STEFEE KNUDSEN, AIA, LEED AP | AUGUST 28, 2026

Mass Timber Ceilings: Functional Beauty

A White Paper Series: Part 3 of 3

Mass timber is more than a beautiful material: it is a proven, sustainable choice for today's schools that supports student and staff wellness, reduces environmental impact, and delivers the durability and low maintenance demands that public school facilities require for the long term.

The question is not whether to use mass timber, but how to use it well. Exposing mass timber as a finished ceiling maximizes its biophilic benefits, connecting students and teachers to nature in ways that research links to lower stress, improved focus, and better learning outcomes. Realizing those benefits while meeting the practical and functional demands of a modern classroom is an achievable goal.

This paper focuses on two key considerations for mass timber ceilings: achieving effective room acoustics, and accommodating the multitude of devices (mechanical, electrical, and technology systems) that today's learning environments require. With thoughtful design, these challenges become opportunities to create classrooms that are not only healthier and more inspiring, but that are functional, adaptable, and durable, serving students, staff, and communities beautifully for generations to come.

ABOUT THE AUTHORS

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Stefee is a Principal at Bora and leader of the firm's K-12 education sector. Her work on Portland's public high schools is leveraging mass timber to cut the carbon impacts of construction while championing healthy, enduring facilities.

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Emily is an Associate and an active mass timber leader at Bora. Her work on public schools and libraries advances the material as a tool for healthy and joyful learning and civic environments.

ABOVE Art Rutkin Elementary School (Photo credit: Josh Partee)

CEILING BASICS

Before exploring mass timber ceiling strategies, it helps to understand what a school ceiling is actually being asked to do. There are two essential topics here: acoustics and devices.

Classroom Acoustics 101

Anyone who has tried to follow a conversation in a large, hard-surfaced room like a gymnasium or restaurant has experienced poor acoustics firsthand. Sound bounces off hard surfaces and lingers, layering new sounds on top of old ones until speech becomes difficult to understand. In a classroom, this is more than an annoyance: research shows that poor acoustics disproportionately affect younger students, English language learners, and students with hearing differences, all of whom rely more heavily on clearly intelligible speech to follow instruction.

The goal of good classroom acoustics is to absorb enough sound that speech stays clear without making the room feel uncomfortably dead or flat. Ceilings play a major role in this. A material's ability to absorb sound rather than reflect it is what determines whether a ceiling helps or hurts. Standard acoustic ceiling tile was designed specifically for this purpose and does its job reasonably well. Exposed wood, by contrast, is a relatively reflective surface, similar to exposed concrete or steel. Thoughtful design is required to balance exposing the beauty of wood and providing excellent acoustic absorption.

For those looking to dig deeper, ANSI/ASA S12.60 is the longstanding industry standard for classroom acoustics, providing specific performance targets for reverberation and speech clarity. It is also worth noting that the 2021 International Building Code introduced mandatory classroom acoustic requirements for the first time. Previously, standards like ANSI S12.60 applied only to projects voluntarily pursuing LEED or CHPS certification. For school districts, this means acoustic performance is no longer optional; it is a code requirement that ceiling design must actively address, and one that informs how we approach every project.

CEILING TYPES

Acoustic Ceiling Tile (ACT)

The familiar default for schools, ACT provides absorptive surface area but often struggles to meet the enhanced classroom acoustic requirements now mandated by the 2021 IBC. Also, the latest code tests the limits of ACT's acoustic absorption. Beyond acoustics, ACT has real drawbacks: tiles hang below the structure, reducing effective ceiling height and shrinking window sizes, which compromises daylight and views. Panels are easily damaged and rarely replaced, leaving unsightly gaps. And contrary to the assumption that ACT allows easy access, fixed panels make it difficult to view or service the systems above. Additionally, while it's easy to mount devices into ACT, code still requires that 10% of devices (fire alarms, speakers, etc.) are located on walls.

Exposed wood ceilings

An exposed wood ceiling places the mass timber structure front and center. Removing the ACT system raises the effective ceiling height, allowing for larger windows, more daylight, and stronger connections to the outdoors, compounding the biophilic benefit of the wood itself.

The practical challenge is that wood is acoustically reflective, so acoustic absorption must come from suspended cloud panels, adjacent surfaces, or wall-mounted treatments.

