Stantec

Design
Quarterly

Methods and mindset

Shaping elevated outcomes

ISSUE 27

Methods
and mindset

In design, everything counts.
Mindset, tools, methods,
goals, and processes all
shape the design outcome.

In this issue, we examine the ways designers
experiment with new digital tools, measure
different metrics to improve results, and
assert what's possible in the shell itself.

ⓘ

With your reading experience in mind, we have built in
easy ways for you to navigate this document. Use the
bottom menu, arrows, and the table of contents to flip
to different sections. Watch for information icons,
arrows, buttons, and underlined hyperlinks throughout
the document. They will lead you to more information.

Interview by John Dugan

AI tools for architecture

8 mantras for using AI in design

By Hans Davis and David Lee

Designers explore the possibilities for AI in architecture with an internal competition

AI tools for architecture are getting better.
They are changing the practice of architecture and interior design.

A few years ago, experimenting with AI tools for architecture often meant a lot of trial and error: we generated many images and found only a few usable. All of that is changing. These AI design tools are increasingly sophisticated. As we found out, many are usable in our day-to-day practice.

We recently took part in IdeaXchange, an internal competition that's intended to showcase the possibilities for AI integration in the design process.

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2025

Idea*x*change

Through the IdeaXchange, designers can explore innovative approaches to using AI in design. It encourages us to refine our application of new design tools and discover new workflows using AI tools for architecture.

Participants were challenged to design new corporate offices for a sustainable aerospace company including a research and development laboratory and an advanced manufacturing floor for product development and testing. The three-story 170,000-square-foot facility would house 275 employees.

For our IdeaXchange design competition submittal, we used AI tools to design an aerospace company headquarters and production facility. So, how did we use AI tools for architecture in our design competition project?

We used AI for massing, modeling, and orientation

We set up the site in a realistic context to understand nearby buildings and daylight orientation. AI tools enabled us to experiment and iterate various possibilities for the building's shape and test them for sustainability. We even used AI tools to convert 2D images into 3D models, which is a new approach for architecture.

We used AI for functional programming and generating floor plans

We used AI to determine the appropriate square footage for the headquarters. Our team validated AI's recommendations for the program against space utilization by real aerospace companies. We ran employee profiles through a large language learning model (LLM) platform to align our program with user experience. We used an AI-powered tool to automate and iterate floor plan layouts.

We used AI for interior materials selection

We trained an AI tool on the interior design for various airport projects featuring a mass timber structure. We used the AI image generator to see how various material palettes would relate to the mass timber in the workplace interior.

We used AI for parametric façade design

Parametric design creates patterns based on a user-defined algorithm. It can take a team a week to program and create a parametric façade. The fictional company's origami-inspired logo inspired our design concept and facade. Our team leveraged AI to generate scripts that we used to create a complex parametric façade in our 3D model. This approach reduced the time required for this task from about 17 hours to just two hours. Many of our design teams already apply AI in this way in their daily workflows.

We used AI for visualization and rendering

Detailed, photorealistic renderings can take many hours to produce and update. AI tools helped us quickly produce realistic renderings of our aerospace headquarters. This made it easier for us to iterate and evaluate our design ideas. AI lets us perform minor editing tasks quickly, add people to our renderings, and test various furniture layouts. We validated the 3D environment for user experience with virtual reality goggles.

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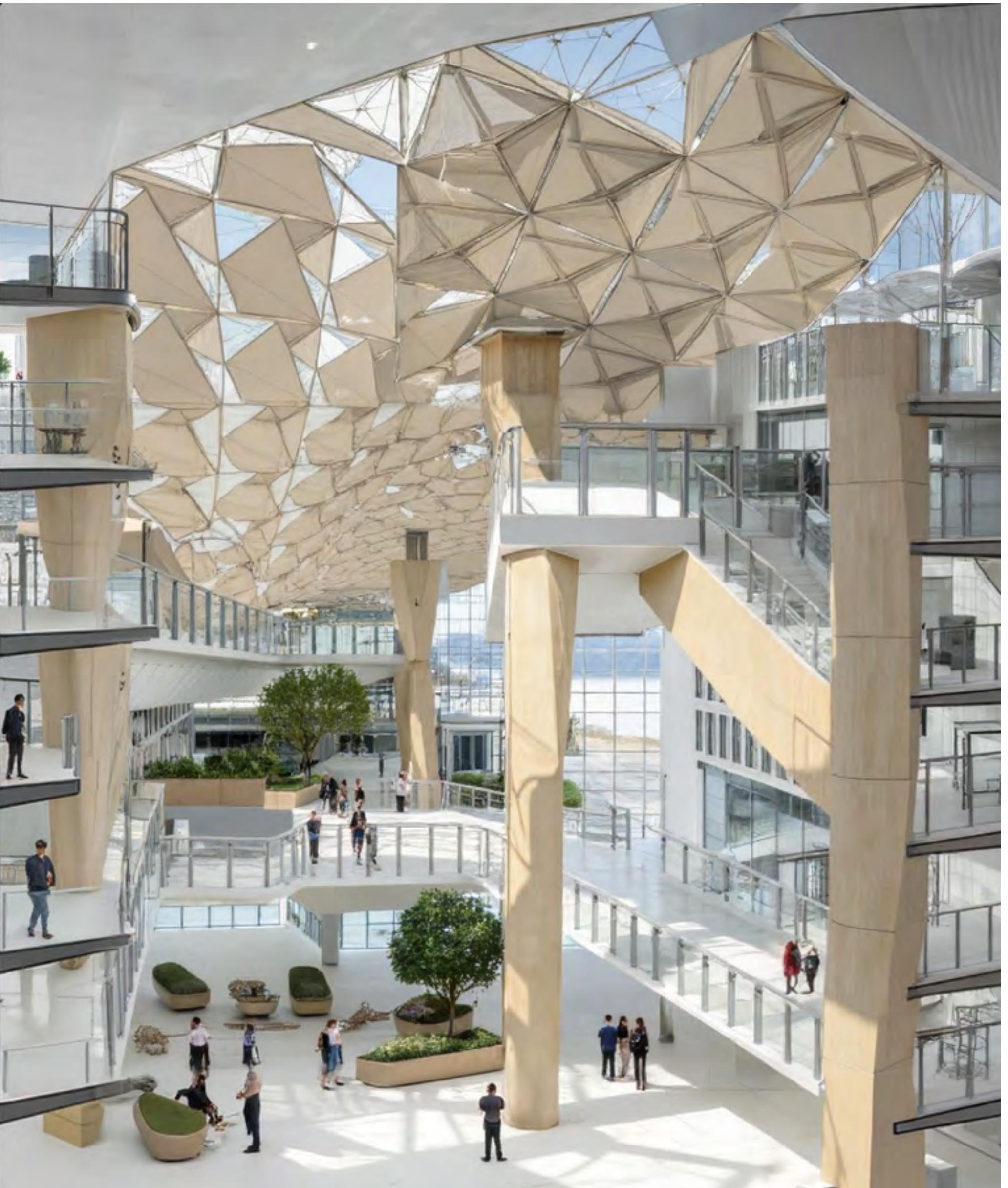
What did we learn about AI tools for architecture in the IdeaXchange design competition?

We can summarize the lessons of AI in the following AI design mantras. These guidelines are, like our AI-powered design process, works in progress which we will continually refine.

01.

APPROACH AI AS A TOOL, NOT A DECISION MAKER

Understanding where and when to apply which AI tool is important. And it's still work. Creating prompts, optimizing workflows, choosing inputs, sorting through the output, retouching imagery: all of that takes time. There's still a lot of work done outside of AI that defines the project outcome. We can use AI to augment our design capabilities, but it doesn't replace human creativity or choice. Designers (and our clients and collaborators) remain the ultimate decision-makers.

02.

OVERCOME FEAR THROUGH USE

For some of us, the first emotion when it comes to AI is fear. We overcame fear through experimentation, play, and curiosity about the power of AI. Using it to iterate and refine our project helped demystify AI. We built confidence in our ability to guide the design process and achieve satisfying results. We're thrilled to have the chance to push this technology to the limit.

> **"**
>
> **For some of us, the first emotion when it comes to AI is fear. We overcame fear through experimentation, play, and curiosity about the power of AI.**

03.

EXPERIMENT, ITERATE, AND PLAY

Success with AI comes from approaching it with curiosity, testing what is possible, and learning from it–again, and again. Some AI tools are new to us, and we need to try them out to see where they are most valuable.

Design is an iterative process. Using AI at this stage doesn't change that. Years ago, we were playing in Midjourney and finding the results unsatisfactory; the quality was not what we required for work. But we kept on playing. Now, as technology is evolving, we are ready to push AI tools to places where they bear fruit. AI is very good at generating multiple options. Practically speaking, AI speeds up the iterative design process. As we sharpen our design intention, it allows us to make hundreds of edits and re-export the imagery.

04.

CHOOSE THE RIGHT AI TOOL FOR THE TASK

A good designer knows that they are better at some things than others. We are always looking for tools that can do the things we don't like to do, or to take on arduous time-consuming tasks.

For example, we love creating renderings, but don't always love that they can take 60 hours to generate. What if we could create quality rendering in three hours? That's the kind of tool we want in our toolkit. On the IdeaXchange project, we were able to dial in astounding results using AI's image generating capabilities in a fraction of the time it would take to render them in conventional technology.

Maybe some AI tools for architecture aren't ready for day-to-day use? Recognizing which AI tool fits a specific design challenge is key; not every tool is suitable, and part of the process is reducing our tech stack to what works best. Example: This competition gave us the opportunity to research certain applications. We tried and discovered that one well-known app was a clunker. It was not useful for our purposes. We can share our results with designers. That way we can spend more time with better tools.

