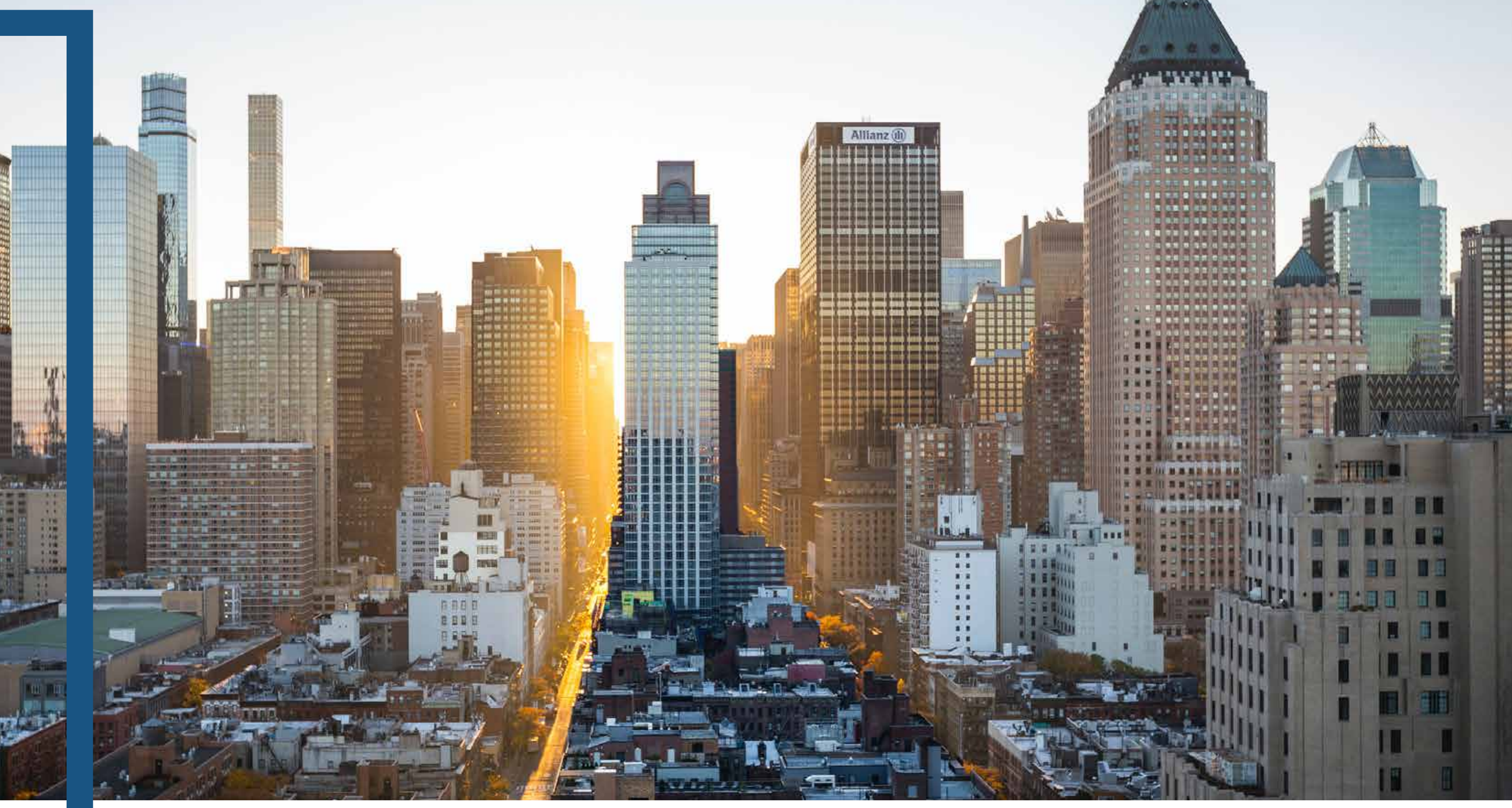
THE ROOM THERMAL PROFILING HANDBOOK

The Complete Guide to a Cost and Energy Efficient Building

airkind



The UN's latest report on climate change paints an alarming picture of where humanity is headed. And if there's one thing we take away from this report, it's that there's no escaping global warming and its crippling effects. This scorching reality can be felt worldwide from India to the U.S. and across all aspects of society. Commercial buildings have been especially hard hit, yet this sector has largely been ignored. Until now.