Exposed wood ceilings also require MEP systems' coordination to run between or along beams rather than below them, and in such a way that avoids visual clutter. The ceiling strategies in the next section each represent a different path to meeting these requirements while maximizing wood exposure.

LOWER LEFT A classroom with an ACT ceiling at Central Catholic High School by Bora

BELOW Timber with applied acoustic panels at Oregon State University - Cascades' Ray Hall by CannonDesign

INTEGRATING MASS TIMBER INTO CLASSROOM CEILINGS

There is no single right answer for mass timber ceiling design. The best approach depends on budget, programmatic needs, and how much wood exposure the project can achieve. Here are the three main strategies, compared:

	Integrated ADLT	Applied Acoustics (Cloud)	Hybrid ACT
Wood exposure	Maximum	Moderate	Moderate to low
Acoustic performance	Excellent	Good	Good
MEP concealment	Requires coordination	Good- above cloud	Full concealment
Upfront cost	Higher	Moderate	Lower
Future flexibility	Limited	Good	Moderate
Maintenance	Low	Low	Low- ACT portion higher
Best for	Classrooms where wood exposure is the priority	Most standard classrooms	Budget-constrained projects or complex MEP

Integrated ADLT builds acoustics directly into the mass timber deck using acoustic dowel-laminated timber (ADLT), maximizing wood exposure and minimizing wall treatment needs. The tradeoff is higher material cost and more coordination with MEP systems. In addition, acoustic separation between spaces must be carefully detailed, and future room reconfigurations are more constrained.

Applied acoustics, or "clouds" either feature acoustic panels directly applied to the wood ceiling, or more commonly, suspended panels slightly below in "clouds" that leave the structure visible while concealing conduits and sprinklers in the cavity above. The air gap between the panels and the wood deck enhances acoustic performance. This is Bora's most commonly specified approach, balancing wood exposure, acoustic performance, MEP flexibility, and cost for most school budgets.

Hybrid ACT divides the ceiling between conventional acoustic tile and the exposed mass timber. The ACT zone handles MEP concealment and acoustics; the timber zone delivers higher ceilings, larger windows, and biophilic benefits. The main drawback is the visual zoning of the room, which can limit future reconfiguration and potential acoustic performance.

Whichever approach is chosen, the goal is the same: expose as much wood as the budget and program allow, resolve the acoustics and MEP coordination early in design, and deliver a ceiling that serves students and teachers beautifully for decades. A skilled design team will help a district navigate these trade-offs, resulting in a gorgeous and maintainable building asset.

RIGHT, TOP TO BOTTOM Integrated ADLT at Kellogg Middle School by Mahlum Architects (Photo credit: Mahlum Architects); Acoustic Clouds at PCC Opportunity Center by Bora; Hybrid, Zoned ACT strategy at Washington School for the Deaf by Mithun (Photo credit: Mithun)

