AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC

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TC/TG/TRG MINUTES COVER SHEET

TC/TG/TRG NO:	TC 2.6	DATE:	June 25, 2012
TC/TG/TRG TITLE:	Sound and Vibration Control		
DATE OF MEETING:	June 25, 2012	LOCATION:	San Antonio, TX

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
VOTING		CORRESPONDING		Mike Brendel
Francis Babineau		Jeffrey Babich		Joseph Brooks
Curt Eichelberger		Mark Bastasch		John Cermak
John Gierzak		Joseph Bridger		Franco Cincotti
Robert Hassler		Norman Broner		Matthew Conrad
Eddie Lau		Todd Busch		Nate Deibler
Dustin Meredith		Nicole Cuff		Sami Elkhazin
Patrick Oliver		John Dunlap		David Herrin
Kim Osborn		Erroll Eaton		Matthew Hooti
Kenneth Roy		Ronald Eligator		John Iacdbellis
Jason Swan		Michael Froehlich		Ed Koop
Randal Zimmerman		Kevin Gaghan		Tim Kuski
		Jason George		Tim Mathson
CORRESPONDING		Lewis Goodfriend		Greg Meeuwsen
Daniel Abbate		Brian Guenther		Dave Meredith
David Carroll		Ali Kemal Guney		John Murphy
Zvirimumwoyo Chinoda		Arthur Hallstrom		Jack O'Leary
Victor Clemente		Joseph Horesco		Dan Rau
Mark Fly		Michael Keating		Brian Reynolds
Radha Ganesh		Reginald Keith		Jenny Sivie
James Kline		Manoj Khati		Mark Smith
Dan LaForgia		Marvin Kloostra		Luis Villegas
Patrick Marks		Glenn Kowald		Greg Wagner
Paul Meisel		Heng-Yi Lai		Don Warick, Jr
Erik Miller-Klein		Brian Landsberger		Josiah Wiley
Andrew Mitchell		Joshua Leasure		Kasey Worthington
Karl Peterman		H Leventhall		Marshal Zabel
Raj Prime		Jinghao Liu		Limin Zhou
Douglas Reynolds		Charles Mattocks		
Mark Schaffer		Duane McLennan		
Jack Wang		Alexander Michaud		
Lily Wang		Ralph Muehleisen		
Zhiping Wang		Jose Nepomuceno		Distribution
Steven Wise		John Pappas		All Members of the TC/TG/TRG
		James Pooler		TAC Section Head: Thomas Sobieski
		Michael Resetar		TAC Chair: Charles Culp
MEMBERS ABSENT		William Rockwood		All Committee Liasions: Jean-Gabriel
VOTING		Lauren Ronsse		Joannette, William McCoy, John Nix, William
Robert Lilkendey		Erica Ryherd		Fleming, Jeff Traylor, Hoy Bohanon
Jerry Lilly		Benjamin Sachwald		
Matthew Murello		Michael Schwob		Manager of Standards: Stephanie Reiniche
Chris Papadimos		Ken Shook		
Richard Peppin		Tim Simcoe		Manager of Research & Technical Services:
Robert Simmons		John Sofra		Michael Vaughn
Matthew Stead		Michael Spencer		
		William Stewart		
		Nicholas Sylvestre-Williams		
		Vijay Tripathi		
		Terence Tyson		
		Jonathan Weinstein		
		Roman Wowk		

ASHRAE TC 2.6 Sound and Vibration Control
Main Committee Meeting Minutes
Monday, June 25th, 2012, San Antonio TX

Attendence List

Voting Members:

Francis Babineau	Johns Manville	francis.babineau@jm.com
Curt Eichelberger	Johnson Controls	curtis.eichelberger@jci.com
John Gierzak	Oriflow	john@oriflow.com
Robert Hassler	McGill AirFlow LLC	rhassler@mcgillairflow.com
Eddie Lau	University of Nebraska-Lincoln	sklau@engineer.com
Dustin Meredith	Trane	dmeredith@trane.com
Patrick Oliver	EH Price Ltd.	patricko@price-hvac.com
Kim Osborn	CES Group / Governair LLC	kosborn@governair.com
Kenneth Roy	Armstrong World Industries	kproy@armstrong.com
Jason Swan	Sandy Brown Associates	jasons@sandybrown.com
Randal Zimmerman	Titus	rzimmerman@titus-hvac.com

Corresponding Members:

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Mark Schaffer	Schaffer Acoustics Inc	mark@schaffer-acoustics.com
Jack Wang	Trane	jjwang@trane.com
Lily Wang	University Of Nebraska	lwang4@unl.edu
Zhiping Wang	Morrison Products Inc	zpwang@morrisonproducts.com
Steven Wise	Wise Associates	stevewise@att.net

Visitors:

Mike Brendel	Lau Industries	mbrendel@laufan.com
Joseph Brooks	AMCA International, Inc.	jbrooks@amca.org
John Cermak	ACME Engineering & Manufactu	john.cermak@acmefan.com
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Limin Zhou	University of Kentucky	unilmzh@gmail.com

ASHRAE TC 2.6 Sound and Vibration Control
Main Committee Meeting Minutes
Monday, June 25th, 2012, San Antonio TX

1. **Call to order (Oliver)**
   - Call to order by Patrick – 2:17 PM.