Increasingly we're seeing that commercial buildings are struggling to meet their energy demands sustainably. Not only do these sites fork out an estimated **$190 billion yearly** in energy-related costs, but according to the U.S. Environmental Protection Agency, **30% of the energy** used in these buildings is wasted. But that doesn't tell the full story.

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It's Time for Grid-Interactive Efficient Buildings.

Many don't realize a typical commercial building's biggest energy expense is for heating and cooling.

In fact, a **report** from the US Department of Energy estimates that 35% of an average commercial building's energy consumption is for heating, ventilation and cooling. In response, we're seeing a shift towards grid-interactive efficient buildings that are energy efficient and climate resistant. But what does that really mean?

Grid-interactive efficient buildings are about focusing on meeting a building's energy needs efficiently to reduce pressure on the grid and cut the building's energy expenses. And meeting a building's heating and cooling demands play a pivotal role here, especially when you consider that 60% of a building's energy consumption is for powering HVAC systems.

A large part of creating a truly grid-interactive efficient building is about finding a sustainable way to ensure indoor climate conditions are comfortable and healthy for building occupants. This is known as thermal comfort. And while it's important, many approaches to climate comfort don't go far enough. More than climate comfort, what we need now more than ever is room thermal profiling.

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Finding (Thermal) Comfort in an Extreme Weather World.

Thermal comfort isn't a new concept. It's about creating indoor climate conditions that are pleasant and suit most occupants. Environmental factors play an important role in impacting the exchange of heat between the human body and the environment. Generally, thermal comfort is when 80% of a space's occupants feel comfortable. But it's more than that. That's just the cold data.

The reality is that with people in cold, hot or humid climates spending more time than ever before indoors, thermal comfort is about quality of life and survival. Thermal comfort is about creating liveable indoor spaces, something we cannot afford to take for granted as we shelter from unforgiving heat waves and snowstorms. And with extreme climate events like heat waves, extreme cold, extreme humidity and forest fires only becoming more relentless, we have to find a way to live with unprecedented temperatures or else. The alternative is too cruel to imagine. A report from the World Health Organization shines a light on the reality of living with heatwaves: 166,000 people died due to extreme heat between 1998 and 2017. Extreme climate events have also been linked to a drop in employee productivity.

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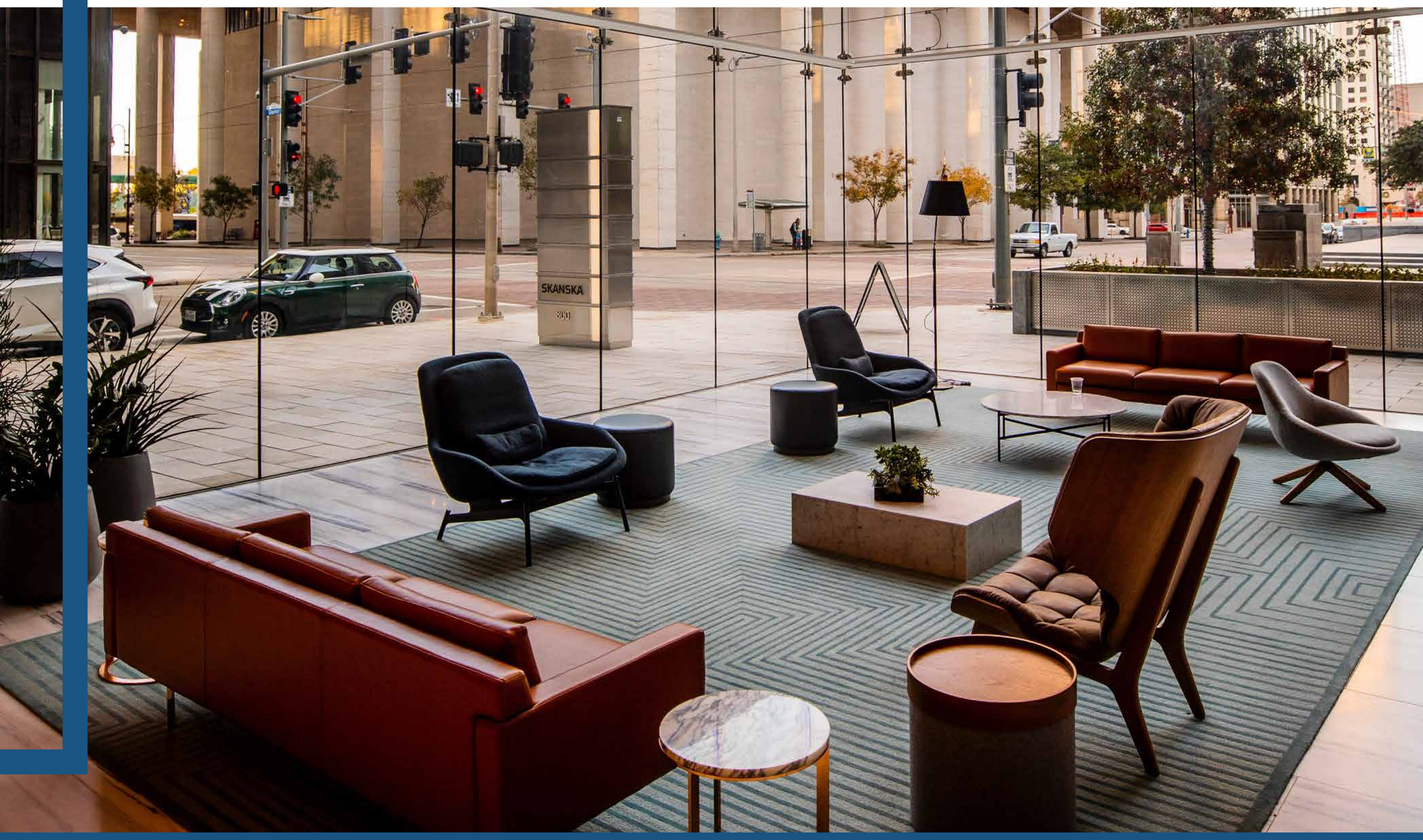
And then there are the cost savings. Thermal comfort also plays an integral role in determining how much energy a building consumes when powering its HVAC systems. The better a building understands the heating and cooling needs of its occupants, the more energy it will save. But this requires a smart approach to thermal comfort that goes beyond the basic understanding of thermal comfort. And this is where room thermal profiling comes in.

