

## ASHRAE TC 2.6 Sound and Vibration Control

### Main Committee Meeting Agenda

2:15-4:15 PM Monday, January 14th

Georgia World Congress Center (GWCC), Level 4, A405, Atlanta Georgia

*NOTE: All Task Group Chairs and Subcommittee Chairs are asked to submit written report to the Secretary (Karina Saenz-Acosta) before Friday January 18<sup>th</sup>, 2019*

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](http://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** (Wowk) [3 minutes]
  - 3.1. 10 members, 9 members present
4. **Review and approval of the minutes** (Saenz-Acosta) [3 minutes]
  - 4.1. Curtis Eichelberger (1<sup>st</sup>), Robert Hassler (2<sup>nd</sup>), 9-0-0-0
5. **Secretary's report** (Saenz-Acosta) [3 minutes]
  - 5.1. Secretary will be in charge of sending out conference schedule in advance to all corresponding members
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. 2019-2020 Chair
  - 7.2. 2019-2020 Vice Chair
  - 7.3. Motion to extend Erik as the Chair for one more year, have Roman as secretary and Karina as Vice Chair
    - 7.3.1. Reginald Keith (1<sup>st</sup>), Jerry Lilly (2<sup>nd</sup>), 6-0-3
  - 7.4. There is a change happening within one year in terms of when and how TCs are going to be working. Currently, there are 110 TCs within ASHRAE and there is a push to combine the 110 TCs to 34 TCs. ASHRAE is looking for groups to interact more.
8. **Subcommittee reports (written reports to be provided to Secretary)**
  - 8.1. **Research Subcommittee** (Meeuwssen) [20 minutes]
    - 8.1.1. Research Chair's meeting report
    - 8.1.2. Work Statements/RTAR's/URP's
      - 8.1.2.1. RAC considered 7 RTAR's, 6 accepted with comments, 1 rejected. 5 work statements considered, 2 conditionally accepted, 3 returned to TC
      - 8.1.2.2. RAC is looking for a new process for funding publications
      - 8.1.2.3. RP-1408 is done. Two technical papers were presented here in Atlanta
      - 8.1.2.4. TRP-1707 started in September. Investigators presented a summary of the research so far to the TC
      - 8.1.2.5. Erik is working in a WS for RTAR-1852