⊡ **Using AI for space programming**
Rather than use a generic aerospace facility program, the team fed professional personas into AI software to customize the space for real users of a research and manufacturing facility.
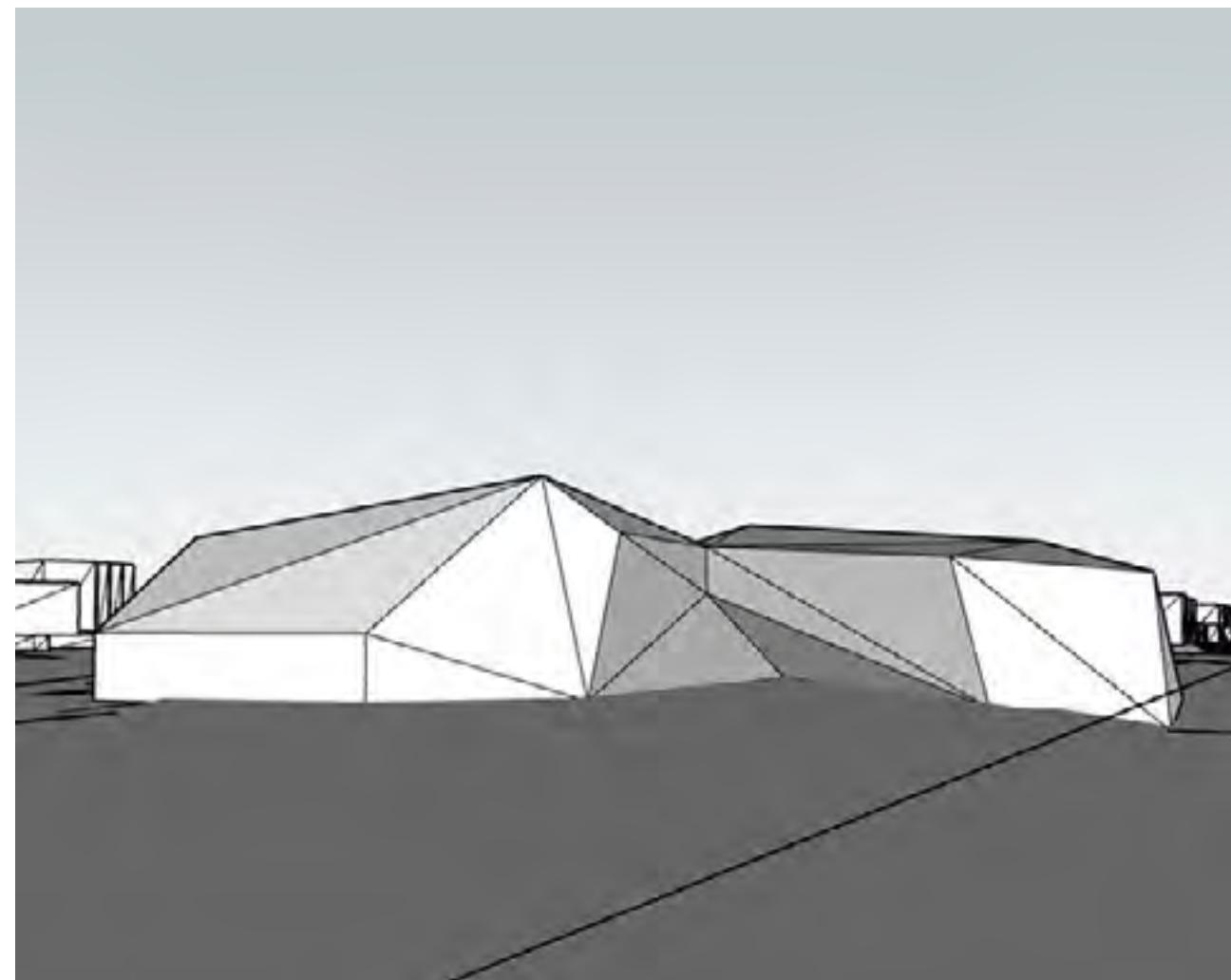
Exploring possibilities
AI tools enabled the team to experiment and iterate various possibilities for the building's shape.

Parametric modeling meets AI
The team leveraged AI to generate scripts it used to create a complex parametric façade.

05.

COMBINE AI WITH OTHER POWERFUL DESIGN TOOLS

It's inevitable that we will find ways to combine different AI tools for architecture to find more efficient workflows. In IdeaXchange, we discovered that using AI in the design process was extra powerful when used in conjunction with the latest and greatest in our digital design toolbox. When we take this intentional, professional approach, we can constrain and control the AI tools to produce output with design utility.

For example, we created the building's complex origami-inspired façade by using various AI tools in conjunction with Grasshopper, an algorithmic design tool. To get the most out of AI, we had to make sure our model was Revit-friendly. We had to ensure that the models we were building with help from AI could be used in our downstream workflow. We wanted to be able to apply our sustainability modeling tools to the models built in AI.

06.

FIND SOLUTIONS THROUGH COLLABORATION AND SHARE THEM

The value of our experimentation is multiplied when we tell our colleagues what we've learned. In IdeaXchange, we shared both our discoveries and failures, helping team members learn about tools and workflows along the way. We plan to share more best practices for AI tools for architecture as we develop them.

07.

REMEMBER THAT CREATIVE FREEDOM FUELS AI EXPERIMENTATION

The value of internal competition can't be underestimated. This competition format allowed us to take risks and explore AI tools for architecture in ways that would be impractical with a current project for an existing client. The freedom to create, explore, and iterate was only limited by our time. It had promising results.

The project helped shift team perceptions, showing that AI can be a positive, creative force in design rather than something to fear. Hands-on experimentation helped us understand the limitations and strengths of AI tools. Through experimentation in the competition, our team moved from apprehension to confident adoption.

08.

APPLY YOUR AI DESIGN EXPERIENCE IN YOUR DAY-TO-DAY PRACTICE

What to do with all this fresh experience? Don't lock it away. Use it and share it, thoughtfully and appropriately.

Once we discovered positive applications for AI in design and saw its reliability and potential for refinement, we soon found we were integrating it into real projects. This is perhaps inevitable. We always look for the best methods and solutions.

2025 IdeaXchange Winner

AVKARBONISERING
"Decarbonization" in Swedish

The winning team designed the building as a flexible framework that supports innovation. The spatial planning encourages fluid interaction between disciplines, fostering an ecosystem of collaboration and continuous exchange.

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Technological change is nothing new in the design discipline. We can embrace progress while staying true to our sense of good design.

Daily application

Since the competition, we have used AI tools for architecture to improve our workflow efficiency in responses to requests for proposals (RFPs). We applied AI to speed up the process of generating visualizations for RFPs, allowing our team to complete multiple proposals in a short timeframe and include high quality renderings in the materials we submitted. This gives potential clients a more immediate understanding of our design vision. Of course, that vision is not the same as a final design. It will take months or years of design development for us to deliver a final, buildable design package. However, with AI tools, we can quickly test the design idea and get a client's reaction. We can share visual representations more quickly and accurately than before, giving them something to evaluate and react to before we commit to a design. It gives the client room to think about what they need in far more detail.
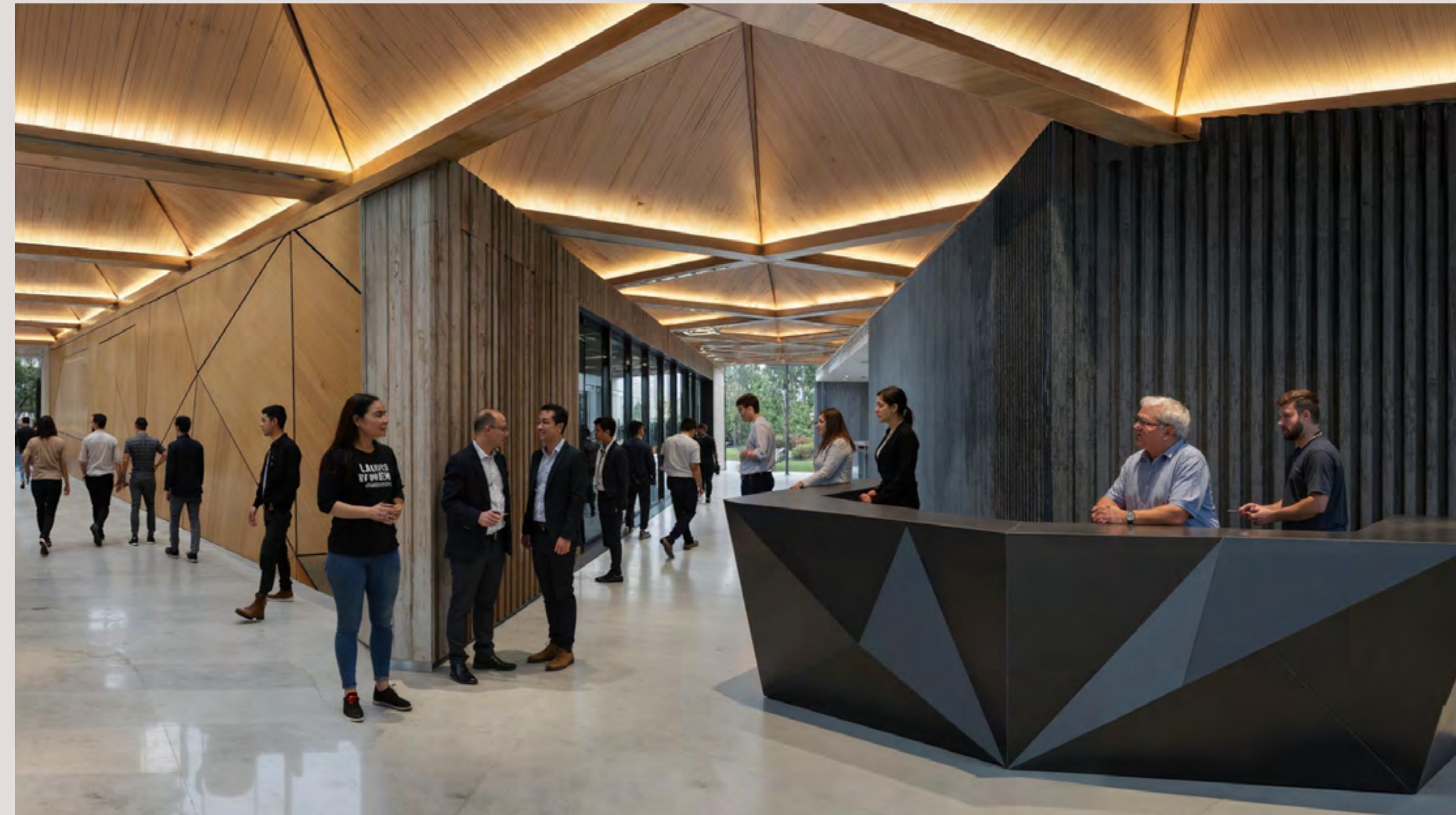
Embracing change but staying true

In IdeaXchange, we learned that these new AI tools for architecture and design can be powerful. But we've also been reminded that technological change is nothing new in the design discipline. We can embrace progress while staying true to our sense of good design. With that in mind, we can adapt to change and benefit from using AI tools.

