

# Ceilings and Wall Partitions for Healthy, Sustainable Spaces.

Addressing Occupant Concerns for  
Well-Being





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## Course Overview

Ceiling systems serve a number of functions: They are a key component in creating an ideal acoustic environment, they enhance artificial lighting and help promote daylighting, and they contribute to cleaner air and overall good indoor air quality. The COVID-19 pandemic has reshaped our world, placing an even greater emphasis on health and well-being inside our buildings.

This course will discuss the key elements of healthy and sustainable interiors with the added considerations related to COVID-19 virus transmission, including from the occupants' perspective. Next, participants will learn how interior finish systems, in particular ceilings and wall partitions, can help address these elements. Emphasis will be placed on systems that help control airflow, clean and filter the air, and/or protect occupants by ensuring adequate physical distancing. Participants will also learn how these systems can help earn green building certification under programs such as LEED, WELL, and the Living Building Challenge, as well as new and evolving standards that protect the health and safety of building occupants in a post-COVID world. Finally, participants will explore how these elements come together in the Healthy Spaces Living Lab pilot project.

## Learning Objectives



By the end of this course, participants should be able to:

- Identify key elements to consider when specifying materials and systems for healthy and sustainable interiors.
- Show how various materials, ceiling systems, and technologies can help create healthy, sustainable spaces in a post-COVID world, including improved indoor air quality.
- Describe how ceiling systems can help earn multiple credit categories in green building programs such as WELL, LEED, and the Living Building Challenge
- Demonstrate how interior finish systems can contribute to the health, productivity, and well-being of building occupants.
- Provide examples of how ceiling systems can help meet evolving standards for cleaning, filtration, and air ventilation.

A modern, bright interior space, likely a lobby or lounge area, featuring a large, geometric, faceted ceiling and large windows. The space is furnished with contemporary seating, including armchairs and a coffee table. A person is visible sitting on a bench on the left. The overall atmosphere is clean, open, and well-lit. A large red triangle is overlaid in the bottom left corner.

# SECTION 1: HEALTHY SPACES

## Elements of Healthy Spaces



- Responsible materials and sourcing
- Lighting and daylighting
- Acoustics
- Indoor air quality
- Thermal comfort
- Aesthetics
- Ergonomics

## Key Findings

2021 Pulse Point Occupants Survey, “Making Space for a Resilient Future,” revealed desires for spaces that account for sustainability and personal well-being.

### Preparing workspaces for returning workers isn't just about COVID-related safety improvements.

**86%**

of respondents expect to feel very or somewhat safe in their workspace when they return to work.

**83%**

of respondents expect to feel that their workspace will be prepared and adaptable for future events such as another pandemic or the changing climate.

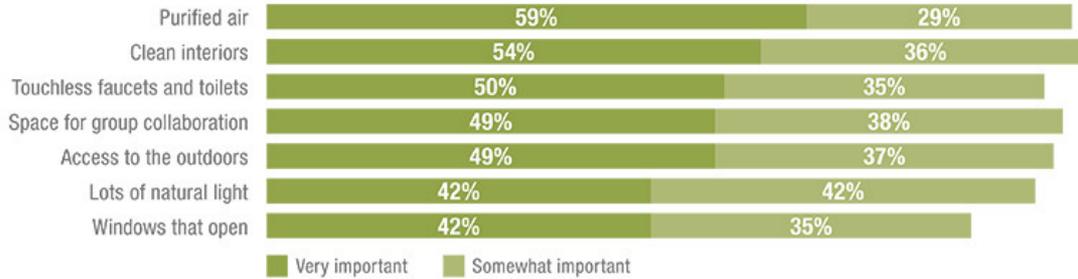
**84%**

of respondents expect to feel that their workspace will be an environment which is supportive of the well-being of people.

# Key Findings

## 2021 Indoor Occupants Pulse Point Survey

What makes a workspace safer can also make it healthier, more sustainable, and better for total well-being.