   1.1. Read scope of TC 2.6
   - The scope is posted on our website.

   1.2. Additions and/or modifications to the agenda:
   - No additions or modifications.
2. **Introduction of those present (All)**
3. **Confirmation of current voting members (Gierzak)**
   - 11 voting members present – constitutes a quorum.
4. **Review and approval of the prior meeting's minutes (Oliver)**
   - Correction to Section 8.4.4: 189.2 should be 189.3 and Ken Roy will become our representative.
   - **Motion** by Pat, seconded by Curt: Approve the Chicago minutes
     - Passed unanimously: 10-0-CNV
5. **Secretary's report (Meredith)**
   - Please provide all subcommittee reports on or before Sunday, July 1st.
6. **TC Chair's meeting report (Oliver)**
   - Met Sunday morning.
   - Several highlights:
     - Hightower technical achievement award nominations are due September 1st 2012 (excludes research/standards). Anyone can nominate.
     - Four + two new Multidisciplinary Task Groups (MTG's) have been formed. How they will operate is still in flux. One person from each affected TC represents the TC on the MTG. Meets before and after the ASHRAE meeting.
     - The Conferences and Expositions Committee (CEC) is looking for TC volunteers at the society meetings to help session chairs and review session papers.
     - Additional Advanced Energy Design Guides (AEDG's) are being considered including grocery stores, highway lodging, and quick-serving restaurants.
     - You should be receiving an email soon from the ASHRAE president with instructions on how to obtain a letter of appreciation for your employer.
     - The Winter meeting will be in Dallas and the Summer meeting will be in Denver.
7. **Chair's announcements and correspondence (Oliver)**
   - Included above.
8. **Subcommittee reports**

   8.1. Research subcommittee (Eichelberger)

   8.1.1. Research Chair's meeting report
   - Bill McCoy stepped down, David John will start July 1st.
   - Please remember to always copy the Research Liaison when submitting RTAR's.

- The number of RTAR submissions is down. There's some concern about the quality. Many RTAR's are being returned for details – a possible reason for the reduced number. Note that there's been some turnover in RAC.
- RTAR's due May 15th, August 15th, and/or December 15th.
- Note that there's a new cover sheet for RTAR submissions; available on the website.

8.1.2.Ongoing research projects

8.1.2.1. RP-1322 Performance, Perception and Criteria with PI Wang/UNL (Schaffer)

- All requirements have been met, just need to approve the final report.
- Lily has submitted a final, final draft to the PMS .
- Approval will be sent for TC vote via letter ballot.

8.1.2.2. RP-1408 Attenuation of Lined Ducts with PI Reynolds/UNLV (Lilly)

- This project has been in process for about three years.
- PI's test laboratory has now been qualified to do the testing.
- Testing has not begun.
- The PI has committed to commence testing by the end of July.

8.1.3.Work Statements/RTAR's/URP's

8.1.3.1. PES-1529 Numerical Modeling of Lined Ducts (Marks)

- Now a TRP.
- Objective: Full frequency numerical modeling techniques. Basically, fill the gaps in the handbook.
- Pat is the PES chair. PES members are Pat, Jack, Steve, and Jerry.
- Bids have been received. Budget = $130,000.
- Motion by Curt, seconded by Kim: Select the University of Kentucky for the project.
    - **Vote:** 10-0-Eddie abstains. The University of Kentucky was selected.

8.1.3.2. RTAR-1560 Installed Performance of Vibration Isolators (Simmons)

- No discussion.

8.1.3.3. RTAR-XXXX Effect of HVAC Noise in Hospitals (Babineau/Roy)

- RTAR was returned.
- Looking for support from TC 9.6.

8.1.3.4. Joint meeting with Criteria:

- Met yesterday.
- Prepare an RTAR for tones and building noise.
- Discussion on the RTAR at the next meeting.

8.1.4.Topics for future research

- Not discussed at this meeting.

8.2. Programs Subcommittee (Oliver for Papadimos)

- Chris will be stepping down as chair of this subcommittee.
- Erick Miller-Klein has volunteered to take this role moving forward.

8.2.1.Programs Chair's meeting report

- Nothing to report.

8.2.2.Programs this meeting:

- 86 total papers submitted, 43 were accepted. There were issues with getting them completed in time.
- 120 total seminars submitted, 67 were accepted.
- We submitted three seminars and three were accepted.
- The quality of the abstract really matters – anyone submitting an abstract is strongly encouraged to consult the track chair to ensure a high quality submission.

8.2.2.1. Seminar #10: "Some Acoustical Impacts of Poor Aerodynamic Conditions in HVAC Systems" (Schaffer)

8.2.2.2. Seminar #23: "New Acoustical Criteria and Methods of Measuring HVAC Sound" (Peterman)

8.2.2.3. Seminar #33: "Review of the Updated AHRI Standards 260 and 880" (Papadimos)

8.2.3.Potential programs for upcoming meetings:

- Dallas, January 2013:
  - Conference papers (ready for final print) due July 9th.
  - Paper reviews will be handled by TAC chairs. Members may be asked to assist.
  - Green Building Acoustics Seminar
    - Lily will champion (was originally Ralph).
    - Many presenters lined up.
  - Back to Basics: Sound and Vibration
    - Erick Miller-Klein will champion.
    - Erick issued a call for ideas.
    - Topic fits well with goal to increase attendance at the conferences. Should encourage junior members to attend.
- Denver, June 2013 & New York, January 2014
  - Nothing at this time.

8.3. Publications Subcommittee (Wise)

8.3.1.Handbook chapters

- Jeff Traylor is the new Fundamentals chapter liaison.
- Goal is to cut redundancy in the two chapters. The Applications handbook will elaborate on the current, best procedure.

8.3.1.1. 2015 HVAC Applications Handbook (Wise):

- Looking for a volunteer to "drive" the 2015 revisions.
- We will spend time on this chapter at the next meeting.

8.3.1.2. 2013 Fundamentals Handbook (Weinstein/Wise):

- Five pages are currently devoted to sound criteria. Had a 3-hour meeting to fix.
- Will submit to ASHRAE by the end of June.

8.3.2.Other Publications

- No discussion at this meeting.

8.3.3. Web page (Schwob)

- Web page has been updated. More user-friendly and more useful.

8.3.4. Smartphone Apps

- New apps are available on the app stores that can do FFT.
- Most smartphones are filtered for low frequency.
- Add-ons can bring a smartphone close to a Type 1 meter.
- The concern is that a novice could misinterpret the results.
- On the flip side, more data could be available to us.
- Potential hot topic at the next meeting.

8.4. Standards Subcommittee (Eddie for Ronsse)

8.4.1. SPC 79 – Method of Test for Fan-Coil Units (Oliver)

- Met on Saturday.
- April/May conference calls: how to add sound testing to get fan-coils tested in a coherent way.
- Significantly reduced the number of pages. The approach now is to simply reference AHRI-260 with the exception of the free inlet/free discharge case.

