (Osborn)

Kim shared updated on 5.1. Not much in relating to sound and vibration.

9.7.4.4. ASHRAE TC 5.2 Duct Design (Hassler)

Kevin shared that 5.2's Duct system design guide was recently updated. Information from handbook chapter is included.

9.7.4.5. ASHRAE TC 5.3 Room Air Distribution (Zimmerman)

None to report

9.7.4.6. ASHRAE TC 9.6 Healthcare (Koukounian)

Nothing major relating to acoustics, but revised chapter in handbook. Focus on IAQ.

9.7.4.7. ASHRAE TC 9.7 Educational Facilities

None to report

9.7.4.8. ASHRAE TC 9.8 Indoor Agriculture

None to report

9.7.4.9. ASA (Reuter)

None to report

9.7.4.10. VISCMA (Waters)

Vegas meeting is going to be virtual. Focusing on increasing activity and webinars.

9.7.4.11. Others: INCE/InterNoise (Golden), NCAC (Bridger), EGSA (Simmons), etc...

INCE:

Abstracts are due tomorrow. NoiseCon in Lexington, KY and Internoise will be in Glasglow, Ireland.

Working on technician certification program on how to perform standards.

No one from NCAC or EGSA.

10. New business/Old business [5 minutes]

No new business

11. Next meeting date and location – Toronto, ON, Canada June 25 – 29, 2022

Continue to meet monthly between now and Toronto

12. Adjournment

Research Report – Winter Conference – January 31, 2022

Research project status:

RP-1707 - Annoyance Thresholds of Tones in Noise as Related to Building Services Equipment

- PMS chaired by Kim Osborne.
- Project is complete, final report and papers submitted. Report returned with editorial corrections.
- Had a discussion on how to best disseminate the software. Needs better instruction on installation and use. Will have at least one more PMS meeting to develop this.

RP-1852 - Develop performance metric, criteria, and process to measure and predict speech privacy in High Performance Buildings

- PMS chair is Erik Miller-Klein.
- Contract awarded to Soft dB Acoustical Consulting, Roderick Mackenzie principal investigator.
- Significant work has been completed, with several delays due to inability to make measurements in occupied spaces under COVID-19. Needed measurements on hold again.
- A no-cost extension has been requested and approved by the PMS. Need a TC vote to approve.

RTAR-1919 - The Effects of Duct Size and Aspect Ratio on Flow Noise in Elbows

- Brandon Cudequest is lead author.
- The work statement was conditionally approved by RAC, but with a few areas that they wanted addressed.
- Modified work statement was submitted, but ASHRAE dropped the ball and did not put it on the RAC winter agenda.

RTAR-1882 - Procedure for Estimating Occupied Space Sound Levels in the Application of UFAD Air Terminals and Air Outlets

- This RTAR was started by TC 5.3, with TC 2.6 as co-sponsor, approved by RAC several years ago, but little progress has been made on a work statement
- TC 5.3 believes it is important but feels it should be led by TC 2.6 because it is entirely acoustics related, and they don't have the resident experts.
- In discussion we did not get a volunteer to lead the effort, and SC feels that TC 5.3 should still lead, or at least be heavily involved.

Report from the RAC "Research Chairs Breakfast".

- The new Research Strategic Plan is published, available on the ASHRAE Research page.
 - There are 6 major thrusts:
 - Resilience
 - IEQ – Environmental Quality in Occupied Spaces and Impacts on Work and Learning, Health and Well Being, and Transmission of Airborne Infectious Viruses
 - Sustainability, Decarbonization, Energy and Resources
 - HVAC&R Equipment, Components, and Materials

