

Course Number:  
006MC1

Learning Units: 1 Hour

# Specifying Metal Ceilings

Inspiring Great Spaces®

 **Armstrong**  
CEILING SOLUTIONS

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# Learning Objectives

- Understand how and why metal ceilings are used
- Learn about metal manufacturing materials and processes
- Understand how size and shape of a panel can affect lead time and cost
- Understand how acoustical performance is achieved with different metal ceiling options
- Learn when metal can be used for exterior applications
- Understand how metal ceilings can provide security



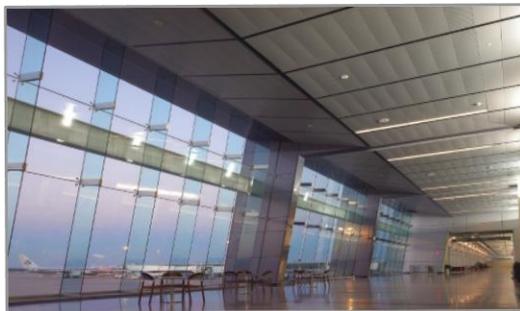
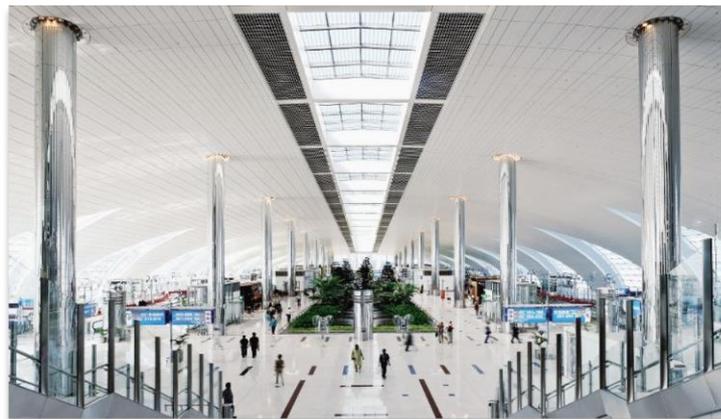
# Trends in Metal Ceilings

- Metal ceilings have long been popular in Europe for aesthetics and durability
- Metal ceilings are growing in the North American market
- Clients are beginning to recognize the performance and design benefits of metal in all market segments



## Highest use segment for metal ceilings:

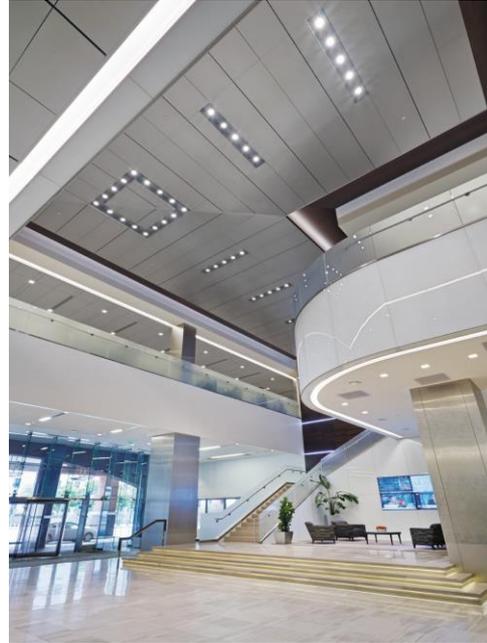
- Transportation
  - Concourses
  - Ticket Areas
  - Exterior Soffits
  - Food Courts



## Transportation

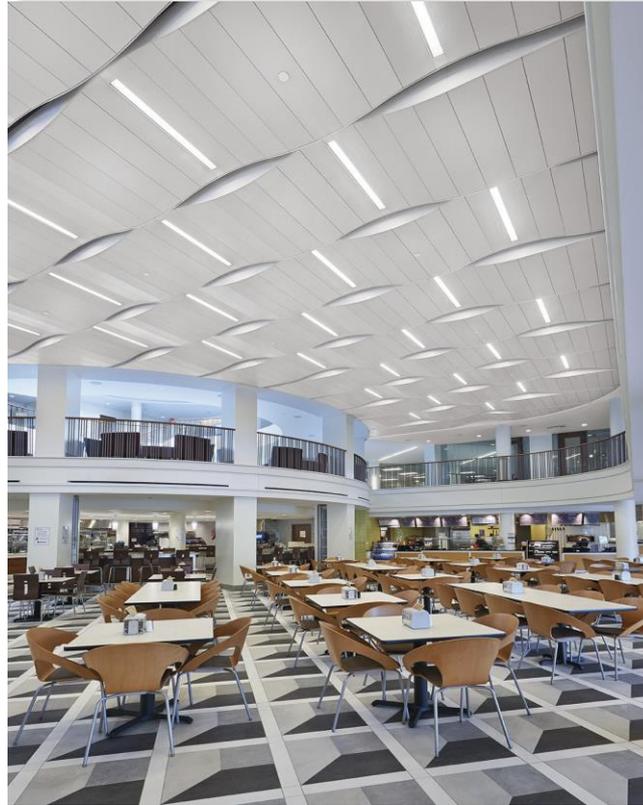
### Class A Offices

- Lobbies
- Conference and board rooms
- Corridors
- Cafeterias
- Executive offices
- Elevator lobbies
- Auditoriums



Transportation  
Class A Offices  
Higher Education

- Student centers
- Lobbies
- Auditoriums
- Recruiting centers
- Conference rooms
- Libraries
- Corridors
- Dormitories
- Arenas
- Laboratories



# Segments

Transportation  
Class A Offices  
Higher Education  
**Healthcare**

- Lobbies
- Corridors
- Conference rooms
- Patient waiting areas
- Cafeterias
- Labs

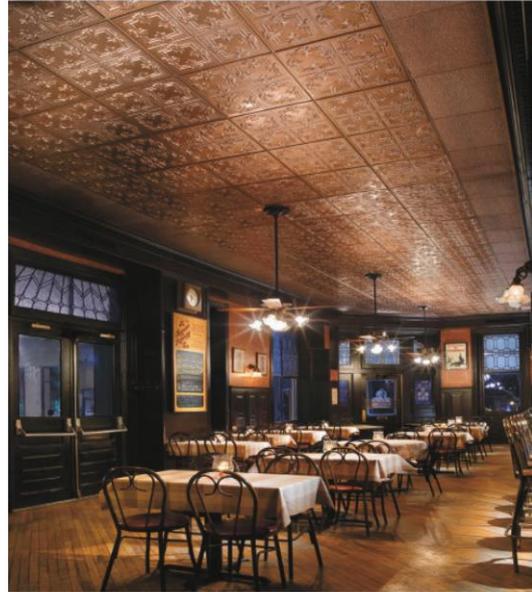


# Segments

Transportation  
Class A Offices  
Higher Education  
Healthcare

## Retail and Hospitality

- Food courts
- Shopping malls
- Convention centers
- Hotel lobbies
- Exterior soffits