8.4.2. SPC 130 – Method of Test for Rating Ducted Air Terminal Units (Zimmerman)

- Randy is a voting member.
- First meeting was in Chicago.
- Currently updating and expanding the standard.
- Randy will incorporate exhaust boxes which were not previously covered.
    - Pushing/pulling air is different; the acoustics will change.
    - Adds a new sound path ("exhaust sound") in addition to casing and discharge.
    - AHRI-880/885 will have to be re-visited. No "exhaust" sound path defined. No flex duct, no end reflection, etc… When looking at manufacturer's data, one must be careful. Performance data for an exhaust box is often being applied for a supply box. Could greatly understate the sound level.
- Changing the requirements for room sound qualification. Taking broadband readings in a narrow band-qualified room. Room must be qualified to 220.
- Does end reflection belong in 130? End reflection is covered in 880, but will add an informative appendix on how to calculate.

8.4.3. SPC 189.1 – Design for High-Performance Green Buildings (Ronsse)

- Mark and Ken will both be attending.
- Expanded to include the quality of environments for people.
- Some measure of speech clarity (especially for healthcare).
- Address privacy requirements.
- Similar to what we've done with the PMP.
- Perhaps use the tables from the PMP instead of the handbook chapter.
- 189.3 will not be a repeat; will address items not in 189.1.
- Mark/Ken will learn what they can at the meeting tomorrow.

8.4.4. SPC 197 – Method of Test for Passive Vibration Isolators (Peterman)

- Nothing to report at this time. Will meet after the TC 2.6 main meeting.

8.4.5. SPC 200 – Method of Test for Chilled Beams (Zimmerman)

- Not much to report.
- Spent time discussing the test chamber requirement for active chilled beams. Need to use the European test chamber (overkill?).
- Will copy the test methods from Standard 70.

8.4.6. GPC 10 – ASHRAE Guideline 10 – Interactions Affecting the Achievement of Acceptable Indoor Environments (Wang)

- Meet on Sunday mornings.
- Covers different parts of the building.
- How to continue to conduct research that will give us more information for the standard.
  - Benefit of field vs. lab studies; no conclusion at the time.

8.4.7. SPC 132 - Performance Measurement Protocol (PMP) Best Practices document (Eichelberger)

- The follow-on document for the original PMP document (which was a tutorial). Next phase was the best practices document (a checklist-type of document).
- For the improvement of commercial buildings.
- The document is now complete. Currently with the ASHARE editorial staff; will publish in September.
- Simple measurements up to consultant-required measurements are covered.
- Potential for real usefulness.

8.4.8. Updates from Other Standards Organizations

8.4.8.1. AHRI (Abbate)

- New versions published: 220, 1120 (transport), & 1140 (sound quality evaluation).
- An addendum to 880/881 is coming.

8.4.8.2. AMCA (Brooks)

- AMCA 300 (reverberant room) and 320 (sound intensity) are under review.
- AMCA 301 (lab data) review almost complete.
- AMCA 330 (in-duct) will adopt the ISO standard identically.
- ISO TC 117 is developing a test standard for air curtains.

8.4.8.3. ANSI (Ronsse)

- Lauren compiled a list related to this TC. Included as an attachment.
- Is there anyone more active in ANSI that would like to take this over?

8.4.8.3.1. Working Group on Sound Measurement in Rooms (Peterman for Lilly)

- Will be meeting at the ASA meeting. Will discuss what was presented at this meeting's seminar.
- If you have any comments, let Karl or Jerry know.

8.4.8.4. ASTM (Peppin)

- Nothing to report.

8.4.8.4.1. ASTM E33 (Oliver for Lilly)

- Method for laboratory testing of duct silencers and sections of lined duct.
- Substantial revisions in the works.
- A draft will be submitted by July 7th with balloting to occur sometime this summer. Expect approval sometime next year.
- If you have any questions, please contact Patrick.

8.4.8.5. ISO (Reynolds)

- Nothing to report.

8.4.8.5.1. ISO TC205 (Roy)

- TC 205 – Building environment design
- Joint with TC 43, subcommittee 2 – Building Acoustics
- A design performance standard.
- Work has moved from ASHRAE to ISO.
- Will continue to report through ASHRAE. Please let Ken know if you have any related comments or questions.

8.5. Standing Subcommittees

8.5.1.Sound Criteria (Wang)

- This standing subcommittee is part of the research subcommittee.
- Problem definition: At what point is a tonal noise rated as 'annoying' by 80% (and 90%) of the general population? Normal hearing age: 19-65?
- Consensus was that this was going to help us define (through diagnostics) when someone would begin to complain.
- How would we want tones quantified/measured?
- Move RTAR forward using narrow band, prominence ratio (PR) and Tone to Noise Ratio (TNR).
- The researcher would be asked to compare the metrics under consideration with other metrics (1/3 octave date, 1/24, etc…).
- What frequencies are we interested in? The seven fundamental tones with harmonics (29.5, 60, 125, 250, 500, 750, & 1000) will be written-up in the RTAR.
- Method of test:
  - Allow the participants to adjust the level of background relative to the tone.
  - How will the tone change with the background level?
- Lily, Mark, Patrick, & Steve will write the RTAR.

8.5.2.Vibration Isolation (Simmons)

- Nothing to report.

8.5.3.Building Information Modeling - BIM (Mitchell)

- The subcommittee has a few volunteers.
- Two goals for the subcommittee:
  - Scope the information we would eventually like to embed.
  - Create a master list of acoustic parameters that could be used.
- What resolution to use (1/3 octave, etc…)?

- Will research the industry groups that are already working on this (especially within ASHRAE) and leverage their work.

8.5.3.1. ASHRAE MTG.BIM

- Has not met yet.

8.5.3.2. ASHRAE SPC 205

- Just starting to explore.
- They are working on a standard for performance simulation data.
- Their focus has been on a thermal energy model.
- Perhaps provide an extension to their work with respect to acoustics.
- Will continue to investigate.

8.6. Operations Subcommittee (Gierzak)

8.6.1.Bylaws (Oliver)

- The bylaws are posted on our website.

