

# THE ROLE OF DESIGN IN BURNOUT

CAN MANAGING ACOUSTIC  
STIMULI IN THE WORKPLACE HELP  
REDUCE BURNOUT?

**Delos**<sup>™</sup>  
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## EXECUTIVE SUMMARY

Burnout is a significant issue affecting today's workforce, costing an estimated \$125-190 billion per year in healthcare spending in the U.S. alone<sup>a</sup>. While there are many factors that influence burnout, one that is often overlooked is the physical environment. Can strategic workplace design play a role in addressing the problem?

With more companies adopting open office layouts there is more potential for employee distraction. Limiting acoustical disruptions by implementing passive workplace interventions (such as sound masking and providing a variety of designated quiet spaces) can give employees the agency to manage distractions. Employers can thereby harness the power of design to manage stress, and help their employees stay focused, engaged and productive throughout the workday.

a. Workplace-related stress factors considered in this estimate include: unemployment, lack of health insurance, exposure to shift work, long working hours, job insecurity, work-family conflict, low job control, high job demands, low social support at work, and low organizational justice.

## AUTHORS



**Dr. Stephanie Timm**  
Delos



**Dr. Whitney Austin Gray**  
Delos



**Basma Rustom**  
The World Bank



**Dr. Anna Obratzsova**  
Delos



**Lida Lewis**  
Wingate Hughes Architects



**Bill Browning**  
Terrapin Bright Green



**Dakota Walker**  
Terrapin Bright Green



**Dr. Judith Heerwagen**  
US General Services



**Dr. Sally Augustin**  
Design with Science

---

### ADVISORS AND REVIEWERS:

**Dr. Angela Loder**  
International WELL Building  
Institute

**Ethan Bourdeau**  
International WELL Building  
Institute

**James Waddell**  
Plantronics

**Dr. Upali Nanda**  
HKS Architects

**Dr. Eve Edelstein**  
Perkins + Will

**Kay Sargent**  
HOK

**Gerda Stelpstra**  
Cushman & Wakefield

**Paige Hodsman**  
Saint-Gobain Ecophon

**Dr. Aurelie N'Songo**  
Delos

### ACKNOWLEDGEMENTS:

Delos Insights greatly appreciates the advisors and expert reviewers who discussed their experience or provided written feedback on an earlier draft of this document. It should be noted, however, that the findings or suggestions discussed in this document are not attributable to any one individual, and remain the sole responsibility of the author.

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For more information, email [stephanie.timm@delos.com](mailto:stephanie.timm@delos.com) or [whitney.gray@delos.com](mailto:whitney.gray@delos.com).  
You can also visit the Delos website at [www.delos.com](http://www.delos.com).



## 1. INTRODUCTION

In the United States, it is estimated that burnout costs \$125-190 billion per year in healthcare spending<sup>b</sup>—a number roughly equivalent to New Zealand’s 2017 GDP.<sup>1</sup>

Burnout, or chronic and unresolved occupational stress, is a concept widely acknowledged throughout the United States, Europe and Asia. Differences lie in the way burnout is defined and interpreted, culturally and in the eyes of the law.<sup>2</sup> In Japan, for example, the consequences of burnout are so embedded in the culture, that a social medicine<sup>c</sup> term, ‘karoshi’<sup>d</sup>, was created to define death or disability resulting from a heavy workload and long work hours.<sup>3</sup> In 2019, the World Health Organization also recognized burnout as a “syndrome” and added it to their International Classification of Diseases chart.<sup>4</sup>

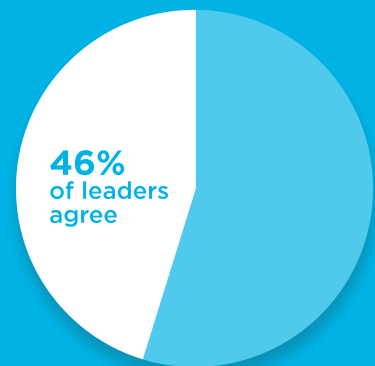
In response, this paper examines workplace design and policy strategies that can be used to help prevent burnout among workers—specifically exploring research that focuses on how control of acoustical stimuli (particularly noise, defined as “unwanted sound”) in the workplace can mitigate issues associated with employee burnout. Design strategies also include behavioral coping supported by the presence of alternative spaces for quiet work or reflection.