Our IdeaXchange experience has given us the confidence and experience to apply AI in our workflows; speed up processes like massing, programming, and design visualization; and achieve high-quality design. We won't look back. ∎

◎ **AVKARBONISERING headquarters**
All images by IdeaXchange team members

IdeaXchange 2025 winners:

Joseph Bastone
Hans Davis
Edson Figueiredo
Ekaxi Hernandez
Erin Kilberg
David Lee
Chandana Mahale

Hans Davis
Architect
⊘ Denver, CO
Hans leads design initiatives related to art and technology integration, particularly as they relate to airports.

David Lee
Design Coordinator
⊘ Boston, MA
David creates guidelines and AI-assisted visualizations for projects.

Tune in

Hear more from Hans and David on IdeaXchange and using AI in design on Design Hive, the Stantec Buildings podcast.

Office acoustics: Are earbuds killing workplace design?

How designers can use soundscaping and auralization in a holistic approach to enhance acoustic comfort and productivity

By Elle Hewett

◻ **Confidential tech client workplace**
Architect of record: BORA Interiors and ZGF Shell

Our team supplied acoustical, lighting, and mechanical
design services for a tech industry workplace.

Office acoustics are important.

To create a workplace that works in the hybrid era, we need designs that take sound seriously. We need a holistic approach to design for office acoustics. When I think about some of the office spaces I've been in recently, I wonder if earbuds have ruined the modern workplace. There are too many spaces that are designed with highly reflective echo-prone surfaces, air gaps where intrusive noise can get in or out, air vents that carry unwanted conversations from one room into another, or annoying building services noise.

In many cases, office acoustics are getting worse. Has anyone considered how these spaces sound, or are they assuming everyone is on a headset anyway? The hybrid workplace is a hot topic. So, why aren't we talking about office acoustics?

I am highly concerned that modern office design places too much emphasis on technology such as noise cancelling headphones, meeting headsets with directional microphones, or video-conferencing equipment with noise suppression software solving the challenges of acoustic privacy and comfort in the workplace. This reliance on technology to solve our problems is not unique to office acoustics; it's a common approach in our era.

Rather than assume that new tech will iron out unwanted office sounds, shouldn't we be looking for innovative approaches to office acoustics that result in a more comfortable sounding workplace, where employees can do the tasks they need to do and flock to the office?

Poor acoustics is a leading cause of workplace stress. Noise negatively impacts our health. But in many places, various bodies and jurisdictions have codified acoustics in building standards and tried to simplify complex acoustic situations into easily definable single numbers and general metrics.

If your number is under, it's good and if it's over, that's bad. Acoustic consultants provide advice to ensure that these metrics are met in new workplaces and office retrofits, often with happy results. But not always.

Common office acoustics issues.

1. Workstation layout forces employees to carry out noisy tasks close to others undertaking tasks that require quiet focus.
2. Open plan spaces have reflective ceilings or open soffits resulting in the build-up of noise and allowing conversations to be carried over large distances.
3. Building services are too loud to allow concentration or too quiet to mask others' noise or conversations.
4. Pivot or frameless doors look great but result in poor acoustic sealing, rendering rooms dysfunctional due to lack of privacy and noise intrusion.
5. Videoconferencing equipment used in rooms with high background noise and high reverberance, leading to poor intelligibility for people on the other end of the call.
6. Poor sealing around service penetrations in acoustically rated walls, leading to lack of speech privacy and noise intrusion.
7. Ductwork crossing partitions connected to air grills in separate spaces allowing crosstalk.

Let's remember that studies show that acoustics matter in the workplace.

According to Leesman's *Focus Forward* report, only 35% of employees are satisfied with noise levels at their workplace. Employees who were dissatisfied with the noise levels in their workplace reported record low satisfaction levels with the movement of people around their workstation, and the quality of quiet rooms, dividers, and space between work settings.

Studies show that employees in noisy environments lose up to 86 minutes per day due to interruptions caused by noise. Organizations with poor sound risk low engagement, miscommunication, office avoidance, and lack of collaboration. Many post-COVID hybrid workplace surveys cite noise as one of the top reasons people avoid the office. Office acoustics can influence satisfaction scores, employee turnover, and space utilization.

Traditional design approaches focus on the four pillars of acoustic design to address these issues:
1. Block or shield the path of sound.
2. Absorb unhelpful reflections and control reverberance.
3. Control background noise.
4. Mask unwanted sound.

But given the persistence of acoustic issues, we are missing a critical piece of design. It's time for a holistic approach to office acoustics.

⌖ **BBC Cambridge Radio Studio**
Cambridge, UK
Architect: Flanagan Lawrence
Stantec contributed RIBA Stage 2-3 mechanical & electrical design, acoustic design, and fire consultancy.

35%   Only 35% of employees are satisfied with noise levels at their workplace.
Source: Leesman

"

**Designing workplace
environments to support
business and employee
well-being requires a new
mindset where acoustics
are integrated into the
design at the outset.**

There's an opportunity for a new approach to sound in the workplace.

We can no longer simply apply the traditional acoustic approach to office design as a bolt on service to shoehorn acoustic advice into an already evolved design. Designing workplace environments to support business and employee well-being requires a new mindset where acoustics are integrated into the design at the outset, before irreversible design decisions are made.

I am excited by a recent design research project completed by my colleagues Reena Mahtani and Jameson Musyoki. They took a holistic approach to acoustics on a pro-bono rugby club project renovation using soundscaping. The results are inspiring, and I am anxious to apply their process to office design projects.

📷 **Weyerhaeuser Headquarters**
Seattle, WA
Architect of record: Mithun

Disconnect at the office

| Top three workplace purposes	Top three work activities
1 Foster collaboration and knowledge exchange	**1** Individual focused work
2 Promote connection and sense of pride	**2** Planned meetings
3 Drive innovation and creativity	**3** Collaborating on focused work

The pressure is on to get the office right.

The hybrid work culture has raised expectations for what the workplace offers, and a disconnect between what companies are providing and what their employees desire is apparent. These results show a disconnect between the top workplace purposes with the top workplace activities. This means that there is a real risk that the workplace does not support what the employees need, which directly impacts the health and prosperity of the organization.

Source: Focus Forward, Leesman 2025

Soundscaping: A new mindset unlocks novel approaches.

Soundscaping is the backbone of this holistic approach. It focuses on the quality of the experience rather than the cold hard numbers of acoustics standards. Soundscaping uses the results of the engagement process to understand the unique needs of the organization's employees so we can focus the acoustic budget on solving their specific issues.

INITIAL SOUNDSCAPE QUESTIONNAIRE RESPONSES

Chaotic — Vibrant

Eventfulness

Monotonous — Calm

Pleasantness

○ Individual responses   ● Average response

Figure 1: **Acoustic research project.** We collect and represent the benchmark user data in a circumplex model, a graph commonly used in psychology.
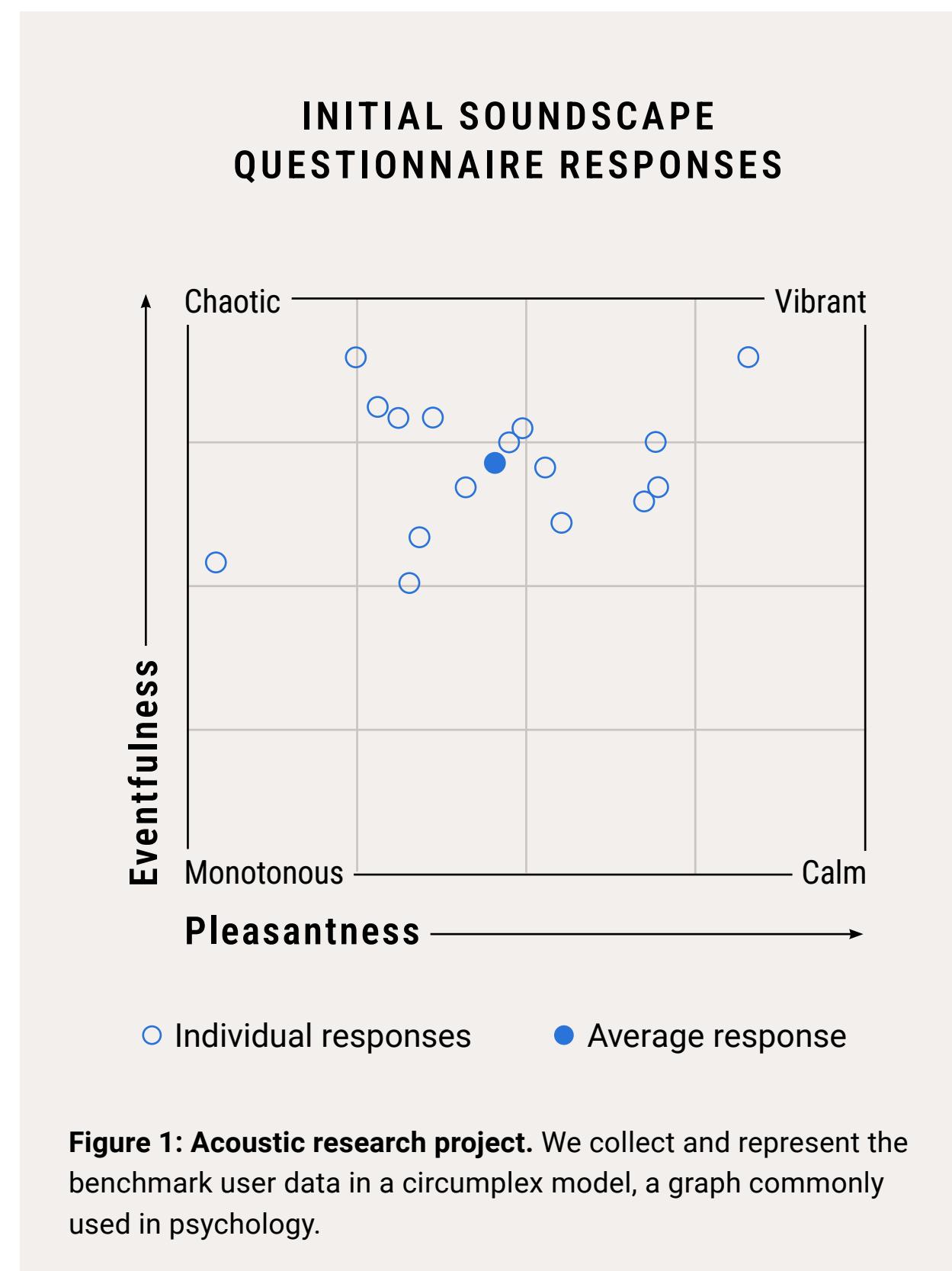
Start with detailed user benchmarking and a design brief.

