

ASHRAE TC 2.6 Sound and Vibration Control

Main Committee Meeting Agenda

2:15-4:15 PM Monday, February 3, 2020

Hilton Orlando, Orlando, FL

NOTE: All Task Group Chairs and Subcommittee Chairs are asked to submit written report to the Secretary (Karina Saenz-Acosta) before Friday February 7th, 2020

1. **Call to order** (Miller-Klein) [2 minutes]
 - 1.1. Read scope of TC 2.6: TC 2.6 is concerned with the fundamental scientific and engineering principles of sound and vibration, particularly as applied to the design and performance of the built environment.
 - 1.2. ASHRAE Code of Ethics statement: "The ASHRAE Code of Ethics is to be adhered to by those doing ASHRAE business whether or not they are an ASHRAE member (www.ashrae.org/about-code-of-ethics)."
 - 1.3. Additions and/or modifications to the agenda
2. **Introduction of those present** (Miller-Klein) [5 minutes]
 - 2.1. Welcome new members and visitors
3. **Confirmation of current voting members** (Miller-Klein) [3 minutes]
 - 3.1. 13 members, 7 members present
4. **Review and approval of the minutes** (Saenz-Acosta) [3 minutes]
 - 4.1. Jason Swan (1st), Karina Saenz Acosta (2nd), 7-0-0
5. **Secretary's report** (Saenz-Acosta) [3 minutes]
 - 5.1. We are currently looking for a secretary and a vice chair.
6. **TC Chair's meeting report** (Miller-Klein) [5 minutes]
 - 6.1. New online Roster changes, if you are not a member of TC 2.6 please go to our website: <https://tc0206.ashraetcs.org/membership.php>
7. **Chair's announcements and correspondence** (Miller-Klein) [3 minutes]
 - 7.1. 2020-2021 Chair, Karina Saenz-Acosta
 - 7.2. 2020-2021 Vice Chair
8. **Subcommittee reports (written reports to be provided to Secretary)**
 - 8.1. **Research Subcommittee** (Meeuwssen) [10 minutes]
 - 8.1.1. Research Chair's meeting report
 - 8.1.2. Work Statements/RTAR's/URP's
 - 8.1.2.1. TRP-1707 Annoyance Thresholds of Tones in Noise as Related to Building Services Equipment. Project is under way. Patricia Davies is the principal investigator.
 - 8.1.2.2. TRP-1852 Develop performance metric, criteria, and process to measure and predict speech privacy in High Performance Buildings. Work statement was approved and released for bids. Bids were received and evaluated by the PES.
 - 8.1.2.3. RTAR-1882 Procedure for Estimating Occupied Space Sound Levels in the Application of UFAD Air Terminals and Air Outlets. Co-sponsor, led by TC 5.3.
 - 8.1.2.4. WS-1829 Inlet and Outlet System Effects on Multiple Plenum Fans in a Parallel Arrangement (Fan Arrays) for Air and Sound Performance. Co-sponsor, led by TC 5.1.
 - 8.1.2.5. PTAR – update Application of Manufacturer's Sound Data book (Eichelberger). The PTAR was approved by RAC and forwarded to the Publication Committee, but they have not acted on it.