8.6.2.Honors and awards (Wang)

- Discussed during the executive committee meeting.
- If you would like to nominate yourself or someone for an award, please let Lily know.
- A member of our TC received the Distinguished Service Award – Karl Peterman.
- Lily also received an award.
- May 1st is the deadline; Lily will submit at least two nominations for next year.
- ASHRAE Fellow nomination forms due in December.

8.6.3.Long-range planning (Executive Committee)

- Nothing to report.

8.6.4.Membership (Gierzak)

- We have 18 voting members and 72 corresponding members.
- 5 voting members will be rolling off: John Gierzak, Matt Murello, Chris Papadimos, Ken Roy, and Matthew Stead
- A few voting members will be rolling on. Will query the membership before the winter meeting.

8.6.5.Liaisons (Gierzak)

8.6.5.1. International Green Construction Code update (??)

- Nothing to report.

8.6.5.2. ASHRAE TC 2.1 Physiology and Human Environment (Wang)

- Main meeting is tomorrow at 1:00.
- Mostly interested in humidity.
- Looking for new people to be on this committee.

8.6.5.3. ASHRAE TC 2.7 Seismic and Wind Restraint Design (Peterman)

- Don't meet until tomorrow.
- Karl is the chair.
- New name: "Seismic wind resistant design"
- The 2nd edition of the practical guide is now released.

8.6.5.4. ASHRAE TC 5.1 Fan Design and Application (Osborne/Brooks)

- Main meeting occurs immediately after the TC 2.6 main meeting.
- Have had multiple research projects on fan inlet noise.
- Two active projects: one is complete and testing for the other is almost complete.
- Will prepare an RTAR to compile the results from all five projects. If you would like to help with this endeavor, please let TC 5.1 know.

8.6.5.5. ASHRAE TC 5.2 Duct Design (Gierzak)

- The duct design guide has around 15-20 chapters; one covers acoustics. Email John if you are interested in getting involved.

8.6.5.6. ASHRAE TC 5.3 Room Air Distribution (Oliver/Zimmerman)

- Main meeting is tomorrow.
- Randy is the secretary.
- Nothing to report at this time.

8.6.5.7. ASHRAE TC 6.10 Fuels and Combustion (Herrin)

- Finishing up the combustion oscillations and boilers project. Will be reported on tomorrow.
- There will be a session Wednesday afternoon at the Southwest Regional institute. Modeling and measurements with involved, hands-on demonstrations. Let David know if you would like to attend.

8.6.5.8. ASA (Wang)

- Upcoming meeting in Kansas City this October.
- 850 abstracts have been submitted.

8.6.5.9. VISCMA (Peterman)

- Met on Saturday.
- Reviewing 412 and upgrading.
- Plan to change the website to be more contractor/engineer oriented.

8.6.5.10. Others (CTI, INCE, NCAC, CIBSE, etc…)

- INCE
  - Inter-Noise will be held in NYC this August.
  - There will be three sessions on low frequency noise measurement, perception, and quantification.
- CIBSE (Jason Swan)
  - IAP 5 will be updated this year.

9. New business/Old business

- Any old business covered above.

9.1. Hot Topics at this meeting (Oliver)

9.2. Hot Topics for next meeting (Oliver)

- Need a venue to discuss Standard 189 acoustics.
- Will also discuss smartphone app possibilities.

10. Next meeting date and location: Dallas, TX; January 28th 2013

11. Adjournment

- **Motion** by Pat, seconded by Curt: Adjourn meeting.
- Meeting adjourned at 3:40 PM.

ASHRAE TC2.6 Research Subcommittee Report, 02/25/2012, San Antonio, TX.

Curt Eichelberger (curtis.eichelberger@jci.com)

Attachment 1:
Research Subcommittee – Curt Eichelberger

Highlights of Research Chair's meeting:

William (Bill) McCoy has stepped down as our research liaison. David John (RL2@ashrae.net) with be our new liaison starting July 1. Reminder that our Research Liaison, should review all RTARs and WS. Please copy Curt Eichelberger (curtis.eichelberger@jci.com) on all correspondence with the Research Liaison.

The Current number of RTARS and WS for RAC to evaluate is quite low which may cause a shortage of promising research projects in the future.

There is a new RTAR coversheet that should be easier to use.

RTARs due May 15, August 15 and December 15.

Ongoing Research Projects:

RP-1322 Productivity and perception based evaluation of indoor noise criteria, Mark Schaffer, chair. Lily Wang, University of Nebraska, principle investigator. Project final report was distributed last week. Next step is for PMS final review. Will submit to TC2.6 for approval by letter ballot.

RP-1408 The effect of lining length on the insertion loss of acoustical duct liner. Jerry Lilly PMS chair. Doug Reynolds, UNLV, principle investigator. The objective of this research is to show how the sound attenuation of lined ducts depends on duct length. This project has been in progress for over three years and a no-cost extension has been granted. To date the facility has been qualified according to ASTM E-477 and the test instrumentation has been upgraded. Testing is expected to start by end of July.

RP-1408 Extension. An extension to the 1408 Work Statement was approved 1/27/10. The purpose is to collect vibration and sound intensity test data on a small subset of duct configurations. This test data will then be used to validate the analytical models of breakout noise that will be developed in RP-1529.

RP-1529 Full frequency numerical modeling of sound transmission and radiation in lined ducts – This project will develop and validate full-frequency numerical modeling techniques for sound transmission through, and radiation from, HVAC ductwork. Project RFP was issued and proposals were received. The PES recommended and the TC2.6 voted to award the contract to SECAT/University of Kentucky.

RTARs:

Tones – A joint meeting was held with the Research and Criteria subcommittees on Sunday, 6/24/12. The purpose was to develop objectives and a scope for an RTAR to quantifying tonal content of building noise. Lily Wang, Mark Schaffer, Steve Wise and Patrick Oliver have agreed to collaborate on a draft RTAR for review at the next meeting.

