NEW TRENDS IN ceiling designs AND MATERIALS

BEN TANNER / COURTESY HUNTON BRADY ARCHITECTS

LEARNING OBJECTIVES

After reading this article, you should be able to:

+ LIST ceiling elements and design variables that affect building interior environmental performance and occupant health and comfort.
+ EXPLAIN the general economic, environmental, and constructability benefits of open plenums and suspended ceilings on building design.
+ DESCRIBE the variables of ceiling design that impact sustainability and occupant health, safety, and welfare.
+ DISCUSS the impact of sustainability advances on ceiling system and manufacturer selection and the health, comfort, and environmental benefit to tenants, visitors, and other building users.

BY C.C. SULLIVAN AND BARBARA HORWITZ-BENNETT

Grandiose, quaint, eccentric or homey, ceiling design statements go a long way toward creating the look and feel desired for a commercial or institutional interior. The key to enhancing building performance, however, is balancing aesthetic appeal with effective acoustics, improved sustainability, and smart integration of mechanical, electrical, and plumbing equipment.

Fortunately, the marketplace for interior materials and systems is brimming with a broad array of new and improved products offering everything from superior acoustics and closed-loop, recycled

A back-lit, dropped wood ceiling creates a focal point and serves as a wayfinding element at the Florida Hospital Memorial Cancer Institute, in Daytona Beach. The facility was designed by HuntonBrady Architects.

content to eased integration with lighting systems, HVAC diffusers, fire sprinkler heads, and other overhead problems. At the same time, more Building Teams are exploring ways to go beyond the treatment of ceilings as white, monolithic planes. Instead, new building designs show how the ceiling can take on renewed importance and focus, much as their historical antecedents did. Even in everyday spaces, ceilings are central to the interior design and an avenue through which creative Building Teams are enhancing the look and effect they are crafting for a particular space.

With that in mind, an improved understanding of both the stylistic and ornamental aspect of ceiling design and the important technical variables of building system integration is warranted.

DIMENSIONAL CEILING SYSTEMS

Scores of new ceiling systems have been developed in recent years to allow for low-cost, lasting dimensional effects. These range from textured and low-profile differentiated surfaces to deeper architectural gestures, including neoclassical shapes.

Domes and vaults. For a more classic ceiling treatment, domes and vaults are often used to create a strong, centralized sense of place, says Charles W. Cole, Jr,, AIA, ACHA, President of Hunton-Brady Architects (www.huntonbrady.com), Orlando. He notes, however, that their geometric shapes may present acoustical difficulties, most notably echoes and reverberations; it's important, therefore, to avoid focusing sound at the center of the space.

Commonly found in civic buildings and traditional cultural venues such as performing arts facilities, domed ceilings can be used to define a space as a focal point or as "the destination" of a site, according to Gene Graff, AIA, Senior Professional Associate in HDR Architecture's New York office (www.hdrinc.com). These celebratory nodes can also mark the intersection of two major circulation routes or building axes, he adds. With their directional quality, vaulted ceilings are often used to orient views or to reflect circulation elements and seating arrangements, or to create a majestic quality or sense of pageantry in an interior space.

LARRY TAYLOR / COURTESY HUNTONBRADY ARCHITECTS/

Sloped coffers conform to the shape of this auditorium at the University of Central Florida College of Medicine, Orlando, designed by HuntonBrady.

Domes and vaults can be made from a number of building materials, including drywall, plaster, and glass-fiber-reinforced concrete (GFRC), but their construction demands a high level of workmanship. "Whether using traditional methods or modern materials, if attention to detail is lacking, the form can become irregular and noticeable to the untrained eye," notes Brent Kelley, AIA, Principal in the Sacramento, Calif., office of Corgan (www.corgan.com).

Cathedral ceilings. As is true with domes and vaults, cathedral ceilings create a centralizing effect but in a form that is smaller in scale. They tend to be easier to construct than domes and vaults, although more intermediate supports are required as the ceiling span increases.

Used to add drama to a room and increase the volume of the interior, cathedral ceilings lend importance to the space while maintaining a comfortable, sheltering quality, says Graff. Cathedral ceilings are often used in conjunction with skylights, clerestories, or large walls of glass, he says. Their plane is usually sloped to suggest the roof line or shape of the building.