b. Workplace-related stress factors considered in this estimate include: unemployment, lack of health insurance, exposure to shift work, long working hours, job insecurity, work-family conflict, low job control, high job demands, low social support at work, and low organizational justice.

c. Social medicine is defined as organized investigation of social, genetic, and environmental factors influencing human disease and disability and promotion of methods of prevention of disease and health measures protective of individual and community

d. For families affected by ‘karoshi’, the government awards \$20,000 while employers can be liable to pay up to \$1 million in damages.<sup>3</sup>

### BURNOUT CONTRIBUTES TO EMPLOYEE TURNOVER



In a large national survey of 614 human resource leaders conducted by Kronos (a human capital management company), **46% of leaders stated that burnout is responsible for up to 20-50% of their annual workforce turnover.**<sup>73</sup>

## 2. WHAT IS BURNOUT?

The term 'burnout' is often used colloquially, but rarely operationalized in work settings. To address this issue, we will first examine how burnout is defined and measured through the lens of the Maslach Burnout Inventory (MBI) and *Areas of Worklife Survey* (AWL). The MBI and AWL were pioneered by Dr. Christina Maslach and are widely recognized as the leading tools for measuring burnout. They have been refined since their original publication to incorporate findings from extensive qualitative and quantitative research.

Burnout is intrinsically linked to stress, which is defined as any "physical, mental, or emotional factor that causes bodily or mental tension."<sup>5</sup> An employee that experiences chronic, unresolved stress is typically deemed 'burned out.' From a research perspective, this syndrome encompasses three key stress response dimensions, which include:

1. **Emotional Exhaustion** - "Feelings of being overextended and depleted of one's emotional and physical resources."<sup>6</sup> Examples of such feelings include being worn out, experiencing loss of energy, and fatigue.<sup>7</sup>
2. **Professional Inefficacy** - "Feelings of incompetence and a lack of achievement and productivity at work."<sup>6</sup> A lack of efficacy arises when job resources do not satisfy job demands, and an otherwise qualified and capable individual lacks the power to produce the desired effect.<sup>7</sup>
3. **Cynicism** - A "negative, callous, or excessively detached response to various aspects of the job."<sup>6</sup> Cynicism can be expressed through negative attitudes about one's work, irritability, and withdrawal from work duties.<sup>7</sup> (see Figure 1)

A survey of 1,200 senior and non-executive employees from various industries was conducted to explore challenges affecting modern-day workers.

They found that almost **two thirds of executives** believed their employees are equipped with the tools they need to deal with distractions at work, **while less than half of employees agree.**<sup>74</sup>

In addition, this survey found that the ability to focus and work without interruptions is more important to employees than amenities like free or subsidized food.<sup>74</sup>

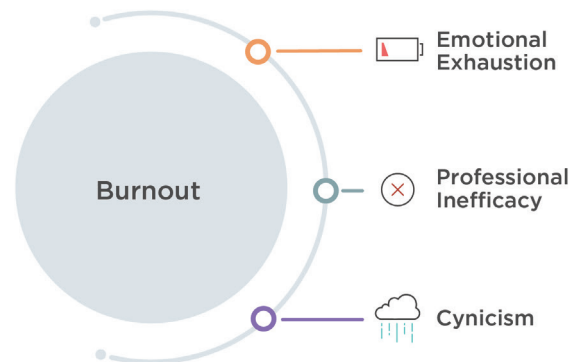


Figure 1: Stress response dimensions of burnout <sup>7</sup>

Individuals can experience these dimensions in different ways – they do not always occur in a specific order, and not all burned-out individuals experience all three dimensions.<sup>8</sup> For example, one person may only experience high levels of emotional exhaustion, while another might experience all three dimensions – professional inefficacy, cynicism, and emotional exhaustion.<sup>8</sup>

That being said, emotional exhaustion is often considered the strongest burnout element. Some experts have even argued that emotional exhaustion could be used as a proxy for the entire burnout experience.<sup>9,10</sup> In a study of 100 critical care nurses, noise-induced occupational stress, in particular, was positively correlated with emotional exhaustion ( $r = 0.300$ ,  $p < 0.01$ ).<sup>11</sup>