- 8.1.2.6. RTAR-1754 – A new lead author and a significant support from vibration isolator manufacturer are needed
- 8.1.2.7. Proposed RTAR – Procedure for Estimating Occupied Space Sound Levels in the Application of UFAD Air Terminals and Air Outlets. Co-sponsor, led by TC 5.3. It will be distributed to voting members for an email vote
- 8.1.3. Topics for future research
  - 8.1.3.1. WS-1829 – Co-sponsor with TC 5.1
  - 8.1.3.2. Follow up project to extend the work of 1529 on modeling duct acoustics, considering the duct attenuation in 1408
  - 8.1.3.3. Update publication “Application of Manufacturers Acoustical Data”. Greg M will develop an RTAR/PTAR
  - 8.1.3.4. Lilly and Wise put together an excel spreadsheet that takes all the data from RP-1408, the duct liner project. It will be in the online version of the handbook
- 8.2. **Programs Subcommittee** (Swan) [15 minutes]
  - 8.2.1. Program Chair’s meeting report
  - 8.2.2. Programs this meeting
    - 8.2.2.1. Tech Session 1: Ductwork Research, RP-1408
    - 8.2.2.2. Seminar 48: Noise/Vibration of VRF Systems
    - 8.2.2.3. Seminar 55: Equipment Selection in Relation to Noise and Vibration
    - 8.2.2.4. Hot Topics
      - 8.2.2.4.1. IBC updates
      - 8.2.2.4.2. Overview of how to use Basecamp
  - 8.2.3. Programs at Kansas City 2019
    - 8.2.3.1. Three seminars to put forward
      - 8.2.3.1.1. Track 4: 189.1 commissioning, measuring room noise
      - 8.2.3.1.2. Track 1/9: Chilled beams, radiant heating/cooling
      - 8.2.3.1.3. Track 5: Hearing protection, TWA, Hospitals, Signal/Noise, STI
- 8.3. **Publications Subcommittee** (Wise) [10 minutes]
  - 8.3.1. Handbook chapters
    - 8.3.1.1. Handbook Applications 2019 (Wise)
    - 8.3.1.2. Handbook Fundamentals 2021 (Wise)
  - 8.3.2. Other publications
    - 8.3.2.1. Duct attenuation calculator will be put on basecamp for people to download
    - 8.3.2.2. Application of Manufacturers’ Sound Data
      - 8.3.2.2.1. Looking at an RTAR for this application
- 8.4. **Web page** (Saenz-Acosta)
  - 8.4.1. Currently posting Agenda, Schedule and Minutes
  - 8.4.2. Working on getting a list of past researches and a list of things we are working on in website
- 8.5. **Standards Subcommittee** (Bridger) [20 minutes]
  - 8.5.1. There are some building code changes in the acoustic sections
  - 8.5.2. SPC 189.1 – Design for High Performance Green Buildings (Miller-Klein)
    - 8.5.2.1. It is published and has been incorporated into the 2018 International Green Construction Code
  - 8.5.3. Updates from Other Standards Organizations
    - 8.5.3.1. AHRI (Cesar)
      - 8.5.3.1.1. TCoS is updating the following standards; AHRI 230, AHRI 250, AHRI 260, AHRI 370, AHRI 530, AHRI 885, AHRI 1120, AHRI 1140
      - 8.5.3.1.2. TCoS is developing the following new sound standards; AHRI 1150P, Declaration and Verification of Noise Emission Values of HVAC Machinery and Equipment Using Published Sound Rating Values and AHRI 375P, Application of

Sound Rating Levels of Large Air-cooled Outdoor Refrigerating and Air-conditioning Equipment

- 8.5.3.1.3. AHRI 275 was recently approved and published
- 8.5.3.2. AMCA (Brooks)
  - 8.5.3.2.1. Looking to restart the project for methods of test standard for fan arrays that will include both, air and sound
  - 8.5.3.2.2. Looking at the comparison of in duct sound measurement of a fan vs reverberant room measurements of sound power
  - 8.5.3.2.3. Having a basic sound seminar in June of this year
- 8.5.3.3. ANSI (Lilly/Reuter)
  - 8.5.3.3.1. ANSI S12.2 has expired because it was not resubmitted. A working group is being created to bring standard back on line
  - 8.5.3.3.2. ANSI 12.72 may phase the same event if renewal time is not watched
  - 8.5.3.3.3. ANSI 12.60 Part 4 – Working group submitted it out to ballot. 1 negative was received, the negative was negotiated. Therefore, next time it goes to ballot, it should be good
- 8.5.3.4. ASTM (Lilly/Shafer)
  - 8.5.3.4.1. E477 – Round robin test has been completed. Final report has not been finished. Standard has to be updated in the next year
  - 8.5.3.4.2. New standard, ASTM 3133 that assesses impact noise on floors
- 8.5.3.5. ISO (Swan)
  - 8.5.3.5.1. A project for Residential Classification Scheme that has to do with ratings for appliances was not approved
  - 8.5.3.5.2. ISO 5135 – A working group is currently reviewing it
  - 8.5.3.5.3. ISO 7235 – Email was sent out for review
- 8.6. **Standing Subcommittees** [10 minutes]
  - 8.6.1. Vibration Isolation (M Hooti)
    - 8.6.1.1. Jerry Lilly presented a case study on noise and vibration control for HVAC units
- 8.7. **Operations Subcommittee** (Miller-Klein) [15 minutes]
  - 8.7.1. Honors and awards (Miller-Klein)
  - 8.7.2. Long range planning (Miller-Klein)
    - 8.7.2.1. Continue monthly meetings
    - 8.7.2.2. Ask ASHRAE to give us more control
  - 8.7.3. Membership (Miller-Klein)
    - 8.7.3.1. Make sure roster is updated
  - 8.7.4. Liaisons (Miller-Klein)
    - 8.7.4.1. ASHRAE TC 2.1 Physiology and Human Environment (Eichelberger)
      - 8.7.4.1.1. Interested in co-sponsoring the WS on speech privacy
      - 8.7.4.1.2. Research to link ventilation with effect on the brain
      - 8.7.4.1.3. Study for sleep disturbance due to different type of noises
    - 8.7.4.2. ASHRAE TC 2.7 Seismic and Wind Resistant Design (Marks)
      - 8.7.4.2.1. Meeting tomorrow at 3:30pm
    - 8.7.4.3. ASHRAE TC 5.1 Fan Design and Application (Osborn)
      - 8.7.4.3.1. Meeting today
      - 8.7.4.3.2. Working on an RTAR that compares air performance and sound for a fan with an EC motor vs a fan with induction and inverter
    - 8.7.4.4. ASHRAE TC 5.2 Duct Design (Hassler)
      - 8.7.4.4.1. Main discussion was on combining subcommittees
    - 8.7.4.5. ASHRAE TC 5.3 Room Air Distribution (Zimmerman)
      - 8.7.4.5.1. Recently re-opened Standard 79, Method of Testing Fan Coils. The purpose of reopening this standard was acoustic related. Trying to harmonize 79 to 350 and 260