# Segments

Transportation

Class A Offices

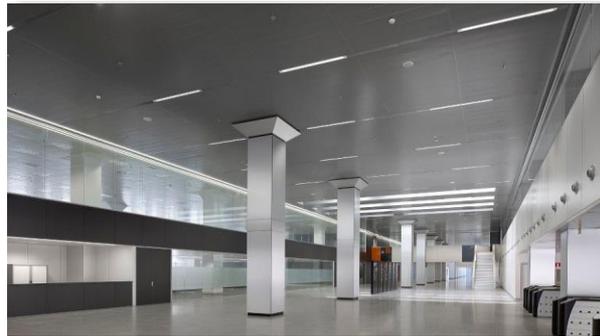
Higher Education

Healthcare

Retail and Hospitality

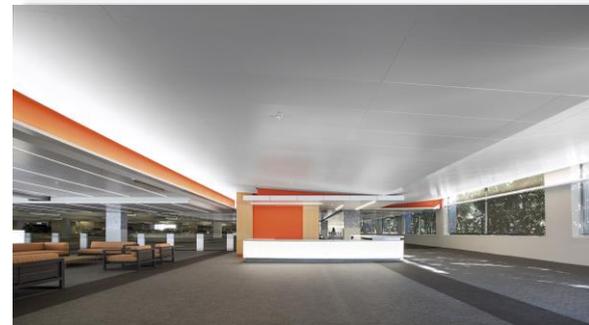
## Security

- Patient rooms
- Detention centers
- Jails / prisons
- Courthouse holding cells
- High-traffic public areas

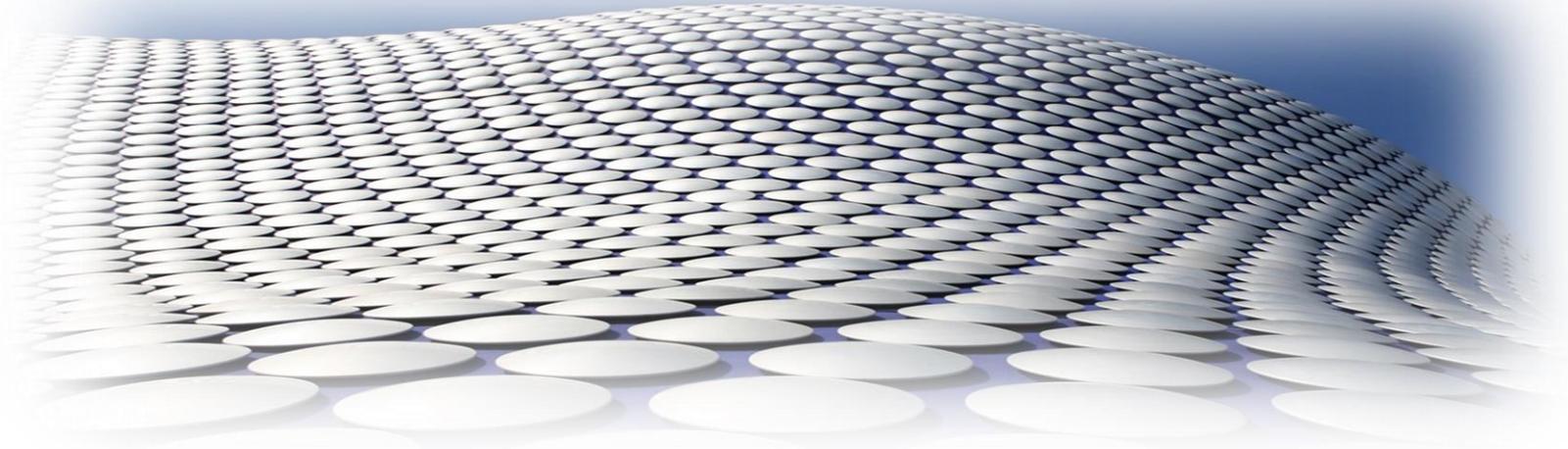


All spaces where aesthetics, access, and durability are important could use metal ceilings

- Lobbies
- Corridors and concourses
- Conference rooms
- Exterior Applications



- Understanding how a metal ceiling is manufactured will help you better understand limitations and possibilities when specifying metal for your projects.
- As is the case with nearly all manufacturing, the more human intervention or handwork required, the more panel types used on a project, the higher the cost.



Whatever the base metal might be, it will usually come to the plant in two ways:

- Coil Stock
- Sheet Stock
- Coils or sheets might be pre-coated or pre-perforated, but not always



Raw material



Raw material set up for perforation

Every panel begins with raw material

- Most metal arrives without perforations. The next step in the process is perforation
- Each perforation, border, and pattern is programmed into the machine. The machine “stitches” the perforation into the panel.
- These machines will trim the panel to length as well
- Sheets are often perforated using a turret press – a large machine that “stamps” the perforation into the metal



“Stitch” type perforation machine



“Stamp” type perforation and forming

- The perforating process imparts a memory to the metal material, similar to a dent.
- Leveling or flattening the panels helps remove memory from the perforated panels.
- Pre-perforated material would still need to go through this process prior to forming.



Material being leveled to remove memory.

- Once the sheets are cut to length they're moved to the mechanical forming line
- The machine will perform all the operations necessary to bend and notch the edges of a panel, but it's limited to rectangular shapes
- Large or odd dimensions and shapes must be hand bent on a bending machine



Mechanical Forming



Hand Forming

# Metal Manufacturing – Forming

- Some curved panels can be pre-bent using machinery, but there are many limitations
- Curves are usually handmade with a custom jig. Sides of curved panels might be stitched on, pop-riveted, or welded



Machinery used to pre-bend curved panels for hand forming



Welding or stitching machine used to attach curved panel edges

After forming, panels must be painted

There are many finish options available, but the two most common are:

- Baked Polyester
- Powder Coated
- Paint is a protective barrier coating for the base material. Whether aluminum or steel, exposed base metal can corrode.