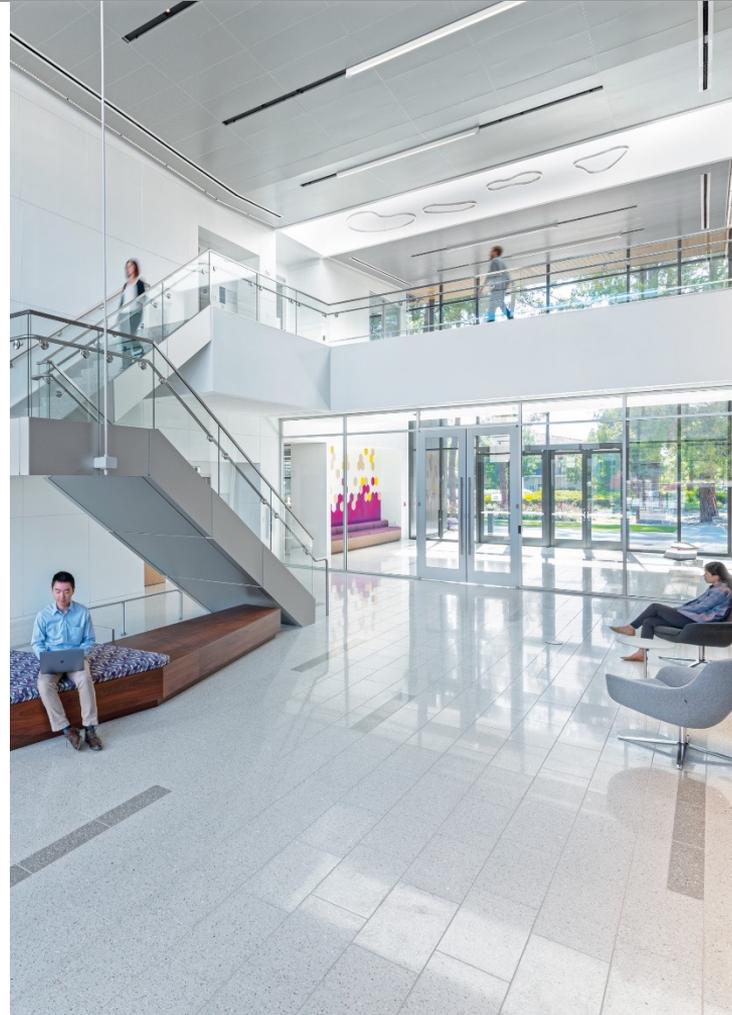
Purified air:  
**59%** Very important  
**88%** Overall importance

Clean Interiors:  
**54%** Very important  
**90%** Overall importance

Factors important to creating resilient workspaces	Very important	Overall importance
Regular cleaning and disinfecting regimens	77%	97%
Air ventilation that can kill germs	65%	92%
Purified air	59%	88%
Layout allows for social distancing	53%	88%
Touchless faucets	53%	85%
Tech disinfects surfaces and air	50%	86%
Space for group collaboration	49%	88%
Access to outdoors	49%	86%
Germ-resistant walls and surfaces	45%	80%
Lots of natural light	42%	84%
Windows that open	42%	76%
Windows that keep out heat	41%	80%

## Lighting and Daylighting

- Helps create more appealing interiors
- Daylighting can help regulate circadian rhythms
- Daylighting can reduce building energy use



## Keys to Effective Lighting and Daylighting



- Number and placement of windows and skylights
- Glare control
- Interior layout
- Integrated lighting, unique designs
- Electric lighting: color balance, luminance levels, balance
- Reflectance of interior surfaces

# Acoustic Control

## Unwanted noise

- Affects productivity, learning, health
- Impacts mood and stress levels

## Good acoustic control

- Ensures speech privacy
- Promotes learning/productivity



## Keys to Good Acoustic Performance



Block sound from outside and from adjacent spaces

- Absorb sound from within a space
- Protect speech privacy
- Other factors: HVAC noise, building vibration, etc.

# Indoor Air Quality

- Key Contributors
  - Chemicals used inside buildings
  - Furniture
  - Building products/materials
  - Humidity/moisture
  - Ventilation
- Sometimes the air inside can be more harmful than the air outside
- Poor IAQ associated with short- and long-term health impacts
- Goal: Reduced concentration of chemical contaminants that can impact air quality and the environment and to protect the health and comfort of installers and occupants



## Keys to Good IAQ



- Eliminate or control pollution sources (nontoxic materials and products)
- Specify low-emitting products
- Ensure adequate ventilation

## Airborne Pathogens

- Most frequently transferred between people in close contact
- Indoor environments pose greater risk
  - Densely occupied
  - Poor ventilation



## ASHRAE Recommended Ventilation Strategies



- Airflow
- Pressurization
- Filtration
- Dilution

## Ceiling Systems with Integrated UV-C Air Purification



- UV-C technology deactivates airborne pathogens
- Continuous air cleaning returns clean air and increases air exchanges for better ventilation

## Cleanable Surfaces



- Surfaces can transmit infectious agents
- Surfaces should be cleaned as per CDC guidelines
- Some surfaces should be disinfected after cleaning
  - Use EPA-approved disinfectants
- Cleanable hard surfaces are key to healthy, safe spaces

## Physical Distancing



- Signage
- Modifications to workstations, seating, etc.