- 8.7.4.5.2. Just reopened Standard 130, Method of Testing Air Terminal Units. It is also acoustically related
- 8.7.4.5.3. Working committee for AHRI 885. Incorporating the new results from the duct liner research
- 8.7.4.6. ASA (Miller-Klein)
  - 8.7.4.6.1. After looking on the work done in 189.1, ASA wants to have a closer connection with TC 2.6
  - 8.7.4.6.2. Erik Miller-Klein presented 189.1
- 8.7.4.7. VISCMA (Meisel)
  - 8.7.4.7.1. Working on webinars. One is setup for April on basic isolation
  - 8.7.4.7.2. Looking to refine FAQs to have more instant gratification
- 8.7.4.8. Others: INCE (Herrin) Inter-Noise 2018 was in Chicago in August. There was excellent participation on the ASHRAE side. There were 110 acoustics papers. Next Noise-Con meeting is in San Diego in August 2019. Next Inter-Noise meeting will be in Madrid, Spain. NCAC (Bridger) met in Seattle last year, coming to Atlanta this year for next meeting. They are starting to build a foundation; and they might be in communication with ASHRAE. EGSA (Simmons), last meeting in September. They developed a working group to write a recommended practice for testing sound pressure on enclosure. First meeting is in March.

**9. New business/Old business [5 minutes]**

- 9.1. ASHRAE Learning Institute Course is due for major update
- 9.2. Change monthly meeting to 1<sup>st</sup>, 3<sup>rd</sup> or 4<sup>th</sup> Thursday of the month
- 9.3. Erik will send the invite for monthly meetings in a way that it can be saved in Outlook