- Tools and Applications
 - Education and Outreach.
- The word “acoustic” appears in the document six times related to IEQ
- Budget concerns and actions
 - Typical research budget is \$2.6M to \$2.7M per year. Due to funding shortfalls a result of Covid, The budget for 2022 is \$1.8M
 - Most research funds now come from individual donations, please consider.
 - The Innovative Research Grant, New Investigator Award, and Grant in Aid programs have been suspended. URP’s are not being considered.
 - All active projects continue, all of budget goes to active projects.
 - Very few new projects are being funded, there is a large queue (17) of approved projects waiting for funding, will mostly be funded in the order they were approved.
 - The total value of active projects is \$8.7M. Another \$7.4M of projects are in various stages of development.
- RAC actions
 - At fall meeting, 6 RTAR’s and 5 work statements were approved, 3 projects released for bid.
 - At winter meeting, 1 RTAR was approved, 0 work statements were approved.
- There is a new BaseCamp site for RAC to share information with Research SC chairs.
- ASHRAE is developing a new web-based process to submit and track Research project documents through the research process.

ASHRAE TC 2.6 Sound and Vibration

PROGRAMS SUBCOMMITTEE REPORT – 2022 Winter Meeting, Las Vegas, Nevada – Monday 31 January 2022 (VC)

1. Reviewed types of program sessions
2. Discussed this meeting's program, which has been postponed, and will be resubmitted for Toronto's meeting in June (Swan/Eichelberger)
3. Decided to expand our existing Doodle poll for future programs to the wider society (Swan/Miller-Klein)
4. Reviewed plans for next meetings' programs, deciding which to submit for Toronto, and which to prepare for Atlanta/Tampa in 2023
5. PMN: Programs subcommittee chairs meeting held Tuesday 1 Feb 22. Toronto seminars deadline moved to 22 Feb 22. Programs are to be created with diversity, equity and inclusion in mind. Other updates added herein.

TYPES OF PROGRAM SESSIONS (with links)

Technical Paper

More rigorous, detailing research/theory
Maximum of 30 double-spaced text pages, not including references and up to 12 figures
Author submits directly, no abstract required, at least 9 months prior to the meeting
3 reviewers: double-blind, commercialism
Present: poster, or oral if grouped with related
Published in Transactions and recorded

Authors' Manual

Conference Paper/Extended Abstract

Less rigorous, can be on case studies
Maximum of 8 pages (3 pages for EAs), includes text, tables, figures, not references
Submitted directly by author, or by TC
abstract 10 months prior to meeting
paper 6 months prior
2 reviewers: single blind, commercialism
Present: oral, which is recorded

Conference paper template

ASHRAE asks for reviewers periodically

Seminar/Workshop/Forum

Session chairs and speakers selected by TCs
Program submitted by session chair/speakers
Include bios, abstracts, learning objectives, example questions/answers
Speakers submit final presentations 1 month prior to meeting for commercialism review

Seminar

60 minutes: 1 – 3 presentations
90 minutes: 3 – 4 presentations

Workshop

One chair and two presenters (maximum)
30 minutes for presentations
30 minutes for discussion

Debates

Experts (team/individual) present 2 sides
Hot button issues

Forum/Panel

One moderator
60-minute length
No presentations
Not recorded, 'off the record'

Hot Topic

Internal subcommittee presentation
Can be invited from outside TC 2.6
Listed in the ASHRAE schedule
Available to both TC 2.6 and larger organization
Speakers can be video-conferenced (ie, no registration fee)

**** ASHRAE encourages use of their approved PowerPoint template for presentations; available on their website ****

THIS MEETING:
Las Vegas, 29 Jan – 2 Feb 2022

Tracks:

- 1: HVAC&R Systems and Equipment
- 2: Fundamentals and Applications
- 3: Refrigerants/Refrigeration
- 4: Buildings in 360°
- 5: Energy System Integration
- 6: Environmental Health/IEQ, International Arena
- 7: Industrial/Commercial HVAC: Challenges
- 8: Refrigerants, Safety, Performances

Seminars/Paper Sessions:

Seminar 36 [postponed]: *How To Select and Size HVAC Fans for Optimum Acoustical Performance* (Track 2)

~~Wednesday 2 February 2022, 8:00 AM PST~~

1. Basics of Fan Noise and Application Considerations
Rad Ganesh, Twin City Fan & Blower
2. Fan Noise in Air Handling Systems
Paul Bauch, Johnson Controls
3. 20/20 Foresight: Choosing the Right Fan for the Job (case studies)
Jerry Lilly, JGL Acoustics

Hot Topics:

[None this time]

Future: Tampa, 24-28 June 2023

Track X: Workshop: Upcoming changes to the Vibration Table (Meeuwssen, Miller-Klein, Wise, Golden, Wowk) Why changing. The theoretical, the practical, the metrics.