Effect of HVAC noise in hospitals – Ken Roy and J.R. Babineau prepared a draft RTAR and this was forwarded to TC members for review on 6/20/2010. This is a potential joint project with TC2.1 (Physiology & Human Environment) and TC9.6 (Health Care Facilities). The next step, is for J.R. Babineau to coordinate support from TC2.1, TC9.6 and other outside organizations.

Topics discussed and prioritized for future research:

The top topics discussed during the past several research subcommittee meetings are listed below.

1. Review the room effect (include effect of single pass ceiling systems).
2. Tones.
3. Fluctuations
4. Silencer system effects
5. Piping noise for equipment
6. Effect of HVAC noise in hospitals
7. Fan elbow effect
8. BIM
9. Flow noise generation in ducts

Looking for a champion to prepare an RTAR on the room effect topic.

TC 2.6 Programs Subcommittee Minutes
June 24, 2012,
San Antonio, TX

Attachment 2:

Programs Subcommittee – Chris Papadimos

This Meeting – San Antonio, TX – June 23 – 27, 2012
Programs Sponsored by TC 2.6

Type	Subject	Chair	Status
Seminar 10	Some Acoustical Impacts of Poor Aerodynamic Conditions in HVAC Systems	Mark Schaffer	Accepted
Seminar 23	New Acoustical Criteria and Methods of Measuring HVAC Sound	Karl Peterman	Accepted
Seminar 33	Review of the Updated AHRI Standards 260 and 880	Chris Papadimos	Accepted

Next Meeting – Dallas, TX – January 26-30, 2013
Programs to be submitted by TC2.6

Type	Subject	Chair	Status
Seminar	Green Building Acoustics - Curt Eichelberger (PMP) - Mark Schaffer - Ken Roy	Lilly Wang	
Seminar	Basics of Noise Control - Fan Selection for Acoustics - Silencers - Hearing / Perception	Eric Miller-Klein	

Notes:

- Chris Papadimos was not able to attend the San Antonio meeting so Patrick Oliver filled in during the Programs meeting. Erik Miller-Klein volunteered to take over the Programs Chair Position
- Seminar abstracts need to be submitted by August 13th and Conference papers for Dallas are due July 9th.
- Discussion about future Topics involved resurrecting an ongoing equipment series for each winter meeting. Pat Marks and Curt Eichelberger to champion possibly for Denver
- Chairs are strongly encouraged to work with the Track Chair for successful submissions
- Starting at the Dallas conference, speakers will be charged a $95. The total number of complimentary conference registrations has been dramatically reduced in an effort to reduce the registration fee for all attendees.
- Twenty Five (25) speakers from Chicago had a speaker rating below 3.5 out of 5.0. These speakers were sent letters indicating that if they receive two additional low ratings they will be required to provide proof that they have received speaker training before they will be permitted to speak again.
- Program Statistics for San Antonio with 100 available slots.

	Accepted	Submitted	Scheduled
Technical Papers	31	43	10
Conference Papers	43	86	14
Seminars	67	120	67
Forums	8	17	8

- Increasing requirements by states for PDH hours on ethics, a session on ethics and legal issues will be offered at every winter meeting.

Program Topics “In the Hopper”

Status	Subject	Type	Champion
~~Accepted at SA~~	~~Acoustic Criteria including ANSI Standard on Measurement Procedurs~~	~~Seminar~~	~~Karl Peterman~~
~~Accepted at SA~~	~~Aerodynamic Noise~~	~~Seminar~~	~~Mark Schaffer~~
~~Accepted at SA~~	~~Updated on Equipment Sound Standards~~	~~Seminar~~	~~Chris Papadimos~~
	Duct Breakout and Flanking Paths		Doug Reynolds
Submit for Dallas	Green Building Acoustics – IGCC, PMP Best Practices	Seminar	Lily Wang
Submit for Dallas	Basics of Noise and Vibration Control	Seminar	Erik Miller-Klein
	Standard method of Test for vibration isolators		Chris Papadimos
~~Part of Basics~~	~~Fan Selection for Acoustics~~	~~Seminar~~	~~Mark Schaffer~~
	Outdoor Noise / Liabilities from Outdoor Noise		Matt Murello
	In-Situ sound testing methods and challenges for different types of mechanical equipment		Chris Papadimos
	RTU Noise		Sami Elkhazin
	Forum on next gen handbook		Bill Rockwood
	Balancing and alignment for mechanical equipment		Chris Papdimos
Start in Denver	Ongoing Equipment Series	Seminar	Pat Marks / Curt Eichelberger

Topics were not voted on and proposed submissions were based on the willingness of someone to champion it.

Attachment 3:

Publications Subcommittee – Steve Wise

To: Dustin Meredith
Date: June 28, 2012
From: Steve Wise
Subject: TC2.6 Publications Subcommittee Minutes from San Antonio, June 2012

Attendees: Mark Schaffer, Jason Swan, Victor Clemente, Dan Laforgia, Matthew Hooti, Erik Miller-Klein, Andrew Mitchell, Kasey Worthington, Robert Hassler, Dustin Meredith, Eddie Lau, Rich Peppin, Ken Roy, Curt Eichelberger, Kim Osborne

TC Website http://ashrae-tc26.org
Mike Schwob was not present to report any details, but generally all is well, as no major problems or questions arose from brief discussion.

Fundamentals Handbook, 2013 revision

The draft of the proposed revisions was held for final edit during this meeting. The issue was to find a consensus to shorten the "Criteria" section (called "Sound Rating" in this chapter). We all agreed to leave the expanded explanations of RC calculations, NCB, RNC, etc. in the Applications chapter, and not to be redundant in the Fundamentals chapter.

All other changes, relatively minor, were voted on by the TC in Chicago.
Ken Roy and Rich Peppin will review the final version and we plan to submit to ASHRAE by the end of June.

Applications Handbook, 2011 revision

We are looking for a volunteer to "drive" the 2015 revisions. Items on the agenda so far:

Vibration Section: We have a series of small changes to various items on the master Table 47 showing recommended isolation types and specifications for a given piece of equipment and installation configuration.
Volunteers are: Robert Simmons, Jerry Lilly, Pat Marks, Chris Papadimos, Karl Peterman, Jack Wang, and Don Warick.