Formed panels entering the powder coating paint line



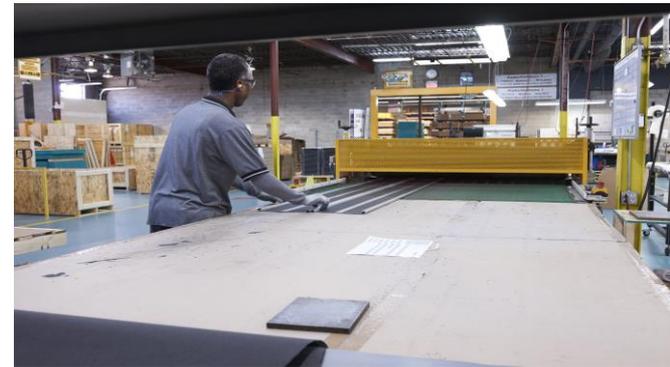
Panels exiting the paint line

Perforated metal panels may now receive other accessories, i.e.:

- Gasketing material, which provides some tolerance variation for installation and removal of panels
- Acoustical fleece improves the ability of a metal panel to absorb sound



Fleece application



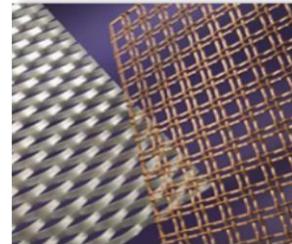
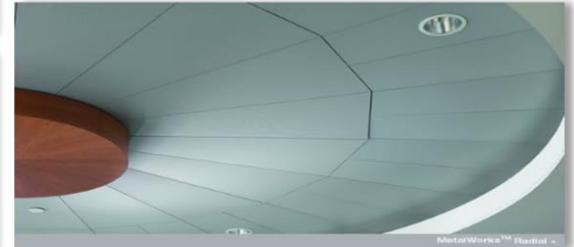
Fleece adhesive is heat activated

- Lead Times – Check lead times for standard and custom designs as early as possible during design
  - Factors affecting lead times include:
    - Shop drawing/system complexity
    - Coil or sheet stock availability. Handmade versus machine-made panels
    - Plant backlogs
- Budget Versus Capability – Make sure your ceilings and project budget can support your design
- Manufacturer’s Reps – Involve a manufacturer as early in the design as possible for budgeting and detailing
- Details of perimeters, transitions, integration of fixtures, diffusers, and edges should be designed to complement the system up front
- System Attributes Affect Manufacturing – Size, shape, material, material thickness, perforation, borders, paint finish, acoustical correction, accessibility, and local codes are interrelated



## When selecting metal, consider:

- Base material
- Colors and finishes
- Shapes
- Sizes
- Patterns and images
- Security needs
- Interior or exterior use
- Perforations
  - For aesthetics and acoustics



### Metal ceilings can be manufactured from:

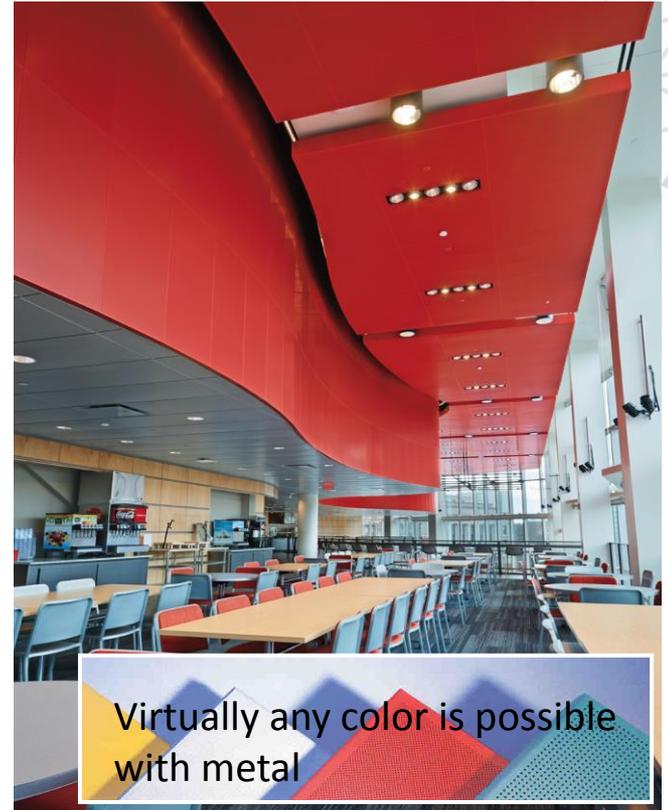
- Stainless steel
- Aluminum
- Galvanized steel
- Wire mesh
- Expanded metal
- Tin
- Composite materials [e.g., “sandwich” type products where an alternate material is embedded between layers of metal]
- And virtually any other metal on the planet!



## Finish Application Methods And Options:

- Powder coating: Electrostatic process applies a very durable, even, and complete finish to the panel (usually applied post-fabrication)
- Pre-coated: Paint is applied to sheet or coil stock prior to fabrication – interior of perforations are usually unpainted
- Baked polyester: Paint is usually applied after fabrication, wet applied, and baked on

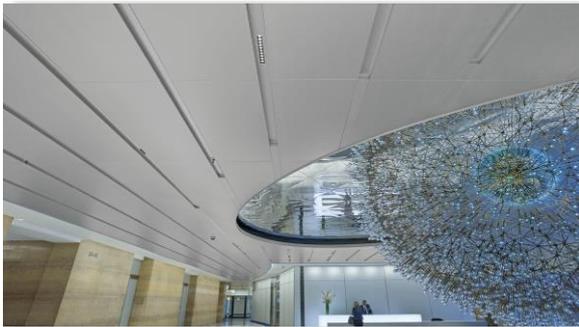
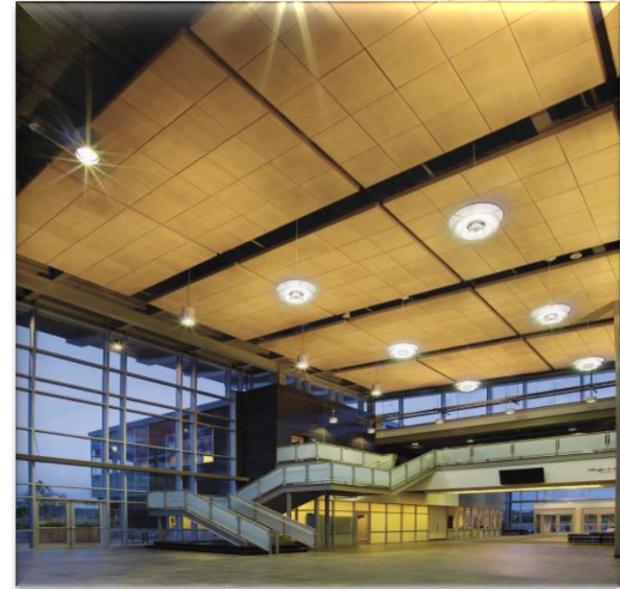
NOTE: Composite Class A fire ratings can be achieved only with tested factory coatings! Some custom color and painting done through third parties might void the fire performance and/or warranty.



