Mission
“Enhancing the stature and effectiveness of the acoustical consulting profession for the mutual benefit of the public and the member firms”

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On the Cover
This issue features an article reprint from An NCAC Anthology in Noise and Vibration by Laymon Miller. This image accompanied that article in the Fall 1999 newsletter.

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A Noise Measurement Trip to Paris in 1957. From the left, Laymon Miller and Leo Beranek are seen with engineers from Sud Aviation and the Orly Airport Administration. Noise measurements were carried out for the Port of New York Authority to determine if the French Caravelle, manufactured by Sud Aviation, could meet the take-off and landing noise requirements set by the Port Authority for their New York and New Jersey airports. Note the table full of “portable” noise measurement equipment required for the tests, which were made at Orly Airport, outside Paris. A brief description of this work was given in the NCAC Newsletter for Fall 1997. A more technical discussion of the work was presented in papers co-authored by Leo and Laymon and appearing in the Journal of the Acoustical Society of America (Vol. 29, pgs 1169-1179, 1957) and in Noise Control magazine (Vol.3, pgs 42-47, November 1957 and Vol. 4, pgs 291-293, September 1958).
Last month we recognized members who have reached membership milestones. Unfortunately three members did not receive the recognition they deserved.

40 years
William J. Cavanaugh, Consultant in Acoustics

30 years
James Perry, Cerami & Associates, Inc.
Jack E. Randorff, Ph.D., P.E., FASA Randorff and Associates Inc.

Last month’s membership report also pointed out five firms with membership over 35 years so we’d like to recognize them as well. All of these long-term members have been instrumental to the legacy of NCAC.

Gregory Tocci, Cavanaugh Tocci Associates, Inc. (1978)
George L. Augspurger, Perception Inc. (1981)
Bertram Y. Kinzey, Jr., FASA (1982)
James L. Read, Jr., George C. Izenour Associates (1982)

On the next page you’ll find preliminary plans for this December’s annual meeting in New Orleans. If you have not attended an annual meeting before I strongly recommend you consider making the trip this year. This meeting is a unique opportunity to connect with your fellow acoustical consultants. Have a challenging project, a proposal that would benefit from a collaborator, or just need a safe space to vent? Then you and your staff will benefit from attending.

Looking at the membership demographics published in the last issue you’ll see that 75 percent of NCAC firms have four or fewer employees and half of those are consultants working alone.

There is power in collaboration and if building your network is a priority then I encourage you to consider attending the meeting. Remember that by building a relationship with your fellow consultants you aren’t just making a connection with the people attending the meeting, you are tapped into everyone they know as well. If you’ve attended an annual meeting and have a testimonial to share, forward that to me as a letter to the editor.
This year’s annual meeting is December 1 through 3 in New Orleans, just prior to the start of ASA’s 174th Meeting which runs December 4 through 8. Watch the NCAC website (http://ncac.com/events/) for all of the details of the meeting as they are confirmed.

Start your annual meeting planning by making your hotel reservation

Ritz-Carlton, 921 Canal Street, New Orleans

Set within the historic 1908 Beaux Arts Maison Blanche building, the Ritz-Carlton, New Orleans retains the grace and charm of an antebellum mansion.

Book your room by calling the Ritz-Carlton, New Orleans at (800) 826-8987. Ask for the NCAC rate of $229/night plus tax.

Reservations must be made by Thursday, November 9, 2017. Group rate is available Wednesday, November 28-Monday, December 4 based on availability. Rooms are limited so please book early!

NCAC President-Elect Stephanie Adams Ball is hard at work finalizing the meeting schedule but she has already confirmed the following special events:

Dinner

Saturday night’s dinner will be at Galatoire’s, 208 Bourbon Street in the French Quarter. Jean Galatoire, an immigrant from a small village near Pau, France, in the foothills of the Pyrenees Mountains, established a “saloon on Canal Street” in 1896. In 1905, Galatoire purchased Victor’s Restaurant, in business at the location since the mid-1800s. Galatoire renamed the restaurant and began cooking the dishes from his homeland. The restaurant is run by his fifth-generation descendants. Galatoire’s specializes in French Creole cooking and the dining experience is considered “a true New Orleans dining experience” says Zagat.9TzuPM3Y.