Ribs and coffers. Originally developed from the articulation of structural elements, embellishments like ribs and coffers are valued for their visual effect and reinforcement of the building grid. The rhythmic appeal of the regularly spaced beams, joists, timbers, or ribs is also an attractive motif for patterning of the ceiling plane, even when it is only an applied, faux treatment. While as a practical benefit these articulations can be used to help organize lights, grilles, speakers, and sprinkler heads, their waffle-slab look also lends a three-dimensional sense of order and structure to the room.

Experienced Building Teams contend that one key to executing a successful ribbed or coffer ceiling plane is attention to scale. "If the ribs or coffers are too robust or oversized, the space will feel overwhelmed and insignificant," warns Graff. "If the members are too small, they will fail to achieve the desired effect."

Cove and tray perimeters. While cove and tray perimeters are most often used to discreetly accommodate indirect lighting fixtures, they can also produce the illusion of a floating ceiling plane. Perimeter coves are also a great way to resolve the transition between wall and ceiling surfaces, especially in cases where the wall was designed with pilasters or column capitals and the ceiling is a dome or vault, says Graff.

"This form also provides a good solution to spaces that have a floor deck above and would otherwise be limited to a flat ceiling," adds Kelley. Lighting designers also appreciate these small nooks for concealing fixtures such as cove lighting and linear diffusers, which can add spatial drama.

Moldings and medallions. These devices are often used as aesthetic flourishes within certain spaces at their perimeters or centers or at regularly spaced intervals. Moldings and medallions, which are often prefabricated, work especially well when the walls and floors are similarly designed with ornamental motifs. They can be paired with ornamental baseboard, door and window trim, pilasters, picture

rails, or wainscot. In functional terms, moldings and medallion-type elements also help terminate the wall planes, or serve as a clear transition between the wall and ceiling.

While the ceiling areas receiving the applied focal points become an integral part of the space and help complete a room's classic design, it is essential that the systems be compatible in materiality and visual presentation, says Graff. Some architects recommend using this type of ornamentation sparingly, even though its detailing and specification are fairly straightforward and good craftsmanship is usually not a great concern.

Soffits. These elements lend dynamism and architectural interest to a space. Soffits are compatible with a range of building typologies and styles that may not benefit from classical decorative conceits. While they are a common ceiling treatment and ideal for varying interior heights and concealing structural, mechanical, and lighting systems, soffits also help organize a space and communicate architectural intent and program. The secondary ceiling planes also are often used to create visual interest, without competing with the look of the primary ceiling surface.

Another benefit of soffits is their use in framing views or announcing a change in interior use. Building Teams can use soffitted ceilings to define circulation zones, seating areas, and reception spaces. "Soffits reinforce the geometry of the space and provide an opportunity to manipulate the scale," says HuntonBrady's Cole.

Ceilings Plus engineered and fabricated the ceiling and wall panels in photo below. They are finished with real wood veneers on lightweight, recycled aluminum and microperforated for acoustical control. For information, see ceilingsplus.com.

JEFFREY TOTARO / COURTESY: HDR ARCHITECTURE

At New Jersey Manufacturer's Insurance Company's corporate lobby in Hammonton, a wood grid helps create a warm, almost residential look.

OPEN VS. CLOSED: Ceiling debate over life cycle studies

While suspended, lay-in ceilings have long been the norm in commercial design, the open-plenum ceiling has become trendy and economical, particularly in office and retail environments. However, calculating the tradeoffs between cost and performance can be tricky.

In 2008, the Ceilings & Interior Systems Construction Association (www.cisca.org) ran a life cycle study comparing suspended ceilings with open ceilings on the basis of cost and performance. Office and retail spaces were modeled in Chicago, Charlotte, Oklahoma City, Orlando, and Phoenix to reflect the differences in energy costs, climate, and installation costs. Initial construction costs were determined using RSMeans data; annual operating costs for HVAC, lighting, and maintenance were calculated according to Building Owners and Managers Association data.