- 8.1.2.6. WS-1754 Developing the Standard Test Method for Dynamic Characteristics of Large Vibration Isolators. The work statement has been revised and distributed to team for review.
- 8.2. **Programs Subcommittee** (Swan) [10 minutes]
 - 8.2.1. Program Chair's meeting report
 - 8.2.2. Programs this meeting
 - 8.2.2.1. Seminar 33: Mech System Vibration Advances.
 - 8.2.2.2. Hot Topic: FGI compared to ASHRAE 189.1.
 - 8.2.2.3. Hot Topic: Speech Privacy.
 - 8.2.3. Programs at Austin 2020
 - 8.2.3.1. Looking at two tracks:
 - 8.2.3.1.1. Track 6: New impact metrics, Fitness noise, Plumbing noise.
 - 8.2.3.1.2. Track 9: Case studies in acoustic remediation.
- 8.3. **Publications Subcommittee** (Wise) [10 minutes]
 - 8.3.1. Handbook chapters
 - 8.3.1.1. Handbook Fundamentals 2021 (Wise)
 - 8.3.1.1.1. Submittal for this revision is due to ASHRAE on March 22nd.
 - 8.3.1.1.2. This chapter does not need any changes.
 - 8.3.1.1.3. 3 members agreed to do a final proof-reading.
 - 8.3.1.2. Handbook Applications 2023 (Wise)
 - 8.3.1.2.1. All the focus at this time is the Vibration Section
 - 8.3.1.2.2. Set a 2-year time frame to address deficiencies
 - 8.3.1.2.3. 5 members volunteered to look into this and report progress in Austin this June.
 - 8.3.1.2.4. The next big revision deadline for submittal is March 22nd, 2022. The document has then to be completed for voting in Las Vegas, January 2022.
 - 8.3.2. Other publications
 - 8.3.2.1. Curt Eichelberger developed a PTAR requesting ASHRAE to consider a general level of funding for a major rewrite. This was passed along to ASHRAE Publications, waiting for their analysis (presumably a forecast of potential sales).
- 8.4. **Web page (Saenz-Acosta)**
- 8.5. **Standards Subcommittee** (Bridger) [10 minutes]
 - 8.5.1. SPC 189.1 – Design for High Performance Green Buildings (Miller-Klein)
 - 8.5.1.1. Meeting Feb 4th and 5th. There are no major changes, just reworking of language.
 - 8.5.2. Updates from Other Standards Organizations
 - 8.5.2.1. AHRI (Bulookbashi)
 - 8.5.2.1.1. Developing a sound quality standard based on RP-1707.
 - 8.5.2.1.2. AHRI 885 is being updated.
 - 8.5.2.1.3. Minor revisions to AHRI 220, adding some clarifying language.
 - 8.5.2.1.4. AHRI 230, main revision is on quality indicator.
 - 8.5.2.1.5. AHRI 350, will be opened for revision.
 - 8.5.2.2. AMCA (Brooks)
 - 8.5.2.2.1. AMCA Standard 210 is due for revision.
 - 8.5.2.3. ANSI (Reuter)
 - 8.5.2.4. ASTM E33 (Lilly/Shafer)
 - 8.5.2.4.1. New metric for impact noise
 - 8.5.2.4.2. Mass discussion for precision and rounding
 - 8.5.2.4.3. Ken Royce is leading for speech privacy
 - 8.5.2.5. ISO (Golden)
- 8.6. **Standing Subcommittees** [10 minutes]
 - 8.6.1. Vibration Isolation (M Hooti)

8.7. Operations Subcommittee (Miller-Klein) [15 minutes]

- 8.7.1. Honors and awards (Miller-Klein)
- 8.7.2. Long range planning (Miller-Klein)
- 8.7.3. Membership (Miller-Klein)
 - 8.7.3.1. Rolling off: Erik Miller-Klein, Jerry Lilly
 - 8.7.3.2. Rolling on: TBD
- 8.7.4. Liaisons (Miller-Klein)
 - 8.7.4.1. ASHRAE TC 2.1 Physiology and Human Environment (Eichelberger)
 - 8.7.4.1.1. RP-1827, going into individual bedrooms and measuring sound
 - 8.7.4.2. ASHRAE TC 2.7 Seismic and Wind Resistant Design (Marks)
 - 8.7.4.3. ASHRAE TC 5.1 Fan Design and Application (Osborn)
 - 8.7.4.3.1. WS-1829 Inlet and Outlet System Effects on Multiple Plenum Fans in a Parallel Arrangement (Fan Arrays) for Air and Sound Performance.
 - 8.7.4.4. ASHRAE TC 5.2 Duct Design (Hassler)
 - 8.7.4.4.1. Main meeting tomorrow
 - 8.7.4.4.2. The rest of meetings are done online, through GoToMeeting
 - 8.7.4.5. ASHRAE TC 5.3 Room Air Distribution (Zimmerman)
 - 8.7.4.5.1. RP-1666, study on passive chilled beams
 - 8.7.4.5.2. ASHRAE Standard 79, has acoustics changes. Trying to get it aligned with AHRI 260 and 350
 - 8.7.4.6. ASHRAE TC 9.7 Educational Facilities
 - 8.7.4.6.1. Looking for corresponsive.
 - 8.7.4.7. ASHRAE TC 9.8 Indoor Agriculture
 - 8.7.4.8. ASA (Reuter)
 - 8.7.4.9. VISCMA (Waters)
 - 8.7.4.9.1. All day meeting last Saturday. Trying to improve their website.
 - 8.7.4.9.2. New executive leader
 - 8.7.4.10. Others: INCE/InterNoise (Herrin) NoiseCon is in New Orleans next June, EGSA (Simmons), meeting in March etc...