Silencers: Dan LaForgia, Karl Peterman, and Patrick Oliver are discussing possible minor changes.

Other Issues: Potential changes, for which we are seeking volunteer driver's for any sections of interest in time for the 2015 next major rev:
Revamp *plenum section* (Karl P. and Emanual M.)
Duct liner attenuation (need RP 1408 data)
Criteria (will we have something new on tones).

Miscellaneous:

In Chicago, we had volunteers to start to rough-out a game plan with an eye toward potential PDA applications for sound meters. Volunteers were Chris Papadimos, Mark Schaffer, and Pat Marks. No progress was made.

A discussion included comments about Studio Six and Faber Acoustics iPhone application software and how with the use of a qualified microphone this could yield reliable measurements even with FFT.
This may be a good "Hot Topic" in Dallas.

Attachment 4:
Webmaster Report – Michael Schwob

Webmaster Report – 15 June 12

Recent website activity:

1. The logo was updated to comply with new ASHRAE logo requirements.
2. The "Minutes" page which contained links to minutes from past meetings has been changed to a "Meetings" page with links to the minutes, agendas and schedules from past meetings and the next future meeting.
3. A page was setup to share information and prepare the TC for a discussion on Tone Criteria and an announcement was sent to TC members.
4. The current meeting addenda and schedule were added to the website.

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Attachment 5:

Liaisons – Lauren Ronsse

ANSI Liaison Report to ASHRAE TC 2.6

Date: June 25, 2012
Submitted by: Lauren Ronsse

Active Working Groups (Select)

S1/WG01 Standard Microphones and their Calibration
Active
(Parallel to IEC/TC29/WG5 and IEC.TC 28/WG 8) – Revision of S1.10-1966(R 1986) Method for the Calibration of
Microphones and S1.12-1967 (W 2001) Specification for Laboratory Standard Microphones
Chair, S1/WG01 V. Nedzelnitsky

S1/WG04 Measurement of Sound Pressure Levels in Air
Active
To revise the current Annex A: Identification and evaluation of prominent discrete tones (Character of the sound) to bring it into consistency with the more up-to-date prominent tone procedures recently published in ECMA-74.
Chair, S1/WG04 VACANT
Vice-Chair, S1/WG04 E. Dunens

S2/WG06 Vibration and Shock Actuators
Active
This WG will monitor workings of ISO TC 108 SC 6, develop standards that relate to vibration generating systems including: electrodynamic, electropneumatic, mechanical generating systems (exciters), shock generating machines, and standards that provide guidance for use and selection of these systems.
Chair, S2/WG06 G.B. Booth

S2/WG07 Acquisition of Mechanical Vibration and Shock Measurement Data
Active
Development of standards for the acquisition of data related to mechanical vibration and shock measurements.
Chair, S2/WG07 B.E. Douglas

S2/WG10 Measurement and Evaluation of Machinery for Acceptance and Condition
Active
The development of standards and standardized terminology for the measurement, analysis, and evaluation of machinery for the purposes of acceptance and condition assessment. This measurement, analysis, and evaluation activity generally applies to the mechanical vibration, balance, structural integrity, and the electrical, thermal and tribology-related properties of machinery. The standardization includes the measurement instrumentation, evaluation procedures, and acceptance criteria related to the balancing, condition monitoring, acceptance testing, diagnostics, life usage, fault analysis, and prognosis of machinery.
Chair, S 2/WG10 R.L. Eshleman

S2/WG39 Human Exposure to Mechanical Vibration and Shock
Active
Standardization in the field of shock, vibration and related biodynamic environments with regard to health, safety, performance and comfort criteria and guidelines regarding the effects of occupational and non-occupational exposures on the human population (environments of primary interest are: vibration, rotational oscillations, shock and impact transmitted to the whole-body or parts thereof). Preparation of standard terminology and characterization of the biodynamic properties of humans with and without support and restraint devices by means of biodynamic models or analogues is also included as a basis for the description of the physical, behavioral and physiological effects of the mechanical environments under consideration.
Chair, S2/WG39 D.D. Reynolds

S12/WG03 Measurement of Noise from Information Technology and Telecommunications Equipment
Active
(parallel to ISO/TC 43/ SC1/WG23) - Development of procedures for measurement and evaluation of noise emitted from
Information Technology and Telecommunications Equipment and their component noise sources.
Chair, S12/WG03 K.X.C. Man

S12/WG15 Measurement and Evaluation of Outdoor Community Noise
Active
To produce a series of Standards for outdoor environmental noise that deal with: (1) definitions and nomenclature, (2)
measurements including both short-term measurements and long-term monitoring, etc., (3) modeling of environmental
noise, (4) quantitative evaluation of the effects of environmental noise such as annoyance, complaints, sleep disturbance,
disturbance by noise-induced vibration and rattles, and (5) compatible land use planning with respect to noise.
Chair, S12/WG15 P.D. Schomer

S12/WG44 Speech Privacy
Active
To develop standards and guidelines for the design and evaluation of speech privacy in health care facilities.
Chair, S12/WG44 G.C. Tocci
Vice-Chair, S12/WG44 D.M. Sykes

S12/WG50 Information Technology (IT) Equipment in Classrooms
Active
Develop new part to ANSI S12.60 to cover IT equipment with 1) recommended sound power criteria for IT equipment in classrooms, 2) recommendations for purchase specification format, and 3) recommendations for installation conditions of IT equipment.
Chair, S12/WG50 R.D. Hellweg

S12/WG51 Procedure for Measuring the Ambient Noise Level in a Room
Active
Develop a new standard that will specify how to conduct ambient noise measurements in a room, including: instrumentation
requirements, microphone placement, duration of each measurement, identification of specific noise sources (e.g., HVAC,
lighting, electrical, exterior traffic and aircraft), and data reduction and analysis.
Chair, S12/WG51 J.G. Lilly

S12/L5 ASTM E-33 on Environmental Acoustics
Active
The development of standards on the characteristics and performance of materials, products, systems, and services relating to the acoustical environment and the promotion of related knowledge (to include the activities of ASTM E33.06 on Building Acoustics, parallel to ISO/TC 43/SC2 and ASTM E33.09 on Community Noise).
Chair, S12/L5 K.P. Roy

