New AIA Guidelines on Acoustical Design in Healthcare

Excerpts from two panel discussions at ASHE-PDC Feb. 26-27, 2007

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Co-founders, ANSI S12 Workgroup 44
& the Joint ASA/INCE/NCAC Subcommittee on Healthcare Acoustics & Speech Privacy

Pebbles Conference, Houston, TX
March 21-23, 2007
Goal: answer some frequently asked questions

• What’s in the new FGI/AIA Guideline?
• Who authorized it?
• Who wrote it?
• Is it practical, actionable information?
• Who to contact for more information?
Appreciation

Our committee appreciates the significant role played by the Center for Health Design, Roger Ulrich and his co-authors, and the Robert Wood Johnson Foundation in focusing national attention on the issue of healthcare acoustics (community & interior noise, sound, privacy, vibration).

Many members of the acoustics profession have been researching and working on this subject for six decades and look forward to contributing their expertise to improving the quality and sustainability of healthcare facilities.
Why the ‘interim guideline on acoustics’ exists

AIA, AAH & The Facility Guidelines Institute responded to growing concern about noise, sound, privacy & acoustics (articulated by Ulrich, et al) by commissioning an “interim guideline/white paper.”

Goal is to include new information and set minimum guidelines in the 2010 FGI/AIA Guidelines for the Design and Construction of Healthcare Facilities which are accepted as code by 7 federal agencies & 42 states.
Who wrote it?

• We publicly outlined this initiative in 2004 in two presentations: at the Pebbles meeting in Boston, and at the Center for Health Design Conference in Houston

• We then formed “ASA Joint TC-AA.NS.SC” in 10/04 to focus on healthcare acoustics & speech privacy

• We applied to ANSI in 2005 for recognition, which was awarded in 3/06 – designated “ANSI S12 Workgroup 44”

• The document was completed & submitted to AIA in 10/06

• See: www.healthcareacoustics.org
Committee scope

Committee membership is currently ~350 professionals from nine constituencies including: legislators; regulatory agency heads in several countries; leaders of large healthcare organizations; lawyers; clinical research professionals; planners, architects & designers; facilities managers; researchers & practitioners in acoustical science; acoustics professionals at leading manufacturing organizations in acoustics.

Roger Ulrich & Craig Zimring of the Center for Health Design agreed to participate & reviewed drafts.
When was it written?

- 12/03: Discussion began when our co-chairman (Sykes) contacted FGI Exec. Dir., (D. Erickson) about the need for systematic treatment of acoustics in AIA’s Guidelines
- 8/31/05: Co-chairman invited to Washington DC to meet FGI’s board + chairs of the 2010 edition and address the need for recognition of healthcare acoustics
- 9/2/05: FGI approved our group as drafting party for the Interim Guideline on acoustics
- 3/06: Group recognized as ANSI S12 Workgroup 44
- 11/06: co-chairman met in Toronto with Core Committee members of the Green Guide for Healthcare, v.2.2
Summary discussions

• See Healthcare Design, 09.06 issue –
  “Evidence-Based Design: The New AIA Guidelines on Noise and Privacy” by D. Sykes, K. Rockstroh, J. Solet & O. Buxton

• The Guideline is described in “Sound Control for Improved Outcomes in Healthcare Settings, Issue paper #4,” by A. Joseph & R. Ulrich, Center for Health Design, Jan. 31, 2007

• See ASHE PDC/San Antonio, Feb 26-27 - our group organized two expert panels there
What is the status of this Guideline before 2010?

- According to AAH/FGI, there is a “significant need now” for expert, authoritative guidance on acoustics
- Information never before codified for HCO’s--so is highly useful as a “digest of expertise & professional best practices”
- Approved & issued on Jan. 31, 2007 as the reference standard for acoustics in GGHC V2.2
- Sets benchmarks that can be systematically tested through clinical research & field trials
Next steps in the process

- ASA/INCE peer review (6/06–10/06)
- HCO peer review (11/06–8/07)
- LEED HC TAG process continues (2/07 +)
- Appointment of HGRC Workgroup (4/07)
- April HGRC “all hands” meeting (4/17-20/07)
- Proposal to HGRC (8/07)
- Public review period (11/06–8/07 & 1/08–8/08)
- Integration into 2010 AIA Guidelines
Document basics

- **Title:** *Interim Sound and Vibration Design Guidelines for Hospital and Healthcare Facilities – Public Draft 1* (Nov. 1, 2006)
- Practical approach covers retrofit & new construction in 36 pages focused on setting “minimum standards”
- Drafting group: 36 leading professionals actively participated in drafting with peer review by the full 350 members of both committees
Document basics

• Intended to be comprehensive
• Peer review by engineering community completed 10/28/06
• Peer review by healthcare profession began 11/1/06
• Obtain a copy: www.healthcareacoustics.org
  » See “Documents”
  » $30 – credit card orders
  » (view-only on FGI website)
Goal: common sense

“The character and magnitude of the sounds in a building should be compatible with the intended uses of the space.”