This holistic approach to acoustics starts with getting the design brief right. It needs to express a clear vision of the desired outcome. Without it, there's a risk of unmet expectations, and missed opportunities for employees and organizational benefits. Benchmarking itself is not new, but it's essential to the soundscape process.

In soundscaping, we use a pre-intervention questionnaire to tease out areas of concern or issues with a current situation. This allows us to focus on an acoustic response integrated with other disciplines and target design interventions to what really matters.

Consultation must run deeper than a simple suggestion box. Organizations need to know their employees' needs, the tasks they need to perform, and the acoustic and environmental conditions to support those tasks. Here we integrate acoustic benchmarking questions with other engagement questions covering ethics, demographics, work activity, wellness, and more to tease out meaningful results. We ask users how they perceive the workplace at different times of day. We present benchmarking data graphically to make it easy to understand. *See Figure 1.*

We can gain critical insights from this type of pre-occupancy benchmarking. For instance, we can spend the budget in areas where intervention will make the biggest impact for employees rather than throwing money at generic compliance. We saw the value of detailed questioning and sound testing on a recent project for a music publisher.

The organization's internal documents asked for lower than usual background sound levels, "soundproof" rooms, and a high degree of privacy. But the term "soundproof" was misunderstood by users and there were competing ideas about privacy. We tested office acoustics to quantify existing conditions and compare them to the company's needs. Testing showed that privacy was poor, and there was nothing close to sound proofing. Low background levels contributed to poor privacy performance.

Benchmaking helped us clarify their issues. It enabled us to recommend higher background levels in certain spaces, while improving privacy between adjacent spaces. The redesign resulted in cost savings because it required less noise control for the HVAC system and allowed for lower performing partitions, whilst improving the privacy rating. The design focused the budget on meeting the needs of different departments across the organization.

Measure the acoustic performance before and after intervention.

Understanding the sound of the space before and after allows for novel design approaches. In soundscaping we use acoustic metrics that are not normally associated with workplace design. For example, Early Decay Time (EDT) measurements, rather than the more general Reverberation Time (RT), help us to understand reflected sound at close quarters. RT measures the time it takes for a sound to decay by 60dB, while EDT measures the time taken for the sound to decay by 10dB after reflection. With these metrics, we can tailor outcomes that deliver better sounding spaces within a budget.

An open-plan office we are working on gets noisy at certain times of day. The occupational noise makes it hard to get work done. If one is not wearing headphones, the harsh sound leads to a ringing in the ears—that's feedback from sound bouncing off the ceiling.

We have tested the RT previously, and it only marginally exceeds the recommended RTs. With the rugby club research in mind, we decided to take EDT, which is often used for performance space design and is associated with the way people perceive reverberance.

EDT metrics showed that the reflection path from the source to the hard ceiling and receiver is short in this office. The short path concentrates the early energy which can cause a high intensity burst of noise, leading to discomfort. Using the traditional broad brush of RT we may not have picked this up. We can also use the acoustic strength (G) metric for the listener's perception of loudness. We can increase EDT by placing absorption and diffusion materials on the ceiling or on surfaces close to the receiver/listener. This longer reflection time should lead to more perceived spaciousness and comfort.

SOUNDSCAPE

"The acoustic environment as perceived or experienced and/or understood by a person or people, in context."

Source: ISO.ORG

Use "auralization" as part of a targeted design process.

Alongside the soundscaping process, we can use advanced digital modeling tools. An auralization is like a visualization but for the ears. With Stantec's auralization tool we can create aural renderings of what spaces can sound like before they are built.

This allows designers and users to hear the acoustic quality of a design. It can be a powerful tool for testing an option with budget and sustainability considerations in mind before committing it. This gives the design team high confidence that the space as designed will achieve the acoustic aims, with no misaligned expectations.

This auralization tool helps us explore options for sound insulating construction and how they affect factors such as room-to-room speech privacy. We can use it to test combinations of background noise and sound insulating performance of building elements.

It helps with privacy between adjacent spaces. On a conference room project, for example, some background noise will mask the sound from an adjacent private space like a boardroom. While higher background noise is preferred in a circulation area to mask sound from a private conference room. To test a conference room or boardroom design, we can vary the level of noise coming through the wall and ductwork and its source: from a human voice to artiificial background noise. And we can explore the sonic quality of intervening building elements. For example: What effect will adding another layer of gypsum to a partition have? *See Figure 2.*

Conduct a post-occupancy survey and collect more data.

Post construction, we gather feedback on the design effectiveness. In the soundscaping approach, we combine a post-occupancy survey and update our acoustic metrics data. We can use this information to supplement traditional acoustic measurements and demonstrate compliance with technical design targets.

It can be difficult to quantify what makes an appropriate and comfortable sound environment. Asking people their opinion on the built environment helps us put a qualitative measurement to the outcome.

For example, on the design research project for the rugby club, my colleagues collected data that showed users found the space "chaotic" and "annoying." After the design intervention, the users told us it was a "pleasant," "calm," and "vibrant" experience. While not all these positive effects could be assigned to improved acoustics, they showed us that comfortable sound added to positive experience. *See Figure 3.*

With the rapidly evolving nature of the workplace, acoustic design has never been more important. The office environment should be conducive to a workforce that draws from various generations and cultures and is neuro and aural diverse.

The office demands a new, integrated approach to acoustic design. Spaces with comfortable sound translate into triple bottom line improvements: people, planet, and profit. ∎
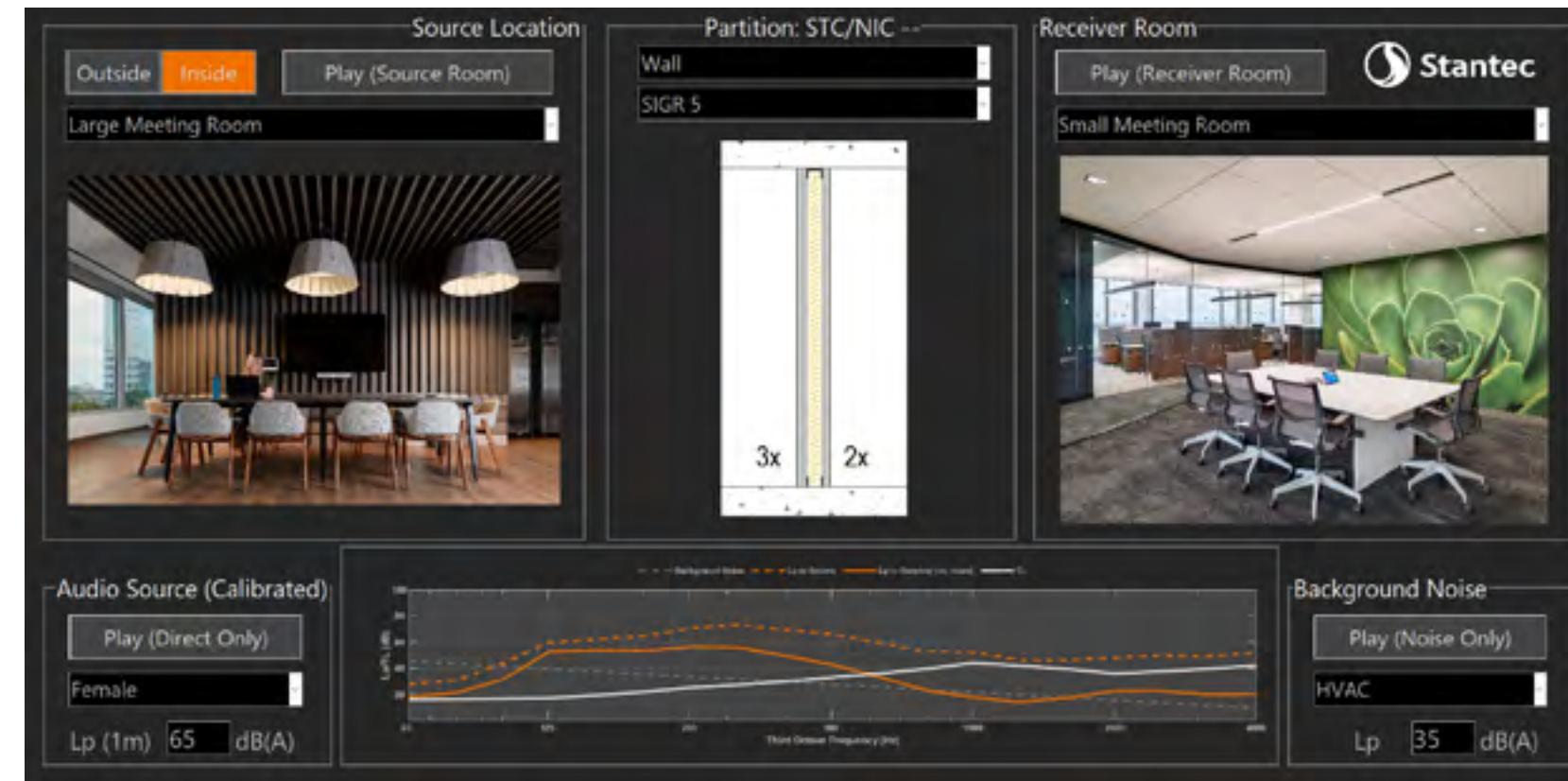
Figure 2: Stantec's auralization tool allows design teams and decisionmakers to hear design outcomes before they commit to a design solution.

SOUNDSCAPE QUESTIONNAIRE RESPONSES, BEFORE AND AFTER

Figure 3: Survey data from acoustic research project. Before and after acoustic intervention ratings of pleasantness versus eventfulness.