S12/L8 ASME PTC 36 Measurement of Industrial Sound
Active
The object of PTC 36 is to describe procedures for measuring and reporting airborne sound emission from stationary sound sources and equipment, or from facilities composed of multiple stationary sound sources. The scope includes procedures to determine compliance with specified acoustical criteria in a variety of acoustical environments, including outdoor settings influenced by ambient sound. Generally, sound pressure levels and/or sound power levels in prescribed frequency bands are used to quantify the sound emission of industrial equipment and facilities. Sound pressure level measurements or sound intensity measurements may be used to calculate sound power level.
Chair, S12/L8 R.A. Putnam

Current ANSI Standards (Select)

• **ANSI S1.13-2005 (R 2010)** American National Standard Measurement of Sound Pressure Levels in Air.
• **ANSI/ASA S1.18-2010** American National Standard Method for Determining the Acoustic Impedance of Ground Surfaces. *(Revision of ANSI S1.18-1999).*
• **ANSI S2.8-2007 (R2012)** American National Standard Technical Information Used for Resilient Mounting Applications.
• **ANSI S2.71-1983 (R 2006)** American National Standard Guide to the Evaluation of Human Exposure to Vibration in Buildings (*Reaffirmation and redesignation of ANSI S3.29-1983*).
• **ANSI S12.1-1983 (R 2011)** American National Standard Guidelines for the Preparation of Standard Procedures to Determine the Noise Emission from Sources.
• **ANSI/ASA S12.2-2008** American National Standard Criteria for Evaluating Room Noise.
• **ANSI S12.3-1985 (R 2011)** American National Standard Statistical Methods for Determining and Verifying Stated Noise Emission Values of Machinery and Equipment.
• **ANSI S12.7-1986 (R 2006)** American National Standard Methods for Measurements of Impulse Noise.
• **ANSI/ASA S12.8-1998 (R 2008)** American National Standard Methods for Determining the Insertion Loss of Outdoor Noise Barriers.
• **ANSI S12.9/Part 1-1988 (R 2003)** American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1.
• **ANSI/ASA S12.10-2010/Part 1** American National Standard Acoustics - Measurement of Airborne Noise Emitted by Information Technology and Telecommunications Equipment - Part 1: Determination of Sound Power Level and Emission Sound Pressure Level
• **ANSI/ASA S12.11/Part 1-2003 (R 2008) / ISO 10302:1996 (MOD)** American National Standard Acoustics – Measurement of noise and vibration of small air-moving devices – Part 1: Airborne noise emission. (Modified Nationally Adopted International Standard*).*
• **ANSI/ASA S12.11/Part 2 – 2003 (R 2008)** American National Standard Acoustics – Measurement of Noise and Vibration of Small Air-Moving Devices – Part 2: Structure-Borne Vibration.
• **ANSI/ASA S12.16-1992 (R 2007)** American National Standard Guidelines for the Specification of Noise of New Machinery.
• **ANSI S12.23-1989 (R 2011)** American National Standard Method for the Designation of Sound Power Emitted by Machinery and Equipment.
• **ANSI/ASA S12.60/1-2010** American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools.
• **ANSI/ASA S12.60/2-2009** American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 2: Relocatable Classroom Factors.
• **ANSI S12.65-2006 (R 2011)** American National Standard for Rating Noise with Respect to Speech Interference.

Attachment 6:

Criteria Subcommittee – Lily Wang

TC 2.6 Special Working Session (Research+Criteria Subcommittees)
Meeting Minutes
June 24, 2012

Attendees: V. Clemente, E. Eaton, C. Eichelberger, S. Elkhasin M. Fly, R. Hassler, M. Hooti, L. Hopkins, D. Laforgia, S. Lau, P. Marks, D. Meredith, E. Miller-Klein, A. Mitchell, P. Oliver, R. Peppin, D. Reynolds, K. Roy, M. Schaffer, M. Smith, J. Swan, J. Wang, L. Wang, S. Wise

I. Scope/purpose of the criteria committee: "To define and promote measurement protocols and benchmarks/guidelines/criteria to evaluate building acoustics, as related to building mechanical systems"

II. Development of an RTAR on Tones: *Today's goal is to decide on some specific guidelines that can be written up in an RTAR, but committee should ultimately remain open to alternative approaches proposed by bidders that still answer the research question*

A. Definition of the problem… what is the research question?

1. It would be helpful if ASHRAE had criteria for acceptable levels of tones in noise (acceptable meaning less annoying, or reduced number of complaints)
2. Less interested in effects of tones on performance (because that effect is not as clearly measurable or simple to detect, based on RP-1322 results)
3. When do 50% say that it's OK? (Or 90%?)
    a. Noise sensitivity may be a significant variable to consider; can acquire noise sensitivity data from test participants

Patrick Oliver referred to ASHRAE Standard 55 on Thermal Comfort which lists levels at which 80% will be satisfied, and those at which 90% will be satisfied. Swan mentioned that similar has been done for environmental noise levels. Consensus of the group is that this should be the goal for our research as well. So the research question may be phrased as: "At what point is a tone in noise rated as 'annoying' by 80% (and 90%) of the general population?"

Previous work by Hellweg-Nobile used 7 point subjective scale on 'prominence', not 'annoyance'.

We may need to specify both absolute and relative levels (K. Roy). Wise pulled up equal loudness contours of tones versus narrow bands of noise, to indicate that the same *relative* levels of tone to different *absolute* levels of BNL may be perceived differently.

Schaffer asked for clarification on the eventual purpose of the research: is it to inform design criterion or to help validate a person's complaint (i.e. diagnostics)? Consensus is to start on the diganostic side … when do 80% or 90% of population claim that this degree of tones in noise is annoying? Then this feeds back to what appropriate design would be.

What is considered the general population for this research? Suggestions are to limit test subjects to be: normal hearing; adults (age 19 to 65?); normal distribution of noise sensitivities?