Example of post-production powder-coating process

## Attribute – Finish Options

- Brushed or Natural Finish leaves the base material exposed or etched
- Real wood veneers can be laminated to some base metals
- Faux “wood look” is usually a PVC laminate applied to the base metal
- Powder-coated “wood look” applies images to the base material
- Mirror finishes are highly reflective



**Finishes can greatly affect cost!**

A wide variety of sizes and shapes are possible with metal ceilings

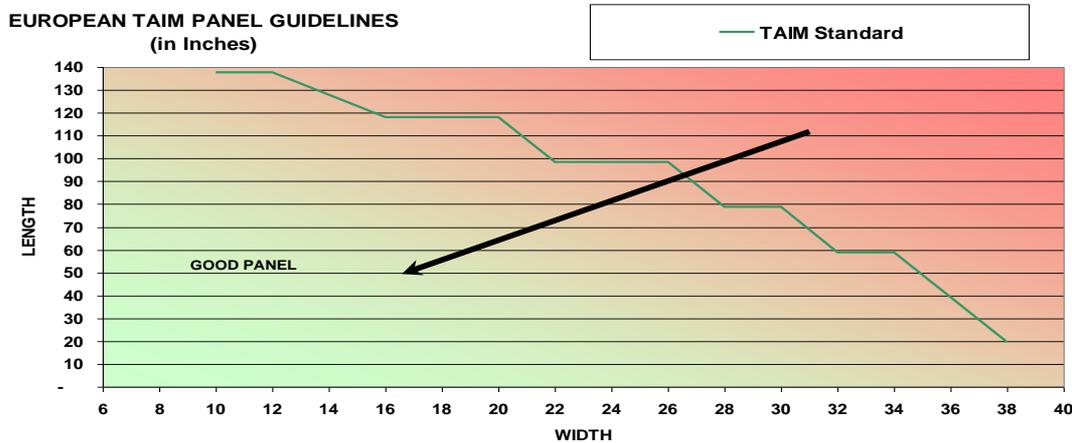
## Considerations:

- Will the panel sag?
- Can one person install/access the ceiling?
- Can the panel be perforated the way I want it to look?
- Can the panel be made on high-speed machinery?



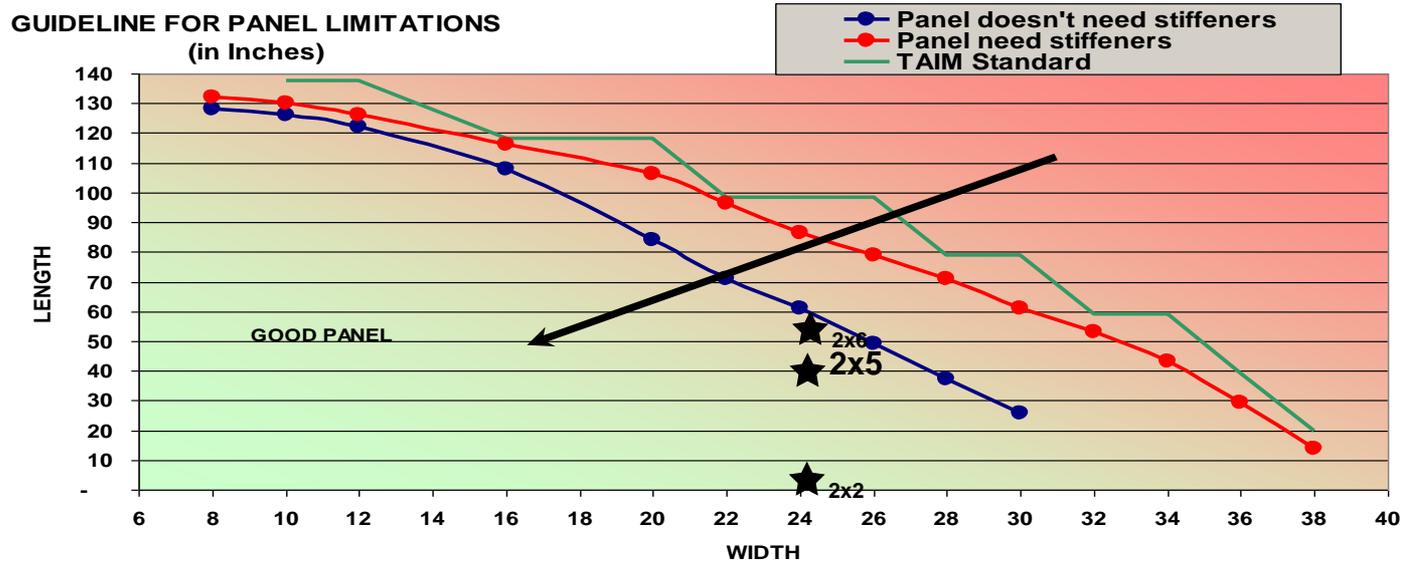
## All metal panels will sag.

- The larger the panel, the more it deflects
- This is related to basic physical properties of metal
- European manufacturers use standards to minimize potential deflection
- CISCA is working on similar U.S. recommendations



## Size guidelines:

Here's a chart manufacturers might use with larger panels to identify when stiffeners would be recommended.



For example: A 2' x 2' panel is fine. A 2' x 5' metal panel also ok. However, a 2' x 6' panel might need stiffeners.