Chicago 20-24 Jan 24 / **Indianapolis** 22-26 Jun 24
Orlando 8-12 Feb 2025 / **Phoenix** 21-25 Jun 2025

NEXT MEETING:
Toronto, 25-29 June 2022
(preceded by 'Ventilation 2022')

Tracks:

- 1: Fundamentals and Applications
- 2: HVAC&R Systems and Equipment
- 3: Research Summit
- 4: Connected Buildings, Connected Communities
- 5: Cold Climate Bldg: Design/Operation/Resilience
- 6: Sustainable Bldg: IAQ/Energy Use/Comfort/Health
- 7: Professional Development and Education
- 8: Buildings in the Aftermath of COVID-19

Seminars/ Workshops/Forums:

Proposals due: Tuesday 22 Feb 22

Accept/reject notifications: Friday 1 April 2022

Track 1: How To Select and Size HVAC Fans for Optimum Acoustical Performance [resubmit] (Eichelberger) with TC 5.1 [17 votes (fans)]

Track 2: Duct Noise Breakout (Lilly/Peterman)
Tied for 2nd, 15 votes, Jerry's INCE paper
David Herrin modelling, Intensity msmts

Hot topics:

Tones and Background Noise (RP-1707)?
Software demonstration (Lilly) [Tied for 4th]

WELL certification acoustics (Miller-Klein)?
Updated standards/codes

Technical/Conference Papers:

Conference Paper abstract accept/reject: 18 Feb 2022

FOLLOWING MEETINGS:
Atlanta, 4-8 February 2023

Tracks:

- 1: Fundamentals and Applications
- 2: HVAC&R Systems and Equipment
- 3: Refrigeration & Refrigerants
- 4: Grid Resilience & Thermal Storage
- 5: Zero Energy Emissions & Decarbonization
- 6: Multifamily and Residential Buildings
- 7: Operations & Maintenance
- 8: Construction: Building Simulation/Virtual Design
- 9: Supply Chain challenges: Innovative responses

Seminars/ Workshops/Forums:

Proposals due: Tuesday 9 August 2022 (↑↓ 10 Oct 22)

Track X: Tunnel/ Underground ventilation
(LaForgia) with TC 5.1 [resubmit?]

Track 6: Latest in Multifamily/Residential Acoustics
(Miller-Klein/Lilly, Eichelberger) [62.2?]

Track X: Prediction v Lab v Field (Papadimos/
Marks, Miller-Klein): Polled 6th, 12 votes (or 1st,
18 votes), attenuators [polled 2nd], validation,
acoustic cameras, ways to improve

Track X: Acoustics issues to get you sued? Why
consultants? Attorney? (Boldt: Lilly)

Track X: Rooftop Systems (Peterman)
Tied for 4th, 14 votes

Technical/Conference Papers:

