



THE OPEN PLAN: THE LATEST IN WORKPLACE DESIGN. METROPOLITAN LIFE, 1896

The Workplace: Is It Getting Worse? Part 2

by B. Alan Whitson, RPA



Productivity in the modern workplace is in decline. Every year research studies and surveys point to the same cause: distraction. The **Gensler 2013 Workplace Survey** reported, “53% of employees are disturbed by others when trying to focus.” Pundits say the cause is the shift from private offices to open plan. This is total nonsense. Other than law firms, it is rare to find an industry or a time in history when more than 10% - 15% of office workers toiled in private offices.

Clearly, there are issues with the modern open-plan office environment. People working in open-plan have 63% of their tasks interrupted; conversely those working in private offices have 49% of their tasks interrupted according to research by **Gloria Mark**, Professor - Donald Bren School of Information and Computer Sciences, University of California Irvine. Since those working in open plan and private offices have the same problem, the solution is more than four walls and a door. This installment will address the issue of distraction in the workplace and its solution.

Distraction in the Workplace

In the simplest terms, distraction is anything that prevents someone from giving their full attention to the task before them. Distraction in the modern workplace can be separated into four categories. Here is a description of each and commentary:

>**Direct interruption caused by others**, such as a co-worker asking for help on a task or seeking suggestions on where to take their spouse for lunch. This distraction is as old as humanity. Improvement in office etiquette will help; it is amazing that we have never developed an effective “do-not-disturb” indicator. [See – Office Etiquette]

>**Indirect interruption initiated by others**, telephone call, email, or instant messaging, etc. The ability to “unplug” from the connected world and applying suitable technology should reduce the negative impact of these interruptions by giving workers the choice to ignore or defer.

>**Self-Interruption**, abandoning a task before completion, and changing focus to a different task without prompting by an external event or entity. This is an interesting topic, but any meaningful discussion is beyond the scope of this article.

>**Environment based distractions**, which include disruptive noises, overhearing conversation of two co-workers or one-side of a telephone conversation of a nearby co-worker. This is the most troubling of the four. The problem of noise and distraction in open plan workplace was taken up by the design profession over 40 years ago. The science, technology, and products to address the problem have been available for 30+ years. Cost-effective solutions have been installed in projects for the last 20+ years. The science and the “state of the art” are well-defined.

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Ringing phones and noisy office equipment are distracting enough; the real problem is background conversations. “Studies with a specific focus on speech sounds have shown that the more intelligible the background speech is, the lower the performance,” says **Helena Jahncke**, a professor of environmental psychology at the University of Gälve in Sweden. The reason is not exactly clear, but one theory is that your brain automatically wants to devote mental resources to understanding speech, so less brainpower is devoted to your tasks.

Prof. Jahncke had people perform a series of tests such as information searching and word fluency, in both a quiet environment and one with people speaking in the background. The workers in the noisy room performed 8.7% worse on the search task, and 10.6% worse on the word fluency task. While this may not sound like a big difference, it effectively extends a 40-hour workweek to 44.5 hours.

The threshold for understandable background speech is roughly 24% of the conversation. At that point, the mind starts to make sense of the conversation and seeks to fill in the blanks. A study by Banbury and Berry found overhearing background conversations could reduce test performance by two-thirds. These background conversations disrupt processes involving memory, reasoning, mental arithmetic and problem solving.

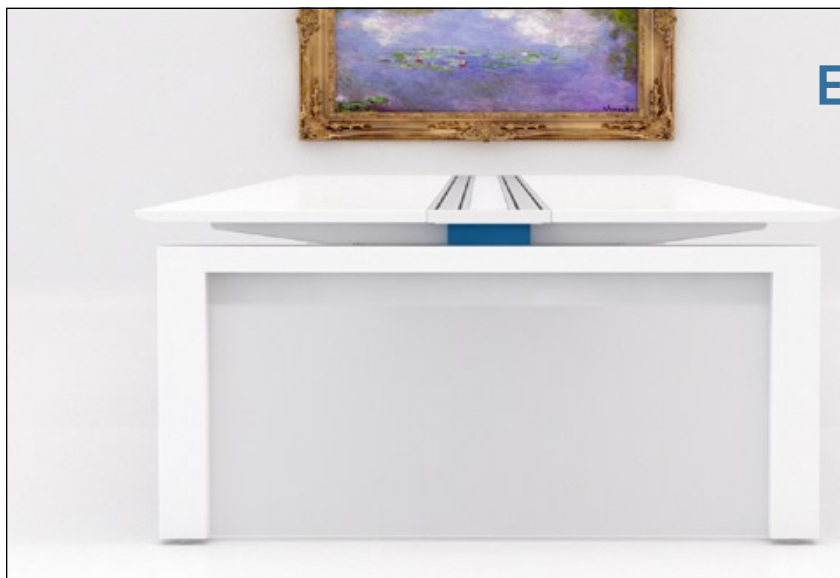
Understanding Sound

The decibel (dB) is the most common measure of sound intensity or volume. This is done by measuring the sound pressure on the eardrum, relative to the pressure on the