● Before intervention
  As seen in Figure 1
▲ After intervention
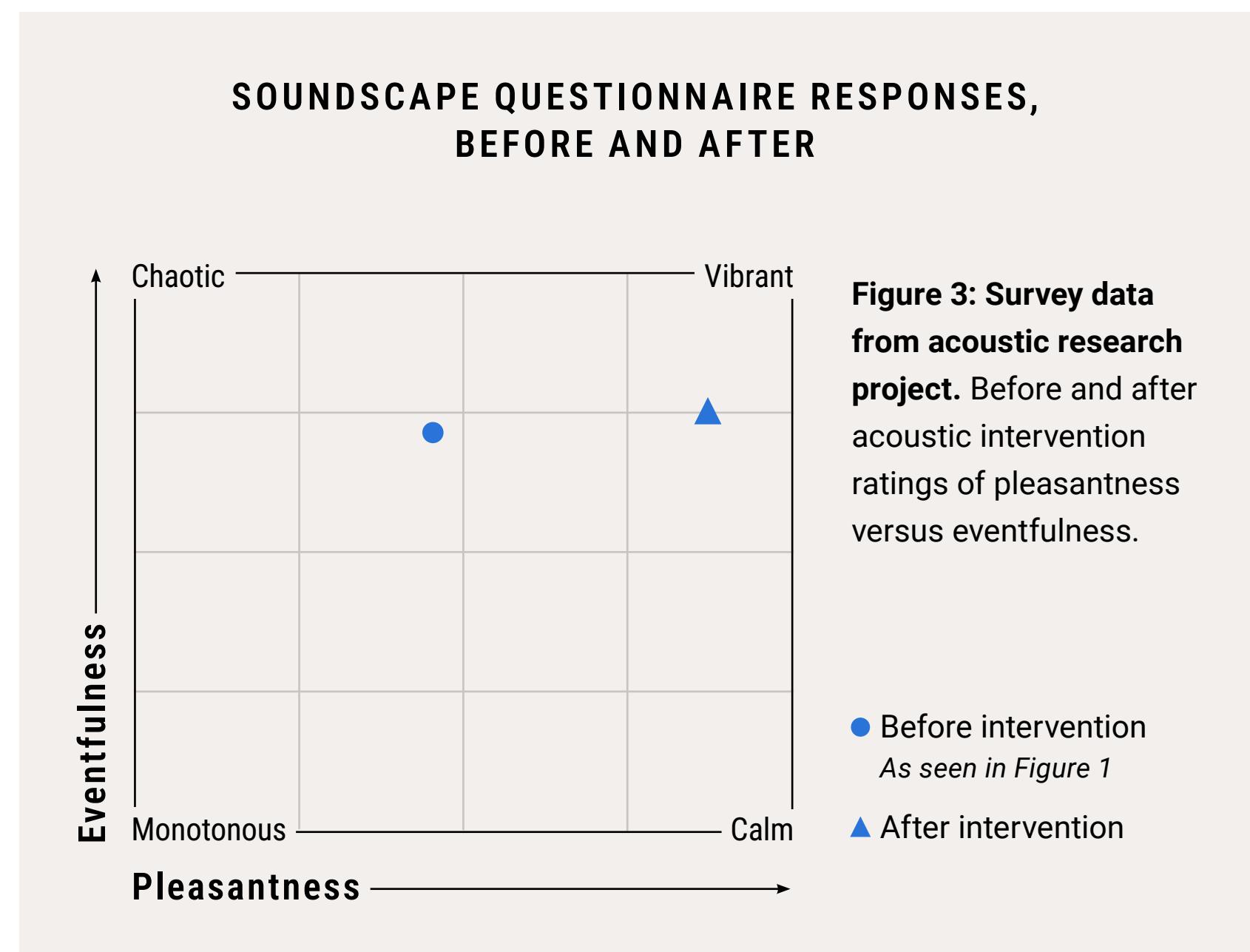
Elle Hewett
Acoustician
⌖ Bristol, UK
Elle delivers integrated acoustic design solutions on public and private projects near and far.

The State of the Workplace: Now and Next

Explore what's next in workplace strategy, space, and culture. *The State of the Workplace: Now & Next* is our new yearly report on the big changes shaping how we work.

You'll learn how adaptable environments, balanced "me" and "we" zones, and inclusive systems can drive innovation, resilience, and well-being.

Look at that!

The power of positive distraction in pediatric healthcare environments

By Beth Carroll
and Calise Gritters

📷 **Intermountain Health Primary Children's Hospital - Miller Family Campus**
Lehi, UT
Photo by Brad Feinknopf

When it comes to kids, distraction is one of the oldest tricks in the human playbook. Simple, positive distractions have the power to transform unpleasant experiences into moments of joy. Think about the wonderfully distracting effects of colorful bandages featuring cartoon characters.

We can apply similar logic to design at a larger scale. When it comes to the built environment, distraction can help or hurt the intended purpose of the environment. This is especially true in healthcare settings, in which alarms, clinical noises, unsettling sights or smells, and intense emotions can dominate. These factors can amplify anxiety, fear, and worry. But distraction can also play a positive role in healthcare.

Distraction alone doesn't heal. But it can aid the healing process by addressing the mental well-being of an individual. DuBose[1] said it succinctly in a 2018 piece on healing spaces: "The environment cannot cause healing to occur but can facilitate engagement in behaviors and emotions that support healing; the environment can induce physical and emotional responses such as happiness, joy, and relaxation; and the built environment can enhance individual control and functionality—all of which are antecedents to healing."

Pediatric environments designed for positive distraction are associated with a variety of health benefits. They can relieve stress and anxiety, encourage calm behavior and sleep regulation, and reduce pain perception. And clinical studies are beginning to associate positive distraction with reductions in the need for narcotics and other pain medications used in pediatric populations.

How does positive distraction help pediatric patients and their families?

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Positive distraction can improve a patient's waiting experience, satisfaction, and overall perception of their experience.

📷 **Children's Healthcare of Atlanta - Arthur M. Blank Hospital**
Atlanta, GA
Architect of Record: ESa
Photo by Jeremiah Hull

Positive distraction benefits children psychologically.

A child's experience within a pediatric healthcare environment will likely shape their perception of healing, wellness, and healthcare for years. When a medical event occurs, children often report experiencing "helplessness, loss of identify and control, lack of social support, and accompanying fear and pain"[2] which, unaddressed, can lead to symptoms associated with depression and anxiety disorders.

One might think a tablet or smart phone could provide the necessary distraction. But research has shown that too much screen time can negatively affect the wellbeing of children and adolescents.[3] So, we want to look at alternatives for distraction in the healthcare environment.

Positive distraction reduces parent/caregiver stress.

A child's emergency visit, procedure, or hospital stay is among the most stressful experiences a parent can face. Even the calmest can enter fight-or-flight mode, shaping negative perceptions of healthcare environments and staff. Positive distraction can significantly lower parental stress and anxiety[4], improving decision-making, communication with clinicians, and overall emotional regulation.[5]

Positive distraction transforms healthcare delivery into a better memorable experience.

Designs that can deliver delight and wonder alongside high-level care have a hidden benefit. Researchers say positive distraction can improve a patient's waiting experience, satisfaction, and overall perception of their experience. Positive memories encourage individuals to regularly access healthcare and this results in better healthcare outcomes. Healthcare designers can harness the power of positive distraction to encourage the creation of meaningful, uplifting experiences that make powerful memories for children and families.

Positive distraction sets the care team up for success.

Providing positive distraction in pediatric healthcare environments allows the clinical and para-clinical pediatric team members to shine. It's easier for them to provide care for a more relaxed and pleasantly distracted child than one that is stressed and fearful. Therefore, adjacencies are important. Positive distractions should be connected to well-designed, flexible spaces for care. In this way, our designs can help the team weave positive distraction into the fabric of day-to-day care.

Incorporating positive distraction in the design process

During the early visioning and programming phase of a pediatric healthcare project, the design team must collaborate with providers to explore what positive distraction could look like in their specific context and culture. They should build these elements into the functional program and champion them in the business plan. Harnessing the potential of positive distraction requires intentionality: this begins with assigning it a value and square footage.

It is important to discuss the benefits of positive distraction because it requires extra programming, extending beyond code requirements and clinical function. Programming these third spaces into a pediatric healthcare environment needs full buy-in from clinical and facility leadership to protect it from value-engineering cuts in later phases.

A CHILD'S POV

Ryan Seacrest Studio

Various locations

"

The studio was so fun and creative. And I learned a lot about production.

—Sofia

Because of her chemotherapy infusions for Hodgkin lymphoma, and rechecks during remission, Sofia, age 15, spends a lot of time at the children's hospital near her home. One of her favorite spots at the hospital is the Ryan Seacrest Studio, which is like a TV and radio studio rolled into one. Kids can be the DJs and learn how to set up production equipment. Sofia remembers when the singer Andy Grammer came by and sang his hit "Keep Your Head Up," right to her. Sofia even had the chance to sit behind the mic and introduce some local athletes who were hosting a mini-basketball free-throw contest. Hanging out in the studio inspired her to find out more about media production from the volunteers. Now, she's considering it as a possible college major.

Photo courtesy of The Ryan Seacrest Foundation

Four types of positive distraction:

1. Create a sense of normalcy.

Amidst the unfamiliar routines, sounds, and equipment of a hospital, making things feel normal can be a powerful way to comfort children and their families. A home-like atmosphere, especially within a pediatric patient's room, has been proven to ease stress and anxiety while fostering a sense of security.

Design solutions such as dedicated zones for patients, families, and staff, enhanced visual privacy and soundproofing and controls to adjust temperature and lighting provide agency and choice. Muted colors and comfortable furnishings create a familiar and welcoming vibe. Access to daylight, large windows, and views of nature can help regulate circadian rhythms and provide moments of calm. Even quiet corners for reading or areas with tables where families can gather to play games reinforce a sense of normal life within the hospital setting.

Spaces that feel warm, personal, and connected to the natural world offer a sense of stability and peace, improving mental health and well-being while supporting a child's recovery process. Med-gas panels and alcoves/closets help to hide "scary" medical equipment, as does the removal of monitors/alarms from a patient room to the hallway or nurses' station. Warm design details and finishes give the interiors of patient rooms a homelike feel.

2. Engage the senses.

Children engage with their surroundings through sight, sound, touch, taste, and smell. Research shows that a rich, multi-sensory environment in pediatric healthcare spaces is closely linked to improved quality of life for patients.[6] And can also increase satisfaction among parents and staff. These environments offer moments of discovery, wonder, and calm. Sensory design can take many forms: tactile furniture finishes, meandering pathways along the floor, vibrant wall colors and patterns, 2D or 3D art installations, playful environmental graphics, and interactive sound and lighting features. Biophilic design features bring the outdoors in. A colleague remembers being in a waiting room with his child and staring at a decorative light with lava-bubbles floating up and down, like a flashback to 1972. "That light really helped all of us," he said. "It almost put us into a meditative state."

