Speech Privacy & Sound Masking in modern architecture

Presented By
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Regional Manager - Central
Cambridge Sound Management
Thank You to McClelland Sound Inc

• Special thanks to our dealer partner for inviting us…

• 345 Ohio, Wichita, KS 67214
• Phone: 316-265-8686
• Contact: Paul Colella
• Click here to learn more
From floor to ceiling, we’ve got you covered
Cambridge Sound Management

• Decades of sound masking and acoustics history
  • Bolt, Beranek, and Newman
    • Beranek developed speech privacy theory
      • Acentech → Cambridge Sound Management

• CSM Founded in 1999, headquartered in Waltham, MA
  • World’s leading provider of sound masking solutions
  • Developer of the QtPRO® direct-field sound masking technology
  • Acquired Dynasound in July of 2016
  • 10’s of millions of square feet installed annually

• Sold only through a network of certified partners
10,000+ companies and over 40% of the Fortune 100 trust our solutions
Learning Objectives
what you will learn

ACOUSTIC PRIVACY
Understand the importance of acoustic privacy in the workplace

SOUND MASKING
Understand what sound masking is and what role it plays in speech privacy

THE ABCs OF ACOUSTICS
Describe the principles involved in the ABCs of good acoustical design

DESIGN ISSUES
Identify some of the major design issues related to speech privacy in open offices, private offices and health facilities

SPEECH PRIVACY
Understand what speech privacy is and how it is measured
Acoustic Privacy

Improved acoustic privacy enhances worker productivity, comfort and fulfills legal requirements.
"I currently work in a cubicle – my neighbors are a man in the midst of a divorce, a woman with a problem child, another woman with an elderly parent who should be in a care facility. The only cure for my personal hell would be a quiet room with a door. Perhaps my employer would then get his money’s worth from my workday… did I mention that I am across from the copier?"

-GSA, Sound Matters (2012)
The Case for Acoustic Privacy

employer concerns

- 54% of individual workers
- 46% of collaborators
- 29,000 respondents

80% of their time is spent with individual work
61% of their overall time is spent collaborating
23% of their overall time is spent collaborating with one other person
24% of their overall time is spent collaborating with three to six people

-Steelcase, Trends 360, Issue 66 (2013)
The Case for **Acoustic Privacy**

industry concerns

- HIPAA
- GBLA
- HCAHPS

Company Confidentiality & Identity Theft
The ABCs of Acoustics

The elements of effective acoustic design
The ABCs of Architectural Acoustics
the elements of effective acoustic design

A
Absorb
i.e., acoustic ceiling tiles, acoustic wall panels
NRC (Noise Reduction Coefficient)

B
Block
i.e., cubicle partitions, walls
STC (Sound Transmission Class)

C
Cover
i.e., background noise, sound masking
NC (Noise Criteria)

D
Distance
i.e., move people much further apart
OPEN OFFICES
ABCs of Acoustics
Typical Open Office

- Standard ACT (0.5 NRC)
- Standard 48” Partition

### Standard Open Office

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling Tile</td>
<td>0.5 NRC</td>
</tr>
<tr>
<td>Partition Height</td>
<td>48”</td>
</tr>
<tr>
<td>Sound Masking</td>
<td>No</td>
</tr>
<tr>
<td>Average PI (Privacy Index)</td>
<td>59%</td>
</tr>
<tr>
<td>Average Cost</td>
<td>-</td>
</tr>
</tbody>
</table>
### Open Office (Increased Absorption)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling Tile</td>
<td>0.95 NRC</td>
</tr>
<tr>
<td>Partition Height</td>
<td>48”</td>
</tr>
<tr>
<td>Sound Masking</td>
<td>No</td>
</tr>
<tr>
<td>Average PI (Privacy Index)</td>
<td>74%</td>
</tr>
<tr>
<td>Average Cost</td>
<td>$$$</td>
</tr>
</tbody>
</table>

**Premium Absorbing ACT (0.95 NRC)**

**Standard 48” Partition**

**Diagram:**
- An image of an open office setup showing a standard 48” partition and a premium absorbing ACT with 0.95 NRC.
### Open Office (Increased Blocking)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling Tile</td>
<td>0.5 NRC</td>
</tr>
<tr>
<td>Partition Height</td>
<td>80”</td>
</tr>
<tr>
<td>Sound Masking</td>
<td>No</td>
</tr>
<tr>
<td>Average PI (Privacy Index)</td>
<td>82%</td>
</tr>
<tr>
<td>Average Cost</td>
<td>$$</td>
</tr>
</tbody>
</table>