5 Apr 22: Conference abstracts, Tech Papers,
Paper Session Requests Due (Abstracts ↑↓ 26
Apr 22)

25 Jul 22 Conference Papers due

TP: Tones and Background Noise (RP-1707)
Tied for 4th

TOPICS FOR FUTURE PROGRAMS

Series: Equipment Noise

- 17 Fan Selection for Acoustics (Schaffer)
- 15 Duct Breakout Noise (Lilly/Peterman)
- 15 Silencers: Performance v Design (Papadimos)
- 14 Rooftop systems (Peterman)
- 9 Fan Boxes: above/below floor (Zimmerman)
- 6 Air Distribution Systems (Zimmerman)
- 3 Compressors: Frequency Characteristics ()
- 3 Ductless Systems: PTACs, WSHP (Weinstein)
- 2 Electrical: Xfmrs, Elec Motors (Papadimos)
- 2 Plumbing noise (Wowk) TC 6.1/6.6?
- 2 Small Fan Coils (____)
- 2 Under-floor Air Systems (Reynolds)
- 1 Boilers (Marks)
- 1 DOAS units (Peterman)
- 1 Generators (LaForgia)
- 0 Fume hoods
- 0 Industrial Ventilation (____)
dust collection, garages, LNG
- 0 Pumps (____)
- 0 Refrigeration: Commercial/Transport (Marks)
- 0 Tankless water heaters

Format:

1. What it is, types, how works, why noisy
2. Standards, specification, lab data, mitigation methods
3. Field issues, case studies, testing

Series: Basics of HVAC Noise

- 14 Tones and Fluctuations (Lilly)
- 12 Prediction vs Lab vs Field (Papadimos/Marks)
- 7 Speech Privacy in Low Noise Offices (____)
- 6 Predicted vs Actual Noise (Papadimos)
- 5 Noise Flanking Paths (Peppin)
- 4 How Noise Affects Design Process (Lilkendy)
- 3 Room Msmt: Test Method (Rockwood)
- 2 Commissioning (____)
- 2 Effects of 'over-design' (Lilly)
- 2 Noise and Productivity (Wang)
- 2 Noise Calculations How To (CD?) (Peterman)
- 0 Applications Chapter Review (____)

Workshop

Vibration Handbook Table: Debate on where to take in future? Get feedback

Hot Topics

How to apply the results of RP-1707 on Tones? Indoors/Outdoors? To products?

New Topics?

VRF/electrical systems, movement to lower carbon equipment
Water Source Heat Pumps

Other Topics:

- 9 Classrooms: ICC adopts S12.60 (Bridger)
- 9 Noise Fluctuations (Lilly)
- 8 Performance Rated Buildings (Roy)
- 5 Passive vs Active (Wise)
- 4 Design of Healthcare Facilities (Miller-Klein)
Alarm fatigue, FGI Guidelines, Privacy
Team up with healthcare TCs?
- 3 Standard Test: Seismic Devices (w/2.7)
- 3 Industrial noise (Keith)
- 3 Noisy kit near to occupied?
- 3 Shell & Core vs Tenant Fit-Out/Improvement
- 2 Tunnel Ventilation (LaForgia)
- 1 Labs internal: Air Valves/Fume Hoods (Wowk)
- 1 Labs external: Stacks, ventilation, nozzles
- 0 Mission Critical Facilities (____)

Past Items:

- 4 Plenum array fans
- 1 *Hearing protection: TWA, Hospitals, Escape / S/N / STI, WHO*
- 0 Refrigerated processes/Storage (Swan offered Keith's talk to TC10.5)

[Contact other TCs that may want to team up]

RESULTS of DOODLE POLL (Spring 2021, redo in Spring 2022?)

34 participants, 208 votes

17 votes

Equipment: Fan Selection for Acoustics (Schaffer)

15 votes

Equipment: Duct Breakout Noise (Lilly/Peterman)

Equipment: Silencers: Performance v Design (Papadimos)

14 votes

Equipment: Rooftop systems (Peterman)

Basics: Tones and Fluctuations (Lilly)

12 votes (technically 18 votes)

Basics: Prediction vs Lab vs Field (Papadimos/Marks/Miller-Klein) **

9 votes

Equipment: Fan Boxes: above/below floor, VAV, CAV, VFD (Zimmerman)

General: Classrooms: ICC adopts S12.60 (Bridger)

General: Noise Fluctuations (Lilly)

8 votes

General: Performance Rated Buildings (Roy)

7 votes

Basics: Speech Privacy in Low Noise Offices ()

6 votes

Equipment: Air Distribution Systems (Zimmerman)

Basics: Predicted vs Actual Noise (Papadimos) **

5 votes

General: Passive vs Active (Wise)

Basics: Noise Flanking Paths (Peppin)