"Growing demand for air conditioners is one of the most critical blind spots in today's energy debate. Setting higher efficiency standards for heating and cooling is one of the easiest steps governments can take to reduce the need for new power plants, cut emissions and reduce costs at the same time." - Fatih Birol, International Energy Agency (IEA) Executive Director.



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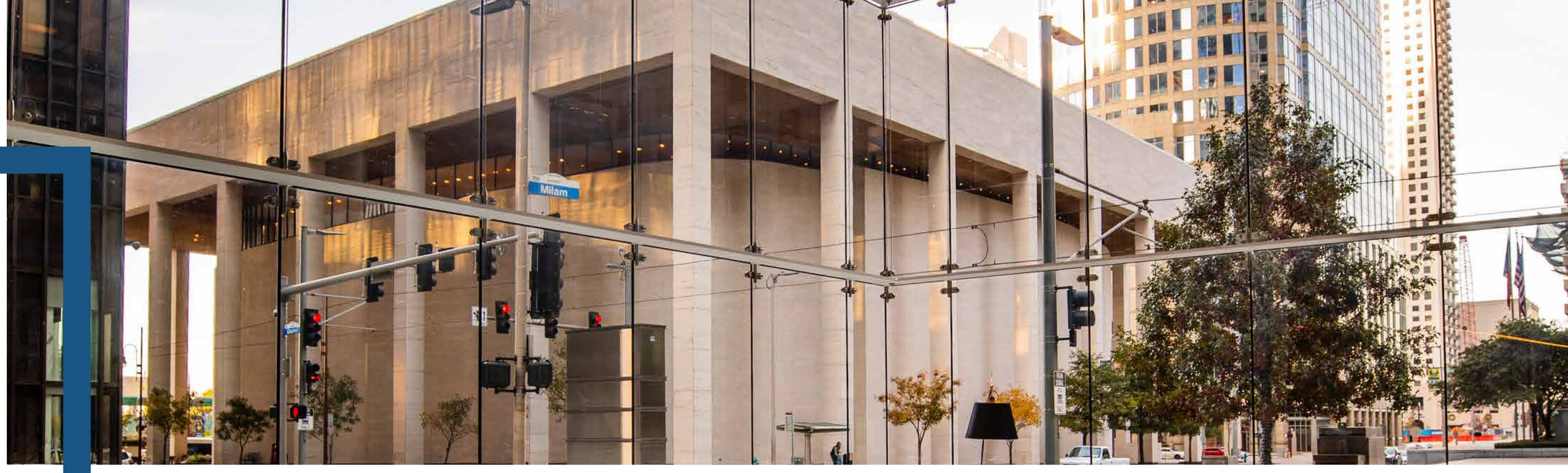

Room Thermal Profiling Case Study: Stay Comfortable; Cut Costs.