The study found initial construction costs for suspended ceilings to be 15-22% higher in offices, and 4-11% higher in retail spaces. However, total energy savings for lay-in ceilings vs. open plenums were 9-10.3% in offices and 12.7-17% for retail. A 10.5% energy reduction qualifies buildings for a LEED EA credit, and a 14% reduction is good for two points.

The study attributed the energy performance advantage of suspended ceilings to the use of a return air plenum with low static pressures and fan horsepower vs. ducted air returns with higher static pressures and fan horsepower in open-plenum systems. In addition, return air plenums more efficiently remove heat from lighting systems and reduce the AC load. Suspended ceilings also offer about 20% higher light reflectance, thereby reducing lighting costs.

For more information, see: http://www.cisca.org/files/public/LCS_brochure_rev_9-08_lo-res.pdf.

	CHARLOTTE	CHICAGO	OKLAHOMA CITY	ORLANDO	PHOENIX
ENERGY COST SAVINGS	9.0%	10.0%	9.7%	10.3%	10.1%
SIMPLE PAYBACK	3.4 YRS	7.0 YRS	5.0 YRS	4.1 YRS	6.5 YRS
LIFE CYCLE PAYBACK	5.0 YRS	>10 YRS	7.2 YRS	6.0 YRS	9.0 YRS

SOURCE: CISCA

A 2008 study across five cities by the Ceilings & Interior Systems Construction Association found that, while first costs for suspended ceilings were higher compared to open plenums for both office and retail spaces, suspended ceilings had greater long-term energy savings, higher light reflectance, and reduced mechanical systems loads.

CEILING DESIGN VARIABLES

Building Teams have to deal with a number of universal variables when designing a ceiling system. Careful balancing of these aspects will determine the appeal and functionality of a given interior zone.

Scale and height. In experiential or haptic terms, ceiling height is among the most essential tools in creating a certain ambiance in a space. To make a room feel more ample or more intimate, the Building Team can adjust the ceiling height in the schematic design phase to visualize the effect on spatial perception. However, a few rules of thumb can provide helpful shortcuts. For instance, if a small ceiling module is used in a larger space with a generous ceiling height, then the space will feel roomier than it actually is, says Graff. Conversely, specifying a larger panel module in a smaller room with a low ceiling height could make the ceiling appear heavy and out of scale.

The newly designed atrium for Oklahoma University Medical Center's Children's Hospital provides an example here. Although the hospital itself is six stories, the atrium's ceiling reaches nine stories, creating a larger-than-life feeling, according to Kara J. McDonald, NCIDQ, Project Designer with architecture, planning, and interiors firm Miles Associates (www.milesassociates.com), Oklahoma City. "The space really overwhelms you with excitement and aims to capture children's attention to bring their eyes up to the ceiling and off of their pain," she says.

MIKE MALONE / COURTESY HDR ARCHITECTURE

Colors and rounded shapes are strategically positioned in a suspended ceiling feature to help create a bright, inviting space at the Children's Hospital and Medical Center's Specialty Pediatric Center, in Omaha, designed by HDR Architecture.

Manipulating ceiling height can also be a good strategy in other building occupancies and functional situations. "Changes in ceiling height can define intimate areas, create a transition from one space to the next, influence circulation through a space, define views to a focal point, and, in the case of a performance venue, direct sound to an audience," says Keith Driscoll, AIA, Senior Associate with the Hughes Group Architects (www.hgaarch.com), Sterling, Va.

At the same time, certain ceiling treatments will only work when executed at the correct height. For example, the ribs in a grille-type ceiling must be properly spaced, depending on the height of the ceiling, says HDR's Graff: The "ribbed" effect will be lost if the ceiling is too high, just as it will if the slats are too far apart in the case of a low ceiling. Furthermore, if ornamentation is applied and the ceiling is too high, the detail will be lost.

Shapes and colors. When used correctly, color can light up a space, shape the spatial quality of a room, add visual interest, and make it feel warm or cool, says Corgan's Kelley, who advises staying away from trendy colors that go in and out of style quickly. Color has a secondary role as an expression of identity and brand. In some instances, building designs make a deliberate attempt to merge floor, wall, and ceiling surfaces by using the same material or color—or both—to create unique effects, such as the feel of a space carved from solid mass.