eardrum in total silence, also called sound pressure level (SPL). The decibel scale is logarithmic – an increase of 10dB means the sound energy has increased tenfold. An increase of 30dB implies the sound energy has increased by a thousand times. However, our ears reduce this effect. A 10dB increase in SPL is perceived as doubling of volume, so a 30dB increase equates to an 800% increase. The measurement term for this effect is dBA.

Sound Level dB.

(log scale)	Sound Source
0	Threshold of audibility
20	Whisper
30	Quiet conversation
40	Background noise in unoccupied office
50	Normal conversation
60	Occupied offices
70	Traveling inside a train
80	Roadside, busy street
90	Police whistle, Food processor
100	Inside a nightclub
120	Jet aircraft taking off 100m away or MP3 player at maximum
120-130	Threshold of pain
140>	Damage to hearing



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During a normal conversation, the typical male produces around sixty to sixty-five dB at three feet, and can be easily understood at 30 to 50 feet or more. The volume of a conversation or sound relative to the background noise level (i.e. signal to noise ratio) in the workplace affects occupants' ability to concentrate and their speech privacy. The greater the sound relative to background noise level, the more understandable and noticeable it is. Maximum speech intelligibility is achieved when speech volume exceeds the background noise level by a 30 dB.

An interesting side effect of constructing better buildings is that the background noise level in the modern workplace has declined 5dB to 8dB, according to **William McCann**, Executive Vice President at Dynasound, a leading sound masking firm. This drop in background noise is the result of improvements in base building construction (HVAC equipment, curtain wall), and the phase out of desktop PC and printers. It resulted in a doubling of the distance the human voice can heard in an office.

Creating A Distraction-Free Workplace

A distraction free workplace is possible when integrated into the initial planning process, not as an add-on. The criteria for speech privacy must be determined early in the

planning or programming process by selecting the appropriate speech privacy or **Privacy Index** for each area.

The Privacy Index is a measure for rating the speech privacy performance of an architectural space. ASTM 1130 defines how Privacy Index is measured. The idea is simple: Imagine sitting in a workstation and reading 100 words at random out of the dictionary. Another person is in the adjoining workstation listening carefully. If this person understands 15 words out of 100, you have a Privacy Index of 85.

There are four levels for the Privacy Index:

>Confidential Privacy, Privacy Index of 95 to 100: Conversations are unintelligible to casual listeners. The conversations may, or may not, be audible. Persons outside the room cannot talk with, or understand, the person inside. Confidential or sensitive conversations are possible. The room occupants have no distractions. Executive and sensitive areas such as, finance, human resources, strategic planning, marketing, and product development may require "confidential privacy." There are occasions where greater levels of acoustical privacy are required for example, defense contractors, government agencies, and financial institutions. Normally this level of privacy is achieved only in closed offices.

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>Normal Privacy, Privacy Index of 80 to 94: Two people have Normal Privacy from each other, when their conversations do not distract each other. Their speech will be audible and partially intelligible to each other. This level of privacy is achievable in open offices with good design. Very few complaints are expected.

>Transitional Privacy, Privacy Index of 70 to 79: Transitional Privacy occurs between two people when their conversations occasionally distract the other. Their speech is audible and partially intelligible. Complaints are expected from people wanting more privacy. Consider using Normal Privacy.

>No Privacy, Privacy Index of 0 to 69: When two people have “No Privacy” from each other, their conversations are clearly intelligible and completely distracting.

To achieve the appropriate speech privacy levels in the modern workplace requires a three-prong approach; *Absorb, Block and Cover*.

-Absorb sound with acoustical ceilings, panels, baffles, and floor coverings. While using sound absorptive materials is necessary, care must be taken since this can reduce the background sound level too much, making the workplace appear noisier and less private.

-Block sound with walls, doors, systems furniture panels, and sound attenuators.

-Cover distracting conversations by increasing the background sound level with a sound masking system.

Acceptable speech privacy is limited by the weakest of the three elements, despite how well the other two perform. The following table shows the Privacy Index of the typical open office environment having standard mineral tile ceiling (NRC .55), non-acoustic furniture panels (62 inch tall), and sound masking (47 dBA). It also reveals how the Absorb (ceiling tile), Block (furniture panel) and Cover (sound masking) strategy works.