9. New business/Old business [5 minutes]

10. Next meeting date and location – Austin, Texas June 27 – July 1, 2020

11. Adjournment

- 11.1. Reginald Keith (1st), Jason Swan (2nd)

Research project status:

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

- Project is under way, Patricia Davies principal investigator
- PMS chaired by Kim Osborne, PMS meeting with investigators for progress review weekly, face to face at Purdue on May 3 and August 7 2019.
- There was a presentation from the investigators today at 3:00.
- The PI has requested a 6 month no-cost extension, which the PMS supports. Vote of the TC was taken in this meeting. Eight of twelve voting members were in attendance, making quorum. The vote was 8-0-0 for-against-abstain.

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

- Work statement was approved and released for bids.
- Bids were received and evaluated by the PES.
- The voting members of the TC heard their report and voted on the recommended bidder in closed executive session Sunday. The recommended bidder was approved on a vote of 7-0-0 CV.

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

- Co-sponsor, led by TC 5.3 – Chris Burroughs
- Not much progress on the Work Statement.
- TC 5.3 has recruited someone to help out.

WS-1829 - Inlet and Outlet System Effects on Multiple Plenum Fans in a Parallel Arrangement (Fan Arrays) for Air and Sound Performance

- Co-sponsor, lead is TC 5.1, lead author Kim Osborn.
- We voted to approve the WS with several comments.
- Work statement was revised per comments from TC and RAC, and submitted to RAC. RAC is holding for co-funding from AMCA or AHRI.

PTAR – update Application of Manufacturer’s Sound Data book – Eichelberger

- The PTAR was approved by RAC and forwarded to the Publication Committee over a year ago, and they have not acted on it. There will be meeting between the RAC and Pubs chairs today to discuss.

WS-1754 - Developing the Standard Test Method for Dynamic Characteristics of Large Vibration Isolators

- Roman Wowk has revised the work statement and distributed to team for review
- There was much discussion. There was general consensus that we need to determine and specify a range of isolator sizes, not just max, and also that we need some more detail on what is expected of PI, but not handcuff them with too much detail.
- Got a few more volunteers for the team, Greg will schedule a conference call.
- The RTAR has fallen off the active list, but we can still submit a work statement under it. RAC can decide if they want to assign a new number.

From the Research Chairs Breakfast:

- Everyone is encouraged to fill out the 2019-2024 Research Strategic Plan survey. E-mail sent 1/16, but another will go out soon.
- There is a new training module for PES members coming out soon. All Research chairs and TC chairs are strongly encouraged to take it.

ASHRAE TC 2.6 Sound and Vibration
PROGRAMS SUBCOMMITTEE – 2020 Winter Meeting, Orlando, Florida

THIS MEETING:

Orlando, 1-5 February 2020

Tracks:

- 1: HVAC&R Fundamentals/Applications
- 2: Systems/Equipment
- 3: Refrigeration/Refrigerants
- 4: Cutting Edge Approaches
- 5: High Efficiency Design/Operation
- 6: Big Data & Smart Controls
- 7: Ventilation, IAQ and Air Distribution Systems
- 8: Standards, Guidelines & Codes

Seminar 33: Mech System Vibration Advances

Monday 11:00, Hilton, Level LL Orlando V

(Track 2: Systems/Equipment)

- Application of Crumb Rubber (Golden)
- Using Elastomeric Foams (Scarlett)
- Impedance Approach (Meeuwssen)

Hot Topics:

Sunday 11:00, Hilton, Level L, Lake George B
ANSI S12.60
FGI compared to ASHRAE 189.1/IgCC

Sunday 2:00, Hilton, Level L, Lake George B
Speech Privacy (Viken Koukounian)

Not submitted:

Track 3: Refrigerated processes/Storage
(Swan offered Keith's talk to TC10.5)

NEXT MEETING:

Austin, 27 June-1 July 2020

Tracks:

- 1: Fundamentals/Applications
- 2: HVAC&R Systems/Equipment
- 3: Research summit
- 4: Professional Development
- 5: Grid-interactive Efficient Built Environment
- 6: Multifamily & Residential Buildings
- 7: Resilient Buildings & Communities
- 8: Zero Energy Buildings & Communities
- 9: Building Myths

Seminars/Workshops/Forums:

Proposals due: 10 February 2020 !!

Track 6: New impact metrics, Fitness noise,
Plumbing noise (Rawlins, Golden, Wowk)

Track 9: Case studies in acoustic remediation
(Miller-Klein, Lilly? Bridger? Bauch? Keith?)