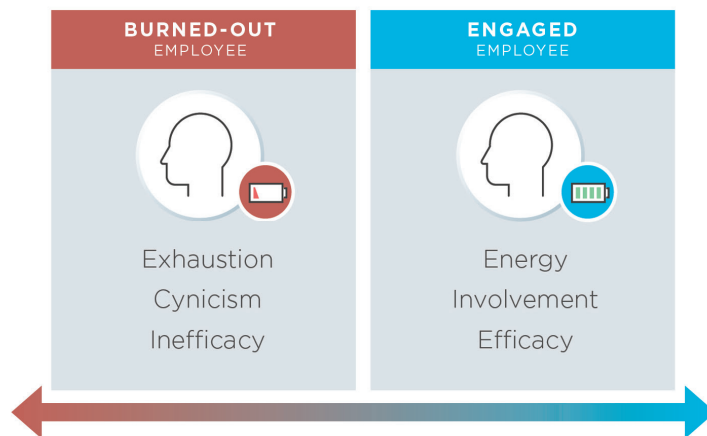


Figure 2: Burnout-Engagement Spectrum <sup>7,14,15</sup>

The dimensions of burnout are often experienced over a long period of time. Dr. Sherrie Bourg Carter explains, “you don’t wake up one morning and all of a sudden ‘have burnout.’ Its nature is much more insidious, creeping up on us over time like a slow leak, which makes it much harder to recognize. Still, our bodies and minds do give us warnings, and if you know what to look for, you can recognize it before it’s too late.”<sup>12</sup>

## 2.1 MEASURING BURNOUT

### *How to actually measure burnout?*

Although several tools have been created – including the 21-item Burnout Measures tool<sup>13</sup> – the most widely used tool is the MBI, a 22-item questionnaire designed to address each burnout dimension. Each questionnaire item gauges the respondent’s feelings about his/her job in relation to one of the three burnout dimensions. For example, statements such as ‘I feel emotionally drained from work’ (measuring emotional exhaustion) and ‘I doubt the significance of my work’ (measuring cynicism) are answered using a 7-item Likert scale. Based on these responses, a score for each dimension is generated.

Some have argued that another way to gauge burnout is to test the opposite of it – employee engagement. Gallup’s Q12 (a 12-question survey) has been frequently used across several industries to assess employee engagement. Survey items include statements like ‘How satisfied are you with [Company Name] as a place to work?’ and ‘I have the materials and equipment to do my work right’.

Both burnout and engagement measurement tools are useful but provide relatively limited information on how organizations can (1) reduce risk of burnout, and (2) help support burned-out employees. The AWL framework<sup>13</sup> helps address this gap and will be explored further in the next section.

## 2.2 EMPLOYEE ENGAGEMENT AND BURNOUT

Engagement lies on the opposite end of the burnout spectrum (see Figure 2).<sup>7,14,15</sup> Employee engagement is the “emotional commitment the employee has to the organization and its goals,” which often leads to better service, high quality work, and productivity.<sup>16</sup> Gallup, a performance management consulting firm based in the United States, reported in 2017 that only 22% of employees are engaged and thriving, and these numbers have remained low since 2000.<sup>17</sup> Declining employee engagement can be an indicator that the burnout process is starting to take shape, with energy turning into exhaustion, involvement turning into cynicism, and efficacy becoming ineffectiveness.<sup>2</sup>

## 2.3 THE EFFECT OF BURNOUT ON THE BRAIN

Although burnout might seem like an abstract concept, it can leave a lasting, physical impact on the human brain. Both brain anatomy and function can be affected by chronic occupational stress and burnout.<sup>18-20</sup>

Several recent studies suggest that burnout affects parts of the brain responsible for stress response (e.g., amygdala, cingulate cortex, and medial prefrontal cortex). These findings suggest physical brain alterations such as:

- Enlarged amygdala (brain structure responsible for emotional response – especially fear).<sup>18</sup>
- Weaker connections between amygdala and cingulate cortex (brain structure responsible for assigning emotions to stimuli).<sup>21</sup>
- Weaker connections between amygdala and medial prefrontal cortex (brain structure responsible for decision making).<sup>22</sup>
- Thinning of the medial prefrontal cortex.<sup>18</sup>

These physical changes can further explain changes in brain function for individuals experiencing burnout. Weaker connections between the amygdala and the medial prefrontal cortex, for example, could explain why studies of burned-out individuals indicate that they have more difficulty controlling their negative emotions than those who are not burned-out.<sup>22</sup>

In a study focused on the startle reflex, burned-out participants had a dramatically stronger response to startling noise compared to a control group,<sup>23</sup> suggesting that acoustical control in workplace settings could potentially help support burned-out employees.