4 votes

Equipment: Plenum array fans

General: Healthcare Facilities: Design, Alarm fatigue, FGI Guidelines, Privacy (Miller-Klein)

Basics: How Noise Affects Design Process (Lilkendy)

3 votes

Equipment: Compressors: Frequency Characteristics ()

Equipment: Ductless Systems: PTACs, WSHP (Weinstein)

General: Industrial noise (Keith)

General: Noisy equipment near to occupied

General: Seismic Devices: Standard Test (w/2.7)

General: Shell & Core vs Tenant Fitout/Improvement

Basics: Room Measurement: Test Method (Rockwood)

2 votes

Equipment: Electrical: Transformers, Elec Motors (Papadimos)

Equipment: Plumbing noise (Wowk) TC 6.1/6.6?

Equipment: Small Fan Coils ()

Equipment: Under-floor Air Systems (Reynolds)

General: Tunnel Ventilation (Laforgia)

Basics: Commissioning ()

Basics: Effects of 'over-design' (Lilly)

Basics: Noise and Productivity (Wang)

Basics: Noise Calcs/How To (CD) (Peterman)

1 vote

Equipment: Boilers (Marks)

Equipment: DOAS units (Peterman)

Equipment: Generators (LaForgia)

General: Labs internal: Air Valves/Fume Hoods (Wouk)

General: Labs external: Stacks, ventilation, nozzles

General: Hearing protection: TWA, Hospitals, Escape / S/N / STI, WHO

0 votes

Equipment: Fume hoods

Equipment: Industrial Ventilation (), dust collection, garages, LNG

Equipment: Pumps ()

Equipment: Refrigeration: Commercial/Transport (Marks)

Equipment: Tankless water heaters

General: Mission Critical Facilities ()

General: Refrigerated processes/Storage (Swan offered Keith's talk to TC10.5)

Basics: Applications Chapter Review ()

Topics from outside? How to poll this? (M-K)
Send to whom? Ask wider ASHRAE?
Sales reps, students/universities, MEP engineering firms, TCs
Ask for suggestions on other topics.
Link to past programs available online as a member for \$120 [link]?

PAST PROGRAMS

2021 "Chicago"/"Phoenix"

Elevator Noise, Vibration, Energy Efficiency
(Boldt/Miller-Klein)

Noise/Vibration Commissioning/Remediation
(Bauch/Miller-Klein)

Sound/Vibration Issues w/Mission Critical Facilities
(Bauch/LaForgia/Miller-Klein)

2020 Orlando/"Austin"

Vibration Isolation Advances
(Golden/Scarlett/Meeuwsen)

Beware These Common Concerns in Multi-Family
Buildings (Miller-Klein, Dong/Rawlins/Golden)

When Is "Quiet" Quiet Enough (Marks/Kollevoll)

HT: ANSI S12:60 / FGI vs 189.1 (Miller-Klein)

HT: Speech Privacy (Koukounian)

HT: Pandemic effects on acoustics

2019 Atlanta/Kansas City

RP-1408 Ductwork research (Herrin/Schwob)

VRF Systems (Lilly/Miller-Klein/Wowk)

Noise/Vib Equipment Selection
(Boldt/Eichelberger/Wowk)

HT: IBC updates (Schmeida)

HT: Basecamp (Miller-Klein)

Commissioning (Miller-Klein/Swan)

Chilled Beams (Searle/Peterman/M-K)

Blocked Impedance (Meeuwsen)

2018 Chicago/Houston

Impacts of Safeguarding Buildings/HVAC Systems
(Miller-Klein)

HT: User Manual 189.1 Acoustic Ctrl, Next Steps

HT: LNG Facilities (Keith)

2017 Las Vegas/Long Beach

Acoustic Performance Standards for Residential
Buildings (Miller-Klein)

HT: Mech Equipment Vibration & Structural Interaction
(Wowk)

2016 Orlando/St Louis

TP: Simulating Noise Attenuation in Ducts (Kuehn)
Acoustics in Multi-Family Residential Environments
(Papadimos)