William Cavanaugh

Architect, FASA, INCE Bd. Cert.,
& 2006 recipient of
the Wallace Clement Sabine Medal
Six topics covered

1. Site exterior noise* (5 pages)
2. Acoustical finishes and details* (3 pages)
3. Room noise levels (2 pages)
4. Sound isolation performance of constructions* including speech privacy (4 pages)
5. Paging & call systems, clinical alarms, masking systems & sound reinforcement (2 pages)
6. Building vibration (2 pages)
### Example 1: Site exterior noise

<table>
<thead>
<tr>
<th>Exterior Site Noise Exposure</th>
<th>A Minimal</th>
<th>B Moderate</th>
<th>C Significant</th>
<th>D Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>STC*</td>
<td>≥35</td>
<td>≥40</td>
<td>≥45</td>
<td>≥50</td>
</tr>
<tr>
<td>Exterior Equipment Goal</td>
<td>45 dBA</td>
<td>50 dBA</td>
<td>55 dBA</td>
<td>60 dBA</td>
</tr>
</tbody>
</table>

*sound transmission loss (STC) rating*
Site exterior noise
Example 2: Acoustical Finishes

<table>
<thead>
<tr>
<th>Space</th>
<th>$\overline{\alpha}_{\text{design}}$</th>
<th>Subjective description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private room</td>
<td>0.15</td>
<td>“Average”</td>
</tr>
<tr>
<td>Corridor</td>
<td>0.15</td>
<td>“Average”</td>
</tr>
<tr>
<td>Waiting</td>
<td>0.25</td>
<td>“Medium-dry”</td>
</tr>
<tr>
<td>Atrium</td>
<td>0.10</td>
<td>“Medium-live”</td>
</tr>
<tr>
<td>Office</td>
<td>0.15</td>
<td>“Average”</td>
</tr>
<tr>
<td>Treatment</td>
<td>0.15</td>
<td>“Average”</td>
</tr>
</tbody>
</table>

Average absorption coefficient ($\alpha$)
Ex.2: Acoustical Finishes &
Ex.4: Sound Isolation
## Example 4: Speech privacy

<table>
<thead>
<tr>
<th>Privacy Goal</th>
<th>Articulation Index (AI)</th>
<th>Privacy Index (PI)</th>
<th>Sound Transmission Index (STI)</th>
<th>Speech Intelligibility Index (SII)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Closed Plan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>≤0.15</td>
<td>≥85%</td>
<td>≤0.19</td>
<td>≤0.20</td>
</tr>
<tr>
<td>Confidential</td>
<td>≤0.05</td>
<td>≥95%</td>
<td>≤0.12</td>
<td>≤0.10</td>
</tr>
<tr>
<td>Secure</td>
<td></td>
<td>Special consideration required</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Open Plan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>≤0.20</td>
<td>≥80%</td>
<td>≤0.23</td>
<td>≤0.25</td>
</tr>
<tr>
<td>Confidential</td>
<td></td>
<td>Special consideration required</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Speech Privacy

[Image of a graph showing sound pressure level (LP) vs. distance, with annotations for speech signal and background noise, and wall sound transmission loss.]
Regulatory compliance

- *Interim Guideline* is based on existing standards from recognized authorities & widely accepted professional best practices
- “Certification”—standard analyses & tests can be performed in design & tested in-situ to show general conformance to the criteria specified in the *Guideline*
- For HCO’s this may be useful for inspections (e.g., JCAHO, FDA, etc.)
Excerpts from: “medical perspective - acoustics matter”

Jo M. Solet, Ph.D.

- Faculty member, Harvard Medical School
- Behavioral Medicine, Cambridge Health Alliance
- ANSI S12 Workgroup 44, Co-director of research
- Member, AIA 2010 Healthcare Guidelines Revision Committee
- Commissioner, Historical Commission, Cambridge MA
- Community noise activist
Goal: test Acoustical Guideline through clinical research

Funding proposals approved by AAH Foundation & FGI, and under consideration by C.H.E.R.