**Diagram Description:**
- **Standard ACT (0.5 NRC)**
- **80” High Partition**

**Increased Blocking**

**B**
Open Office (Cover with Sound Masking)

Increased Covering

- Ceiling Tile: 0.5 NRC
- Partition Height: 48”
- Sound Masking: Yes
- Average PI (Privacy Index): 87%
- Average Cost: $
Open Office (Increased Distance)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling Tile</td>
<td>0.5 NRC</td>
</tr>
<tr>
<td>Partition Height</td>
<td>48”</td>
</tr>
<tr>
<td>Sound Masking</td>
<td>No</td>
</tr>
<tr>
<td>Average PI (Privacy Index)</td>
<td>??</td>
</tr>
<tr>
<td>Average Cost</td>
<td>$$$$$$</td>
</tr>
</tbody>
</table>
Speech Privacy

What is speech privacy?
How is it measured?
What is Speech Privacy?
highlights from decades of scientific research

Speech Privacy

Speech Privacy is the inability of an unintentional listener to understand another person’s conversation.

Speech privacy complaints are due to *distractions* caused by overheard conversations.

The perceived level of distraction relates directly to the *intelligibility* of the overheard conversation.

Intelligibility depends on the loudness of overheard speech compared to the loudness of the background noise.
The effects of **Privacy Index (PI)** & **Articulation Index (AI)**

The light brown dog jumped over the picket fence  = 95% PI / 5% AI
Signal to Noise Ratio
the higher the ratio, the clearer the signal

**Signal to Noise Ratio Diagram**

- **Talker**
  - Sound from talker (dBA): 65 dB
  - Distance from speaker: 0 feet

- **Listener**
  - Sound from talker (dBA): 47 dB
  - Background noise (dBA): 41 dB
  - Distance from speaker: 24 feet

- **Sound from talker (dBA)**
  - 47 dB
  - 41 dB

- **Background Noise (dBA)**
  - 41 dB

- **Signal to Noise Ratio (dB)**
  - 6 dB

**Note:** 15 dB represents excellent speech intelligibility.
Defining a Goal

reducing the radius of distraction
Speech Privacy Potential (SPP)

**Speech Privacy Potential**
A measurement used primarily by the GSA to determine speech privacy. The measurement is the sum of the space’s sound isolation (Noise Isolation Class) & background noise (Noise Criteria).

**STC + NC = SPP**
(Wall) + (Noise) + (Speech Privacy Potential)

35 STC + 30 NC = 65 SPP

<table>
<thead>
<tr>
<th>Privacy Rating</th>
<th>SPP</th>
<th>Description of Privacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>90</td>
<td>Shouting is barely audible</td>
</tr>
<tr>
<td>Highly Confidential</td>
<td>85</td>
<td>Normal Voices - not audible, Raised Voices - barely audible</td>
</tr>
<tr>
<td>Excellent</td>
<td>80</td>
<td>Normal Voices - barely audible, Raised Voices - audible, mostly unintelligible</td>
</tr>
<tr>
<td>Good</td>
<td>75</td>
<td>Normal Voices - audible, mostly unintelligible, Raised Voices - somewhat intelligible</td>
</tr>
<tr>
<td>Fair</td>
<td>70</td>
<td>Normal Voices - Audible, somewhat intelligible, Raised Voices - Intelligible</td>
</tr>
<tr>
<td>Poor</td>
<td>65</td>
<td>Normal Voices - Mostly intelligible</td>
</tr>
<tr>
<td>None</td>
<td>&lt; 60</td>
<td>No Speech Privacy</td>
</tr>
</tbody>
</table>
Sound Masking

What is sound masking?
What does it sound like?
Sound Masking

**what is it?**

Sound Masking is the process of adding low level background sound to an environment to promote speech privacy and freedom from distractions.

Ideally, the background sound level of a workplace environment should neither be too low nor too high, but somewhere between these two extremes.

It is believed that one of the earliest examples of sound masking is the Roman’s use of water fountains to mask the sound of chariots on cobblestone streets.