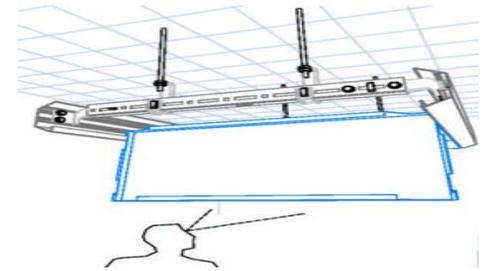
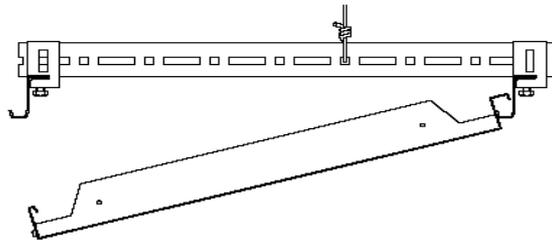
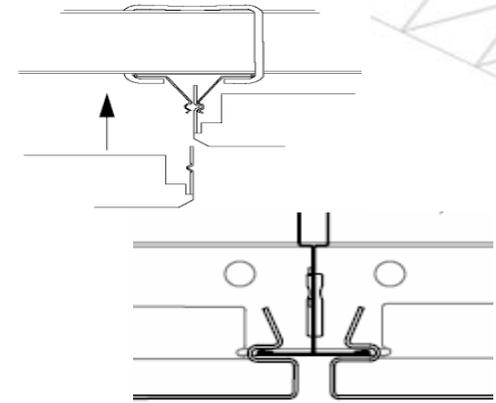
## Guidelines on Panel Size:

- All metal deflects – even 2' x 2' panels – but in that size, it's usually not detectable or objectionable.
- For larger sizes work with your ceiling manufacturer to identify acceptable sizes and potential deflection.
- When larger panels are desired:
  - Manufacturers can use stiffeners or different configuration layouts to support panels.
  - Larger panels will tend to be more expensive.



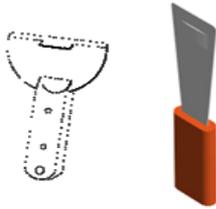
Metal ceilings can have access designed into the system using a variety of methods:

- Hook-on systems simply “hook” over a suspension system
- Snap-in systems hide the grid and often require a tool to access the ceiling
- Some concealed systems can hide or diminish the views of the suspension system, and can be accessed without a tool
- Some systems can be provided with swing-down access. This is helpful in areas where frequent access is required

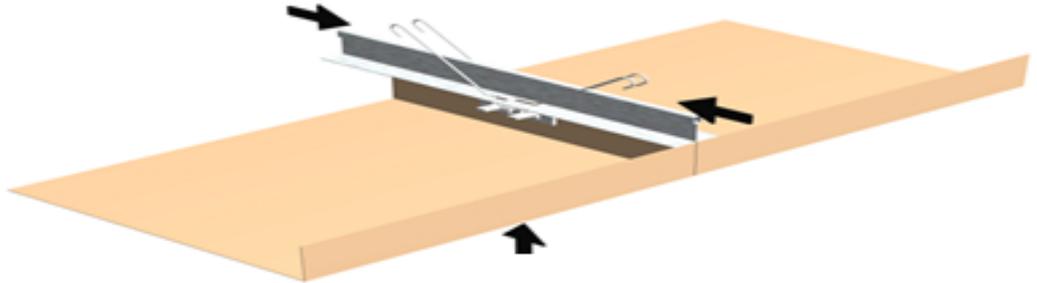


# Attribute - Accessibility

- Security ceilings can be accessible if installed with specialty exposed fasteners
- Torsion spring systems can provide concealed access similar to snap-in.
  - Special tools for removal:



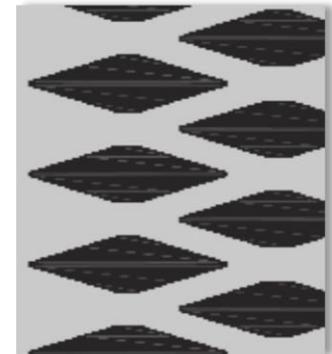
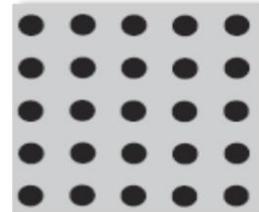
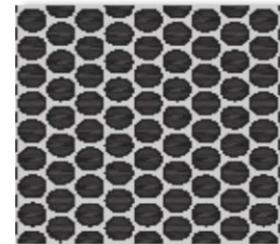
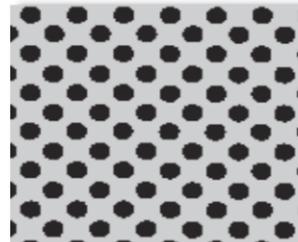
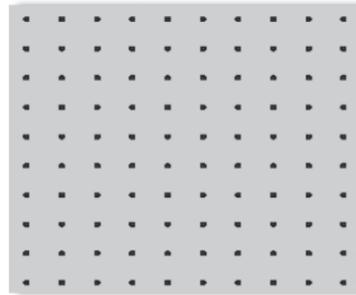
**Typical  
Removal Tools**



- Consider the frequency and type of access needed. Common problems that can occur with accessing metal ceilings include oil-canning, misalignment, and scratched panels.

A wide variety of design styles allows varying degrees of openness, blending aesthetics with acoustics

- Examples:
  - Round
  - Square
  - Slotted
  - Straight
  - Staggered
  - Diagonal



Replace with new swatches from web redesign?

# Attribute – Perforation Options

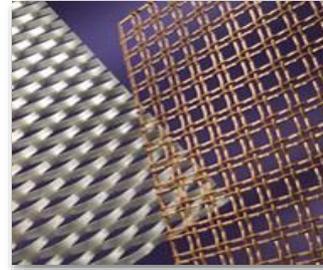
Creating different visual possibilities



# Attribute – Open Patterns

Metal ceilings for “open plenum” spaces typically include:

- Welded Wire (B)
- Expanded Metal (A&C)
- Woven Wire (A&D)



(A)



(B)



(C)



(D)

Perforated metal panels can act as transparent and resonant sound absorbers

- Acoustical performance is based on:
  - Size of perforations and spacing (% open area)
  - Backing material
  - Plenum depth
  - Metal thickness
- Design benefits:
  - Perforation patterns with very different visuals can have the same percentage open area
  - Metal panels with different percentage open and backing material might have similar acoustical performance



## High-performance acoustical options are available

- Consider a typical scenario with a 2' x 2' perforated panel:
  - 22% open area (based on this perf size, shape, and on-center spacing)
    - acoustical fleece backer
    - acoustical fiberglass infill pad
    - NRC of 0.65 [with fleece] or up to 0.90 [with infill]