**10. Next meeting date and location – Kansas City, Missouri June 22–26, 2019**

**11. Adjournment**

- 11.1. Research Chair's meeting report
  - 11.1.1.1. RAC considered 7 RTAR's, 6 accepted with comments, 1 rejected. 5 work statements considered, 2 conditionally accepted, 3 returned to TC.
  - 11.1.1.2. The RAC proposal for a new process for funding publications was presented. Different forms, and publications committee must approve before going to RAC. Publications has not developed their process yet, but we will likely get new forms before that is done.
  - 11.1.1.3. Next due date for RTAR's and WS's to RAC is May 15.
- 11.2. Work Statements/RTAR's/URP's
  - 11.2.1.1. RP-1408 – The Effect of Lining Length on the Insertion Loss of Acoustical Duct Liner in Sheet Metal Ductwork. Two technical papers were presented here in Atlanta
  - 11.2.1.2. TRP-1707 - Annoyance Thresholds of Tones in Noise as Related to Building Services Equipment. Project started in September of 2018, and is on track. Investigators presented a project summary to the TC yesterday.
  - 11.2.1.3. RTAR-1852 - Develop performance metric, criteria, and process to measure and predict of speech privacy in High Performance Buildings. Erik Miller-Klein plans to have the WS voted on by all sponsoring TC's and submitted to ASHRAE by May 15.
  - 11.2.1.4. RTAR-1754 - Developing the Standard Test Method for Dynamic Characteristics of Large Vibration Isolators. We need a new lead author, and significant support from isolator manufacturers. Don Warrick Jr volunteered, need one more. It will be dropped by RAC at next meeting if no activity.
  - 11.2.1.5. WS-1829 Co-sponsor go TC 5.1 Inlet and Outlet System Effects on Multiple Plenum Fans in a Parallel Arrangement (Fan Arrays) for Air and Sound Performance. May or may not be ready for vote, TC 5.1 will address it later today.
  - 11.2.1.6. Proposed RTAR - Procedure for Estimating Occupied Space Sound Levels in the Application of UFAD Air Terminals and Air Outlets. Co-sponsor, led by TC 5.3. Decided to distribute to voting members for an e-mail vote.
- 11.3. Topics for future research
  - 11.3.1.1. Follow up project to extend 1529, considering 1408 – Dave Herrin UK. RAC liaison recommends a URP is the best way to go. Volunteers to develop scope are Erik Miller-Klein, Joe Bridger, Steve Wise. Need specific suggestions added to BaseCamp.
  - 11.3.1.2. Update publication “Application of Manufacturers Acoustical Data”. There will soon be a new process coming from RAC to fund development of publications, this is an obvious candidate, as we have not been able to pull it off with volunteers. Greg M. will develop an RTAR/PTAR.

ASHRAE TC 2.6 Sound and Vibration  
**PROGRAMS SUBCOMMITTEE** - Winter 2019, Atlanta  
Jason Swan

## DEFINITIONS

### Technical Papers

Submitted directly by author  
More involved papers, usually detailing research or similar activities  
Maximum of 30 pages  
Rigorous double-blind review process; subject to commercialism review  
Longer timeline for development and approval  
Published in Transactions  
Once paper reviewed/approved, submit presentation for review ~11 months before conference. (eg, March 2017 for Jan 2018)

### Conference Papers

Submitted directly by author  
Less rigorous than technical papers  
May highlight case studies or ongoing research  
Maximum of 8 pages  
Single blind review process; subject to commercialism review  
Shorter timeline for development and approval  
Abstract due just after conference year before, Approval/rejection within 1 month,  
Full paper due in 6 months,  
Present 1 year from current conference.

### Seminars/Workshops/Forums/Debates

Session chairs and speakers selected by TCs  
Program submitted by session chair  
Includes speakers, bios, abstract, learning objectives, Q&A  
Speakers submit final presentations 1 month prior to meeting for commercialism review

### Seminars

60 minutes: 1 – 2 presentations  
90 minutes: 3 – 4 presentations

### Workshops (new in Summer 2014)

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

### Forums/Panels

One moderator  
60-minute length  
No presentations

### Debates

Expert teams/individuals present both sides

### Hot Topic

Subcommittee Presentation  
Invite outside special topic speaker to meetings  
Listed in the ASHRAE schedule  
Available to both TC 2.6 and larger organization  
Speakers can be video-conferenced for this special session

