

A Newsletter from **Stewart Acoustical Consultants** and **F.C.Schafer CONSULTING**  
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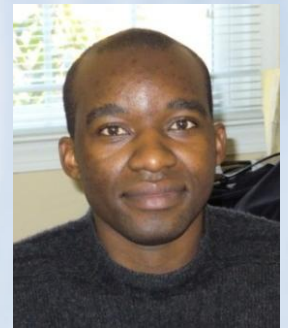
*Making our World Sound Better Since 1979*

## Merry Christmas and Happy New Year!

We wish everyone a happy holiday season and look forward to serving you in the new year. We appreciate your business and the confidence you have in us. As some of you have found, with the recovery of the economy we had to stop accepting any new work for this year in early November. January is largely filled. Anyone needing work in 2014 needs to contact us early. We can expect to encounter problems scheduling near the end of the year again.



**Welcome Rodell Means – Our new administrator – Goodbye Obadiah** - We are very pleased to announce the addition of Rodell Means to our staff as administrator. She comes to us with much experience in similar positions in accounting, healthcare, and legal firms. We could be transferring more responsibilities to work with clients on administrative matters to her and expect many of you will be interacting with her.



We thank Obadiah Kilonzo for coming back and helping us through the past year in the early morning.



**Stewart Elected to NCSU Mechanical & Aerospace Engineering Hall of Fame** – Dr. Noral Stewart was elected as one of 41 members of the inaugural class of the NC State University Mechanical and Aerospace-Engineering Hall of Fame. The MAE Hall of Fame was established 1) to inspire current students, and 2) to celebrate accomplishments of those extraordinary graduates who have used their education to excel in a profession, career, or service. The nomination is based on professional and service achievement, entrepreneurship and contributions to professional societies. The total number of Hall of Fame members will be capped at about 1% of the departmental alumni base.

**Worship Spaces - “Can You Hear Me Now?”**– The number one type of complaint we get asked to look into for newly constructed or renovated worship spaces is the inability to clearly hear speech or music. When we ask the person calling us what they think the problem is, many have no clue, and some suggest it’s the room acoustics, or perhaps the loudspeakers. Rarely does anyone tell us it is HVAC noise. However, in our experience a majority of the time the primary culprit is insidious HVAC noise. **Humans have an amazing ability to ignore HVAC noise** up to around 47 dBA/NC 40 for daily consumption throughout the work week and not be annoyed by it. For shorter durations, such as a church service, we can amazingly tolerate even higher noise levels without getting highly annoyed.



**So why should we care?** As funny as this sounds, HVAC noise is the ‘silent killer’ so to speak of speech. This is the principal behind sound masking systems in office buildings. Noise destroys speech. So we may not notice in the office place that we cannot understand someone else’s conversation when masking noise is present,

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so long as we can hear ourselves and someone in our office talking to us. HVAC noise in worship spaces can have the same effect. We can wonder, “why doesn’t the person speaking talk louder?”, “What’s wrong with the sound system?”, or “Maybe the acoustics are bad”. When often the reality is, HVAC noise is destroying the ability to understand the consonants clearly from the bottom up.

**One Case Study of many** - I helped one church with such a problem recently (no, not the church in the picture – to make the points I will keep it anonymous). I had helped them with room acoustics in design, but was not contracted to assist with HVAC noise control. They had not implemented all of my recommendations for room acoustics and were having problems understanding speech in the space. They figured they needed to add the wall treatment but wanted to assess the space first to see if they still needed what was originally specified or something different. I had some concerns about the line arrays and amount of energy that may be hitting the back wall and reflecting back. I asked the question, have they noticed whether the HVAC was too noisy? They felt it was not, and so I asked to at least measure the HVAC to see where it is. Once we finished investigating the room acoustics, I asked for the HVAC to be turned on. The noise was NC 47 (roughly 54 dBA). The sound system performed well for the budget conscious design (with HVAC off) and the room was perhaps more reverberant than we planned but clearly the HVAC noise was the chief culprit. What amazes me is how easily we as humans are fooled by this. Have you ever been washing the dishes and try to talk to your spouse down the hall and wonder why you cannot hear them clearly? Then it finally dawns on us, oh yeah, the noise from the running water!



For this project, **there were a host of items that led to the HVAC noise.** The largest air handler was running at too high a CFM versus the specification, Second, it was not properly tested and balanced (A report had been done but it had to be redone with correct methods of obtaining flow data). Third, the lining that was specified in a key location was not installed (the section of duct had to be replaced). Two of the smaller units had no lining or other methods of silencing. Just a reminder to my Mechanical Engineer friends out there, ALL fans make noise and WILL be heard without noise control. We added lined plenums and installed some lining in the ductwork we could reach. The result was closer to NC 32. We try to design for NC 25 for worship spaces. We usually accept an actual result up to NC 30. Considering where we started, this was considered close enough.