Avoiding Pitfalls Integrating Seismic and Sound
Control (w/2.07)

HT: Algorithms for HVAC Acoustics

2015 Chicago/Atlanta

System Effects from Inlet of Centrifugal/Plenum
Fans (w/5.1,5.9)

Acoustic Mitigation for Lightweight Roof
Assemblies (Miller-Klein)

Green Building Acoustics (Miller-Klein)

HT: Condensing Units on Lightweight Roof (Lilly)

HT: Sound measurement in rooms (Lilly)

2014 New York/Seattle

Equipment: Hydronic Systems (Miller-Klein)

Basics: Environmental Noise Impact & Mitigation
(Wang)

2013 Dallas/Denver

Basics of HVAC Noise Control (Miller-Klein)

Numerical Methods for Noise/Vibration Simulation
(Eichelberger)

HT: ASHRAE 189.1

2012 Chicago/San Antonio

Vibration Induced Noise & Mech Equipment
Isolation (Marks)

HT: BIM and Acoustics

Impacts of Poor Aerodynamic HVAC Conditions
(Schaffer)

New Acoustical Criteria and Measuring Methods
(Peterman)

Review of Updated AHRI Standards (Papadimos)

2011 Las Vegas/Montreal

Recent Research: Healthcare Facility Acoustics
(Papadimos)

Acoustic Codes/Standards/Guidelines
(Muehleisen)

HT: Classroom Physical Environment Effects on
Learning (Reynolds)

Fan Array Efficiency/Performance (Raychaudhuri)

Forum: Incorporating Acoustics into BIM
(Peterman/Mitchell)

2010 Orlando/Albuquerque

Acoustics in High Performance Building (Peterman)

Noise & Mech System Design Process (Lilkendey)

Multiple Plenum Fans in an Array (Ganesh)

HT: Criteria (Paige) / Lined Duct End Reflection
(Lilly)

HT: Int'l GBC (Marks) / Terminal Unit
Tests/ASHRAE 130 (Peterman)

Classroom HVAC Noise Control (Lilkendey)

Unique Case Studies (Papadimos)

TP: Effects of Mech System Noise on Human
Perf./Perception (Roy)

Sustainability and Our Environment (Ronsse)

2009 Chicago/Louisville

Staff Performance/Patient Welfare in Healthcare
Facilities (Wang)

2008 New York/Salt Lake City

TP: End Reflection (RP-1314) (Eichelberger)

TP: Fan System Effects (RP-1219) (Eichelberger)

2007 Dallas/Long Beach

Acoustics for Green Buildings (Roy)

Acoustic vs Seismic (Lama/Marks/Blazier)

Lab Noise Control (Johnson/Moiseev)

ASHRAE TECHNICAL COMMITTEES

1.0-FUNDAMENTALS AND GENERAL

- 1.1 Thermodynamics and Psychrometrics
- 1.2 Instruments and Measurements
- 1.3 Heat Transfer and Fluid Flow
- 1.4 Control Theory and Application
- 1.5 Computer Applications
- 1.6 Terminology
- 1.7 Business, Management & General Legal Education
- 1.8 Mechanical Systems Insulation
- 1.9 Electrical Systems
- 1.10 Electric Motors and Motor Control
- 1.11 Moisture Management in Buildings
- 1.13 Optimization

2.0-ENVIRONMENTAL QUALITY

- 2.1 Physiology and Human Environment
- 2.2 Plant and Animal Environment
- 2.3 Gaseous Air Contaminants and Gas Contaminant Removal Equipment
- 2.4 Particulate Air Contaminants and Particulate Contaminant Removal Equipment
- 2.5 Global Climate Change
- 2.6 Sound and Vibration
- 2.7 Seismic, Wind and Flood Resistant Design
- 2.8 Building Environmental Impacts and Sustainability
- 2.9 Ultraviolet Air and Surface Treatment
- 2.10 Resilience and Security
- TG2 HVAC Security