When the ceiling design successfully takes cues from the geometry of the building and its interior spaces—that is, when it is integral to the spatial experience that the Building Team is trying to create—then the ceiling plane takes on a role of "completing" the intended design characteristics of the space, notes Graff. "For instance, a curvilinear space will yield a much stronger effect if the ceiling system lends itself to curved forms, such as long and narrow planks or wedge-shaped panels, instead of the usual square or rectangular ceiling tile," he explains. "Similarly, a linear grill or plank ceiling can imply direction to a space or inflect the eye toward a featured element."

Health, safety, and welfare concerns. With regard to occupant well-being and life safety, selected ceiling systems and designs must take into account a number of variables. For starters, panels, tiles, and other elements must be able to be cleaned to some extent. They must also be durable, except in situations like retail interiors, where frequent change is expected.

From a structural standpoint, ceilings need to be designed and built with the attention to proper supports and attachment details that limit deflection and provide for safe, stable assemblies. This is particularly true in earthquake zones and locations with other severe conditions, where seismic restraints and other system enhancements may be in order. "Proper engineering is required to secure the elements to the structure to guard against falling," says Kelley. "Code parameters come into effect to also ensure floating elements, lay-in ceilings, and even drywall ceilings are properly secured in a seismic event."

Ceilings can also interface with other critical life-safety elements, such as emergency lighting, fire alarms, exit signs, fire suppression, and fire and smoke separations, so design and installation must be carefully integrated and code compliant. In some environments, such as clean rooms, kitchens, or manufacturing sites, the ceiling

system should be sensitive to unusual temperature and humidity conditions. In any case, the ceiling's ability to absorb sound, reflect and diffuse light, and provide visual interest can make a significant contribution to occupant well-being, which in turn, can enhance productivity, reduce stress, and increase comfort.

Acoustic balance. One of the most critical aspects of ceiling system is the design solution's impact on acoustical performance. "The acoustic balance of a space can define the character of the room," says Kelley. "Even if a room has memorable design or spatial characteristics, if it is acoustically unbalanced or uncomfortable, it will not be appealing." A noisy room can overstimulate occupants and make them uneasy, whereas a too quiet interior may be perceived as dull and uninviting.

By carefully selecting ceiling materials, sound reverberation can be controlled and sound frequencies selectively absorbed. To control interior acoustics within the atrium at Oklahoma University's new Children's Hospital facility, Miles Associates and its Building Team members specified perforated ceilings with an acoustical backer. This material system choice helped to preserve the majesty of the atrium's soaring height while also achieving the proper acoustical balance in the high-traffic space.

The key to proper ceiling material selection is to take a holistic view of speech intelligibility, speech privacy, sound intrusion, and noise reduction to find the right combination of sound absorption, sound attenuation, and transmission–without losing sight of aesthetics.

Life cycle cost. From a sustainability standpoint, Miles Associates' McDonald observes that clients still express concerns regarding higher first costs for more durable and effective high-performance building products. This concern has lessened in recent years now that so many sustainable ceiling products have come to market, she adds.

One pitfall Kelley sees some building designers falling into is the choice of pure aesthetics over durability. "Because building occupants have little physical contact with ceiling installations, owners assume these systems will last," he says. "Materials such as metal, lay-in, and wood can add beauty, but can degrade when used in an accessible ceiling plenum." Similarly, systems can be easily damaged if improperly removed or replaced, so it's important not only to select durable products but even more so to handle the panels with care during servicing.

MARK TREW / COURTESY HDR ARCHITECTURE

Showcasing the aesthetics of open plenum with exposed pipes, ducts, and vents is HDR Architecture's ceiling design for a University of Texas M.D. Anderson Cancer Center research building in Houston.

Integration with MEP equipment and other systems. Because most lighting, mechanical/electrical, and life safety systems typically reside at or above the ceiling level, integration is an important consideration when selecting the ceiling system. Fortunately, most off-the-shelf ceiling systems and products have been designed with this integration in mind; however, specifiers still need to make wise decisions to guard against potential integration problems.