**Ability to understand speech really is not an ‘off’ or ‘on’ result.** It is a slippery slope. There are different populations that are affected differently. If the primary language of the speaker and listener is not the same, even if the language being spoken is known by both, a much better environment is required to clearly understand speech than for those with the same primary language (and I would add dialect). Older populations and very young populations require better speech conditions than age groups in between. Also, **just because you can listen carefully and understand, does not mean you can comprehend fully the message being spoken and internalize it.** For critical listening, getting the heart of the message if you will, you need better than ‘fair’ speech conditions. Also, the ability to have a broad dynamic range of speech enables the person speaking to use greater variation of delivery to help the listener connect with more intimate thoughts and more exclamatory expressions and draw the congregation in. Simply being able to have quiet respite between words that are spoken, is an important element for many in worship. Lastly, **music and singing during worship services can have a much greater impact on the congregants when quiet pauses and quiet hushed tones are able to be truly quiet,** and provide greater contrast with the louder phrases in the singing and music. The cost to a church for a noisy HVAC system design could mean that people simply go somewhere else and do not come back, or are there, but never get engaged in the message.

**There are so many ways that HVAC systems can be too noisy in spite of the attempts of their designers**, that it is simply a costly mistake that is very difficult to correct after the fact. Mechanical engineers who design HVAC system are generally only given rudimentary training in noise control. **They often do not realize what they do not know** can create noise problems. So even though sound system design is important, and room acoustics is also important, please learn the lesson from the experience of others. If you are involved in a new church building project or a renovation/upgrade of the HVAC system, do not rely on the well meaning mechanical engineer or mechanical contractor. **Get a noise control expert involved in ensuring proper noise control. You will not regret it.**

**Virtual Paul's Cross Project** – We were introduced to a very interesting project conducted at NCSU with Dr. John Wall, Department of English, as the principal investigator. As stated on their website, "The Virtual Paul's Cross Project helps us to explore public preaching in early modern London, enabling us to experience a Paul's Cross sermon as a performance, as an event unfolding in real time in the context of an interactive and collaborative occasion. This Project uses architectural modeling software and acoustic simulation software to give us access experientially to a particular event from the past..."



The acoustical consulting firm Acentech created the virtual acoustics, creating an interactive virtual environment, that responded to the sermon, and modeled the acoustic environment using state of the art software. This effort was presented at our NC ASA regional chapter meeting. To learn more about it, visit the website at <http://vpcp.chass.ncsu.edu/hear/>. At Stewart Acoustical Consultants we are excited to be able to offer people the ability to hear spaces, especially worship spaces, before they are even built. We have the tools and the experience to handle even the most complex projects.

**LEED v4 released** – The much awaited LEED v4 is now released (<http://www.usgbc.org/v4>). Acoustics is now more than ever intertwined into the various LEED rating systems. Lower levels are being required in schools as they strive towards the classroom acoustics standard. We must now meet 40 dBA for classrooms and other core learning spaces. This is down from 45 dBA. There are also more specific requirements for reverberation time (RT) for spaces over 20,000 ft<sup>3</sup>. There are credits now readily available for most of the LEED rating systems. Prerequisites are primarily impacted with schools at this time. Acoustical consultants are encouraged to be team members for the various project types.



**Progress on Hospital Alarms** – Two major developments have occurred regarding alarms in hospitals. First the Joint Commission (which accredits and certifies more than 20,000 healthcare facilities in the US) has released a new National Patient Safety Goal NPSG.06.01.01 on clinical alarm safety for hospitals and critical access hospitals. See [http://www.jointcommission.org/joint\\_commission\\_announces\\_2014\\_nps\\_g/](http://www.jointcommission.org/joint_commission_announces_2014_nps_g/) It elevates "alarm fatigue" to a necessary action item for all hospitals. Also many of the major manufacturers of medical equipment with alarms have announced an agreement to work together to design their equipment in ways such that they can communicate and coordinate alarm systems so as to minimize duplicative alarms. Up until now all the various medical systems have been unable to communicate with one another. This will make it easier for hospitals to network the various systems and establish central alarm systems.



**Gun Silencers now Legal in North Carolina** – The North Carolina legislature made many changes in state laws this year. One was to make it legal for North Carolina residents to own and use silencers on guns. This has potential implications with regard to gunshot noise from sport shooting and target practice. However, there are still federal regulations and requirements to be met which will make it more difficult to implement such requirements for commercial ranges where such could be a major benefit.



