



Rejuvenation of Suspended Ceilings

by Steven H. Miller, CDT, and Michael Chusid, RA, FCSI, CDT

Photo courtesy Foundry Commercial

THE CEILING IS THE MOST VISIBLE SURFACE IN MOST ROOMS. THE LEAST OBSTRUCTED OF THE HORIZONTAL AND VERTICAL BOUNDING PLANES. INEVITABLY, AESTHETICS IS ONE OF THE CEILING'S MAJOR FUNCTIONS. THE MOST COMMON TYPE OF SUSPENDED CEILING IN NON-RESIDENTIAL BUILDINGS HAVE A T-BAR CEILING SUSPENSION SYSTEM OR GRID WITH LAY-IN CEILING PANELS. COMMERCIAL-GRADES OF THESE PRODUCTS TEND TO BE DURABLE IN TERMS OF SERVICEABILITY, BUT THE AESTHETIC FUNCTION IS PRONE TO PREMATURE FAILURE. TO PUT IT ANOTHER WAY, MANY CEILINGS UGLY OUT BEFORE THEY WEAR OUT.

The impetus for rejuvenation varies. The ceiling's visual condition may simply have fallen below a level that is acceptable to the owner or occupant. Remodeling of other aspects of a space can raise the question, "What should we do about the ceiling?"

The COVID-19 pandemic is prompting other changes that may affect ceilings. Businesses are taking a fresh look at their premises to see if they are clean and hygienic. Property owners

and their design consultants may have to remediate deficiencies in their buildings, remodel to accommodate changes in workflow or occupant spacing, or replace mechanical systems for improved ventilation—these changes can occasion a reconsideration of the ceiling's condition, as well.

Rejuvenation-triggering problems can include a T-bar grid that is yellowed, stained, rusted, and, in more extreme circumstances, bent or damaged. Ceiling panels and tiles are even more vulnerable to discoloration and stains, and some types are prone to physical damage, as well. For example, absorbent panel materials that have been exposed to moisture can develop "water stains" that may actually be colonies of mold or bacteria.

Can a ceiling be rejuvenated? Is it worth the cost? Or should it be removed and replaced with new materials? Answers to these questions depend on the degree of damage and the demands of the occupant.

On the grid

Of the two major components of a suspended ceiling—the T-bar grid versus the panels populating it—the former is usually more durable. In most instances, grid can be renewed

by cleaning, repainting, or applying cover strips; replacement is only required if it has significant damage or the function of the ceiling has changed.

Before undertaking any substantive modifications to the ceiling, it is advisable to verify that the suspension system is adequate for the proposed work. For instance, when the authors looked above the suspended ceiling of an office they had rented, they discovered abandoned ductwork had been lowered and was dangerously resting on the grid. In another violation of safety requirements, heavy fluorescent troffers had not been secured independently to the structure above and were imposing load on the grid.

Grids are commonly made of light-gauge steel, but may also be aluminum, plastic, or pultruded fiberglass. Assuming the suspension system was installed properly to begin with, it should provide years of serviceability under normal conditions. Heavy use, misuse, or abuse can induce sagging or misalignment of tees, or damage to the suspension wires supporting the grid. Suspension systems are particularly apt to be damaged during above-ceiling work, by impact from moving objects, and though improper use of the grid to support items beneath the ceiling.

The grid's appearance can be less enduring. Painted coatings are prone to fade or yellow. Steel T-bar can rust, despite a thin galvanized coating, especially if it has been scratched through to the underlying steel or is located in a humid or chemically aggressive environment. Grid may also get stained or discolored by indoor air contamination, ordinary dust and grime, sprayed particles, splashed liquids, airborne grease, smoke, and handling with dirty hands. Grid that no longer matches the color adjacent ceiling panels can draw attention to the deteriorated appearance of a ceiling. The appearance will be particularly jarring if dirty grid is juxtaposed against new panels.

Cleaning the grid

In many cases, simple cleaning may be all that is required. Prior to cleaning the grid, adjacent ceiling panels, wall finishes, and anything beneath the ceiling may have to be protected, depending on the messiness of the cleaning procedure and how damage-resistant the adjacent materials are.

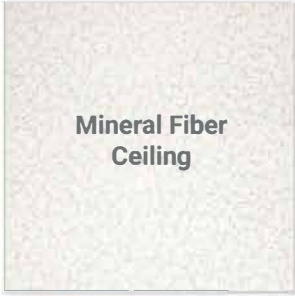


Lightly attached dust or dirt may be wiped or vacuumed off. Soiling that is


stuck to the surface requires washing. Common household or janitorial cleaning products will usually do the job; always test in an inconspicuous location on grid before applying any cleanser broadly.