- Partitions



# SECTION 2: INTERIOR FINISH SYSTEMS

## Lighting/Daylighting and Reflectance

- Ceilings, walls, and floors reflect light and enhance daylighting
- Reflectance: percentage of light reflected by surface
- Ceilings: Reflectance of at least 80%



## Ceilings and Acoustic Performance



- High performance = High NRC + CAC
- Sound absorption reduces noise
- Sound blocking keeps noise from traveling to adjacent spaces
- Sound blocking helps ensure speech privacy
- Adaptable spaces require high-performance ceilings that absorb and block sound

## Indoor Air Quality

- Choose low VOC-emitting products
- Look for certifications and transparency labels
- Some ceiling products resist mold, mildew and bacteria growth
- Some systems enhance ventilation/filtration
- New systems incorporate active filtration and air purification



## Ceiling Systems and Cleaner, Healthier, Safer Indoor Air



- Reduce air leakage through the ceiling plane
- Increase effectiveness of HVAC to control and improve airflow
- Airborne pathogens
- Partitioning of spaces
- Cleanability
- Incorporation of active filtration

## Gasketed Ceiling Systems (Ceiling Panels with Factory-Sealed Edges)



- Helps control and direct airflow
- Reduces air leakage through the ceiling plane up to four times
- Increases effectiveness of in-ceiling air filtration/purification up to 40%
- Enables conversion of existing spaces to negative or positive pressure-controlled spaces
- Enables conversion of existing spaces to containment areas quickly using existing suspension system

## Partitioning of Spaces

- Physical distancing a key strategy to reduce virus transmission
- “Open” offices challenging for physical distancing
- Suspended ceiling facilitate partitioning



## Wall Partitions



- Used to reconfigure spaces quickly and easily in response to changing needs
- Don't require structural changes
- Ideal partitions: Non-porous; easily cleaned and disinfected
- Flexible: use singly or in groups

## Cleanability



- Aerosols may cling to wall and ceiling surfaces
- Ceilings comprise at least 20% of office surface area
- Choose wall and ceiling surfaces that can be cleaned per CDC recommendations
  - Wiping
  - Spraying
  - Fogging