Located in Springfield, Illinois, both The Crowne Plaza Big Box Hotel and the Holiday Inn Express experience freezing cold winters and scorching hot summers. In addition, both hotels have erratic occupancy rates and no effective way to manage their heating and cooling needs.

This meant that their HVAC systems had to be controlled manually from guests' rooms, leading to peak demands and costly spikes in their electricity bills. They turned to us to help them better manage their heating and cooling needs and to help them reduce unnecessary energy consumption.

Airkind Created a Thermal Profile of all Rooms:

- Measured key parameters of each room: Temperature, humidity, occupancy
- Maximized thermal comfort, minimizing workloads of heating & cooling systems
- As a result of our room thermal profiling, our clients saw a net savings of $61,000 annually, with flattened peak demands.

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No One Size Fits All: Achieving True Thermal Comfort Isn't Easy.

What makes thermal comfort so challenging is that it isn't an absolute. It varies greatly from person to person and room to room. And when you think about it, that makes sense. After all, many factors (many of which you can't predict) influence the thermal comfort of a space, including time of day and the direction a room faces. Bottom line: Ensuring thermal comfort is no small task. You could even say it's more of an art than a science. Almost.

ANSI/ASHRAE Standard 55 details the necessary conditions for indoor thermal environments. This defines thermal comfort by considering everything from temperature, thermal radiation, humidity, and airspeed to a host of personal factors such as activity and clothing. While these guidelines are important and a step in the right direction, they fail to account for how climate needs vary dramatically. For example, two spaces within the same building will likely have different indoor climate needs depending on variables such as where they face, how many people are in the space and how active they are, the type of insolation and the size of the windows and room. Take a room that’s very humid as an example: Such a space would require a lower Airkind to maintain thermal comfort.

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But it's more than just indoor variables. Thermal comfort is also affected by the temperature outside. And that's where most approaches to thermal comfort go wrong. Typically, thinking about thermal comfort is static and focuses only on the temperature indoors and outdoors. This fails to account for the dynamic climate needs of every space and how the smallest variable, like size or where a room faces, can alter the thermal comfort.

At a Glance: Understanding Thermal Comfort

Thermal comfort can be evaluated by considering a space's climate (indoor and outdoor) and the occupants' physical and physiological features. This includes things like their age, health, sex, activity level and even the clothing they're wearing.

There are two models for evaluating thermal comfort: The medium-voting predicted model (PMV) and the adaptive model. The PMV model doesn't take into account temperature fluctuations or other anomalies. The adaptive model accounts for thermal subjectivity by considering how people interact and adapt to their environment.