Another example? The curved graphic feature wall between the lobby bistro and the main dining room at Intermountain Health Primary Children's Hospital stimulates visitors with motion-activated lights. As children walk along the wall the adjacent vertical light strips respond to with changing colors and varying intensity.

Image by Matthew Cooper

A CHILD'S POV

Texas Children's Hospital— North Austin

Austin, TX

Charlie, age 7, has a rare form of epilepsy and has been hospitalized half a dozen times. Welcoming spaces and kid-friendly touches have a significant impact on the whole family's well-being and comfort. Charlie loves the ceiling tile art in the emergency patient rooms, with an aqua blue river flowing past owls, ladybugs, trees, and kites, and colorful canoes and kayaks floating downriver. What an adventure, to be in that yellow kayak passing through the woods. He adores a large wall mural with an orange cat jumping, a happy pig, and a friendly dog and cow cavorting. Sometimes at night, he enjoys curling up on the windowsill of his room and watching the lights twinkling and cars passing by below.

Charlie's favorite distractions might be the service dogs especially the big yellow lab wearing a bandana. The family has been able to bring their own dog, Midas, in for a visit, too. Charlie's whole family loves the paw prints, dog art and the children's pup drawings displayed in the hospital hallways.

So, what is a positive distraction experience like for children?

In creating, evaluating, and validating positive distractions for pediatric environments, it really helps to see the visit to the hospital from the perspective of the users. A child's point of view shows us where distraction can be the most effective.

3. Encourage play.

Free play is essential for a child's social, emotional, and cognitive development. Pediatric environments can nurture a child's natural curiosity and need for self-discovery. Inclusive design is a key consideration within these environments, harnessing interactive technology and adaptive equipment to ensure that children of all abilities can participate. Playful elements can also be integrated into treatment areas, transforming intimidating spaces into environments of imagination and comfort.

For example, at the Intermountain Health Primary Children's Hospital's Lehi campus an outer space–themed MRI suite can turn a daunting machine into an adventure to explore. Research has shown that engaging a child's imagination can reduce pain, ease distress, and promote calmness during diagnostic and treatment procedures. Getting outside has health benefits, too. And the outdoor areas at Arthur M. Blank Hospital - Children's Healthcare of Atlanta provide easy access to active play.

4. Make social connections.

A hospital stay often means the child is abruptly separated from family, friends, and support systems. Adolescents in particular report strong feelings of isolation during hospitalization and crave opportunities for meaningful social connection, within the hospital and with their communities back home. Whether through music or art therapy, cooking classes or game nights, thoughtful spaces for socializing encourage connection.

Sophie's Place at Intermountain Primary Children's Hospital serves as a music therapy and hangout space for teenagers. And Ryan Seacrest Studios are media centers embedded in pediatric hospitals where young patients can explore radio and TV production like real broadcasters.

When designing opportunities for socialization, consider the following:
- How can the design maximize opportunities for patients to access social support?
- Who is the audience and what is their demographic and health status?
- What types of interaction should the design encourage?

Image by Brad Feinknopf

Intermountain Health Primary Children's Hospital

Lehi, UT

> " Instead of feeling scared, I could just pretend I was in outer space.
>
> —Alex

Ten-year-old Alex came home Monday afternoon after soccer, complaining of stomach pain. The next day, he limped out of bed unusually early, grasping his stomach and grimacing with pain. "I don't think I can go to school today, mom. I'm really not feeling good." It was a field trip day, which Alex had been looking forward to for weeks. Mom knew this was more than a muscle strain or stomach bug. "Get in the car, let's go get you checked out!" Arriving at the pediatric ED, Alex was quickly seen by the care team, who conducted a physical exam and abdominal ultrasound, followed by an MRI scan to diagnose the pain.

The astronaut-themed MRI room helped Alex distract himself momentarily— instead of entering a large, scary piece of equipment, it felt as if he were boarding a space shuttle.

The scan confirmed that Alex had appendicitis, requiring same-day surgery. After the procedure, he was transferred to the medical/surgical unit for an overnight stay. Alex felt right at home in his room— his room at home is the exact same shade of green.

Alex's younger siblings, Ana and Gabriel, came to visit with dad. They were greeted by an expansive stairway where dichroic glass guardrails changed color with the light and created fun patterns on the surrounding walls. Racing up the stairs, Ana and Gabriel passed by the Lake, Desert, and Alpine levels before arriving at Alex's Sky-themed floor. As dad talked with the greeter, the two delightedly climbed into a mountain-like seating nook built into the wall. At dinner, the curved wall between the lobby and dining room delighted them with motion sensor-activated lights. They enjoyed colorful balloon sculptures on the corridor ceiling as they walked back to say goodnight to their brother.

What do distractions in pediatric healthcare look like?

For designers, it's often valuable to consider what small, daily distractions a child might miss out on during a hospital stay: being with friends at school, playing with peers on the playground, enjoying games with the family, or trying a new restaurant. How can design address these gaps in a child's life while they are in a healthcare setting?

We see a variety of distractions in today's leading pediatric healthcare facilities. These distractions can be simple such as a themed floor that also assists in wayfinding for visitors. Engaging distractions can range from patient-friendly cinemas to accessible playgrounds, activity gyms to meditation spaces. Distraction areas can include art galleries, sensory rooms, performance stages, outdoor respite areas, children's libraries and even family "camping" areas. The future of positive distraction is wide open. ∎

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The elements of positive distraction
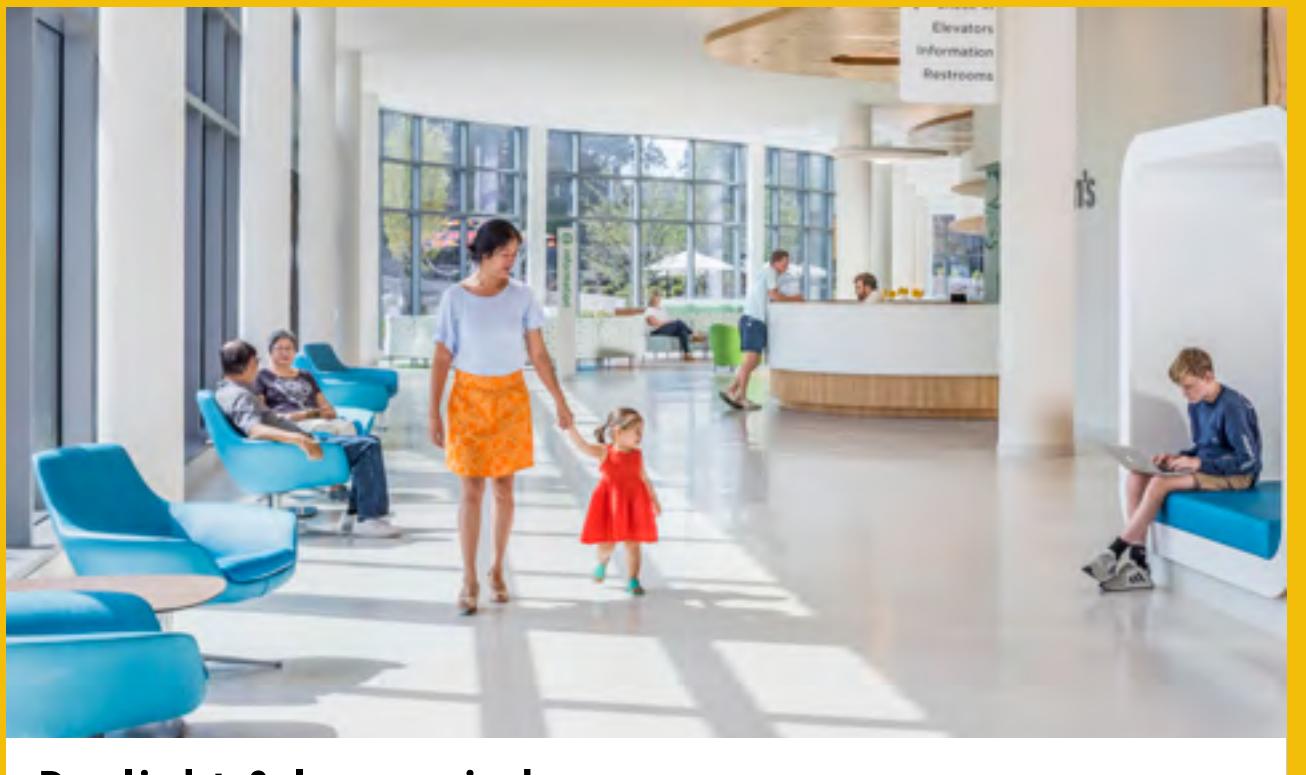
Daylight & large windows

2D & 3D art installations

Spaces to encourage connection & socializing

Interactive sound/lighting features

Outdoor activity spaces

Beth Carroll
Regional Healthcare Director,
Page, now Stantec
⊙ Dallas, TX

Beth is skilled at leading initiatives to optimize sustainability, adaptability, and patient experience.

Calise Gritters
Healthcare Planner,
Page, now Stantec
⊙ Denver, CO

Calise is on a mission is to promote health, well-being, and wonder in the built environment through applied evidence-based design.

Look at that! *Writer: Mary Loftus*

George Bush Intercontinental Airport (IAH)
Terminal B Transformation
Houston, TX
Page, now Stantec in collaboration with Grimshaw

What trends are shaping airports today?

Airport fundamentals keep Aviation Design Director Lee Glenn grounded

Interview by John Dugan

Based in Dallas, TX Lee Glenn is the Aviation Design Director for Page, now Stantec. He's an architectural designer who has worked on multiple projects for Dallas Fort Worth International Airport (DFW) and led the design of terminal and concourse projects at San Francisco (SFO), Atlanta (ATL), Salt Lake City (SLC), Seattle (SEA), and Nashville (BNA). Most recently, he contributed to the expansion at Austin-Bergstrom International Airport (AUS) Terminal and Terminal B project at George Bush Intercontinental Airport (IAH). *Design Quarterly* checked with Lee to find out what's happening in the world of airport design.

LEE GLENN

Lee leads phased design on complex airport terminal and concourse additions.

◦ Dallas, TX

Q How did you wind up in the world of aviation design?