**National Council of Acoustical Consultants News** - The National Council of Acoustical Consultants after celebrating 50 years has adopted a new logo seen at right. This is the third such logo, which has been updated about every 25 years. Also recognizing the changing ways in which consulting businesses are organized, Dr. Stewart as chair of the Bylaws Committee is leading an effort to update the Bylaws to address several issues that have come up with new membership applications.

**Supplier Test Data Availability** – We continue to be surprised by the variability among suppliers in the availability of test data such as E90 sound transmission data or C423 sound absorption data. Suppliers readily supply STC and NRC results, but when it comes to the details of the data, some make it difficult. Some even seem to feel suspicious of anyone who would want such information. This is especially true of suppliers who are not specialists in acoustical products. The acoustical specialists realize that we need that data. Actually, they are more likely to put the data online where it is readily available, at least in tables if not original test reports. Others will require us to call them and request specific data on specific products. This is before we even know which of their products will fill our needs. We find ourselves having to call back for more. One supplier of windows and doors goes so far as to even require us to sign a non-disclosure agreement to see the test report. Suppliers need to understand that in our view, the primary purpose of the laboratory test report is to provide us reliable information including results at the third octave frequencies and descriptions of what was tested. Suppliers need to realize that we will be more likely to recommend products for which full data are readily available.

Test Number: A-6054-0203  
Sound Absorption Test

Results According to ASTM C423

Frequency Hz	Absorption Coefficient		Absorption Coefficient For 2.000 Hz	
	Repeatability	Reproducibility	Repeatability	Reproducibility
125	0.91	0.97	0.91	0.97
150	0.91	0.94	0.91	0.97
200	0.94	0.94	0.94	0.94
250	0.91	0.97	0.91	0.97
315	0.94	0.97	0.94	0.97
400	0.97	0.97	0.97	0.97
500	0.91	0.94	0.91	0.97
630	0.91	0.94	0.91	0.97
800	0.91	0.94	0.91	0.97
1000	0.91	0.94	0.91	0.97
1250	0.91	0.97	0.91	0.97
1600	0.91	0.94	0.91	0.97
2000	0.94	0.97	0.94	0.97
2500	0.94	0.97	0.94	0.97
3150	0.91	0.97	0.91	0.97
4000	0.91	0.97	0.91	0.97
5000	0.94	0.97	0.94	0.97

SAA 1.00 NRC 1.00

The repeatability and reproducibility are from section 11 of ASTM C423-07. The sound absorption average (SAA) is the average of coefficients between 100 and 2000 Hz, expressed to the nearest integer multiple of 0.01. The noise reduction coefficient (NRC) is the average of coefficients at 250, 500, 1000, and 2000 Hz expressed to the nearest integer multiple of 0.01.

Tolerability: These results are traceable to NIST.  
Compliance: Pass

Approved by:

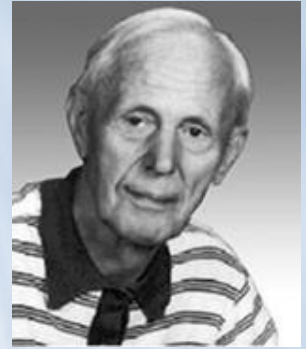
nvlab

The only method that meets the needs of our customers is to provide the most accurate and reliable test results. We are committed to providing the highest quality test results and customer service. We are committed to providing the highest quality test results and customer service. We are committed to providing the highest quality test results and customer service.

**Roofs – They need some weight to block sound** – A lightweight building roof is often considered desirable since it takes less structure to support it. However, we commonly encounter situations where it is necessary to either contain sound within a building or keep sound out. Examples might be a nightclub or church with loud music in an otherwise quiet residential neighborhood, or a building in a noisy area such as near an airport. Often, the major weakness is the roof, which might be nothing more than a sheet of metal and a little thermal insulation. Such light roofs are very poor sound blockers for sound whether it is coming in or going out. This is especially true for low-frequency sounds such as the bass beat of music or locomotives. It is possible to use such metal roof systems with a little extra weight added by a layer of gypsum under the metal, and then combined with a ceiling and a large cavity to achieve greater sound blockage. Major problems can occur when there are metal roofs with no ceiling.