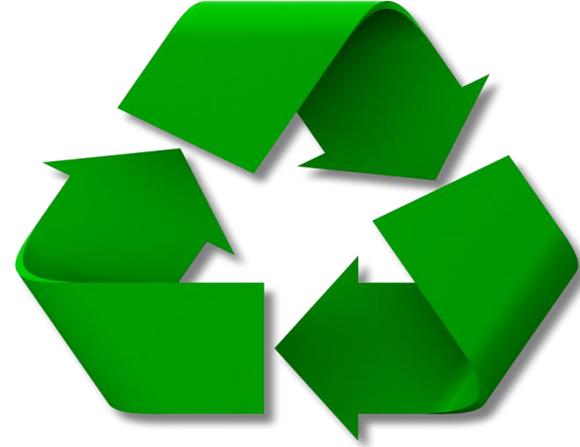
- Example: NRC 0.90 panel with fleece and infill.
- ⇒ Perforations are round and diagonal.
  - ⇒ Hole size is 1.5 mm, with 4.3 mm OC spacing.
  - ⇒ Generating a 22% open area.

# Attribute - Durability

- Minimal long-term maintenance requirements
- Improved life cycle of the building
- Versatility – for interior or exterior use
- Durability is determined by the type of metal, thickness, perforation, edge detail and panel construction

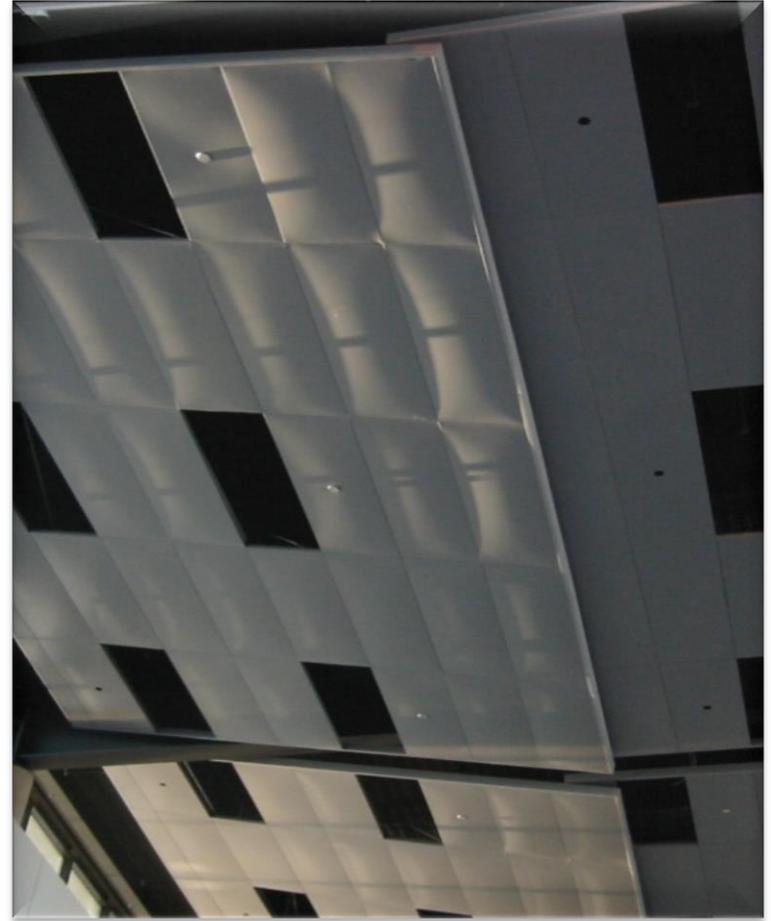


- Long life cycle – almost a permanent ceiling
- Metal can be reclaimed after use
- Metal ceilings contain a recycled content
- No airborne particles or “dusting” off of the product
- Can be integrated with radiant heating and cooling technology, which is known to lower heating and cooling cost and be healthier than forced air



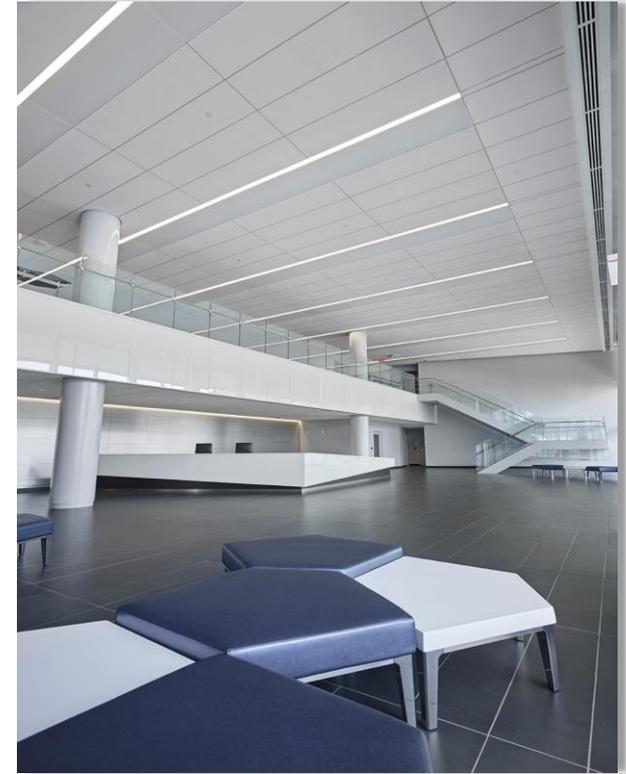
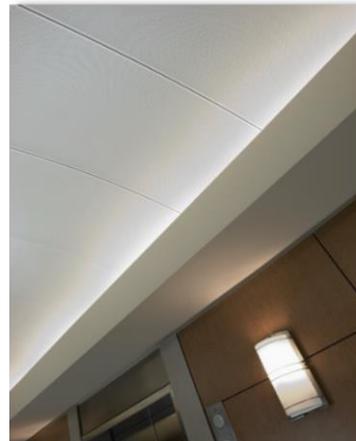
## Attribute – Lighting

- Look at the panels on the left and on the right
- All metal ceilings sag to some extent. Lighting can accent or diminish the appearance of sag