# SECTION 3: GREEN BUILDING PROGRAMS AND STANDARDS

# USGBC LEED v4.1



MAY 2020

**Healthy people in  
healthy places equals  
a healthy economy**



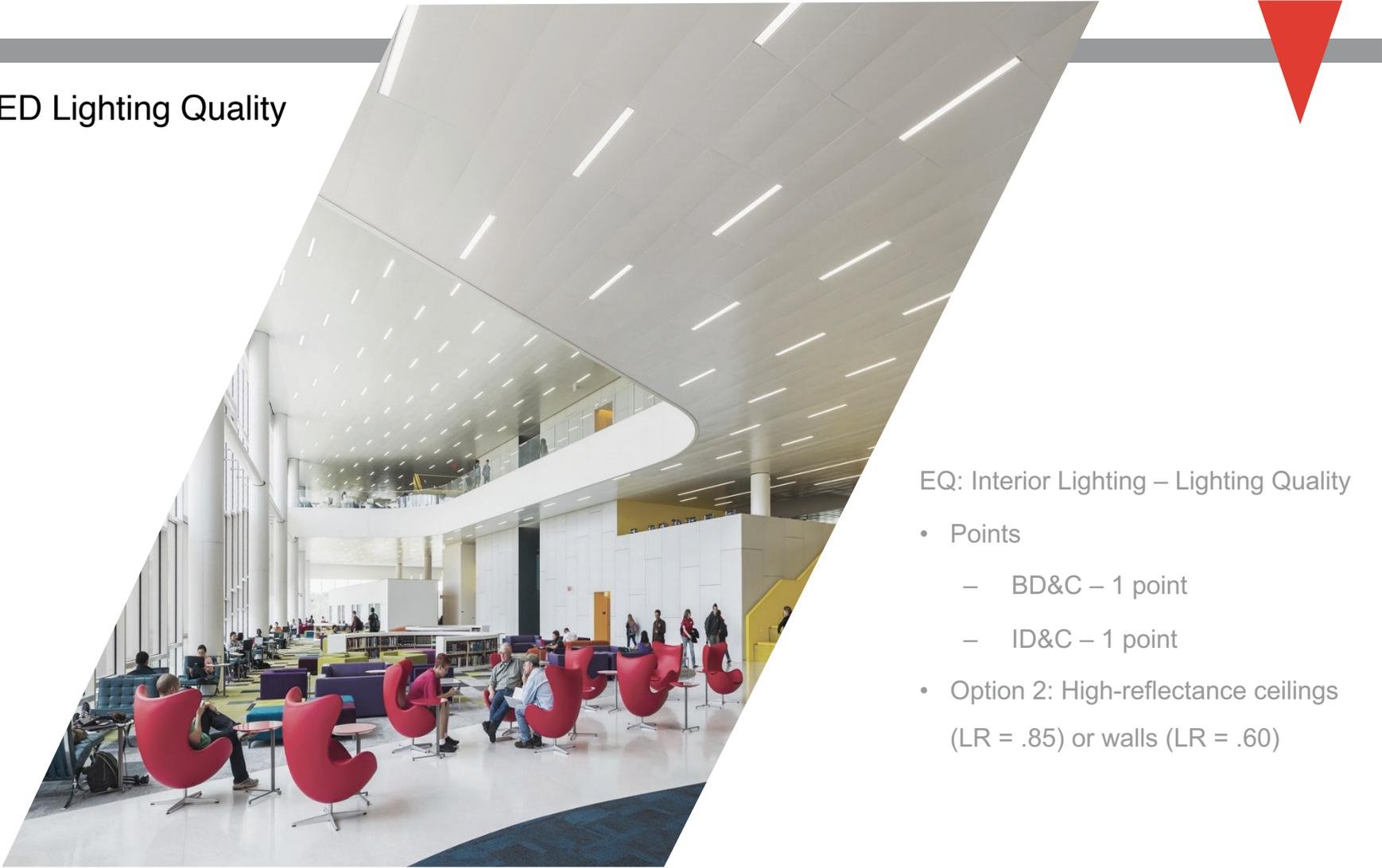
## Indoor Environmental Quality credits

- Low-emitting materials
- Acoustic performance
- Interior lighting

## Materials and Resources & Indoor Environmental Quality credits

Note: GREENGUARD Gold-certified products qualify as low-emitting materials

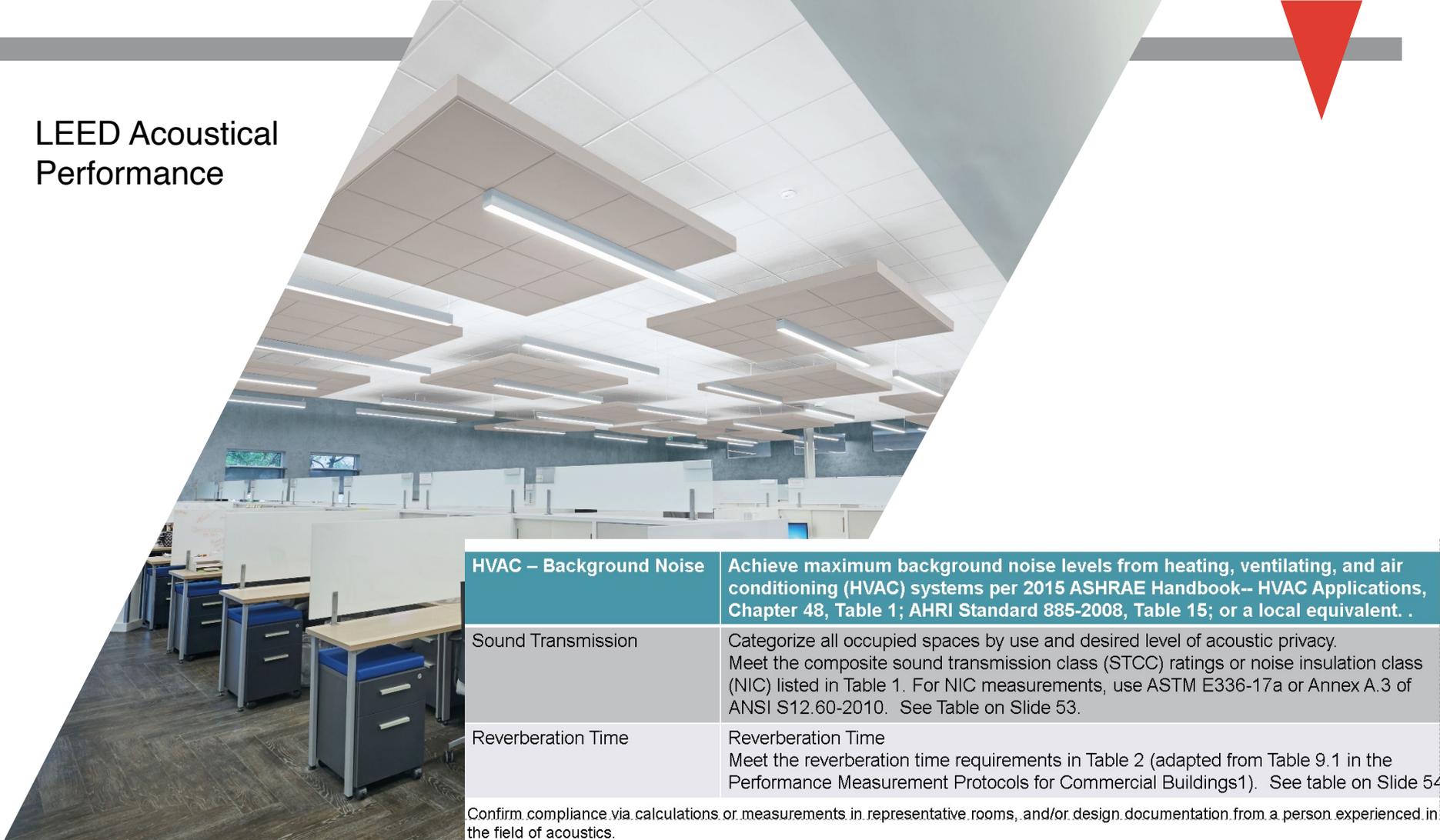
# LEED Lighting Quality



## EQ: Interior Lighting – Lighting Quality

- Points
  - BD&C – 1 point
  - ID&C – 1 point
- Option 2: High-reflectance ceilings (LR = .85) or walls (LR = .60)

# LEED Acoustical Performance



HVAC – Background Noise	Achieve maximum background noise levels from heating, ventilating, and air conditioning (HVAC) systems per 2015 ASHRAE Handbook-- HVAC Applications, Chapter 48, Table 1; AHRI Standard 885-2008, Table 15; or a local equivalent. .