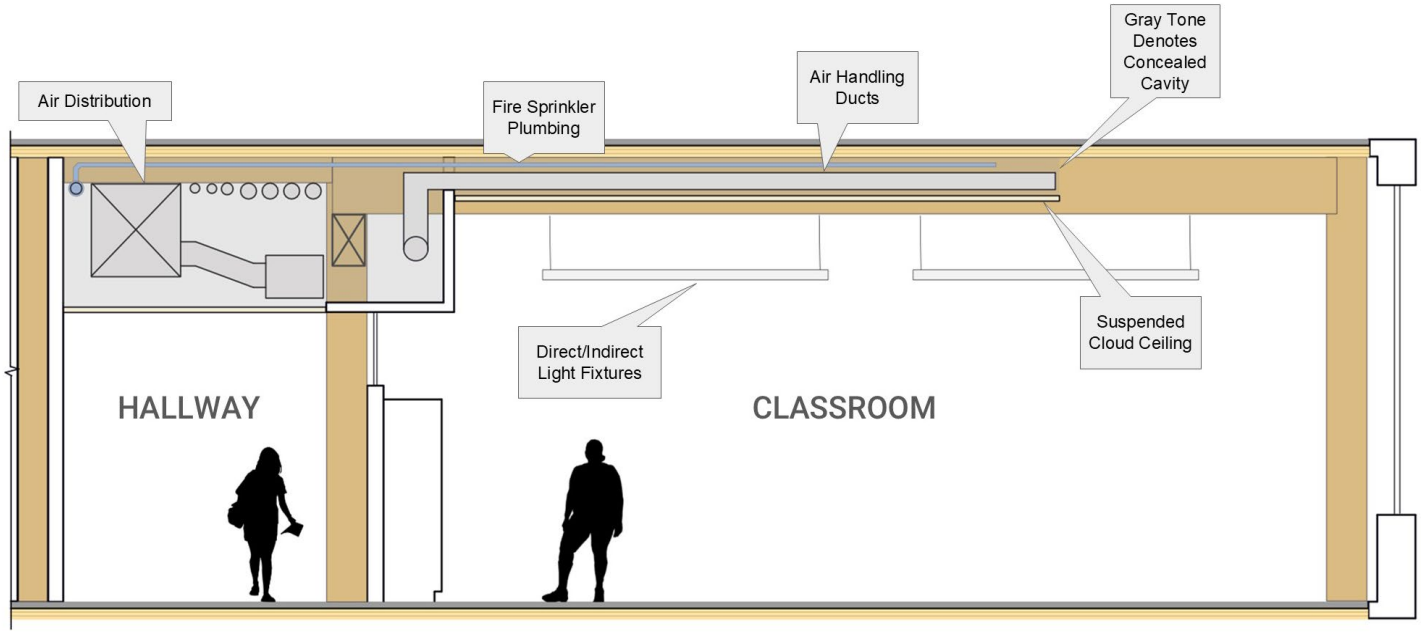
CASE STUDY: IDA B. WELLS HIGH SCHOOL MODERNIZATION

The ceiling strategy at Ida B. Wells High School illustrates one of the most effective approaches Bora has utilized for mass timber schools: using the building's circulation spine to do the heavy mechanical lifting so classrooms can remain as open and wood-rich as possible.

As shown in the diagram below, the hallway carries the building's largest MEP infrastructure (primary air distribution ductwork, plumbing, and fire sprinklers) concealed above a conventional ACT ceiling. This is a deliberate trade: the hallway sacrifices exposed wood in exchange for full mechanical concealment, freeing the adjacent classrooms entirely. With the bulky ductwork relocated to the corridor, classroom ceilings rise to the timber deck above, accommodating a suspended acoustic cloud that conceals only the smaller-scale systems (air ducts, sprinklers, and conduit) while leaving the mass timber structure visible above.

The result is a classroom environment that delivers on multiple levels simultaneously. The higher ceiling height allows for significantly taller windows, increasing daylight penetration and strengthening students' visual connection to the outdoors, compounding the biophilic benefits of the exposed wood overhead. Noise from terminal units and air handling equipment stays in the hallway, out of the learning environment, contributing to a quieter classroom baseline and easier for maintenance access during the school day.

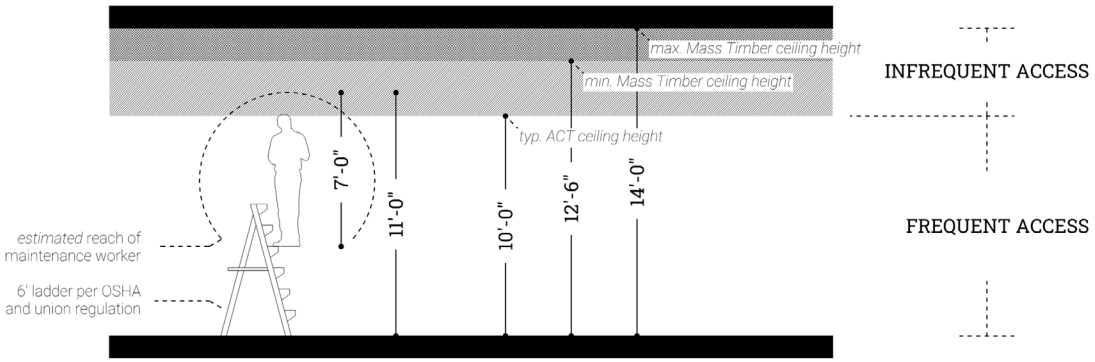
On the acoustic side, the design targets NC 30 for classroom spaces, a standard that limits background noise to a level where speech remains clearly intelligible without strain. The project also incorporates the accessibility-focused acoustical requirements of ANSI A117.1 for Group E classroom spaces, ensuring the environment works for students with hearing differences as well as the broader school community. This hallway/classroom strategy has become a reliable model in Bora's mass timber school work: it manages cost and complexity by concentrating MEP in one zone, while maximizing the health, wellness, and experiential benefits of exposed timber in the area where students spend most of their time.