LEE GLENN: I was in the right place at the right time. Back in 1998, I was hired as a senior designer by a firm that was chasing two big projects: a program at the Washington Navy Yard and a complete redevelopment of Salt Lake City Airport—a billion-dollar job, which was a great deal of money then. They won both.

I started on the Navy Yard for six months, then got tapped as lead designer for Salt Lake City's terminal. I'd never worked on an airport before, so it was terrifying. Luckily, I had great terminal planners as mentors.

That project went on hold after a full schematic design, but I got an incredible introduction to airport design—new terminal, concourses, ground transportation center, light rail connection, landside roadways. They kept winning more airport projects. From there, I just kept rolling from one airport to another.

Q What kind of projects are you working on now?

LG: I'm based in Dallas, in Page, now Stantec's office. I joined Page about three years ago when they were chasing their first big terminal project as a prime leader: a new landside terminal at Houston Bush Intercontinental. The stakes were high. We won the job, which is under construction now, and I spent a year and a half on that.

Then we landed a major redevelopment project at the Austin Airport. No downtime—I've jumped from one big airport project to another. It is a little unusual. More often you end up at this interim period where the excitement of one is gone and the next big one hasn't hit yet.

Q What trends are shaping airports today?

LG: Passenger experience has been a buzzword for 20 years, but now it's standard practice—amenities, wellness rooms, sensory spaces, yoga rooms.

It's not revolutionary anymore; it's expected. The real differentiator is how much airports invest and promote it. SFO makes it part of their DNA, they are really good at it; others do it more quietly.

The other big trend is seamless travel. Boarding passes on phones were the first step, but biometrics are now mainstream. A few years ago, people fussed about privacy; now, nobody blinks when TSA takes a photo.

I recently boarded a flight to Canada using facial recognition—no boarding pass. Automated bag drops are improving, and concessions like Amazon's "walk in, walk out" stores are popping up.

The goal? Minimize human interaction. Studies show younger travelers want to avoid talking to anyone unnecessarily. Seamless travel is sneaking up on us— we'll look back and realize we're already doing it.

◎ **George Bush Intercontinental Airport (IAH)**
Terminal B Transformation
Houston, TX

Page, now Stantec in collaboration with Grimshaw, is working with United Airlines to redefine the passenger experience at George Bush Intercontinental Airport (IAH). The Terminal B renovation project aims to create a new, state-of-the-art headhouse, enhancing efficiency, capacity, and connectivity.

Q   How do revenue and design priorities intersect in airports?

LG: Concessions and parking are airports' biggest revenue streams—bigger than airplanes. So, airports push for great concessions programs, which dovetail with passenger experience goals. But there's tension: architectural designers want cohesive, high-quality spaces; concessionaires want flexible shells for branding. Some airports prioritize design integration; others just hand over space.

Airports tend to brand themselves as part of the community that they're in. We used to do that strictly with architectural design, but now a big part of it is with concessions programs. Branding now means local—Austin wants to "keep Austin weird," for example—so concessions become cultural ambassadors. It works. People love local flavor.

Q   Let's talk about scale. Are airports getting bigger? What's driving that?

LG: Absolutely. Two forces: First, years of criticism about aging U.S. infrastructure (we're in our third generation of airport infrastructure) sparked massive investment. Second, explosive growth in mid-sized cities like Nashville and Austin. Pittsburgh just opened a new terminal—$7 billion program. Austin's spending $4 billion; Nashville, over $2 billion. LaGuardia, Boston, Chicago, LAX—multi-billion-dollar programs everywhere.

It's no longer unusual to spend a billion dollars on a terminal. But it's the airlines that drive growth. They go where the market is, and the airports respond. Airports have strong bond ratings to fund development in the United States. It's a great time to be an airport architect.

📷 **Santiago International Airport Expansion**
Santiago, CL
Joint venture: Stantec Architecture / Capitel S.A.

Q **What's next—EVTOLs, vertical airports?**

LG: EVTOLs (electric vertical takeoff and landing aircraft) aren't science fiction anymore. United has a $2 billion purchase agreement with a leading manufacturer. Our Houston terminal is EVTOL-ready—the roof is structured for future pads, with vertical circulation planned. The FAA even has design guidelines for EVTOL facilities. It's not impacting our daily work yet, but it's coming.

Vertical airports? Not likely. Moving people vertically is costly and inefficient, and you can't park planes on the second floor. Land constraints push creativity, but horizontal expansion still wins. It's simplistic, but if you make passengers go up or down or take a convoluted path, that diminishes the quality of the experience at a very basic level.

Aerotropolis—airports as commercial hubs—is big in Europe and Asia, less so in the U.S. Some airports with huge acreage, like Denver and DFW, are developing office parks and hotels. But most U.S. airports are land-constrained, so it's rare.

Q **What's something people don't understand about airport architecture?**

LG: The passenger side experience gets a lot of attention, but programming those areas is not a big deal. Seen from the inside, making a viable piece of transportation infrastructure is so much more complicated and difficult than setting aside space for amenities.

In the end, we're building transportation infrastructure. We're not building a park. We're not building a place for people to come and relax. If you can make the experience less stressful, that's worthwhile, but most people go to an airport to get on an airplane and go somewhere else. If you want to make it a better experience, you make that easier.

We're making a workable piece of machinery that facilitates processes for all the people in it. Passengers are one part of the puzzle. There are also airline employees, and there are incredibly expensive, big, clumsy airplanes. The terminal or a concourse? They're designed from the airplane in. Everything starts with the airplane and how to park it around the building.

$62.4B

The FAA's 2023-2027 National Plan of Integrated Airport Systems (NPIAS) estimates approximately $62.4 billion in airport development between 2023 and 2027.

Source: Airports Council International (ACI 2025)

Q **Where do you find the most fun in the work?**

LG: When you start a project, you must get to know the community culturally and the goals for the airport.

The first time I went to Salt Lake City, I found an antiquarian bookstore and I bought $500 worth of books on Utah: art, history, culture, religion, everything. I read all of them and it gave me a lot of insight. Our design drew on historic plans for Mormon settlements and the distinct palette that artists have used to portray Utah throughout the years. It's fun to get into the mindset of a place. ∎

John Dugan
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John Dugan is the editor of *Design Quarterly* and creator of the Design Hive podcast. He collaborates with Buildings authors on thought leadership content.

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Building envelope design in healthcare: Beyond energy efficiency

An integrated approach to building envelope design can create more comfortable and energy efficient hospitals

By Ivan Lee and Elmira Reisi

Hamdan Bin Rashid Cancer Hospital
Dubai, UAE

You might assume that a hospital's "skin," which keeps out bad weather and pollution is important.

But in healthcare design, the exterior skin or building envelope is a small portion of the overall space. And high-performance design usually focuses on a hospital's ventilation needs. Building envelope design is not considered critical to energy performance in hospitals. However, our recent project experiences reveal that a truly high-performance building envelope must address much more than energy metrics. Hospitals and healthcare facilities can benefit from a holistic approach to high-performance building envelope design.

As a building envelope and facade designer and a building performance consultant for healthcare, we regularly see, from an analytics and performance perspective, how building envelope design can impact a project.

Example breakdown of heating load components

A building's heating load breaks down into heat loss through the building envelope, air leakage, and internal heat gains that offset these losses.

Losses			
35%	**35%**	**23%**	**7%**
Windows	Ventilation	Walls	Infiltration

Gains					
28%	**23%**	**17%**	**13%**	**12%**	**7%**
Heat Recovery	Solar	Equipment	Lighting	Heating Output	People
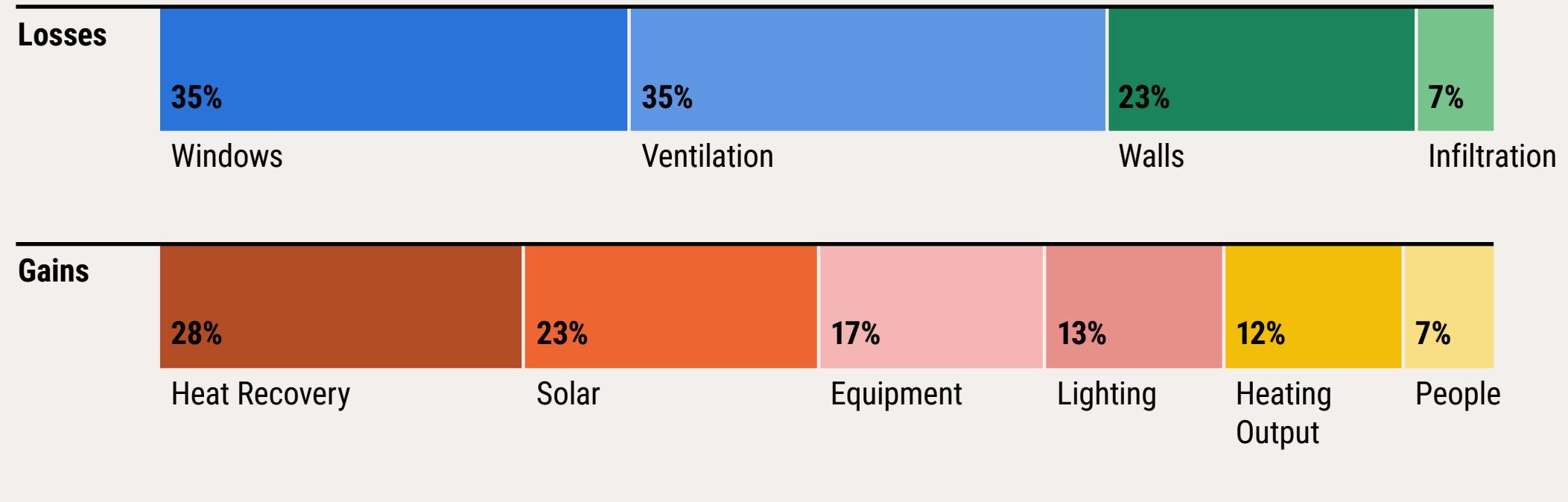
Why is the building envelope important?

The building envelope separates the interior and exterior environments. It keeps the elements (wind, rain, snow) out and acts as a thermal barrier. The building envelope helps maintain environmental control of the indoor space: temperature, humidity, ventilation, natural light, and air quality. You want to heat and cool your building, and keep water, air, and pollutants out.

A building envelope is comprised of walls, windows, doors, and roofs. In healthcare, we often see components like curtain walls, concrete masonry, and steel stud walls making up the envelope. The envelope has an aesthetic function, too.