Sound Transmission	Categorize all occupied spaces by use and desired level of acoustic privacy. Meet the composite sound transmission class (STCC) ratings or noise insulation class (NIC) listed in Table 1. For NIC measurements, use ASTM E336-17a or Annex A.3 of ANSI S12.60-2010. See Table on Slide 53.
Reverberation Time	Reverberation Time Meet the reverberation time requirements in Table 2 (adapted from Table 9.1 in the Performance Measurement Protocols for Commercial Buildings <sup>1</sup> ). See table on Slide 54

Confirm compliance via calculations or measurements in representative rooms, and/or design documentation from a person experienced in the field of acoustics.

## LEED IAQ/Emissions Credit

### INDOOR AIR QUALITY



- EQ: Low Emitting Materials
- Points
  - BD&C – 1-3
  - ID&C – 1-3
- 100% of ceilings and walls must meet the general emissions evaluation criteria

## LEED Safety First Pilot Credits



- Cleaning and Disinfecting Your Space
- Managing Indoor Air Quality during COVID-19
- Building Water System Recommissioning
- Re-Enter Your Workspace

# The WELL Building Standard/ International WELL Building Institute (IWBI)



- WELL v2: 10 Concepts
- Air, Light, Thermal Comfort, Sound, and Materials address aspects of IEQ