### 3. ORGANIZATIONAL QUALITIES THAT PLAY A ROLE IN BURNOUT

Burnout is a widespread<sup>24</sup> and costly<sup>1</sup> global issue that is correlated with increased employee turnover and reduced productivity in organizations. As such, it is helpful to explore what companies can do to help prevent employee burnout.

Maslach suggests that employee perception of six key contextual areas can contribute to burnout (or engagement) in the workplace:

1. **Workload** – the amount of work to be completed by a given deadline. Workload also assesses the extent to which duties infringe upon one's personal life.<sup>14</sup>
2. **Values** – consistency between personal values and values inherent to one's workplace.<sup>14</sup>
3. **Control** – the willful participation in important work decisions. Control also includes a range of personal autonomy in decision-making.<sup>14</sup>
4. **Community** – quality of the social context of one's work setting, including relationships with managers and colleagues.<sup>14</sup>
5. **Reward** – financial and social recognition that one receives for one's contribution to the job (i.e. salary, awards, praise).<sup>14</sup>
6. **Fairness** – the extent to which rules and regulations in the workplace are instituted equally for all employees.<sup>14</sup>

These areas focus more on the working relationship between employers and employees (rather than the needs of the organization or the individual) and can be measured using the AWL Survey.<sup>25</sup> This survey generates a score that can help identify strengths and weaknesses in each of these contextual areas.

Risk of burnout is high when employee perception of these six areas doesn't align with their expectations. For example, if a new employee joins an organization thinking he/she will work 40

The Occupational Safety and Health Administration sets legal limits for noise exposure in the workplace and for those who work 8 hour-days. **The maximum noise level permissible is 90dBA.**<sup>75</sup>

Typically, open-office plans experience noise levels ranging from **60-65 decibels**, which is considered too loud for 'intellectually demanding' work.<sup>37, 76</sup>

"Mind the Workplace," a survey administered by Mental Health America, found that **71% of respondents** state that they are always, often, or sometimes distracted and find it difficult to concentrate because of their work environment.

*Mind the Workplace Survey<sup>77</sup>*

hours per week, but the workload actually requires 60 hours per week, this is a mismatch between employee workload perception and expectations.<sup>26</sup>

Control is a dimension that can greatly be impacted by workplace design and policy (see Figure 3). High work demands are often more tolerable when an employee feels they have control over their work and work environment. Many factors may impact feelings of control over the physical work environment—ranging from lighting, to scent, to noise levels. Particularly, the ability for employees to choose where they work and how, as well as their ability to adjust environmental factors in the workplace to meet their needs is central to a sense of control within the work environment.

### 3.1 WORKPLACE INTERRUPTIONS AND PERCEIVED CONTROL

When examining workplace stress as it relates to the environment, most theoretical models focus on the misfit between the environment and the individual. Control theory, for example, suggests that an individual's perception of control over their environment affects whether or not they experience stress.<sup>27</sup> This theory, although not all encompassing, relates to burnout in that it does not focus on the environmental stressor, but rather the perceived intensity of the stressor.<sup>27</sup>

One way an employee can feel a lack of control is through workplace interruptions. The typical office employee spends 11 minutes on a given project before being interrupted, and it takes them about 25 additional minutes to refocus.<sup>28</sup> Employees are often interrupted multiple times during the workday (from email notifications, phone calls, co-workers talking, etc.), requiring the brain to use valuable energy to refocus throughout the day. Over time, this experience has potential to trigger a stress response (e.g., the professional inefficacy stress response mentioned above, which relates to the feeling of lack of achievement or productivity at work).<sup>29</sup>