Components – Open Office Environment

Privacy Index

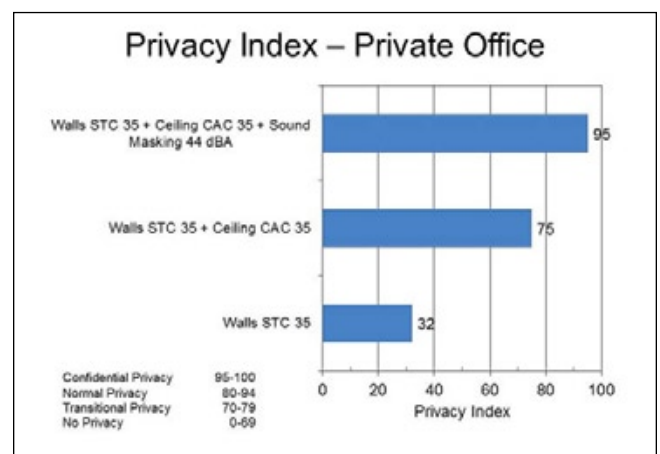
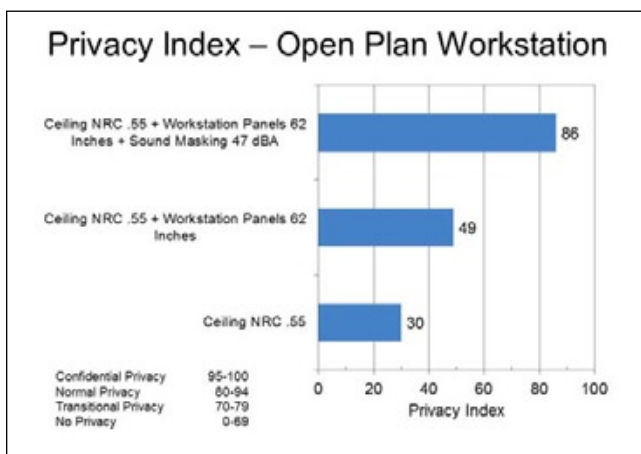
Standard mineral tile ceiling (NRC .55)	30 - No Privacy
Standard mineral tile ceiling (NRC .55) + Non-acoustic furniture panel (62 inch tall)	49 - No Privacy
Standard mineral tile ceiling (NRC .55) + Non-acoustic furniture panel (62 inch tall) + Sound masking (47 dBA).	86 - Normal Privacy

The typical closed office has a Privacy Index of 75 or less, which does not provide confidential speech privacy even when the door is closed. Ironically, closing the door can reduce the privacy level in some cases. Constructing a closed office with STC 35 walls, CAC 35 mineral tile ceiling, and with sound masking at 44 dBA can provide a Privacy Index of 95.

Components – Private Office

Privacy Index

Full height walls (STC 35)	32 - No Privacy
Full height walls (STC 35) + Standard mineral tile ceiling (CAC 35)	75 - Transitional Privacy
Full height walls (STC 35) + Standard mineral tile ceiling (CAC 35) + Sound masking (47 dBA).	95 - Confidential Privacy



Confidential Privacy 95-100
 Normal Privacy 80-94
 Transitional Privacy 70-79
 No Privacy 0-69

Confidential Privacy 95-100
 Normal Privacy 80-94
 Transitional Privacy 70-79
 No Privacy 0-69

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Speech Privacy Checklist

Designers have many tools and methods to create a suitably quiet, distraction free workplace. Here is a breakdown of the components. The goal is to reduce the signal to noise ratio without creating an acoustically oppressive environment. *When carried out early in the design process*, construction costs can be optimized, resulting in minimal impact on the final budget. Considering the effect of distraction on worker productivity, this yields the best value for the time and money invested.

The most important design factors for achieving speech privacy in open plan are:

- (a) the sound absorption of the ceiling,
- (b) the height of panels between workstations,
- (c) sound masking, and
- (d) the workstation plan size.

While secondary, one cannot ignore the other design factors: (a) panel transmission loss, (b) panel absorption, (c) floor absorption, (d) ceiling height, and (e) the details of ceiling mounted lighting.