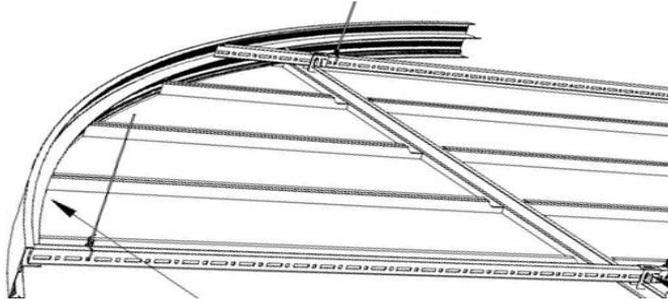
## Lighting and Diffusers:

- Accessories like air diffusers can be coordinated
- Standard metal panels are typically field-cut
- Prefabricated factory cutouts [like below] might be available on custom panels for installation ease and best visual
- Use with indirect lighting for best light reflectance

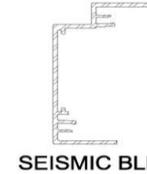


## Bulkheads And Perimeters:

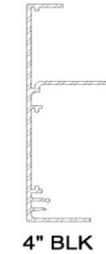
- Variety of standard and custom options typically available
  - Including designs to address seismic requirements
- Custom bulkheads very dependent on custom panel details
  - Can be



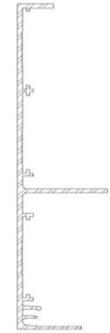
RA1



SEISMIC BLK



4" BLK



6" BLK



RA4F



RA5F



RA6F

# Attribute – Exterior Applications

Metal ceilings are often used outside. Some issues to consider:

- Accessibility – Available with some systems
- Wind Uplift – In some regions, Class 60 or 90 is required to withstand 138 to 180 mph winds
- Testing – For pre-finished panels and suspension systems tested to protect against rust, corrosion, acid rain



Hurricane-driven water and dirt stains can be cleaned from powder-coated surfaces. System shows no movement in ceiling panels

Hurricane damage evident on building, but not on ceiling panels

Metal ceilings are often used to secure spaces. Consider:

- Security need – Minimum or maximum?
- Accessibility – Secure exit doors or panels
- Testing – How do the systems perform and how are they tested?
- Suspension method – Do panels and grid work together (and are they tested together)?



- Consider standard versus custom in terms of budget, design intent, availability, and lead time
- Understand the importance of performance needs like access, acoustics, fire, and seismic approvals
- Explore installation ease and future access for panels and suspension
- Compare apples to apples with competing systems
- With custom systems:
  - Involve a manufacturer's rep as early as possible
  - Provide design details and preliminary drawings electronically (including reflected ceiling plans, section cuts, perimeter details)
  - Review spec with manufacturer before project goes out to bid
  - Keep number of unique panel types down to limit the cost



## Designing with metal ceilings

- Work closely with a proven product partner during the design process to:
  - Describe the design intent
  - Explore capabilities and any limitations
  - Confirm expectations
  - Avoid surprises
  - Achieve intended results





This concludes your  
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**THANK YOU FOR ATTENDING**

## Planks



# Beyond the Square

Trapezoidal Panels  
(for bold or subtle radial effects)