AIR



WATER



NOURISHMENT



LIGHT



MOVEMENT



THERMAL  
COMFORT



SOUND



MATERIALS



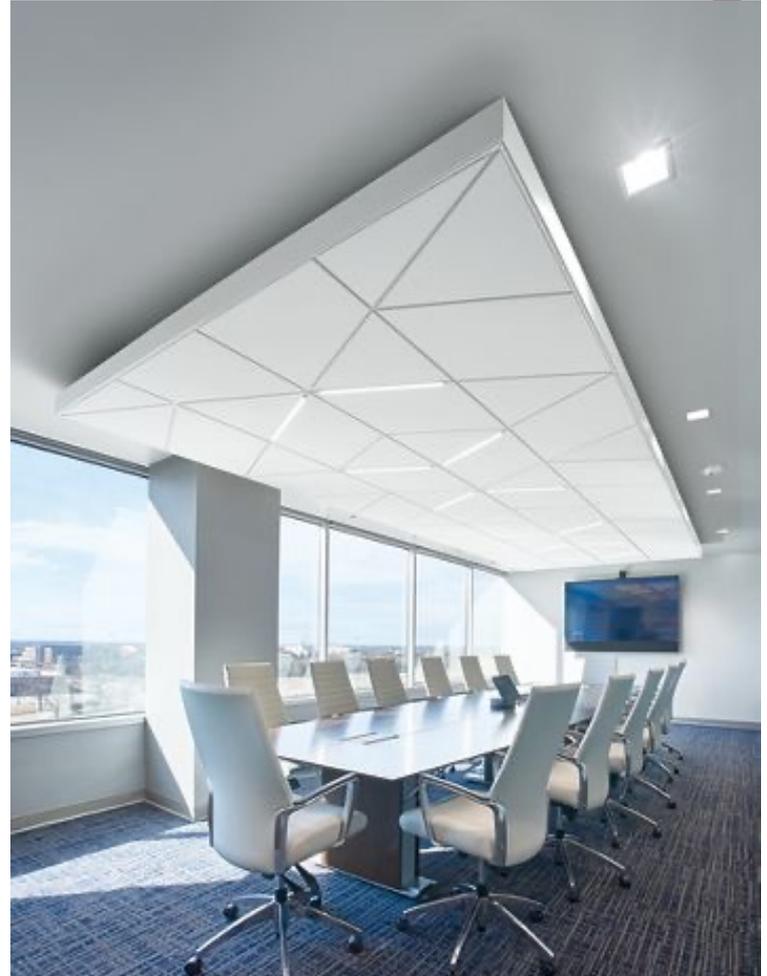
MIND



COMMUNITY

## WELL v2 Light Concept

- L02: Visual Lighting Design
- L04: Electric Light Glare Control
- L05: Daylight Strategies
- L07: Visual Balance



## WELL v2 Sound Concept

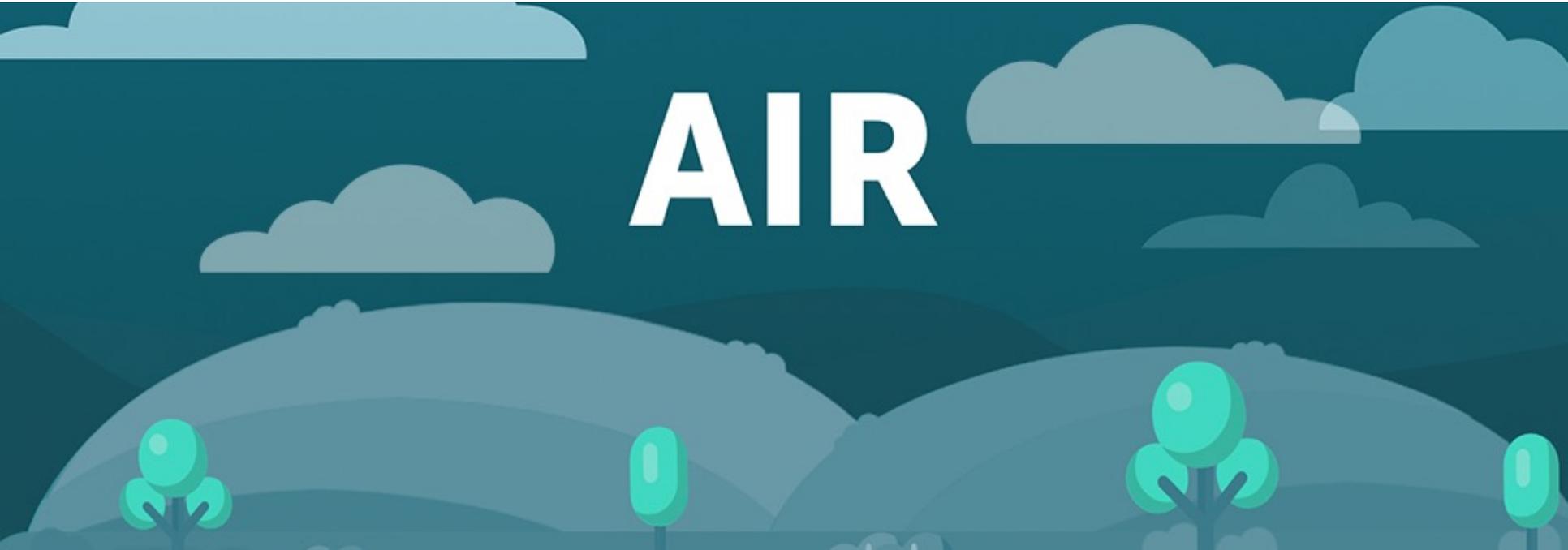
- Feature S03: Sound Barriers
- Feature S04: Reverberation Time
- Feature S05: Sound Reducing Surfaces