Some ceiling systems approach the problem of building systems integration by organizing lighting and ventilation elements along narrow bands running across the ceiling. Not only do these systems lend a nice aesthetic touch, they also offer easier access and maintenance. However, it should be noted that these narrow access panels may present obstacles for customized equipment and lighting fixtures requiring narrower or wider openings.

With regard to air plenum access, the owner's access requirements will dictate system selection. For example, panels with ducted or plenum return systems will directly affect detailing and material selection for both the ceiling and elements above the ceiling, says Hughes Group's Driscoll.

While ceiling systems have traditionally been designed with standard access points, the marketplace is now offering alternatives; even so, says Kelley, ease of accessibility remains a priority with building owners and facility managers. "There is typically a preference to specify accessible ceilings when plenum spaces are required, rather than drywall systems that require multiple access panels which may be necessary to maintain systems above the ceiling," he explains.

OPEN PLENUM VS. DROPPED CEILING

The most challenging aspect of ceiling system design could be the development of an orderly scheme for protecting and maintaining all the pipes, ducts, wiring runs, and sprinkler systems that are critical to a building's function and occupant health, safety, and comfort. The debate over whether to expose some or all of these elements, cover them up with a dropped ceiling, or use a mix of these approaches is ongoing. While the dropped ceiling affords a simpler, more straightforward solution, it can lack visual interest. In addition, the designer may end up compromising some of the ceiling's potential to create numerous effects such as scale, directionality, color, texture, depth, or rhythm, according to Graff.

However, if a continuous, uniform look is desired, then a lay-in suspended ceiling grid certainly fits the bill. The modular, panelized systems are easily installed and readily accommodate mechanical, electrical, and plumbing components such as light fixtures and air diffusers, with good access for maintaining those building systems. They can also offer high-reflectance surfaces for improved lighting

performance, as well as a controlled means for properly tuning room appearance and sound. “Many panel types are also engineered to help shape the acoustic properties of the space, improving the comfort level in the facility,” notes Hughes Group’s Driscoll.

On the other hand, suspended ceilings are generally limited to modular systems, which can make the plane appear highly repetitive or homogeneous. Also, if the selected system is not appropriate for the space, it can appear out of scale or prematurely behind the times. In contrast, open ceiling designs, originally used for practical reasons in older structures where ductwork and cabling had to be added on at a later time, have emerged as a trendy aesthetic.

The greater height, volume, and raw character of an open ceiling can be used as a neutral backdrop for highlighting specific

LARRY TAYLOR / COURTESY HUNTONBRADY ARCHITECTS

HuntonBrady Architects designed this Health First Viera facility in Viera, Fla., using floating colored sails to accent the black, lay-in tiled ceiling. Dropped elements like this are adding to the ceiling designer’s tool kit.

architectural elements, materials, or objects as in a stage set, showroom, or gallery, says Graff. Exposed piping, ductwork, and structure can add rich detail, serve as an ordering device, and make an important statement about the nature of the building, the use of the space, the historical significance of the structure, and the image or identity of the occupants.

While open ceilings obviate the need for a separate lay-in system, the specification and organization of exposed MEP systems also can be quite involved. For example, says Driscoll, materials like spray-applied fire protection and duct insulation can be rather unsightly and the exposed elements need to be dusted regularly to maintain a clean look. According to Graff, “If the wiring, piping, or ductwork is too random in its placement, or if an extensive amount of flex-duct is used, these unattractive and disorganized elements detract from the visual rhythm of the space and can make the space feel congested, dirty, and unsettled.”

Cole recommends painting the cavity and mechanical systems the same color to minimize the visual impact of the overhead equipment. An alternative is to use screens or baffles to obscure the clutter of exposed ceilings. Scott Aspenson, Associate AIA, a designer with RSP Architects in Minneapolis (www.rsparch.com), likes to take this approach for many of his firm’s project. He explains that the technique takes advantage of the open ceiling look, while addressing some of the aesthetic and acoustical concerns associated with suspended baffles or ceiling “clouds.”