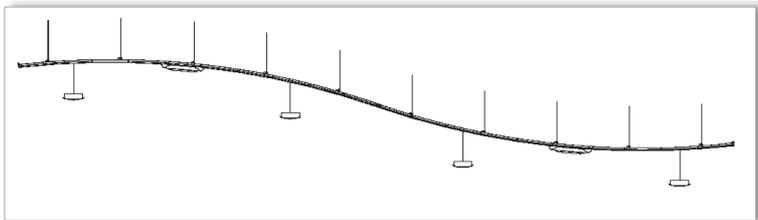


## Curved Panels

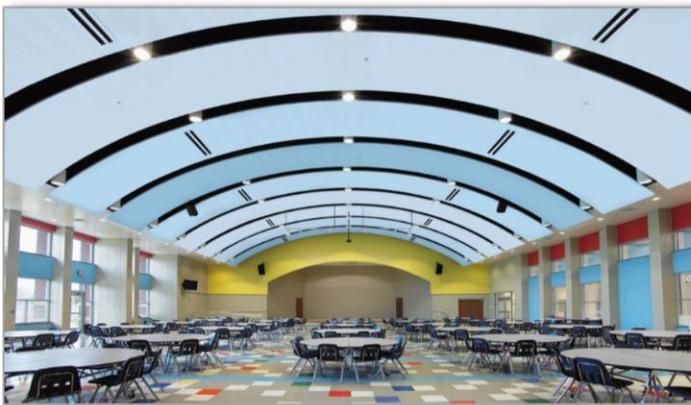


## Custom Panel Sizes

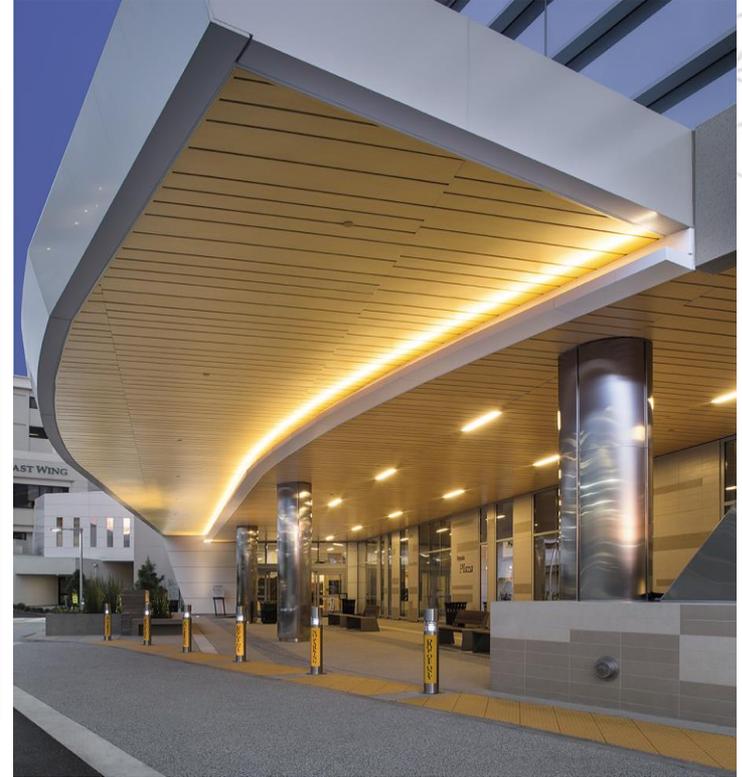
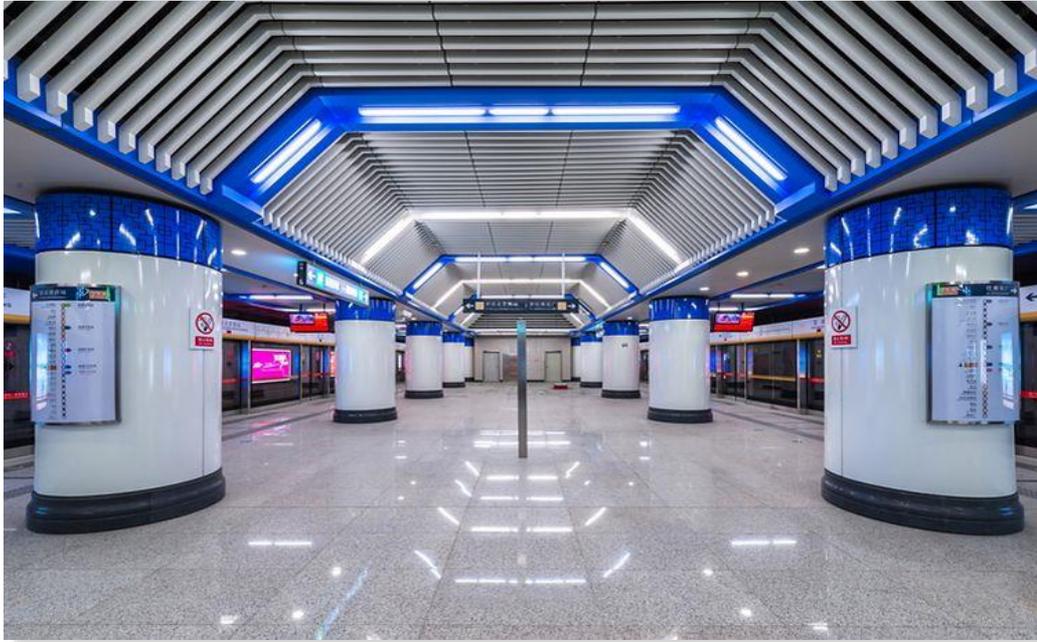
- Cost-Effective Curves – Flat Panels on Faceted Grid



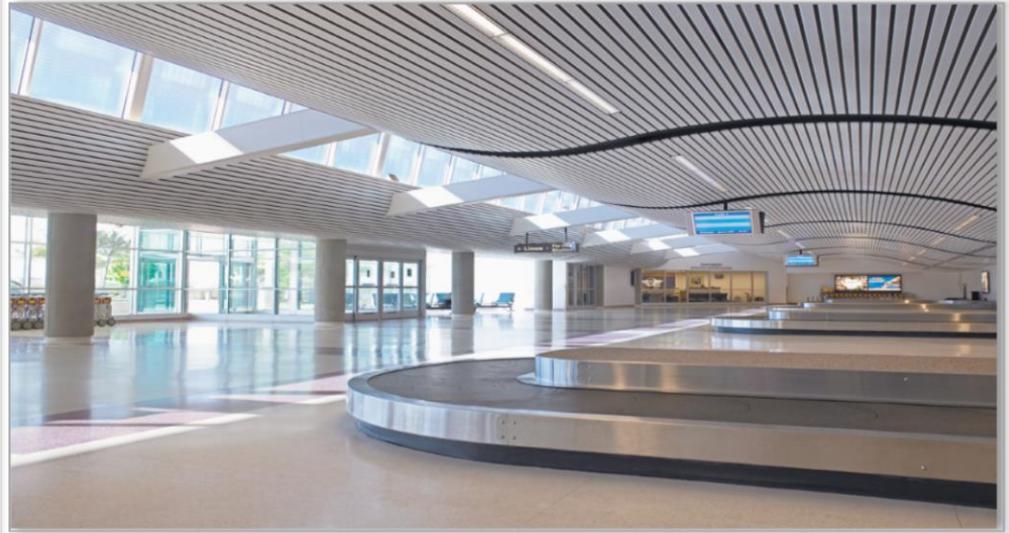
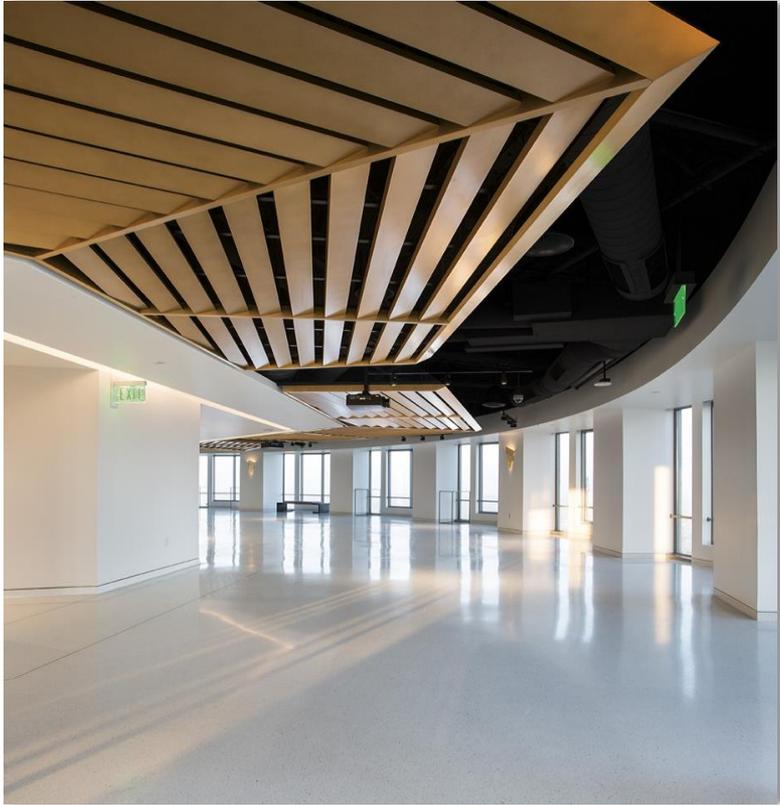
## Flat Panels on Faceted Grid – 2' x 2' Panel Sizes



## Linear



## Linear



# Beyond the Square

## Linear