Hot topics:

TBD (TBD)

Technical/Conference Papers:

Abstracts/requests due: 12 August 2019

Final papers due: 2 December 2019

Track 6: New impact metrics, Fitness noise,
Plumbing noise (Rawlins: Golden, Wowk)

FOLLOWING MEETINGS:

Chicago, 23-27 January 2021

Tracks:

- 1: HVAC&R Fundamentals/Applications
- 2: Systems and Equipment
- 3: Refrigeration and Refrigerants
- 4: Environmental Health Through IEQ
- 5: Building Performance and Commissioning for
Operation & Management
- 6: Energy Conservation
- 7: International Design
- 8: Standards, Guidelines & Codes

Seminars/ Workshops/Forums:

Proposals due: 8 July 2020

Bring up in monthly calls

Track 2/3: Maglev chillers/ compressors
(Marks) with TC 8.2

Track 4: Noise effects on health (Miller-Klein)
with TC 2.1

Track 7: Tunnel/ Underground ventilation
(LaForgia)

Technical/Conference Papers:

Conference Paper Abstracts due: 18 March 2020

Technical Papers due: 18 March 2020

Paper session requests due: 18 March 2020

Final Conference Papers due: 8 July 2020

Final Technical Papers due: 10 August 2020

Phoenix, 26-30 June 2021

Las Vegas, 29 Jan – 2 Feb 2022

Toronto, 25-29 June 2022

Atlanta, 4-8 February 2023

Tampa, 24-28 June 2023

TOPICS FOR FUTURE PROGRAMS

Series: Equipment Noise

Air Distribution Systems (Zimmerman)
Boilers (Marks)
Compressors: Frequency Characteristics (Rockwood)
Duct Breakout Noise (Reynolds)
Ductless Systems: PTACs, WSHP (Weinstein)
Electrical: Xfmrs, Elec Motors (Papadimos)
Elevators (Lilly)
Exhaust Noise (____)
Fan Boxes above/below (Zimmerman)
Fan Selection for Acoustics (Schaffer)
Fume hoods
Generators (LaForgia)
Industrial Ventilation (____)
 dust collection, garages, LNG
Maglev chillers
Pumps (____)
Plumbing noise (Wowk) TC 6.1/6.6?
Refrigeration: Commercial/Transport (Marks)
Silencers: Performance v Design (Papadimos)
Silencers: When? E477 Round Robin (Lilly)
Small Fan Coils (____)
Tankless water heaters
Under-floor Air Systems (Reynolds)
Variable Capacity Compressors (____)
VAV, CAV, VFD (w/5.1) (Gierzak)
 Insulation of

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

Applications Chapter Review (____)
Commissioning (____)
Effects of 'over-design' (Lilly)
How Noise Affects Design Process (Lilkendy)
Noise and Productivity (Wang)
Noise Calculations How To (CD?) (Peterman)
Noise Flanking Paths (Peppin)
Outdoor Noise Control (Murillo/Peppin)
Predicted vs Actual Noise (Papadimos)
Prediction vs Lab vs Field (Papadimos/Marks)
Room Msmt: Test Method (Rockwood)
Speech Privacy in Low Noise Offices (____)
Tones and Background Noise (Wowk)
Tones and Fluctuations (Lilly)
Vibration Isolation (Keith)

Other Topics:

Classrooms: ICC adopts S12.60 (Bridger)
Design of Healthcare Facilities (Miller-Klein)
 Alarm fatigue, FGI Guidelines, Privacy
 Team up with healthcare TCs?
Labs internal: Air Valves/Fume Hoods (Wouk)
Labs external: Stacks, ventilation, nozzles
Mission Critical Facilities (____)
Noise Fluctuations (Lilly)
Passive vs Active (Wise)
Performance Rated Buildings (Roy)
Standard Test: Seismic Devices (w/2.7)
Tunnel Ventilation (LaForgia)
Vibration: Upper Level Installations (Simmons)
Industrial noise (Keith)

Past Items:

Track ?: Elevators (Marks) Otis? (Keith?)

*Track ? : Hearing protection: TWA, Hospitals,
Escape / S/N / STI, WHO*

Track 3: Refrigerated processes/Storage (Swan
 offered Keith's talk to TC10.5)

Track 7: Tunnel/ Underground ventilation
 (LaForgia)

Track X: Plenum array fans

[Contact other TCs that may want to team up]

PAST PROGRAMS

2020 Orlando/Austin

Vibration Isolation Advances (Golden, Scarlett, Meeuwssen)

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

HT: Speech Privacy (Koukounian)

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 (Meeuwssen)

2018 Chicago/Houston

Impacts of Safeguarding Buildings/HVAC Systems (Miller Klein)

HT: User Manual 189.1 Acoustic Control, Next Steps

HT: LNG Facilities (R 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)