



# Acoustic Performance

## Description of the Problem

Today, many companies have moved to an open-office design intended to increase teamwork, communication, and productivity. However, studies show that interactive, collaborative spaces augment noise in the workplace; and prolonged exposure to noise may have serious physiological effects on occupant stress levels, productivity and mood.

Additionally, commercial work spaces with poor acoustic performance may cause issues with speech intelligibility and comprehension, distraction, loss of privacy, increased rate of errors, and loss of productivity. A study using a survey to evaluate occupant perceptions about acoustical quality in office workstations found that occupants were dissatisfied with acoustics citing problems with officemates talking on the phone or with each other, and speech privacy. More than 50% of respondents thought that noise in their workspace interfered with their ability to get their job done.<sup>1</sup>

Complicating acoustics in the workplace is the reduction of space allocated per worker. In 2001, an average of 300 sf was allotted per worker. By 2010, space allocation was down to 225 sf - and by 2013, it had dropped to 150 sf or as little as 85 sf per person.<sup>2</sup>

Acoustical control is a critical problem confronting office planners. The American Society of Interior Designers recommends that solutions to noise in the work environment be focused on four design elements: ceiling systems, systems furniture, sound-masking systems, and carpeting.<sup>3</sup>

## Impact of Poor Acoustics in the Work Place:

Companies and workers in all work environments, whether office, housing, education, healthcare or other, are directly and indirectly affected by noise levels.

Noise interferes with communication, causes distractions, affects occupants' cognitive performance and concentration, contributes to fatigue, and sleep deprivation.<sup>4-7</sup> Research has shown that decreasing noise levels has a noticeable effect on building occupants' physical health by decreasing blood pressure, heart rate, and stress.<sup>8,9</sup>

- Environmental stressors may have an adverse impact on occupants' physical and mental well-being that can, in turn, negatively affect an organization's bottom line.
- In educational learning environments, unacceptable noise levels can be directly correlated to student achievement and teacher stress.<sup>10</sup>
- Chronic noise in the classroom is detrimental to both students and teachers. For teachers, it has been shown to cause a host of negative outcomes including vocal cord strain, increased cognitive fatigue, low job satisfaction, lack of energy, interest in leaving the job<sup>4</sup>, lack of motivation, and sleepiness.<sup>11</sup>
- Acoustics figure prominently in healthcare environments where patients require a quiet environment to heal, when privacy is critical for patients and families, and healthcare workers need to have clarity in their conversations about patients' needs and instructions.<sup>12</sup>
- In the hospital setting, noise leads to unsatisfied patients. According to the American College of Health Care Administrators (ACHCA), noise disruption routinely receives one of the lowest scores. Unsatisfied patients directly affect revenue for hospital.<sup>13</sup>
- Flooring choices may have a substantial impact on noise and comfort.<sup>14</sup>



## Acoustic Research Studies:

- Open-plan offices and chattering colleagues contribute to an environment where concentration is virtually impossible...**office workers are 66% less productive in an open-plan office**, according to Julian Treasure, Chairman of The Sound Agency and author of *Sound Business*.
- **Employees waste 759 hours each year due to workplace distractions.** A third of employees are distracted at work for up to three hours a day, blaming their lack of concentration on chatty colleagues, social media and even the weather. This adds up to 60 hours a month, or a total of 759 hours each year.<sup>15</sup>
- Removing “conversational distractions” by making specific adjustments to the acoustical conditions in open office environments with the goal of improving speech privacy may:<sup>16</sup>
  - Increase the ability to focus on work tasks improved by 48%;
  - Decrease distractions by 51%;
  - Reduce error-rates – accuracy and short term memory improved 10%;
  - Reduce stress - physical symptoms of stress was reduced by 27%.
- According to Dynasound Collaborative Studies, research conducted with six major US corporations found that lack of speech privacy decreases employee satisfaction and productivity:
  - 70% of employees say that noise in the open plan environment is the number one workplace distraction, affecting satisfaction and productivity.
  - 52% of employees reported that they felt stressed at work – due to lack of ability to think and concentrate in the open plan environment.<sup>11</sup>
- According to *2013 State of the Global Workplace Report, Gallup*, office workers are interrupted as often as every three minutes by digital and human distractions. These interruptions carry a destructive ripple effect because, once a distraction occurs, it can

take as much as 23 minutes for the mind to return to the task at hand.<sup>17</sup>

### *Gallup's Consequences of Distraction:*

- When working on a project, employees are interrupted every 11 minutes (on average). When interrupted, it takes us up to 23 minutes to get back into FLOW — the state where we're deeply engaged.
- Longer interruptions cause a greater chance of error<sup>18</sup>
  - Interruption of 2.8 seconds doubles the rate of errors
  - Interruption of 4.4 seconds triples the rate of errors
- The reverberation time of noise in open-plan classrooms which affects how clearly speech is understood, is as low as 50% in 'normal' classrooms, meaning students understand and absorb only half of information being presented.
- At an average noise level of 65 dB in the classroom, teachers' heart-rate increases to hit heart-attack levels.
- A study conducted by Finnish Institute of Occupational Health (FIOH) shows that unwilling listeners demonstrate a five to 10 percent decline in performance when undertaking tasks requiring concentration.<sup>19</sup>

Employees undertake a variety of tasks during any day – some requiring a collaborative team approach and some solitary, requiring focus. A successful work environment is created when acoustic planning is done to anticipate types of work being done in the spaces, to minimize distraction, and to create spaces where employees feel they are accomplishing their best work.



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