ABOVE Portland Public Schools' Ida B. Wells High School design maximizes wood ceilings in the classroom

OPPOSITE PAGE, TOP Device positioning should be stratgized based on frequency of access

OPPOSITE PAGE, BOTTOM Device accessibility strategy in a typical classroom using mass timber



REACHING CEILING DEVICES

Mass timber's higher ceiling heights are a genuine benefit, but they do raise a practical question: how does facilities staff safely access and service what's overhead? The answer lies in sorting devices by how often they need attention, then designing placement accordingly.

Device Types

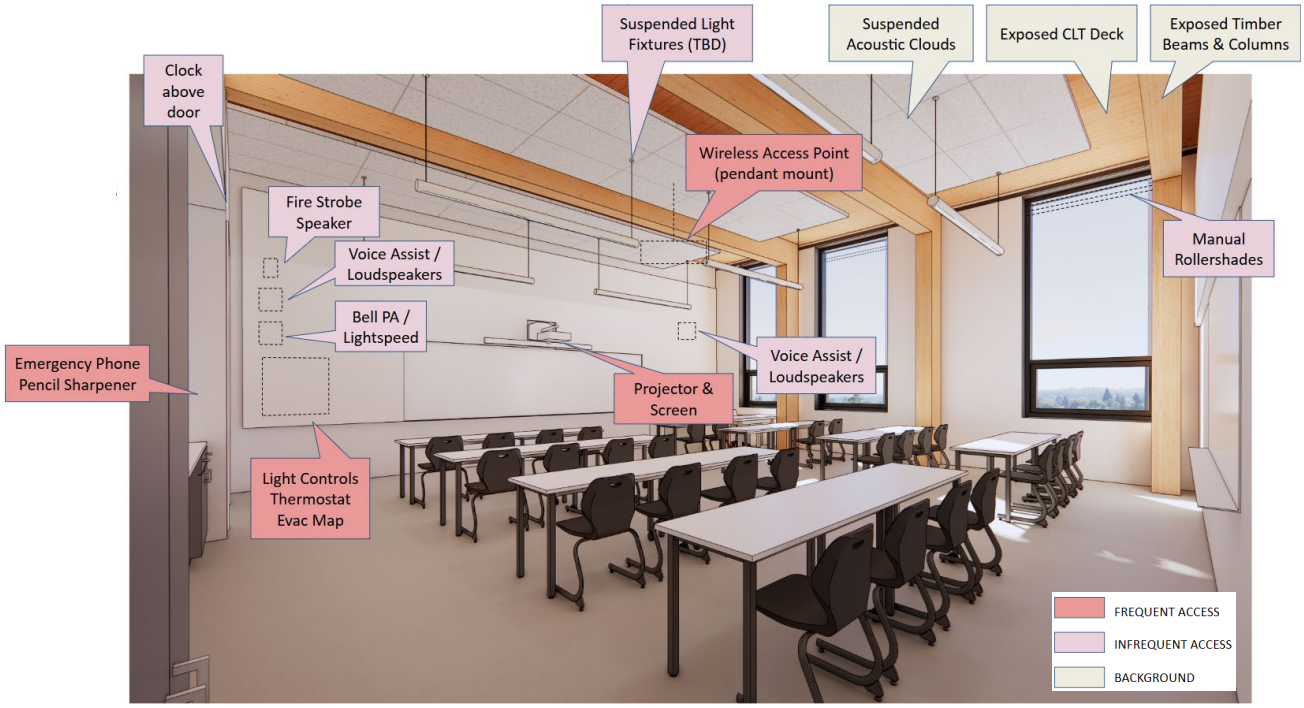
School ceiling devices fall into two categories: frequent access and infrequent access. Frequent-access devices (fire alarms, projectors, strobes, speakers, and PA systems) are best located on side walls where they can be easily reached without a ladder. When ceiling placement is necessary, a pendant-style suspension brings the device down to a reachable height. Conversely, infrequent-access devices like sprinklers, LED drivers, and vents can sit higher or be tucked behind an acoustic cloud, which (much like a traditional ACT ceiling) is removable for easy access when servicing is needed.