If ceiling panels are in-situ then, consideration must also be given to how the proposed cleaning technique will affect panels. Some types of ceiling panels

BREAK

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<p>Breaks easily.</p> <p>Stains and holds dirt.</p> <p>Sags and mildews.</p> <p>Releases silica fibers.</p> <p>Difficult to install.</p> <p>Prone to ugly-out.</p>		<p>Strong and robust.</p> <p>Impervious and washable.</p> <p>Unaffected by moisture.</p> <p>Fiber, dust, and itch free.</p> <p>Lightweight and flexible.</p> <p>Long-lasting beauty.</p>

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The original ceiling panels at OC Recording Company (left) emitted a bad odor and were falling apart and filling the air with dust and fibers, according to the owner of the Santa Ana (California)-based studio. He said that the replacement ceiling panels (right) improved the appearance, air quality, and acoustics of the space and he has, “noticed a lot less dust on my desk.”

Photos courtesy OC Recording Company

can be damaged by liquid cleaning products and even gentle brushing or vacuuming can cause erosion of fibers. It may be necessary to remove or mask such panels to protect them—both are labor-intensive processes that can also dislodge fibers and dust.

Grid refinishing

For grids that cannot be cleaned adequately, refinishing may be an option. Grids can be refinished either by painting or by covering with a refinishing strip. Before repainting, the grid must be cleaned thoroughly to remove contaminants. Any rust must be removed and priming may be required. Some paint manufacturers recommend sanding existing gloss and semi-gloss coatings before repainting. Adjacent ceiling panels, especially fragile or porous panels would have to be masked or removed.

Grid covers may be a more cost-effective choice when labor is included in the calculation. Available options include adhered strips and plastic covers that slide over the bottom flanges of standard T-bars and perimeter angles. Adhesive types require grid to be thoroughly cleaned, and they must be pressed firmly into place to assure adhesion. Slide-on covers require less labor; they can be applied without removing adjacent panels and are easy to install without special training or tools. Grid covers are available in white and colors that match or are compatible with popular panel colors and faux finishes.

Panel discussion

Ceiling panels comprise the majority of a ceiling’s surface and present most of its aesthetic failures.

Their surface may be discolored or soiled by many of the same processes affecting the appearance of grid. In addition, panels with textures, fissures, perforations, or crevices have more surface area that can harbor contaminants. Porous types of panels can emit odors, absorb stains, and support mold and mildew if exposed to moisture. Painted metal panels are subject to the same types of failures as metal grid is. Black or gray streaks are often seen surrounding HVAC diffusers, when particulates in the ventilation stream collect in the immediate area due to the Coandă effect (*i.e.* the tendency of a fluid jet to stay attached to adjacent surfaces).

Liquid staining agents can come from either below or above the ceiling. Splashed liquids from below are essentially surface stains that may be cleanable, depending on the absorbency of the ceiling material. Liquids from above—usually water from leaks or condensation—can enter absorbent materials and cause stains that go through the entire thickness of the ceiling product. Leaks often carry dirt or other contaminants picked up on their journey to and through the ceiling panels.

In the case of ‘water stains,’ no form of cleaning or refinishing can be expected to last long if the source of water is unaddressed. Fixing leaks or remediating condensation should be the first step before any other options are tested.

Panel surfaces can also be physically damaged by impacts. Some frangible ceiling materials suffer edge and corner damage simply through routine handling. This can cause fibers to slough off, potentially causing skin and respiratory irritation.



These painted metal ceiling panels can be rejuvenated by wiping with a degreasing cleaning agent. However, the non-woven acoustic fabric behind the perforations may have to be replaced since grime attached to the fabric is more difficult to remove and may also interfere with noise reduction.

Photos courtesy Ceilume



Dust, soot, grease, and other schmutz can accumulate around air diffusers due to the Coand effect. Panels with textures and tegular edges provide additional surface area to trap contaminants and make cleaning more challenging.

Panel cleaning

Dusting or vacuuming will often remove loose or lightly adhered dust and dirt from ceiling materials. Vacuuming may be more effective on panels with crevices, as it can remove dust lodged below the surface. A major manufacturer of mineral fiber panels recommends vacuuming as a primary method, with a caution related to the textured surface of the product: “Care must be taken while vacuuming to avoid

excessive pressure. Use a blotting action to minimize potential loss of surface texture.”

More severe grime and stains may require some sort of liquid cleaning agent. Washable products like metal or thermoformed vinyl panels can often be cleaned in place with a damp cloth or sponge. If necessary, they can be removed from the grid and washed with soap and water or other mild cleansers.