Tour

A tour is being planned at the New Orleans Jazz Museum including a technical tour of their performance space pictured on the front cover of this issue. The New Orleans Jazz Museum, housed in the Old US Mint which produced coins from 1838 to 1909, is home to one of the foremost jazz collections in the world. Louis Armstrong’s first cornet, Sidney Bechet’s soprano saxophone, Edward “Kid” Ory’s trombone, George Lewis’ clarinet, Warren “Baby” Dodds’ drum kit, performance costumes, photographs, original manuscripts, historic recordings and rare film footage are among the thousands of irreplaceable treasures stored here, but only a fraction of this collection is on display.

Speaker

We are excited to welcome Gervais Tompkin, AIA, LEED® AP, Principal at Gesler, San Francisco to speak about workplace strategy, including perspectives on acoustics. Gervais’ favorite thing to talk about is the future of how people think, feel and work. Although he is based in the San Francisco office, his work spans the world, as he oversees global services for some of the world’s best-known tech companies. Gervais has a passion for research that has led him down a multidisciplinary path in the world of real estate strategy and design. You can hear a TEDx presentation by him at https://www.youtube.com/watch?v=EVz

Exhibits

The annual meeting exhibit hall has already confirmed 27 manufacturers and service providers planning to join us. It isn’t easy to stay current on new products and emerging technology so this is your chance to be face to face with these industry experts.

National Council of Acoustical Consultants

2017 Annual Meeting Preview
Editor’s Note: In the Fall issue of the NCAC newsletter member Dr. Joseph “Yossi” Soker contributed his perspectives on the Mary B. Galvin Recital Hall. In addition to the comments published in the Winter issue, Dennis Paoletti has sent these additional thoughts. You are encouraged to comment to rdaeger@ncac.com.

Below: The glass wall, relatively unusual, preserves the simplicity and airiness wanted by Renzo Piano, architect of the Kimball Art Museum, Fort Worth TX.

Right: Talk about distractions - people walking by, autos, even emergency vehicles! What was/should be a “studio” environment acoustically now has full glass with the same issues as a music hall. Dennis’ television images from March 24, 2017.
Total Acoustics™ ceilings have sound absorption (NRC) and sound blocking (CAC) in the same panel for more space planning flexibility. Products include WoodWorks®, MetalWorks™, and Mineral Fiber to ensure the right ceiling for any project. Learn more about the flexibility of Total Acoustics™ ceilings at armstrongceilings.com/totalacoustics
Clean Water Without Noise Pollution

Jeff Kwolkoski, P.E., INCE Bd. Cert., President, Wave Engineering, JeffK@WaveEngineering.CO

A noise study had not been anticipated by the water treatment plant owner and design team, but noise quickly became a critical issue for this important project. A limited study of an ozonation system replacement project soon became a comprehensive study of the entire site including all existing noise producing equipment.

The Paul M. Neal Water Treatment facility in Lake Bluff, Illinois provides drinking water to communities in Lake County, Illinois, about 35 miles north of Chicago. The facility is owned and operated by the Central Lake County Joint Action Water Agency (CLCJAWA) which consists of nine members representing 12 different communities. Since 1992, the facility has provided water from Lake Michigan that exceeds EPA...
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requirements. The plant was the first in Illinois to use ozonation as part of the disinfection process. While the system has performed reliably and effectively, it is nearing the end of its useful life and due for replacement.

The plant is surrounded by a local landscaping business, a developed residential neighborhood, and an undeveloped residential zoned property.

**Regulatory Requirements**

The new system design was completed and ready to move forward when an unexpected issue arose during the construction permit review process. The local officials asked “Is the new ozone system going to be louder than the existing ozone system?” The design team realized that they could not answer the question. A noise study was needed.