Height Zones

The diagram above illustrates how ceiling height determines access protocol. Most facilities staff can safely service devices placed within 10 to 12 feet of the floor working alone. Above that, safety and union regulations typically require two people. Any frequent-access device should therefore be placed in the 10- to 11-foot zone; infrequent-access devices can be installed higher without creating a maintenance burden.

As shown in the classroom rendering below, thoughtful device placement in a mass timber classroom is entirely achievable with frequent-access items resolved at the walls and lower zones, and infrequent-access items tucked into the concealed cavity above the acoustic cloud. The result is a clean, uncluttered ceiling that doesn't compromise functionality.

One important note: device placement should be worked out early in design, in close coordination with the technology consultant and facilities team. Decisions made late in the process, particularly around wireless access points and AV systems, can force ceiling compromises that are difficult and costly to undo. Early alignment across the design team is the single best way to ensure the ceiling delivers on both its aesthetic and its functional promise.



CONCLUSION

As we design schools for our next generation and in ways to reduce carbon and increase biophilic attributes, the hope is that mass timber structures gain momentum. At the same time, it is important to also consider the realities for our schools, in terms of classroom devices, the importance of acoustics, and the rules and limited resources for facilities to maintain these spaces. As we've seen with any shift in building technology, designers will approach the challenges that come with change as an opportunity to innovate and think creatively for the future.

FREQUENTLY ASKED QUESTIONS

Does mass timber limit flexibility for future classroom reconfigurations?

Most ceiling strategies for mass timber offer more flexibility than an ACT ceiling, which normally extends wall to wall and likely requires replacement of the ceiling grid to support a classroom reconfiguration. Acoustic cloud systems between mass timber beams could remain virtually as they are if a wall is moved to the next grid. In addition, the ceiling clouds provide access similar to ACT and allow for MEP adjustments. Integrated acoustics, such as ADLT, require more coordination upfront and may limit future changes when moving wall locations.

Are there fire safety concerns with leaving wood exposed overhead in a school?

This is one of the most common misconceptions about mass timber. As noted in our white paper *Mass Timber in the Learning Environment*, because of its mass and density, mass timber does not easily catch fire. Rather, heavy timber actually chars on the outside when exposed to fire, forming a protective layer that slows combustion and allows the structural core to remain intact far longer than unprotected steel, which can deform or fail rapidly under high heat. Mass timber buildings are designed to meet the same life-safety standards and codes as any other school construction type.

Is an exposed wood ceiling harder to maintain than acoustic ceiling tile?

Actually, the reverse is often true. Unlike ACT panels, which are easily damaged and rarely replaced (leaving unsightly dings and gaps), tidy but exposed pipes and conduits are easier for facilities staff to monitor, access, and repair. Mass timber itself is durable and does not require resealing or replacement.

How does the cost of a mass timber ceiling compare to that of a conventional acoustic ceiling tile system?

Applied and integrated acoustics in mass timber spaces typically carry a higher upfront cost than conventional ACT systems, but that comparison does not consider ancillary cost savings and advantages. When the benefits of reduced long-term maintenance, greater durability, and the documented improvements in student health and performance are factored in, the total value proposition over the long term looks considerably better, especially for publicly funded schools designed to last for decades that have only a modest maintenance budget.

ADDITIONAL WHITE PAPERS + RESOURCES

We are always eager to share our research and lessons learned with others to advocate for mass timber as a viable, sustainable design solution.

- Prior white papers in this series:
  Paper 1: *Mass Timber in the Learning Environment*
  Paper 2: *Caring for Mass Timber (It's Not That Fragile)*
- *Getting Acquainted with Mass Timber*, an introduction for new mass timber building occupants by Bora Associate Principal Scott Barton-Smith
- *Mass Timber 101: A Podcast,* a user-friendly dialogue around key mass timber topics (available on Spotify and Apple Podcasts)

ABOVE Student Commons of Portland Public Schools' Jefferson High School