In the late 1950’s and early 1960’s, an acoustical consulting firm in Boston known as Bolt, Beranek, Newman (BBN) pioneered the first electronic sound masking systems.
Sound Masking **Key Elements**

how to establish an effective sound masking system
Key Elements: **Sound Spectrum**

- Those in the sound masking industry generally agree on a spectrum for effective sound masking.

- This chart highlights the effective spectrum and the resulting influence of the spectrum on speech privacy.
The color of noise: sound masking is not white noise.

**Key Elements: Sound Spectrum**

- Those in the sound masking industry generally agree on a spectrum for effective sound masking.
- When sound masking operates within this spectrum, it is simultaneously effective and unobtrusive.

![Graph showing recommended spectrum, white noise, pink noise, and masking sound.](image-url)
Key Elements: Level of Sound

comparing common noises to masking sound

The graph below gives the decibel level (dB SPL) of common sounds:

- Quiet Library: 30 dBA
- Office Conversation: 60 dBA
- Vacuum Cleaner: 70 dBA
- Passenger Aircraft: 85 dBA
- Power Drill: 98 dBA
- Sound Masking: 47 dBA
Key Elements: Proper Zoning
zones help to meet the requirements of diverse spaces
Sound is emitted from the speaker, creating a uniform masking level.

**Key Elements:** Uniformity

uniformity = undetectable
Key Elements: Uniformity

uniformity = undetectable
Implementing Sound Masking: Indirect out of sight

Early approaches to sound masking relied on large loudspeakers placed in plenum spaces and fired upward. Today, these designs and incorporate sophisticated networking technologies to enable excellent uniformity.
Networked Sound Masking System
DynasoundPRO Network Topology

- Independent Control of Each Loudspeaker
- Control, Audio & Power over a single Ethernet connection
- No changes within ceiling
- Add DS3008/2 for delivering 8 Paging or Music sources to any speaker without pre-wire restrictions.

8 Audio Sources (Paging/Music) 4 Masking Generators

DS1356
DS8000
DS1356
DS8000
DS1375
DS1398

DSPP24
DSPoE24
DS3008
Privacy Manager

DS8000
DS1356
DS8000
DS1398

Privacy Manager

DS8000
DS1356
DS8000
DS1398

Privacy Manager

DS8000
DS1356
DS8000
DS1398

Privacy Manager

DS8000
DS1356
DS8000
DS1398

Privacy Manager
Implementing Sound Masking: Direct-Field

a new approach

Modern loudspeaker driver technology allows small, barely-noticeable sound masking emitters that are unaffected by objects and variations in the ceiling or plenum.
Direct Field Sound Masking System
Qt® Technology by Cambridge Sound Management

• Patented *direct field technology* will deliver:
  • Better Performance (Speech Privacy & Distractions)
  • Better Uniformity
  • Ease of Installation, Adjustment & Reconfiguration
  • Very Low Power Consumption

[GreenSpec® Listed]
Acoustical Ceiling Tile Example
Drywall Ceiling Example
Beam Mount Example
Universal Mount Example
NEW Pendant Mount Example

Also available in Black
Want a solution that does more for your investment?

• Same tiny architectural size.
• Uses advanced technologies to play **louder** and **lower** for…
  • Office Paging
  • Background Music
• Great 3-in-1 solution
• Save on redundant hardware and labor costs
Sound Masking Myths
setting the record straight

• HVAC noise is a substitute for a sound masking system
• Sound masking can reduce noise that is already too loud (i.e. restaurants/bars)
• Sound masking cancels sound
• Sound masking absorbs other sounds
• Sound masking can block sound
• Sound masking will prevent face-to-face communication
• Sound masking causes headaches, or is otherwise detrimental to health
• Sound masking will interfere with hearing aids or cochlear implants
Employees waste at least 21.5 minutes per day due to noise distractions - that’s 4% of an average work day!

Do the Math...

\[
\text{10} \times \text{260} \times \text{100} \times \text{25/hr.} = \$108,355
\]

Payback 3-9 Months
Summary

What we have learned today...

A + B + C + D = Speech Privacy
Questions & Answers

Go ahead. Ask away.
Give us your best shot.
Want to learn more?

www.CambridgeSound.com

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From floor to ceiling, we’ve got you covered