Compare guideline-compliant with standard rooms:
- Sleep quantity/quality
- Patient comfort and satisfaction
- Pain perception
- Staff and caregiver experience
- Privacy/speech intelligibility
Acoustics & clinical outcomes: mechanisms of influence

- Stress response
- Lost privacy
- Sleep disruption
- Impaired communication
- Clinician “burnout”
Stress response

- Arousal
- Trauma
- Pain
- Lack of control
- Inability to interpret experience
Adapting the Neonatal Intensive Care Environment to Decrease Noise

Johnson in J. of Perinatal & Neonatal Nursing 2003

Noise Effects:

- Lower oxygen saturation
- Higher respiratory rate
- Higher blood pressure
- Faster heart rate
- Lower weight gain
- Impaired sleep
Influence of ICC Acoustics on the Quality of Care and Physiological State of Patients

2004 Hagerman, Rasmanis, Blomkvist, Ulrich, Erikson, Theorell, in Internatl. J. of Cardiology

- Poorer acoustic environment = higher re-hospitalization rates
- Sickest patients showed the most reaction: Acute MI and unstable angina patients had raised pulse amplitudes, greater sympathetic arousal
- Quieter environment elicited higher patient quality of care ratings
Sleep disruption

- Physiological Changes
- Memory and Cognition
- Epidemiological Evidence
Consequences of poor sleep

- Impaired Attention and Reaction Time
- Decreased Memory and Concentration
- Worse Mood; depression
- Impaired Task Completion
- Psychosocial difficulties
- Insufficient or Disordered Sleep

- Risk of Injuries, Falls
- Incidence of Pain
- Weight Gain
- Diabetes
- Cardiovascular Disease

Increased Consumption of Healthcare Resources
Significance of sleep for US obesity?

Overweight and obese in the U.S. (%)

mean sleep duration (hrs)

SOURCES
Obesity: CDC (NHES, NHANES)
Sleep: Roffwarg *Science* 1966, NHIS (unpublished data), National Sleep Foundation polls, Hale *J Public Health* 2005
Quieter work environment

- Lower stress levels/decreased sympathetic activation
- Greater control in high demand situations
- Increase in speech intelligibility
- More sustained attention for careful decision-making = fewer errors
- Respectful of workers and their mission
- Less burnout/staff turn-over
Solving acoustical problems

- Most solutions already exist…
- 8,500 licensed professionals available
- What holds up implementation?
  - Assumptions about cost
  - FUD (fear, uncertainty & doubt)
  - Quality issues like noise & privacy often get lost in “value-engineering”
A “revolution” in building sciences

• Has already brought new products to market
• Many well-suited to solving healthcare acoustics & sustainability issues
  – Fabrics (anti-microbial, stain-proof, colorfast)
  – Insulation/glazing (thermo/acoustic & translucent)
  – Flooring & carpeting (anti-microbial, acoustical value)
  – Filtration methods (HVAC & water)
  – Electronics & wireless communications
Need to specify performance

Crucial for administrators, planners & facilities managers to charge architects, designers & engineers to consider the performance of the full range of solutions (including newer materials) because conventional solutions may raise problems.
What about GGHC & LEED?

The new *Green Guide for Healthcare Version 2.2* (released 1/31/07) contains two credits for acoustics; we advocated, drafted and won passage of this.

- See “Environmental Quality - Acoustics Credits 9”
- The *Interim Guideline on Sound and Vibration* is the sole reference standard cited in GGHC,V2.2
- Download from: [www.gghc.org](http://www.gghc.org)
Ongoing committee work

• Continue organizing clinical research under the guidance of Harvard Medical School faculty & others
• Further develop “Interim Guideline” based on input from healthcare & design professionals
• Continue work with LEED HC on acoustics credits
• Provide expertise to Pebbles Projects
• Continue outreach & advocacy (e.g., ASA-ASJ, ASHE, AIA/AAH webinar-CEU, meetings with DHHS/OCR & AHJs, ICA-Madrid, UIA-PHG, etc.)
• Deliver presentations & executive briefings at future professional meetings
Expertise available to Pebbles

Our committee offers Pebbles Partners:

- Comprehensive, up-to-date expertise on the AIA Guidelines, the Green Guide for Healthcare Acoustic Credits, and continuing LEED HC developments
- A single point of access to professional best practices and 8,500 qualified members of the acoustics profession anywhere in the world
Questions?

- Feel free to contact us with questions & comments
- Join us: committee membership is open to all
- Contact the three co-founders (we are a team) at this special address: pebbles@healthcareacoustics.org you will be put in touch with our Pebbles/acoustics team
- Or dial 800-765-5580 and mention that you are a Pebbles Partner
- we look forward to serving you