Other factors that we should continue to keep in mind:

- Multiple tones
- Time variance… because if more than one tone, there will be some time-varying fluctuations. Variations in noise also often due to operating conditions. That variation may be frequency modulation, amplitude modulation, or combinations of both. Consensus of the group is that these should perhaps be areas of future research.
- Does the individual have control over it? This has been shown to affect annoyance in other areas (thermal comfort, etc.) Consensus is to limit our study to 'worst case' where individual has no control over it.
- Subject's ability to adapt to the noise… or notice the noise when it's particularly pointed out.

B. How should the tones be quantified or measured? Current methods include:

1. Prominence Ratio (PR) and Tone to Noise Ratio (TNR), both in ANSI S1.13-2005
    a. RP-1322 only tested tones with PR = 5 or 9 … but tones with PR from 9 to 18 are now listed as limits of acceptability in the current ANSI S1.13-2005 standard, based on Hellweg-Nobile work (2002).
2. Aures Tonalness Metric
3. Annex D of ISO Standard 1996-2 (2007): 1/3 octave band method
4. Appendix D of ANSI/AHRI Standard 1140 (2006) provides sound power level penalties in dB for tones in assorted 1/3 octave bands (source of data still unclear?)
    a. But one-third octave band data do not always show the tonal problem; should we move towards narrowband FFT procedure, providing signals that could be used to 'calibrate' FFT?
5. Check new ISO loudness standard (based on work by Moore and Glasberg) ... and review how this metric changes with tonal components. Muehleisen reports that there is a way to include a temporal component as well.
6. Consideration of Sound Quality Indicator (SQI), resulting from AHRI sponsored research at Penn State (PI: Hodgdon) (because tones does factor into SQI)… someday this information will become mandatory from manufacturers.

For this research, consensus is that it's best to use narrow band data and apply the psychoacoustically developed metrics of PR and TNR (already used in standard ANSI S1.13).

Researcher will be asked to use high quality equipment and specify what FFT procedures will be applied (window, number of lines, etc), and also perhaps to determine what the variability of metrics would be based on FFT settings.

Part of research scope may also be to compare reliability of different metrics (PR, TRN, 1/3, 1/12, 1/24 octave band data) in assessing annoyance of tones … can a new technique be proposed, using one-third octave band data?

C. Signal/measurement details

1. Number of signals to test?
    a. Hellweg-Nobile study (2002) only looked at 250 Hz and 1000 Hz
    b. Vary frequency of tones
        i. Should include 29.5 Hz fundamental … because that's motor rpm; plus sixth harmonic (177 Hz) which is the one that particularly sticks out (Hopkins shared a typical spectrum)
        ii. Low frequency tones (60 Hz fundamental)
        iii. Mid frequency tones (250 or 300 Hz fundamental)
        iv. Higher frequency tones (750 or 800 Hz fundamental)
        v. As high as 1000 Hz (screw chillers moving in this direction…)
        vi. One proposal: include 7 fundamental tones alone (29.5, 60, 125, 250, 500, 750, 1000 Hz) and also all of the above with harmonics (e.g. 29.5 Hz + 177 Hz, etc.)
    c. Vary number of levels?
        i. Rather than using set levels, Oliver (after reviewing ASHRAE Std 55) suggests a similar test procedure of magnitude adjustment … allow subjects to adjust levels until the point at which the tone is considered acceptable (not annoying).
        ii. Approach 'annoyance threshold' from both above (with PR too high) and below (PR too low)?
        iii. Test effect of the base absolute level of the background noise … so is 18 dB PR above a 50 dBA noise more annoying than 18 dB PR above 30 dBA noise? (Steve Wise's hypothesis is that a smaller PR is required at higher levels, and a larger PR at low levels.) Maybe this would be a Phase I of research?

2. Questions that remain…
    a. Should we have test signals mimic spectra produced by actual equipment? Or completely digitally synthesize (tone on top of pink noise spectrum)?
    b. No need to add other subjective tests, or questionnaire … or should we consider?
        i. Paired comparison tests between signals where subjects rate annoyance
        ii. Attention
        iii. Working memory, cognitive load
        iv. Similar questions to those used by Berkeley's Center for Built Environment : two fundamental questions
            - "Are you dissatisfied with the acoustics?"
            - "Does it interfere with your work (or with what you're trying to do)?"

D. Ongoing Tasks
    1. Volunteers to take this information to draft RTAR: Lily Wang, Mark Schaffer, Patrick Oliver, Steve Wise
    2. RTAR to be discussed in Dallas, 1.5 hours requested for criteria meeting

III. Standard 189.1 “Standard for the performance of high performance buildings, except for low-rise residential buildings”
    A. Schaffer mentioned that the new revision seems to include table of acceptable BNL due to HVAC equipment, listing NC/RC/NCB for design
    B. Will move forward by attending meeting on Tuesday, and suggesting that they only include NC and dBA, in line with our Handbook Applications Chapter
    C. There is a TC 2.6 Standards Subcommittee, currently being led by Joe Bridger

Minutes submitted by L. Wang, Criteria Subcommittee Chair

Attachment 7:
Building Information Modeling (BIM) – Andrew Mitchell

A group of volunteers within TC2.6 have been working on two (2) initial goals with respect to Building Information Modeling (BIM).

1. Defining the extent of acoustic information that should be embedded into BIMs. This is a master list of acoustic parameters with defined resolution that could be used in BIMs for information and/or calculations.

2. Research industry groups, particularly those within ASHRAE, that are working on the data exchange aspect of BIM, with the intent that we might be able to leverage existing standards as a foundation for acoustic data.

Current groups within ASHRAE:

MTG.BIM (Formerly ASHRAE BIM Steering Committee)

Description: Will coordinate the activities of multiple TC/TG in the area of standards and approaches to support the implementation of BIM within ASHRAE products and within the industry workplace. MTG-BIM will also represent ASRHAE interests within the BIM marketplace outside of ASHRAE and provide a conduit for funneling information about the BIM industry to ASHRAE members.

SPC (Special Projects Committee) 205

Description: Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment

With the SPC 205 group focusing on performance simulation data, there may be opportunity to have an extension of their work relate to acoustic performance data.