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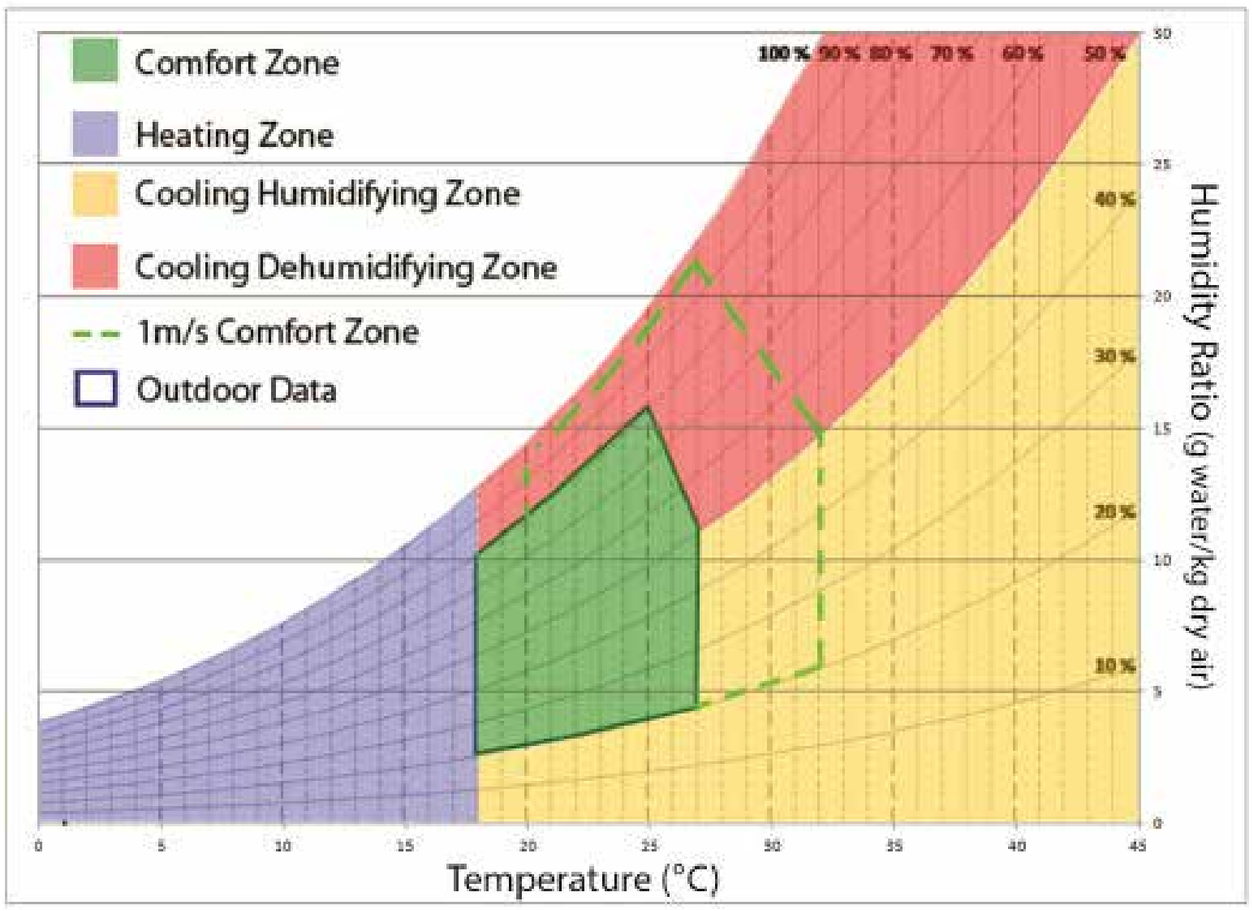
Psychrometric Chart



The psychrometric chart above demonstrates the range of thermal comfort that lies between varying levels of temperature vs. humidity. It is often found that climate comfort is often dependent on lower humidity levels, as opposed to lower temperature.

While both these approaches have their own set of pros and cons, they both fail to consider the indoor climate at the granular level and how it varies from space to space.

Iftach Cohen, Airkind Co-Founder and CEO:

"Room thermal profiling isn't a luxury. It has become essential for ensuring all commercial buildings play an active role in creating a sustainable future."

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More than Thermal Comfort. We Need Climate Intelligence.

It's clear we need a more adaptive and intelligent approach to indoor climate. Because as well-meaning as thermal comfort is, it can't meet the dynamic needs of today's buildings while also ensuring energy efficiency. But it's more than that.

Obsolete HVAC systems were built for a different time when weather patterns were milder and more predictable. These heating and cooling systems aren't able to meet heating cooling needs as the weather becomes more extreme. And that's where room thermal profiling comes in as it upgrades old infrastructure for extreme weather conditions.

Room thermal profiling is a more intelligent approach to indoor climate. This applies the principles of thermal comfort on a granular level. So in the case of a hotel, for example, each room's indoor climate needs are considered individually. Because the reality is that every space has different heating and cooling needs to get it to its Airkind.