Figure 3: Areas of Worklife Model <sup>14</sup>

### 3.2 ACOUSTICS AND SENSE OF CONTROL

Sound itself is not an undesirable condition, however noise—which is unwanted or disruptive sound—is. The difference between the two depends on both the circumstances and the listener's sensitivity, which makes the issue of control paramount. The ambient noise of a coffee shop, for instance, can be perceived as desirable to some individuals performing certain tasks and disruptive to others. The inability to escape unwanted noise or audible distractions at work can make employees feel they have little control over their work environment, and also lead to perceptions of increased workload.<sup>30-32</sup>

As the traditional office loses its physical barriers, noise has become one of the biggest issues in modern-day open-offices.<sup>32,e</sup> Depending on the design, open-offices can experience a higher level of noise than single or low occupancy offices due to architectural characteristics such as the reduction of absorptive surfaces such as walls and other partitions, as well as the increase in the number and proximity of occupants sharing the same space.<sup>33</sup> Although open-office layouts make it easier for employees to physically approach one another, some designs<sup>f</sup>

e. It should be noted that noise and poor acoustic design has long been an issue even in traditional closed offices.

can also be associated with increased distraction, reduced concentration levels, and lower levels of motivation.<sup>34-36</sup>

Noise exposure can be distracting depending on the nature of work. Exposure to noise is more detrimental to productivity for complex work which requires executive functioning and information processing (i.e., working memory). When employees in a poorly implemented open-office setting become distracted by noise, there is little that they can do to address the issue due to lack of control. Some may try to work through the noise, while others may use noise-canceling headphones to block out the sound. This, however, can defeat certain benefits of an open-office plan, which are intended, in part, to foster a collaborative work environment.<sup>37</sup>

With sporadic or episodic exposure to noise, no place to escape noise, and little to no control over the noise, employees may find it difficult to avoid audible distractions. Strategic workplace design can help mitigate the risk of chronic occupational stress that can result from the lack of acoustical control within the work environment.

f. Please note that the term 'open office' is colloquially used to reference an otherwise wider and more nuanced spectrum of office designs. There are a vast spectrum of open layouts (Alternative or Activity Based Working or Neighborhood-based Choice Environments, to name a few)<sup>71</sup> that can help address typical disruption / noise issues (see Section 4.2.4 for additional information). Here, we refer to "open offices" which have minimal, often low, vertical barriers between occupants and types of activities, and assigned seating with little to no alternate work areas to provide a choice of work environment.





## 4. DESIGN AND ORGANIZATIONAL SOLUTIONS

Thoughtful workplace design (and supporting policy) are vital in helping create office spaces where employees can thrive. As the workplace landscape evolves, many strategies have emerged to help occupants enjoy the benefits of open-office spaces without sacrificing their ability to focus or recover from stressful situations. In particular, environmental design features have the potential to limit audible distractions, which can contribute to a reduction of stress and overall improvement of job satisfaction.

Below we discuss how specific workplace interventions can potentially help reduce occupational stress. These strategies include flexible work locations and spatial design, as well as more specific interventions designed to absorb, block, and cover noise.

### 4.1 FLEXIBLE WORK LOCATION AND SPATIAL DESIGN

Activity Based Working—or giving employees the freedom to work (and recover) at the place and time that best suits them - is often a key component of addressing acoustic distractions. For many, traditional ‘open office design’ conjures up memories of sitting in a sea of grey-walled assigned desks under fluorescent lighting for 8-9 hours. Noisy co-worker conversations, ringing phones, or loud air-conditioning units were problems to be solved by the facility management or human resource teams. This left the employee disempowered to solve problems they might be experiencing on a daily basis.

Today, more workplaces acknowledge that employees feel a greater sense of control and satisfaction when they have the freedom to choose between work and recovery environments according to their needs.<sup>38</sup> So, in addition to the typical cubicle and conference rooms, workplaces are adding spaces like game lounges, phone booths, wellness rooms, and nap pods. If occupants want to take a private business call, celebrate an office birthday, or meditate after a big meeting—there’s a space for that. The combination of thoughtful spatial design and supporting organizational policies (such as prohibiting talking or phone calls in certain areas) shift more of the locus of control into the occupant’s hands.

Large budgets and massive renovations aren’t necessarily needed to accomplish these goals. Where an architectural renovation isn’t plausible or currently in budget, a variety of manufacturers offer modular architectural components and high-backed upholstered furniture elements to bridge the gap.