The local officials required the plant to comply with the State of Illinois noise statutes. Illinois Title 35: Environmental Protection Subtitle H: Noise, Chapter I: Illinois Pollution Control Board, Parts 901 and 910 are among the most detailed state statutes in the country in that they set octave band limits from 31.5 Hertz to 8,000 Hertz, and include detailed measurement procedures for enforcement.

The allowable sound pressure levels that can be emitted from the CLCJAWA plant (Class C) to residential property (Class A), and commercial property (Class B), are shown in Table 1.

<table>
<thead>
<tr>
<th>Octave Band (Hz)</th>
<th>Class C to Class A Daytime</th>
<th>Class C to Class A Nighttime</th>
<th>Class C to Class B Daytime</th>
<th>Class C to Class B Nighttime</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.5</td>
<td>75</td>
<td>69</td>
<td>80</td>
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<td>8000</td>
<td>40</td>
<td>32</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

Table 1: State of Illinois Allowable Sound Pressure Levels

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continued from page 8...

Part 910 of the Illinois statute includes detailed measurement procedures, but essentially one-hour equivalent sound pressure levels are measured at the property line for enforcement.

**Initial Noise Assessment**

We were asked to assess the noise impact of the new equipment on the east property line. While all of the new ozone generation equipment will be indoors, it requires approximately 20 new air intake and discharge louvers for ozone generation, general ventilation, and exhaust air. Most new louvers are in the east wall, but several are in the south wall.

There are existing homes to the southeast of the site. The closest homes to the east are approximately 650 feet from the building, but the property line is within 50 feet of the building and the adjacent property is zoned residential for future development.

I visited the site to measure daytime and nighttime ambient sound levels. A fairly busy road borders the site on the north side. Highway 41 and rail lines run within one half mile to the west and their traffic is audible on site. While assessing the ambient noise environment, we determined that an existing rooftop air-cooled chiller and other existing process equipment exceeded the allowable limits of the Illinois statute on the east property line. This was not part of the project, at least not at the start.

continued on page 12...

Figure 2: East Elevation Showing New and Existing Louvers
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We then predicted noise levels from the proposed new ozonation system. The system included multiple ozone generators that utilize reversible fans, several exhaust fans, and air-handling units for ventilation. The new equipment included approximately 20 noise sources for modeling purposes. We also incorporated approximately five existing sources that affect noise levels on the east property line.

We used Datakustik CadnaA noise prediction software to predict noise levels around the site. The software takes into account sound that radiates from the sources, the terrain, buildings, walls, and atmospheric conditions, and follows the methodology of ISO Standard 9613-2: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation.

One obstacle to modeling noise from the ozone generators was that the sound level data was very limited. The equipment is unique in that it uses reversible fans that change direction approximately every 60 seconds in the process of extracting ozone from the air. The sound levels fluctuate with the fan speed and direction. Each ozone generator has an inlet and an outlet duct. In the interest of time and budget, the manufacturer agreed to obtain and provide additional octave band sound pressure level data, but sound power levels were not available. Average and maximum sound levels were provided.

The noise study showed that mitigation was needed to reduce noise levels from virtually all of the new equipment. A report was submitted for review by the local officials. As we have done previously for other municipalities in Illinois, the report included A-weighted noise level contours supplemented with a table of octave band sound levels at representative locations on the property lines to show compliance with the allowable sound levels.

The noise study showed that mitigation was needed to reduce noise levels from virtually all of the new equipment.

Additional Regulatory Requirements

The second review by local officials included two new requirements. First, CLCJAWA was required to investigate the existing sound levels around the entire perimeter of the site for compliance with the Illinois statute, not just the east side impacted by the ozonation project. Second, the revised report must provide octave band sound level contours for all nine bands. The contours must include both existing and new sound sources.