A recent study showed that suspended ceilings can achieve a life cycle payback of about 11 months, according to Shirley Wodynski, Executive Director, Ceilings and Interior Systems Construction Association (www.cisca.org). “An objective, independent study was needed to quantify life cycle data and to clarify the advantages of each ceiling type,” she said. The study used energy and construction data for retail/office buildings in five cities. Lower energy costs—due to smaller HVAC systems being required—were an important benefit for dropped ceilings, translating into operational savings that outweighed any premium in initial construction costs.

SUSPENDED GRIDS AND DROPPED ELEMENTS

Although lay-in acoustical tiles appear to be the most commonly specified system in commercial spaces, Building Teams often appreciate the design opportunity afforded by suspended grids and dropped elements.

Traditionally, these systems came in one color, white, with 2X2- or 2X4-foot spacing. New suspended grid products offer color choices and different size options, such as 5X5-foot panels and 2X8-foot planks, and easier accessibility above the ceiling plane with hinged or spring-loaded access panels. Some newer systems also support the integration of lights, diffusers, sprinkler heads, and other devices into the ceiling.

These larger, more monolithic panels were an essential element of RSP Architects’ design of the Musical Instrument Museum galleries in Phoenix, where a six-inch utility strip was specified and located on center above the major grid channels to organize and coordinate all the ceiling utilities and devices, according to Aspenson.

He has also observed a trend to reduce the use of a visible 15/16-inch grid with a fine grid or cover to conceal the ceiling tile edge in order to give the ceiling an even more monolithic, uniform look.

Product manufacturers are also offering specialty components to integrate with standard ceiling systems, which allows designers to raise or drop the ceiling wherever desired, adds Driscoll. Wood ceilings, which were used extensively in the mid-20th century, are now seeing a rebirth in the form of linear grill, flat panel, and linear slat systems, says HDR’s Graff. A suspended-grid, wood-paneled ceiling can create warm, inviting spaces, particularly in lobbies and waiting areas.

Manufacturers are also producing metal ceiling panels in very complex shapes, with grid systems to support them, says Graff. “We’re seeing more metal fascias, coves, HVAC diffusers, and infill panels to provide a complete, integrated system for these metal systems,” he says.

New prefabricated concepts in canopies, clouds, and kites are being utilized to bring human scale, color, and light to room designs. “It is helpful for a cloud to be designed as a distinctive feature within a larger space—an interesting shape, color, or material that is at a lower ceiling height and can be seen and experienced in relationship to the overall space around it,” says Graff. Miles Associates’ McDonald often specifies dropped ceiling features at nurses’ stations in hospitals, to bring warmth and provide a wayfinding element to these locations.

RSP’s Aspenson explains that varying the ceiling height with clouds or canopy can add a layer of dimension and depth to the ceiling plane. For the Musical Instrument Museum, the RSP team floated a 2X2-foot suspended ceiling below a 4X4-foot ceiling to create a light cove between the two planes. “It worked, in this case, because the indirect light of the cove accentuated the layers of the ceiling plane, while the curving perimeter trim provided a clean, hard edge that defined the curving ceiling,” he says. Clouds and soffits can also be used to differentiate program spaces, break up long corridors, or emphasize a specific space.

A word of warning: These design elements must be carefully integrated with the building’s fire-suppression system. The sprinklers may need to be placed above the cloud element as well as at the cloud ceiling level, depending upon local building and life safety code requirements.

SERVING UP A DASH OF NOVELTY

There is a robust niche for faux and specialty materials, particularly in restaurants and retail settings where designers are using the ceiling plane as a canvas to express image and brand identity.

For instance, some retro and traditional designs are embracing faux materials to mimic classical architecture methods. “These materials allow the designer freedom to express a certain style or flavor with materials that lead the beholder to believe they are original to the era they replicate,” says Kelley.

Some popular material choices are faux wood finishes as well as painted foam or GFRC (glass fiber reinforced concrete) castings that give the appearance of stone, painted wood, or plaster. Faux tin

COURTESY RSP ARCHITECTS

An integrated ceiling system at Phoenix’s Musical Instrument Museum, designed by RSP Architects, uses large, monolithic panels to coordinate all utilities and devices in the ceiling into a six-inch utility strip at eight inches on center.

ceilings have been used more frequently in recent years, too. Others include high-pressure laminates and thin veneers.