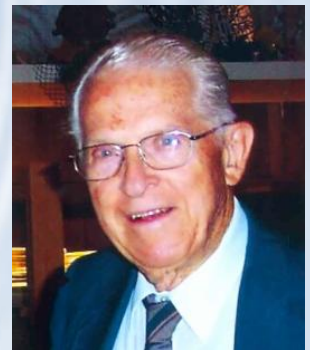
**NC Acoustical Society Chapter holds competition, begins planning for 50<sup>th</sup> Anniversary** – The NC Chapter of the Acoustical Society of America held poster competitions for student awards on November 15 with 5 students from UNC Chapel Hill and Virginia Tech competing for \$6500 in scholarship money. The major prize was the Royster Award from funds contributed by Larry and Julie Royster. Ravish Mehra of UNC and Sriram Malladi of Virginia Tech were each awarded \$2500 for their continued education. Sharing in \$1500 of additional awards were Alok Meshram, Carl Schissler, and Qi Mo of UNC. The chapter founded in 1965 is approaching its 50<sup>th</sup> anniversary and has begun planning for a celebration. The chapter website is [www.ncacoustics.org](http://www.ncacoustics.org) and you can find it on Facebook at <https://www.facebook.com/ncacoustics>.

**Viggo Kjaer – 1914-2013** - Dr Viggo Kjær, the co-founder of Brüel & Kjær, passed away on July 25th 2013 at the age of 99. After earning a Master's degree in Engineering in 1939 from the Danish Technical University, Kjaer went on to work for Philips. In 1942, Viggo Kjær and his university friend Per Brüel started a company to develop, manufacture and sell measurement equipment. During the next decades, a string of pioneering products left the factory, including the world's first audio analyzer in 1942 and the revolutionary Type 2301 Level Recorder. As the company evolved, Kjaer managed production, finance, and personnel, while Brüel concentrated on product development and sales. After 50 years of managing the company, and developing a range of innovative products for measuring and analyzing sound and vibration, the two men sold the company in 1992. Per Brüel at age 98 is a partner in the firm of Brüel Acoustics of Rome. A book on the life story of Brüel and Kjaer and the company is available.



[www.sandv.com/books/form03.doc](http://www.sandv.com/books/form03.doc)

**Laymon Miller – 1919-2013** – Master consultant and master teacher Laymon Miller passed away October 21, 2013. Miller began his life in acoustics when as he was a semester away from his PhD in nuclear radiation at the University of Texas he was sent to Harvard to work on torpedo transducers in World War Two. The book Hellions of the Deep about that effort begins with his name. After helping found the Applied Research Laboratory at Penn State, he was recruited by Leo Beranek to be his right hand man at Bolt Beranek and Newman. BBN gave him a sabbatical with condition that he does something useful. He developed a weeklong class in practical noise and vibration control, and he and his wife Lucy toured the country with an airstream trailer behind his Cadillac giving lessons to many. Having personally attended one of his classes in Winston-Salem, he was unmatched as a teacher. He was very sharing of his experiences writing many articles for the NCAC Newsletter, which are being compiled along with other papers into a book to be published next year by NCAC [www.ncac.com](http://www.ncac.com). One memory is of a daylong lecture he gave recounting his experiences in which he mentioned a certain professor from North Carolina who once told him of the three most important tools in noise control – the screwdriver, monkey wrench and oil can.



## Acoustical Product News

**Anti-Microbial Door Seals** – One of the problems in achieving isolation and quiet sleeping conditions in hospitals has been sound leakage around doors without seals. Hospitals have been reluctant to use seals due to sanitation concerns. Door seal manufacturers are now offering Anti-microbial seals. These have anti-microbial treatment permanently incorporated into the seal material. Two companies with such products are Door and Hardware Systems Inc. and Zero International. Tests indicate they are more effective than other methods of sanitation.

**Maxxon Expands HP line** – Both Enkasonic and Acoustimat 3 are now available in HP versions offering significantly improved IIC performance for floors. [http://www.maxxon.com/product\\_list/sound\\_control\\_systems](http://www.maxxon.com/product_list/sound_control_systems)

**Absorbers in Tires for Quieter Cars** – In many cars that have a high degree of interior sound control, the dominant sound is now generated inside tires and transmitted structurally through the wheels and suspension into the cabin. Continental Tire is introducing Conti-Silent tires with sound absorbers built inside the tires, which are said to reduce cabin sound levels in some cars by up to 9 dB. They will initially be available on some Audi models.

[http://www.continental-tires.com/www/tires\\_de\\_en/themes/news/meldungen/pr\\_2013\\_08\\_07\\_contisilent\\_en.html](http://www.continental-tires.com/www/tires_de_en/themes/news/meldungen/pr_2013_08_07_contisilent_en.html)

**Not Quite Yet, but practical Window Sound Cancellation may be on the way** – An Austrian firm is developing a commercially viable device that can be placed on windows which can selectively cancel sounds coming through windows, perhaps cancelling traffic noise by allowing bird chirps to come through.

<http://jamesdysonaward.org/Projects/Project.aspx?ID=3515&RegionId=0&Winindex=0>