This was well beyond the scope of the ozonation system replacement project, and required additional measurement and analysis of five emergency power gensets and radiators, main electrical transformers, rooftop HVAC units, blowers and other process equipment. We were now dealing with approximately 35 sources.
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STC & IIC LAB & FIELD TESTING RESULTS

<table>
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<tr>
<th>CONCRETE STRUCTURAL DECK</th>
<th>WOOD-FRAMED CONSTRUCTION</th>
<th>PARTITIONS &amp; WALLS</th>
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<tbody>
<tr>
<td>ABOVE DECK</td>
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<tr>
<td>BELOW DECK</td>
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<td></td>
</tr>
<tr>
<td>ABOVE &amp; BELOW DECK</td>
<td></td>
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</tr>
</tbody>
</table>

KineticsNoise.com/testing
The extended analysis found that most of the existing equipment was in compliance with the Illinois limits, but mitigation of several pieces of equipment was required and would be implemented under separate projects by CLCJAWA.

Figure 3 shows an example of the existing noise level contours at 500 Hertz created with in situ measured sound levels and CadnaA software. Similar contours were produced in all nine bands for existing sound levels, and then for the combination of new equipment sound levels plus the existing equipment sound levels, with and without mitigation.

Mitigation

Meeting the noise level limits required mitigation of most of the ozone system equipment, but also existing process blowers and an existing rooftop chiller.

Conventional noise barriers were planned on the roof and ground to mitigate noise from the chiller and large louvers serving process equipment.

The new ozone equipment transmitted noise outdoors through many different louvers in the east and south walls of the building. Several options for...
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mitigation were considered and priced. To mitigate noise from multiple louvers in the east wall, an 18 foot high noise barrier along the entire length of the building was evaluated. The tall barrier could effectively mitigate noise, but was not elected because of price, concerns with excavation near main incoming water lines, and interference with maintenance access.

The mitigation that will be implemented includes a combination of measures. Acoustical louvers replaced most of the standard louvers. This required making the louvers larger. In addition to the acoustical louvers, custom designed acoustically lined hoods were designed to be placed over many of the louvers.

The initial design included propeller fans immediately inside the louvers for ventilation and exhaust. Several of these fans were replaced with different types of fans and relocated to the roof to take advantage of additional distance from the property line and the shielding provided by the roof parapet.

Duct silencers were installed between air-handling units and their outdoor air intake louvers.

Internal duct liner was added to intake and discharge ducts for the ozone generators.

Conclusions

Illinois requires that sound levels in nine octave bands be evaluated instead of just the overall A-weighted sound level common in most states and municipalities. A combination of mitigation measures was required to mitigate noise levels to the octave band limits.

It was interesting to me that most of the engineers I met stated that they had never dealt with outdoor noise issues on a project.

The octave band sound level limits stipulated in the Illinois statute undoubtedly provide more protection for the community than an overall A-weighted limit. For acoustical consultants who have not dealt with this, expect that predicting mitigation measures and providing sound level contours in all nine bands will require more than nine times as much time and effort. Attempting to correct measured equipment sound levels (in octave bands) for background sound all around the site perimeter, when the existing equipment cannot be shut down, can also be quite time consuming.

The project is currently under construction and we expect that post-construction noise levels will be measured to demonstrate compliance with Illinois limits.

I had the opportunity to present aspects of this project to water system engineers at the Illinois Section of the American Water Works Association. It was interesting to me that most of the engineers I met stated that they had never dealt with outdoor noise issues on a project. Perhaps this is a function of the rural or less developed locations typical of water treatment plants. However, many of them also indicated that they expect noise to become more of an issue as residential development continues to grow closer.

One final comment for consultants… I wholeheartedly endorse (unpaid) Sawyer Products Premium Permethrin Clothing Insect Repellent (tick mitigation). After about three hours walking through tall grass and brush during Trip #1, I found approximately 20 ticks on my clothing and body. After applying the Permethrin product to my clothes before Trip #2, I only found two or three ticks. I love that we constantly learn new things in this job!
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