#### *Why not just allow employees to work from home every day and avoid office distractions entirely?*

At first glance this does seem like a viable option. Research by Global Workplace Analytics suggests that roughly 3.9 million U.S. employees (2.9% of the total U.S. workforce) work from home about 50% of the time.<sup>39</sup> Additional research suggests as office distractions increase (auditory distraction, lack of privacy, visual distraction & noise), the positive effects of telework also increase.<sup>40-42</sup>



However, strong social connections at work—which are more difficult to build as a remote worker—have been shown to improve employee engagement, productivity and quality of work.<sup>43</sup> Increased connection with co-workers can also reduce feelings of loneliness and isolation, as well as improve health.<sup>44</sup> Therefore, it's likely that the best option would be to spend a portion of week in the office and working remotely. This suggestion is supported by Gallup, who reports that the most engaged employees spend up to 20%—or 1 workday—of their time working remotely.<sup>15</sup>

*During the other 4 days, however, what interventions can be implemented to reduce stressful acoustical distractions?*

## 4.2 ACOUSTIC SOLUTIONS

### 4.2.1 SOUND ABSORPTION

Deployment of noise absorption material is a critical part of an optimized work environment.<sup>45</sup> Sound absorbing office materials and furniture are gaining popularity, and due to the expansion of the open-office layout, the market for these products is on the rise.<sup>46</sup> These materials may be used on a variety of surfaces. For more complex designs, the expertise of an acoustician is highly advisable to balance the needs for privacy, speech intelligibility, and noise reduction.

Walls should be considered for absorptive material where possible, both on open environments and in closed conference rooms and work spaces to reduce reverberation and improve speech intelligibility. These surfaces can also be decorative, such as perforated wood panels or acoustic backed paneled fabric artwork, or functional, such as tackable fabric or cork materials. Walls are highly effective surfaces for occupant noise absorption, as they are in the direct path to receive occupant speech.

Acoustic ceiling tiles have long been considered one of the most effective ways to absorb sound,<sup>47</sup> particularly as designs have incorporated less walls and sound barriers. These ceilings may take the form of a monolithic dropped ceiling surface, though this is not the only possible design. Where an elevated height, more open and industrial feel, or more complex design is desired, a variety of highly absorptive panels and shapes may be suspended in the open plenum. In addition, some absorptive panels (with careful attachment detailing) may be adhered directly to the structural deck.

Floors, though out of the direct path of speech, can also play a part in effective acoustic environments. Carpeting and other resilient

and absorptive surfaces can reduce the noise generated by footfalls, carts, and other equipment, as well as general reverberation in the space.

#### 4.2.2 NOISE BLOCKING

For expectations of privacy, and to accommodate a variety of work styles and social needs, noise blocking is an important component of good acoustic design. Designers and clients should endeavor to create acoustic maps alongside space plans to understand where disparate expectations for acoustic environments exist in adjacent spaces, so that sound barriers may be effectively deployed.

Sound barriers must be carefully constructed in all dimensions to be effective. Sound, much like water, will find any opening through which to transfer to adjacent spaces. Mass is the most effective, though not always the most practical, form of sound barrier. The Gypsum Association Fire Resistance Design Manual, though written for fire safety concerns, provides a wealth of generic and proprietary assembly constructions for sound barriers with tested sound transmission class (STC) values.<sup>48</sup> A wealth of manufacturers provide the materials to create these designs, including specialty items such as sound isolation clips which can reduce the reverberative transmission of sound. Additionally, the National Research Council Canada has a free prediction tool—soundPATHS—that can help predict sound transmission between two rooms.<sup>49</sup>

Where these barriers meet other construction assemblies is also a point of concern. Penetrations must be tightly packed and well designed. Exterior mullions can be insulated with caulk, expanding foam, or lightweight cement to avoid transfer sound around well-constructed interior walls. Ceilings can also provide barriers to sound transfer and permit the necessary free transfer of air for HVAC system and ventilation operation. Doors and windows introduce points of weakness in the assembly, but solid core doors and well-designed jambs and thresholds can minimize these concerns. Where hard surface flooring is used, installation methods should be used which reduce the IIC, or Impact Isolation Class, which measures transference of sound.