**SOUND**

## WELL v2 Air Concept

- A01: Air Quality
- A05: Enhanced Air Quality
  - Part 2: Meet enhanced thresholds for organic gasses
- A06: Enhanced Ventilation Design
- A12: Air Filtration
- A14: Microbe Mold Control



AIR

## WELL Health-Safety Rating (HSR)



Look for the WELL Health-Safety Seal

- Evidence-based, third-party verified rating
- New and existing building and facility types
- 22 strategies under six themes
- Air & Water Quality Management
  - Includes several features which ceiling and wall systems can help address



## AIA Reopening Guidelines



Example: Open Office Recommendations

- 3.6.4 Increase ventilation rates and air changes
- 3.6.9 Align HVAC filter selection, cleaning schedule and replacement cycles with ASHRAE recommendations
- 3.9.1 Install physical barriers such as clear plastic partitions



# SECTION 4: AESTHETICS ENHANCEMENT

## New Design Options for Seamless Acoustical Ceilings



## New Design Options for Suspended Ceilings



## Design Options for Exposed Structure



## Design Options for Exposed Structure



## Design Options for Wall Partitions

- Materials: polyester, acrylic, metal
- Styles: frosted, clear, solid
- Range of colors and patterns, including digital graphics
- Sizes: standard and custom
- Suspension systems: posts, cables, frames





**SECTION 5: PUTTING IT  
ALL TOGETHER**

## Holistic Design Approach



- Heightened emphasis on health, safety, and well-being
- How does each element address multiple attributes?
- Ceiling and wall systems
  - Lighting/daylighting
  - Acoustic performance
  - IAQ
  - Aesthetics
  - Enhanced HVAC/reduced risk of airborne pathogens

## Case Study: Armstrong World Industries Living Lab, Lancaster, PA

### Healthy Spaces Pilot Space

- Create a space that inspires creativity and is supportive of well-being
- Hybrid workspaces
- Individual and collaborative work areas
- Specific strategies:
  - Protect occupants in “hot spots”
  - Optimize HVAC / Ventilation
  - Containing and controlling airflow



## Armstrong Living Lab



- Dashboard metrics in real-time make health and safety more visible
- New and prototype ceiling and wall systems used throughout
- Incorporates different materials
- Airflow and purification that complements interior design
- Ideal acoustics within each area
- Optimal use of daylighting
- Integrated lighting, unique design

# Armstrong Living Lab



## Armstrong Living Lab



# Armstrong Living Lab



## Armstrong Living Lab



A modern office lobby with a geometric ceiling and large windows, overlaid with a red tint and the word 'CONCLUSION'. The scene shows a woman sitting on a bench on the left, a person walking in the center, and several armchairs and coffee tables on the right. The ceiling features a complex, faceted geometric pattern. Large glass windows and doors provide a view of the outside world. The overall atmosphere is clean and professional.

**CONCLUSION**



Thank you!

This concludes the continuing education unit:

**Ceilings and Wall Partitions for Healthy,  
Sustainable Spaces Addressing Occupant  
Concerns for Well Being**

**Thank you for your interest in ARMSTRONG  
CEILINGS.**

For more information, visit:

<https://www.armstrongceilings.com/healthyspaces>