Most mineral fiber panels cannot be exposed to bulk liquids, including cleansers, without damage. Some types, however, have coatings or membranes that allow a greater degree of cleaning and stain resistance. Manufacturers suggest light wiping with a sponge or cloth dampened with mild detergent. Few mineral fiber products, however, can actually be washed. Many thermoformed and metal ceiling panels, in contrast, are comparatively stain resistant and robust and can be washed without damage.

In all cases, manufacturer’s instructions for the specific product should be consulted to determine what type and degree of cleaning is allowable. Manufacturers should also be asked for clarification of vague marketing terms, such as “cleanable” or “scrubbable,” made without reference to standards or quantifiable test results.

Professional cleaning services may have access to cleaning methods and materials that are unavailable to typical maintenance crews (See “Cleaning Services and Proprietary Methods,” page 34).

Panel refinishing

There are limitations on panel refinishing options pertaining to the ceiling’s performance requirements. Painting panels may alter the flame spread and smoke development properties of the ceiling and invalidate the results of product test data. Manufacturers of most types of ceiling panels say painting voids their warranties.

Mineral fiber panels often have surface crevices or fissures that are crucial to the panel’s acoustic control performance. If the perforations get filled with paint, noise reduction coefficients (NRC) drop significantly. A leading mineral fiber panel manufacturer offers recommendations for painting even though it voids the warranty. They include the caution, “the painter should be very careful that he does not close up the acoustical surfaces,” and say, “at minimum, repainting will result in a .05 to .10 reduction in NRC.” Repeated painting is likely to cause an even more precipitous drop in noise reduction.

Small, discreet stains on mineral fiber panels can be touched-up by spot-painting and have minimal



Damaged, dirty, and stained ceiling panels can be removed and replaced, and discolored suspension grid could be cleaned and repainted. In some circumstances, it may be expedient to cover the old materials with refacing panels and slide-on grid covers.

impact on acoustics. There are paints in aerosol spray cans with upward-pointing nozzles available on the consumer market for precisely this application. The ability of these paints to suppress a specific stain, and to match the color of an existing panel, can only be determined by field testing.

If painting perforated vinyl or metal panels, do not allow paint to bridge small openings as this will

CLEANING SERVICES AND PROPRIETARY METHODS

Building owners often contract with independent janitorial or cleaning services to maintain ceilings. These firms have the ladders and lifts that may be necessary to reach high ceilings, drop cloths to cover furnishings and equipment, and special equipment such as vacuum cleaners with extra-long wands or that can be worn on the back.

Thermoformed and metal panels can usually be cleaned as described in the main article. However, the services may be able to provide a variety of proprietary methods to clean grids and panels without removing panels from the ceiling.

One formula for treating mineral fiber panel, is a spray-applied liquid that is said to encapsulate contaminants in droplets that fall to the floor where, presumably, they are vacuumed. Panels are then allowed to dry. Since this is only successful to varying degrees, the standard procedure of the company offering this formula is to use a test panel to determine the optimum cleaning mixture, treat the test panel, and then ask the customer if it is clean enough.

According to one of their service providers, this cleaning method is intended to be cosmetic and is not offered as a form of sanitization. Stains that are associated with water damage are acknowledged to be difficult to remove adequately. If the stains are, in fact, mold, panels should be treated or replaced. According to the service provider, "If [the stains are] coming from above and you have water damage, those tiles are damaged in themselves. You would have to remove all those tiles to properly treat every single one. To treat a tile is probably a lot more expensive than to replace a tile."

If panels cannot be cleaned satisfactorily, the service offers a recoating application that they claim does not void the panel manufacturers' warranties or violate fire codes. Such claims should be verified with the product manufacturers and authorities having jurisdiction. The service provider describes the recoat as "not paint-based, or in any way much like a paint. It is almost like a spray powder." If applied with a specific spray nozzle and pressure, the application is said to not accumulate in the acoustic fissures in the panels, and to not stick the panels to the grid.

CS



Water leaking through the floor deck above this ceiling leached dirt and contaminants that stained these back-illuminated thermoformed panels. The panels could be readily cleaned because they are stain resistant, impervious to water, and washable.

decrease acoustical performance. Care should also be taken to avoid painting any acoustical insulation or backing that is visible through the perforations.