3.0-MATERIALS AND PROCESSES

- 3.1 Refrigerants and Secondary Coolants
- 3.2 Refrigerant System Chemistry
- 3.3 Refrigerant Contaminant Control
- 3.4 Lubrication
- 3.6 Water Treatment
- 3.8 Refrigerant Containment

4.0-LOAD CALCULATION, ENERGY REQUIREMENTS

- 4.1 Load Calculation Data and Procedures
- 4.2 Climatic Information

- 4.3 Ventilation Requirements and Infiltration
- 4.4 Building Materials and Building Envelope Performance
- 4.5 Fenestration
- 4.7 Energy Calculations
- 4.10 Indoor Environmental Modeling
- TRG4 Indoor Air Quality Procedure Development

5.0-VENTILATION AND AIR DISTRIBUTION

- 5.1 Fans
- 5.2 Duct Design
- 5.3 Room Air Distribution
- 5.4 Industrial Process Air Cleaning (Air Pollution Ctrl)
- 5.5 Air-to-Air Energy Recovery
- 5.6 Control of Fire and Smoke
- 5.7 Evaporative Cooling
- 5.9 Enclosed Vehicular Facilities
- 5.10 Kitchen Ventilation
- 5.11 Humidifying Equipment

6.0-HEATING EQUIPMENT, HEATING AND COOLING SYSTEMS AND APPLICATIONS

- 6.1 Hydronic and Steam Equipment and Systems
- 6.2 District Energy
- 6.3 Central Forced Air Heating and Cooling Systems
- 6.5 Radiant Heating and Cooling
- 6.6 Service Water Heating Systems
- 6.7 Solar and Other Renewable Energies
- 6.8 Geothermal Heat Pump and Energy Recovery Applications
- 6.9 Thermal Storage
- 6.10 Fuels and Combustion

7.0-BUILDING PERFORMANCE

- 7.1 Integrated Building Design
- 7.2 HVAC&R Construction & Design Build Technologies
- 7.3 Operation and Maintenance Management
- 7.4 Exergy Analysis for Sustainable Buildings (EXER)
- 7.5 Smart Building Systems
- 7.6 Building Energy Performance
- 7.7 Testing and Balancing

- 7.8 Owning and Operating Costs
- 7.9 Building Commissioning

8.0-AIR-CONDITIONING AND REFRIGERATION SYSTEM COMPONENTS

- 8.1 Positive Displacement Compressors
- 8.2 Centrifugal Machines
- 8.3 Absorption and Heat Operated Machines
- 8.4 Air-to-Refrigerant Heat Transfer Equipment
- 8.5 Liquid-to-Refrigerant Heat Exchangers
- 8.6 Cooling Towers and Evaporative Condensers
- 8.7 Variable Refrigerant Flow (VRF)
- 8.8 Refrigerant System Controls and Accessories
- 8.9 Residential Refrigerators and Food Freezers
- 8.10 Mechanical Dehumidification Equipment and Heat Pipes
- 8.11 Unitary and Room Air Conditioners & Heat Pumps
- 8.12 Desiccant Dehumidification Equipment and Components

9.0-BUILDING APPLICATIONS

- 9.1 Large Building Air-Conditioning Systems
- 9.2 Industrial Air Conditioning and Ventilation
- 9.3 Transportation Air Conditioning
- 9.4 Justice Facilities
- 9.6 Healthcare Facilities
- 9.7 Educational Facilities
- 9.8 Large Building Air-Conditioning Applications
- 9.9 Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment
- 9.10 Laboratory Systems
- 9.11 Clean Spaces
- 9.12 Tall Buildings

10.0-REFRIGERATION SYSTEMS

- 10.1 Custom Engineered Refrigeration Systems
- 10.2 Automatic Ice-making Plants and Skating Rinks
- 10.3 Refrigerant Piping, Controls and Accessories
- 10.5 Refrigerated Processing and Storage
- 10.6 Transport Refrigeration
- 10.7 Commercial Food and Beverage Refrigeration Equipment
- 10.8 Refrigeration Load Calculations