"Faux wood ceiling planks in metal or PVC provide an opportunity to bring warmth and human scale to a project without the inherent problems associated with real wood planks," notes Cole. "Many of these products are fire-rated, impact resistant, and warp-free, and require little if any maintenance. They can also create a seamless transition from exterior to interior using the same material."

Other advantages of faux woods and stones are lighter weight, ease of installation, and lower cost. In terms of aesthetics, the ceiling's height helps disguise the material's identity and makes it hard to distinguish from genuine wood.

Meanwhile, replicated pressed-metal ceiling tiles that suggest antique tin ceilings may also be used for borders, trim, or even wall coverings. While faux tin products are relatively inexpensive, Building Teams seeking a rich patina of color that tin takes on over time may compromise with tin-plated steel.

"An even more interesting development is the honest use of new materials such as molded fiberglass, sheet metal, acrylic resins, polycarbonate sheets, fabric, and metal panels," says Graff. "Ceiling designs using these new materials can be very sculptural and expressive, like a custom work of art."

For instance, stretch ceilings can be molded into an array of shapes such as waves and three-dimensional curves. A typical system consists of a perimeter track and a canvas, which connects to the track once it's been stretched to the desired shape via heat treatment. Available in a variety of finishes, such as matte, satin, or translucent, the novel ceiling designs can be backlit or integrated with projected images for a truly artistic, modern look.

MORE SUSTAINABLE CEILING SPECS

Aesthetics aside, many Building Teams are looking for sustainability factors in their ceiling systems, says Katie Mesia, AIA, LEED BD+C, Regional Director of Sustainability in Gensler's Washington, D.C., office (www.gensler.com). "The construction materials industry has morphed at a dramatic pace in response to market pressure to provide more sustainable options," she says. "Five years ago, we advocated for higher percentages of recycled content. Now, we have options with 95% recycled content, diverting a large amount of waste and helping clients achieve LEED certification."

For example, many acoustical tile products contain post-consumer recycled content—both old product and salvaged waste from the manufacturing process. Meanwhile, metal ceilings are now including more recycled content, due to rising metal and aluminum costs.

A brief comparison of building materials identifies mineral fiber—a mix of mineral wool, clay, perlite, cellulose, and starch—as among a number of eco-friendly choices. Wood ceiling materials may include locally and sustainably harvested products, which are favored over rarer, imported species for green building projects. Metal tiles benefit from the use of recycled content, which makes them a relatively sustainable option. However, end-of life options should be balanced against resource extraction and processing needs, which for metal include mining, milling, and fabricating, all of which are relatively energy intensive.

PHILLIP SPEARS / COURTESY HDR ARCHITECTURE

A dropped ceiling is tucked beneath clerestory windows at Kaiser Permanente TownPark Comprehensive Medical Center, in Kennesaw, Ga. Building Teams are taking advantage of new materials and product offerings to give clients a much wider choice in ceiling systems than in the past.

Another upcoming trend: *environmental product declarations* for various ceiling system products. EPDs are a standardized, internationally recognized, and comprehensive way of identifying a product's full environmental impact. EPDs have been described as the next generation of product transparency.

At their essence, EPDs are very detailed reports, based on a life cycle assessment that complies with ISO standards. (ISO stands for the International Organization for Standardization.) EPDs incorporate all aspects of the product's life cycle, including material extraction and refining, energy use and efficiency during manufacture, transportation methods, and end-of-service-life recycling, and are verified by an independent third party. Currently, the *LEED Pilot Credit 61: Material Disclosure and Assessment* awards credit to projects that select products backed by EPDs. The next version of LEED, LEED v4, is anticipated to incorporate a new EPD-related credit.

> EDITOR'S NOTE

This completes the reading for this course. To earn ***1.0 AIA/CES HSW/SD learning units****, study the article carefully and take the 10-question exam posted at*:
www.BDCnetwork.com/CeilingDesignMaterials