Panel replacement

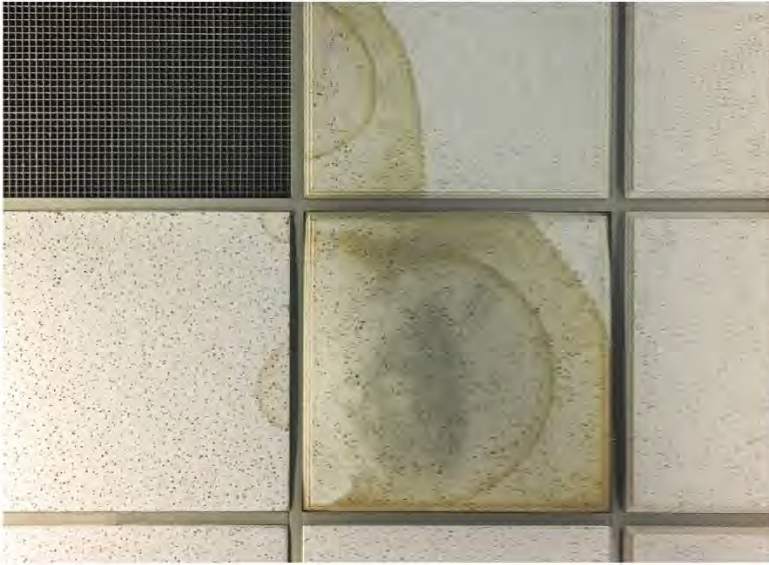
Ceiling panels that cannot be cleaned or refinished acceptably will have to be replaced. If replacing an entire ceiling, considerations about what type of replacement panels to use is similar to the decision-making process used in new construction.¹

If most of the existing ceiling is still relatively new and only a small percentage of panels are discolored or damaged, spot replacements may be the best option. The specifier will have to determine whether replacements will blend with the remaining panels, and develop a process (such as unit pricing) for indicating which ones need replacing.

Consideration should be given to life-cycle costs and whether existing panels should be replaced in-kind or with something more durable and sustainable. If 25 percent of the ceiling needs to be replaced every four years, then the entire ceiling is theoretically replaced in 16 years, in addition to cleaning costs over the interim period. A more sophisticated analysis makes clear that spot replacement becomes less acceptable with time because newer panels will increasingly contrast with old ones and accelerate the need to replace the complete ceiling. It could be more cost effective to replace the entire ceiling at once with a material that will last 20 years or more, and be less expensive to clean over that period.

Environmental impact should be factored into a replacement decision. A major manufacturer of mineral fiber products recycles panels. However, they may not be recyclable if painted, wet, or moldy (often the condition of panels that need to get replaced), and they must be stacked and palletized.

High-quality vinyl and metal panels are often recyclable without degradation in their material



Porous ceiling panels can be damaged by water from leaks, spills, cleaning solutions, and condensation from chilled pipes and equipment and thermal short circuits through the building envelope. Discoloration is caused by contaminants in the water and by colonies of microorganisms feeding on starch and other organic materials in panels. Cleaning is not practical since stains penetrate the surface.

properties. Small quantities of installation scrap can generally be recycled into local material recovering streams, and one maker of thermoformed panels has a take-back program to recycle retired vinyl panels.

Another option avoids, for the time being at least, concerns about recycling decrepit panels. Panels are available that can be used to reface a ceiling; the thin thermoformed panels are installed beneath existing ceiling panels. Combined with slide-on grid coverings, it may be one of the most expedient ways to rejuvenate a ceiling.

Replacement products need to match the fire-safety performance of originals. In this regard, it is important to note some mineral fiber panels are fire-resistance rated, and some thermoformed panels are tested and approved for use as drop-out panels beneath fire sprinklers.

Conclusion

Ceilings are subject to soiling and damage despite being out of reach of most occupants. Due to their exposure, visual degradation may make a ceiling unacceptable even though it is still functional. For ceilings needing frequent cleaning or rejuvenation, it is worthwhile to determine whether replacement or refacing is more cost-effective than restorative treatments. If spot replacement happens often, then complete replacement with more durable and easy-to-clean materials may be a better choice.

Ceilings can become dirty or disfigured during construction due to improper handling, leaks, and damage, so this discussion about rejuvenating ceilings is also applicable to final cleaning of newly constructed or remodeled spaces prior to being turned over to building owners. Full appreciation of durability and maintainability should be part of the product selection process during design and specification. **CS**

Note

¹ Read the article, “Breaking Habits: A Rational Approach to Ceiling Product Evaluation,” published in the March 2020 issue of *The Construction Specifier*.

ADDITIONAL INFORMATION

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Key Takeaways

The ceiling is the most visible surface in most rooms. Inevitably, aesthetics is one of the ceiling's major functions. The most common type of suspended ceiling in non-residential buildings has a T-bar ceiling suspension system or grid with lay-in ceiling panels. Commercial-grades of these products tend to be durable in terms of serviceability, but the aesthetic function is prone to premature failure. To put it another way, many ceilings ugly out before they wear out.



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