Design Factor**Summary of Effect / Importance**

Ceiling absorption	The ceiling is the most important reflecting surface in open plan offices. Acoustical ceilings should be installed continuously from exterior wall to building core. Specify a high Noise Reduction Coefficient (NRC = .70 minimum) and standard Ceiling Attenuation Class performance (CAC = 35 minimum). Supplement the ceiling grid system with components that prevent sound leaks from return air grills and other utility penetrations.
HVAC Return Grill	Center in private office and install sound attenuator
Ceiling height	Increasing height is better However, increasing NRC to 0.90 is equal to adding 2 feet in ceiling height. Reducing it from 9 ft. to 8 ft. decreases performance to a marginal level. Low ceilings should be avoided.
Lighting	Direct/indirect light fixtures suspended from the ceiling or furniture mounted are best. Light fixtures with flat lenses reflect sound and should be avoided
Ceiling high partitions	Fixed drywall ceiling-high partitions (3- 5/8" studs with 1/2" drywall and fiberglass bating) or relocatable wall systems that provide good speech privacy, high STC-rated (STC = 45 minimum). Ceiling-high mullion-less glass partitions must have joints caulked.
Doors	Solid core door equipped with automatic door bottom, doorframe should be fully gasketed.
"Flanking paths"	To be effective, the acoustical envelope must be designed and constructed so there are no sound leaks around light fixtures, wall joints, and wall interface at ceiling. Avoid back-to-back outlets.
Flooring	The floor in office areas should be carpeted although thickness of carpet is insignificant. Use of carpets reduces noise of footsteps and moving furniture, and minimizes sound propagation through gaps at bottom of screens.
Workstation panels	Screens must be high enough (60 to 66 inches) to "block" direct path of speech from one workstation to another, so sound diffracted over them is sufficiently reduced to allow acceptable speech privacy. Panels above a height of 66 inches or below 60 inches add little acoustical performance. Minimum STC of 20. STC is the important factor, not NRC. A high STC panel with a high NRC, of course, is good
Sound masking	Sound masking system 1/3 octave band noise of 44 dBA to 48dBA is necessary. Sound masking should not exceed 48dBA
Office etiquette	Low voice levels should be promoted. Do not speak over or through workstation panels or shout across the office. Meetings in which lengthy discussions are necessary should be held in closed rooms.

Consultant & Software

Designers should seek out qualified acoustical consultant as part of their design team. Manufacturers of sound masking products can be helpful and can produce computer simulations to validate different design and budget options early in the design and planning process.

Final Thoughts On What Is Killing Productivity

If you are familiar with the LEED rating system, you know its power for market transformation. However, LEED encourages point chasing – going for the cheapest, quickest points available. One of those credits is daylight and views, since introducing those credits; the typical workstation panel height has decreased from 66 inches to 42 inches in height. This created an insidious downward spiral: 42-inch panels are cheaper than 66-inch panels, and no panels are cheaper than 42 inch.

While, the architectural fashion of open plenum ceilings, bare concrete floors, and open workstations look great in the magazines and marketing packages for design firms, it is killing productivity. The inability of workers to stay focused is the result of the trend to “open concept” offices. The arguments for companies to switch to “open concept” offices include improved employee communication and enhanced creativity. As Prof. Jahncke succulently put it, “There is, however, no clear scientific support for such hopes.”

Starting in 1950s, many studies have identified “conversational distractions” (overheard conversations) as the main impediment to productive office work. A significant body of scientific literature on “speech privacy” has been produced. A Google Scholar search for “speech privacy” returned 2,780 results. Technical standards and measurement methods are defined by ANSI, ASTM, ISO and others groups. The military, government agencies, financial intuitions, and major corporations have used these techniques for decades to protect sensitive information. While the science and the “state of the art” on speech privacy and worker distraction are established, the design community is moving in the opposite direction. ■

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Civility & Manners in the Workplace

Developing a set of shared expectations regarding noise and appropriate behaviors can create a sense of civility and contribute to the development of successful relationships with coworkers.

>Before entering someone's workspace, look to see if they are visibly occupied with a task. If so return later or send them an email.

>Do not check voice mail on a speakerphone.

>Only use a speakerphone in an enclosed room. If you need to use your hands, while on the phone use a hands-free headset.

>Set your phone's ringer to a low-level and pick up after one or two rings.

>Set voicemail to pick up after a maximum of three rings.

>If possible, use the vibrate feature on cell phones, or turn it off while in the office. Ensure that you take it with you when you leave your workstation.

>Be aware of things that you do that create noise and might be distracting to those around you

>Avoid the constant clicking of a pen when thinking, reading, or working on a task at work.

>When you speak with a coworker, ensure that you are close enough to them to talk at a normal volume, and try to keep them brief

>Do not speak over or through workstation panels or shout across the office.

>Do not hold sensitive meetings in your workstation. Take visitors to an area reserved for such activities.

>Avoid noisy screensavers or email settings that announce every time a message appears in your inbox. If you need to use sound for your work, set the volume to a low-level or use headphones.

>Ask that squeaky chairs, drawers, doors or other items in your area are fixed.

If a coworker is making noise that is disrupting your concentration, speak to them about the problem. Be direct, but polite because they might not realize that they are causing a distraction.