#### 4.2.3 NOISE COVERING

##### 4.2.3.1 SOUND MASKING: WHITE / PINK / BROWN NOISE

Several research studies have documented the detrimental effects of office noise on performance and stress.<sup>32,50–52</sup> Sound masking systems can be used in offices to provide a steady background noise that can drown out speech and other noise. These systems typically produce a sound that is between ‘pink’ and ‘brown’ noise.

In office settings, white, pink, and brown noise are used to cover acoustical distractions. The difference between ‘noise colors’ lies in the combination of frequencies. White noise is high pitched and includes sounds like television static; pink noise has less energy at higher frequencies and includes sounds such as rainfall; brown noise has the lowest sound frequency of the trio and include sounds like distant traffic.<sup>53</sup> Noise is most effectively covered when the frequency characteristics of sound-masking matches the sound being masked.<sup>54</sup> White and pink noise systems have been linked with improved cognitive processes and performance<sup>55–57</sup> as moderate noise levels may increase processing difficulty and ultimately lead to higher creativity.<sup>58</sup>

#### 4.2.3.2 NATURE-BASED SOUNDSCAPING

The study of soundscapes, or acoustic ecology, examines sounds in combination as acoustic environments. Natural sounds, in particular, draw upon humans innate affinity for living things - often referred to as Biophilia.<sup>59</sup> Principles of biophilic design have been incorporated into a variety of building types to improve the indoor experience and reconnect humans to nature within the built environment. These experiences of nature support a number of measured outcomes including stress reduction, improved cognitive function and enhanced mood.<sup>59,60</sup>

Effective biophilic design strategies create multi-sensory environments, stimulating not just the visual system, but also the auditory, somatosensory, and even olfactory systems in the same way nature might. For example, Pheasant et al. found that landscapes and soundscapes deemed 'tranquil' need both auditory and visual inputs.<sup>61</sup> In one study, water sounds were played with and without an accompanying running water video, and participants reported greater restoration (lower tiredness and lack of motivation) following the running water video over all other tested sounds.<sup>62</sup> Other studies have found that sound masking of speech using natural water sounds is found to be rejuvenating and lead to higher scores on cognition tests as compared to alternative masking sounds such as pink noise, ventilation noise, instrumental music, and vocal music.<sup>56</sup>

Subjective categorizations of noise (unwanted sound) rely heavily on the meaning attached to the sound.<sup>63</sup> Surprisingly, sound level accounts for only 25% of the variance in sound annoyance.<sup>64-66</sup> Because of humans evolutionary history with nature sounds, in particular moving water, one positively associate those sounds with tranquility, safety and "non-taxing involuntary attention."<sup>63</sup> In a 2009 study, Watts, Pheasant, Horoshenkov, and Ragonesi found that the perception of a water sound as "natural" was the key determinant to whether the participants considered the sound to be tranquil.<sup>67</sup> Alvarsson, Wiens, and Nilsson (2010) observed that birdsong or rippling water may promote faster physiological stress recovery compared to traffic noise or ambient building noise.<sup>68</sup>

Acoustical control is, of course, one part of a much larger picture that can impact employee stress response and burnout.





## 5. CONCLUSION

Burnout continues to be an important issue affecting today's workforce, and with the evolving workplace, workers must adapt in order to succeed. Employees today are experiencing very low engagement levels, and employers are continuing to see rising health and turnover costs. Burned-out employees often struggle with a mismatch of organizational qualities such as workload and control, which directly affect their stress levels in the workplace. By placing employee health and well-being at the center of design, we can create workplaces that help mitigate burnout.

Organizational qualities such as workload, community, values, reward, and fairness are all equally important to address. Employee control facilitated by workplace design, however, is a critical but often overlooked component of addressing burnout. Limiting acoustical distractions by implementing passive workplace interventions (such as sound masking and designating quiet workspaces) gives employees the agency to manage acoustical stimuli. In doing so, employees have a lower chance of experiencing stress from distractions in the workplace, which in turn, can reduce the likelihood of stress building up to a chronic, burnout level.

The estimated \$125-190 billion annual cost of work-related stress in the United States is too large to ignore.<sup>1</sup> Employers can harness the power of design to mitigate stress, and help their employees stay focused, engaged and productive throughout the workday.

## 6. APPENDIX A: BUILDING CERTIFICATION

Many employers are now taking interest in ways to improve the workplace to cater to occupant health and well-being more broadly. Building certifications offer a way for employers to demonstrate their achievement in and receive recognition for implementing multiple health and well-being promotion interventions in the workplace.