Healthcare demands a bit extra from the building envelope.

Healthcare facilities require tighter control of temperature and humidity to promote health and recovery. Healthcare is an essential service, so the healthcare building envelope needs to be extra durable. An ideal healthcare building envelope should last a long time. It shouldn't need a lot of downtime for service and maintenance.

In recent decades, the trend in healthcare has been towards more sustainable high performance building design. First, the industry focused on reducing energy costs and then we started looking at energy efficiency and cutting building energy use. After that it became about reducing greenhouse gas emissions, through decarbonization studies around operations and now embodied carbon.

We've written about **smart decarbonization in healthcare** before as a more nuanced approach than full electrification. Today, healthcare designers are called upon to achieve decarbonization within capital cost constraints. In Canada, the design budget focuses on achieving clinical priorities and then decarbonization within these cost constraints.

Higher performance design often comes with additional costs. It's natural for decision makers to ask, what are we getting from this? Does it help with energy efficiency? Does it help us hit our energy targets?

In healthcare facilities, ventilation requirements dominate energy use, so improvements to the building envelope often have limited impact on energy targets. The result is that envelope upgrades have been deprioritized in healthcare buildings despite other benefits. We often see healthcare projects choose a wall design simply because it hits an effective R-value (insulation performance) to meet energy targets and budget.

However, healthcare design is increasingly concerned with thermal comfort. We believe designing a space that's inherently more comfortable is better than relying on the HVAC system to create those comfortable conditions which could drive up carbon appetite. When we look at thermal comfort in this way, building envelope is much more important.

We believe the conversation about building envelope needs to be more nuanced, and the design more holistic. What kind of space is it? Is it acute care or a medical office? What are the ventilation needs? Because these factors drive energy use.

Cambridge Memorial Hospital Redevelopment
Cambridge, ON

What makes up the building envelope?
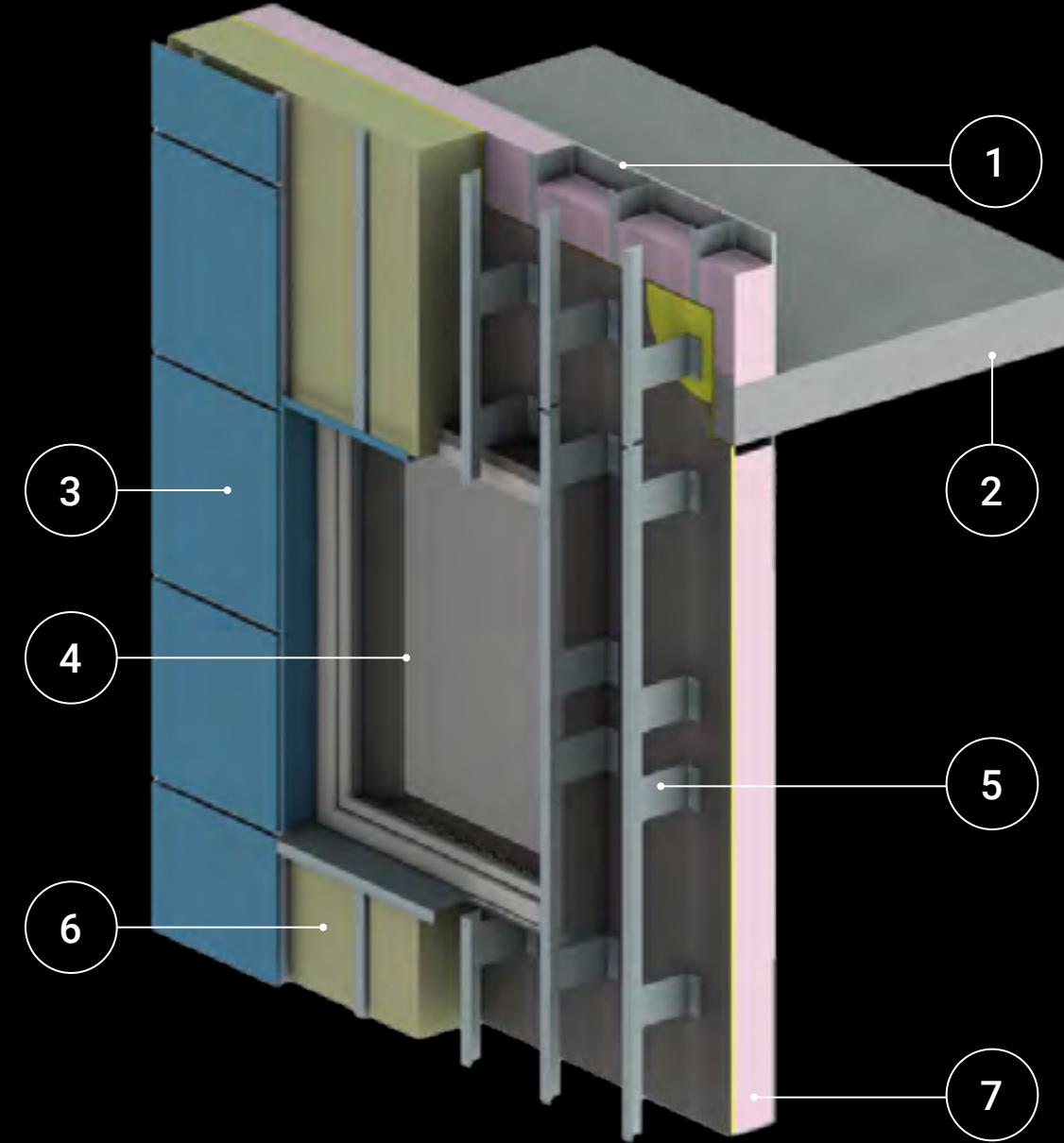
1. Steel-framed wall
2. Concrete intermediate floor
3. Cladding
4. Window in punched opening with combustible frames
5. Cladding attachment with brackets and rails
6. Exterior insulation outboard of exterior sheathing
7. Interior insulation in steel stud cavity

"

Using tall narrow windows made it possible for us to reduce the HVAC system requirements and install fewer diffusers to control condensation on the project.

What's possible in the envelope for a hospital?

On a recent healthcare design project, we had the opportunity to pursue a carefully considered approach to the building envelope. On this P3 project, we are serving as PDC (planning, design, and construction) consultant. We had a chance to talk about windows and thermal comfort.

In healthcare design, windows are important. When it comes to inpatient units, architects and designers care about creating a connection to the outside with windows. This connection has been shown to benefit building occupants. As envelope designers, we need to consider the placement of windows, plus shape and orientation. How much window area do we have versus wall area? We must balance the windows' impact on the overall envelope with creating a visual connection to the outside, providing access to daylight, while balancing thermal comfort and avoiding condensation.

When we modeled the energy use for this acute care hospital in Canada we looked at using a higher performance envelope with more insulation and triple pane windows. That approach didn't make a big dent in energy use—because, as we said, in this kind of building ventilation uses the most energy.

We wanted to have an efficient low carbon HVAC system, which means low temperature heating. We preferred to avoid having perimeter radiators because they use high temperature water. They usually need boilers. High temperature heat pumps are an option, but right now they're just expensive.

So we asked ourselves what kind of envelope design would allow us to get rid of perimeter radiators? We studied thermal comfort in relation to window and diffuser placement. We looked at the window shape and orientation. The wide window design would

require more diffusers and radiators. By making the windows narrower and taller, we were able to reduce these requirements. Using tall narrow windows made it possible for us to reduce the HVAC system requirements and install fewer diffusers to control condensation on the project. A wider window design would require a longer run of diffusers. We were able to adjust the building envelope design and design the window placement for thermal comfort without using perimeter radiators.

This is just one example of how better buildings come from holistic envelope design.

Holistic envelope design has additional benefits.

Building envelope design in healthcare should consider durability, thermal comfort, airtightness, resilience, and occupant well-being, not just energy efficiency. In this approach, the design team tries to balance these considerations with a connection to the outdoors and budget.

Thermal comfort
As in our example, getting the envelope right and window placement and sizing can help improve efficiency and reduce energy use. A high-performance building envelope can result in a building that's less reliant on systems for thermal comfort.

Efficient systems
An airtight building envelope has benefits for decarbonization and energy use. It helps keep the cold or warm air in, so systems don't need to work as hard.

Acoustic comfort
An airtight envelope is also quieter. This results in greater acoustic comfort in patient areas.

Environmental control
An airtight envelope also keeps out pollutants and particulate matter. For example, wildfire smoke has been an issue in recent years, especially in Canada. In 2023, Canadian wildfire smoke increased hospital visits for heart and lung issues thousands of miles away in Maryland. No one wants to breathe those particulates, especially if you're unwell and in the hospital. A good way to limit exposure is having an airtight building envelope. But a lot of existing buildings aren't very airtight, they weren't designed to be airtight. To control particulates, the operators typically pressurize the building by blowing air out to keep particulates from entering the building. Blowing all this air just intensifies building energy use and operational costs. A good envelope will keep out particulates.

Integrated approach to building envelope

Building performance experts and integrated design teams can optimize envelope and facade decisions, ensuring project goals are met holistically and avoiding suboptimal, prescriptive solutions. Involve your envelope and sustainability experts early in the design process to influence facade decisions, especially in integrated firms, rather than retrofitting solutions after architectural concepts are set.

Building envelope design needs to balance decarbonization, embodied carbon, and operational efficiency. The optimal envelope design varies by project location, function, and organizational needs. A flexible, context-sensitive approach to building envelope design better serves project and community needs better than a one-size-fits-all, budget-driven method.

While ventilation loads often take the high-performance building envelope out of the healthcare conversation, we shouldn't forget about it. Energy models alone are insufficient for guiding building envelope decisions in healthcare environments. Thoughtful building envelope design can enhance resilience and comfort in a variety of building types. Building envelope design should be an outcome of an integrated process that brings together architects, engineers, and building scientists. The skin is just as important as it sounds. ∎

REDUCING ENERGY USE INTENSITY

To reduce a building's EUI (energy use intensity) designs should consider increasing the effective insulation, improving the airtightness of the envelope, and installing windows that resist heat transfer.

Ivan Lee
Building Science Engineer
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Ivan leads Stantec's Component Modeling team.

Elmira Reisi
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Elmira models energy modeling, daylighting, and thermal comfort on building projects.

The Stantec *Design Quarterly* tells stories that showcase thoughtful, forward-looking approaches to design that build community.