**\*\* Must use an ASHRAE approved PowerPoint template for presentations; available on their website \*\***

**THIS MEETING:**  
**Atlanta, 12-16 January 2019**

Tracks

- 1: Systems/Equipment
- 2: HVAC&R Fundamentals/Applications
- 3: Refrigeration
- 4: High Performance Systems
- 5: Common System Issues/Misapplications
- 6: Comfort/IAQ/Energy Efficiency Convergence
- 7: Bldg. Integrated Renewables/Nat. Systems
- 8: Engineer's Role in Architecture

Tech Session 1: Ductwork Research (RP1408)

Sunday 09:45-10:45, GWCC A303

- Review of prior research (Herrin)
- Effect of length on insertion loss: rectangular
- Effect of length on insertion loss: round (Schwob)

Seminar 48: Noise/Vibration of VRF systems

Tuesday 08:00-09:30, GWCC A405 (Track 5)

- Noise Testing Standards (Lilly)
- Condensing Unit Vibration (Miller-Klein)
- Field Applications (Wouk)

Seminar 55: Equipment selection re: noise/vib.

Tuesday 11:00-12:30, GWCC A301 (Track 8)

- Engineer's perspective (Boldt)
- Manufacturer's perspective (Eichelberger)
- Consultant's perspective (Wouk)

Hot Topics:

Sunday 13:00, Omni Cottonwood B

- IBC updates (Schmeida)
- Basecamp (Miller-Klein)

**NEXT MEETING:**  
**Kansas City, 22-26 June 2019**

Tracks

- 1: Systems/Equipment in Built Environ
- 2: Fundamentals/Applications
- 3: Optimization in HVAC&R
- 4: Commissioning New/Existing Buildings
- 5: Occupant Health & Safety
- 6: Modelling Throughout Building Life Cycle
- 7: Professional Development
- 8: Research Summit
- 9: Radiant Heating/Cooling

Seminars/Workshops/Forums:

Proposals due: 8 February 2019

Track 4: 189.1 commissioning, measuring room noise (Miller-Klein)

Track 1/9: Chilled beams, radiant (Peterman) TC 5.3

Track 5: Hearing protection: TWA, Hospitals, Signal/Noise, STI (Peterman)

Hot topics:

**FOLLOWING MEETINGS:**  
**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

Seminars/ Workshops/Forums:

Proposals due: 8 July 2019

Track 2: Maglev chillers (Marks) TC 8.2

Track 3: Refrigerated processes/Storage (Keith) (Swan to contact TC10.5)

Track 1: Tunnel ventilation (Laforge)

Track 8: Plumbing noise

Track 2: Elevators (Marks) Otis?

Technical/Conference Papers:

Abstracts due: 18 March 2019

Final papers due: 8 July 2019

Hot topics:

**Austin, 27 June-1 July 2020**

**Chicago, 23-27 January 2021**

**Phoenix, 26-30 June 2021**

## TOPICS FOR FUTURE PROGRAMS

### Series: Equipment Noise

Air Distribution Systems (Zimmerman)  
Boilers (Marks)  
Chilled Beams: ASHRAE Std 200 (Peterman)  
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 hood  
Generators (Laforgia)  
Industrial Ventilation (\_\_\_\_)  
    dust collection, garages, LNG  
Maglev chillers  
Pumps (\_\_\_\_)  
Plumbing noise (Wouk) 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 (Wouk)  
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)

[Contact other TCs that may want to team up]

## **PAST PROGRAMS**

### 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 System Acoustics (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 in Acoustics for Healthcare Facilities (Papadimos)

Acoustic Codes, Standards, Design Guidelines: A Primer (Muehleisen)

HT: Classroom Physical Environment Effects on Learning (Reynolds)

Efficiency/Performance of Fan Arrays (Raychaudhuri)

Forum: Incorporating Acoustics into BIM (Peterman/Mitchell)

### 2010 Orlando/Albuquerque

Acoustics in High Performance Building (Peterman)

Noise & Mechanical 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)

HVAC System Noise Control for Classrooms (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)