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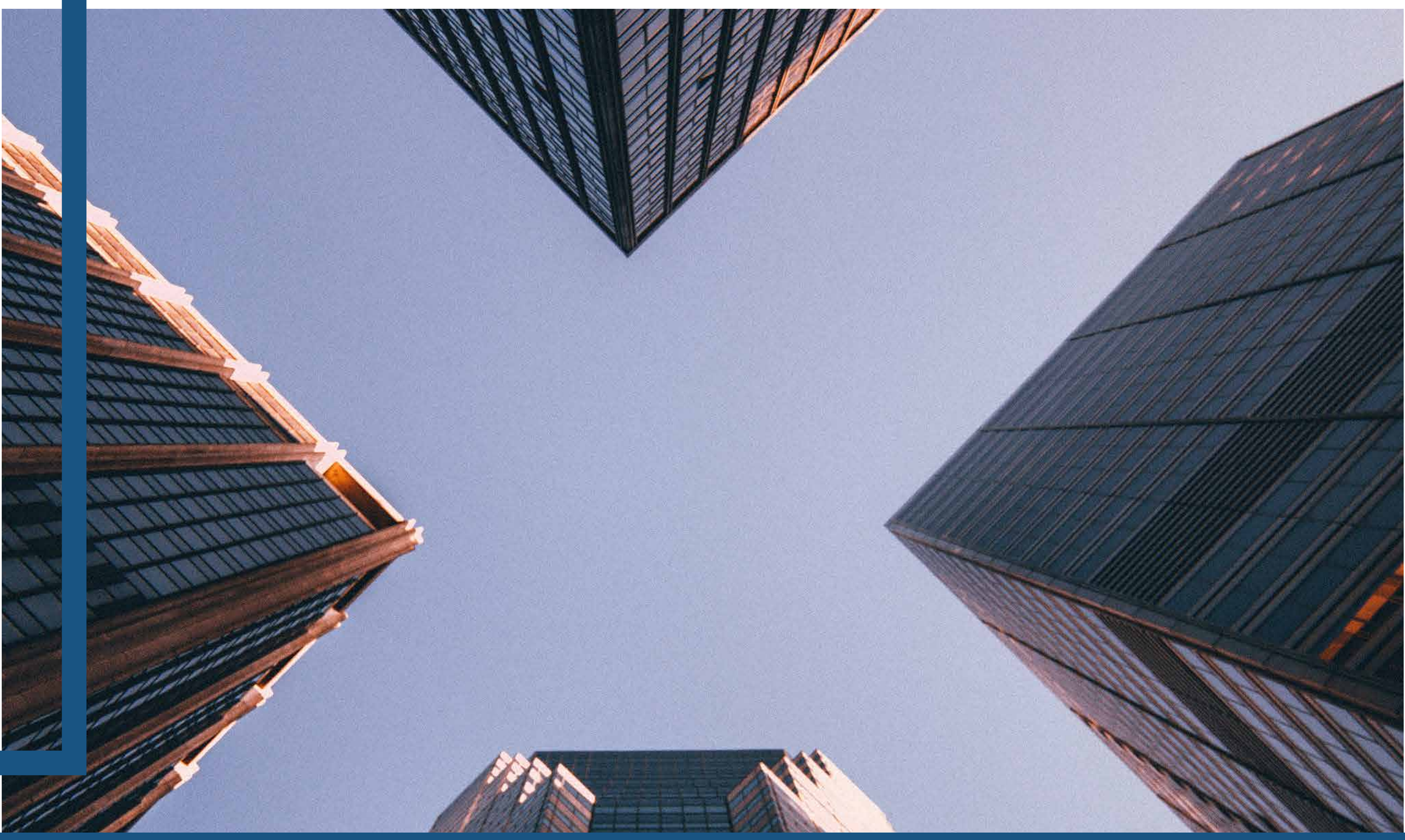
With room thermal profiling, we control every room’s indoor climate based on its thermal profile:

- We focus on:
  - Temperature control
  - Humidity control
  - Airspeed control
- We control a space's temperature so it remains within a comfortable range
- We can adjust the air conditioning and manage usage to save energy

Daniel Heifetz, Airkind Co-Founder and CTO:

"Commercial buildings play a big role in fighting climate change. And with small steps like integrating room thermal profiling, we can make a big difference."



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More than Thermal Comfort. We Need Climate Intelligence.

Our starting point is always the same: With the understanding that every space has its unique thermal profile. We use our proprietary machine learning technology to analyze a room and then build its thermal profile. Even after completing the initial analysis, we continue analyzing the room at regular intervals to check for fluctuations. This enables us to adjust the room's profile accordingly and ensures the space is configured for optimal thermal comfort.

When building a room's thermal profile, we consider both indoor and outdoor temperatures. In addition, we consider factors like the size of the room, the materials it's made of, the direction the room faces and activity within the space. While not related to room thermal profiling, we also consider factors that can impact air quality, such as humidity, Co2 levels, VOCs and fine particles.

We call our approach to room thermal profiling Climate Intelligence. Using the data we collect, we can quickly and accurately build a personalized thermal profile for each room. This guarantees indoor climate comfort while paving the way for significant energy savings.

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The Fineprint: What All This Means for You.

Room thermal profiling helps create grid-interactive efficient buildings. Our technology makes it easy to convert old buildings into green, energy-efficient structures without expensive renovations or construction. It's also an easy way to further optimize buildings that are already green. This not only alleviates pressure on the electrical grid, but because it enables peak shaving, it reduces a building's utility bill.

Want to see what our **Climate Intelligence Platform** can do for you? **Schedule a demo.**

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