The WELL Building Standard™ Version 2 pilot (“WELL”) focuses on ten concepts of health and well-being, including: air, water, nourishment, light, movement, thermal comfort, sound, materials, mind, and community. It uses best practices in design and construction, along with evidence-based wellness interventions and is the first standard to focus primarily on occupant health and well-being. WELL has many features, which aim to be the foundation for wellness in the built environment, and optimizations, which are optional technologies, strategies, protocols and designs that can be applied to demonstrate additional achievement in WELL and to qualify for top tier (Gold, Platinum) certification.<sup>69</sup>

WELL includes multiple features supporting acoustical comfort for building occupants. WELL offers recommendations to insulate, absorb and mask sound to provide a more beneficial work environment for occupants. As part of WELL, in order to maintain a project’s certification, a building must also maintain a healthy environment over time by re-certifying every three years.



### 1. FEATURE S01: SOUND MAPPING

Interior and exterior noise sources increase background noise levels in occupant spaces, which increases susceptibility to distraction and reduces productivity, memory retention, and increases stress levels.<sup>69</sup> To reduce intrusive interior and exterior noise sources, WELL requires interior planning and site zoning (to improve the acoustical environment of the interior space).<sup>69</sup> This feature includes three parts: managing background noise level, managing acoustical privacy and labeling acoustic zones (loud, quiet, and mixed zones).<sup>69</sup>



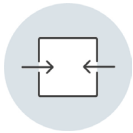
### 2. FEATURE S02: MAXIMUM NOISE LEVELS

To cater to occupant acoustical needs, WELL requires a plan to identify quiet and loud zones of work. These zones offer occupants a chance to escape when needing a quiet place to work, or spaces to collaborate with coworkers. This feature works in tandem with Feature S01: Soundmapping, and sets recommendations for sound pressure levels. For example, open workspaces must have an average dBA of 55 to be awarded points.<sup>69</sup>



### 3. FEATURE S03: SOUND BARRIERS

This feature focuses on increasing privacy between spaces to reduce disturbance from external noise sources.<sup>69</sup> The measure used for verification is Speech Privacy Potential (SPP), which is the sum of the noise reduction across a partition and the dBA within a receiving space.<sup>70</sup> Additionally, the feature also has door specifications for private offices and conference rooms to minimize acoustic distractions for occupants outside of those rooms.<sup>69</sup>



### 4. FEATURE S04: SOUND ABSORPTION

To enhance speech intelligibility, WELL recommends designing spaces that reduce reverberation time. Distractions from other occupants such as phone calls can be disruptive to focused work in an open office setting. This can be achieved by using sound-insulating materials to reduce and control the transmission of sound from room-to-room.<sup>69</sup> Part 1 of the feature requires that conference rooms, regardless of size, achieve the ideal reverberation time in less than 0.6 seconds.<sup>69,g</sup> Part 2 requires the implementation of sound reducing ceilings, especially for spaces where floor finishes are hard (i.e. wood, polished concrete).<sup>69</sup> Finally, part 3 requires that wall finishes meet NRC<sup>h</sup> specifications to enhance the absorption of sounds in open and closed office spaces as well as conference rooms.<sup>47,69</sup>



### 5. FEATURE S05: SOUND MASKING

Electronic sound masking systems deliver a “minimum level of low-level, unobtrusive background sound” similar to the spectrum of human speech.<sup>56</sup> These systems mitigate disruptions called by intelligible human speech, increasing speech privacy. This feature requires that sound masking levels measured from the nearest workstation are 45-48 dBA in open offices, and 40-42 in enclosed offices and conference rooms.<sup>71</sup>

g. The time (in seconds) required for the sound pressure level to decrease 60 dB in a room after a noise source is abruptly stopped.<sup>40</sup>

h. A number rating of the sound absorption of a material, for ceilings and walls in open and closed spaces in the office.

## LIMITATIONS:

This publication is intended for educational and discussion purposes. The information and resources described within this document should not be relied upon to make investment decisions. Any projections or forecasts described may not come to pass. Any correlations mentioned may or may not be causal, and/or could be confounded by unidentified variables and/or the research methodology itself. The opinions expressed within this document are as of June 2019 and could change at any time.

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