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Software Consolidation in the AEC Workflow: The Case for Whole-Building Platforms

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The architecture, engineering, and construction (AEC) industry is not short on software. In fact, if anything, many engineers and project teams find themselves grappling with an overload of tools. Load calculations? There's a tool for that. Daylight simulation? Another tool. Energy modeling? Yet another. The result is a patchwork of applications, each doing a specific job well, but often in isolation from the rest, and/or unsuitable for multiple phases of the design process.

While specialized tools can have their strengths, collaboration with other stakeholders in the design of the building is not generally one of them. With shrinking project timelines, growing regulatory complexity, and pressure to reduce embodied and operational carbon, fragmented workflows are now a barrier to both efficiency and performance.

THE PROBLEM WITH SILOED TOOLS

For decades, AEC professionals have relied on a variety of disparate tools, each built for a specific task: energy modeling, load calculations, HVAC sizing, daylighting analysis, code compliance, and so on. While this approach has allowed for depth and accuracy in each domain, it has also created significant drawbacks:

- **Redundant Data Entry:** Every time an engineer has to recreate a building geometry or re-enter system parameters in a different tool, it introduces opportunities for error and wastes valuable time. In some cases, engineers might manually re-enter dozens or hundreds of room and system parameters.
- **Limited Feedback Loops:** A change made in one tool often doesn't automatically carry over to others. This lack of interoperability hampers iteration and real-time optimization and misses opportunities to capture benefits across design disciplines.
- **Inconsistent Assumptions:** Each tool has its own calculation methodologies, default values, and configuration options, and when each tool handles assumptions (e.g., weather files, occupancy schedules, calculation methods, etc.) differently, the overall analysis can become fragmented or misleading, which can often result in a lack of trust in the tool or tools. This distrust, in turn, results in additional work

on the designer's part in order to determine which result is accurate and trustworthy.

» **Reduced Agility:** Project demands change quickly — new client priorities, revised codes, unexpected site constraints, etc. When data lives in isolated systems, it becomes harder to iterate quickly or run new scenarios. Engineers can frequently spend more time managing data and inputs than actually doing analysis work that benefits their project outcomes.

These challenges are not new, but they are becoming more pressing. As regulations grow stricter and design targets become more ambitious, the inefficiencies of jumping between tools can materially affect project outcomes.

But regulatory complexity is only part of the equation. Engineers and design teams are also under constant pressure to maintain healthy profit margins, meet increasingly high client expectations, and find ways to differentiate themselves in a competitive marketplace. In this environment, time lost to redundant workflows and inconsistent modeling assumptions doesn't just slow projects, it erodes profitability, risks client satisfaction, and compromises competitive edge.

THE CASE FOR WHOLE-BUILDING PERFORMANCE PLATFORMS

Whole-building performance platforms attempt to address this fragmentation by providing an integrated environment where multiple performance tasks can be conducted from a single model. Rather than exporting and importing between tools, engineers and architects work within a unified simulation framework that can:

» Model energy, carbon, comfort, lighting, ventilation, and HVAC from the same dataset

» Use common assumptions and shared parameters across analyses

» Provide feedback in real-time as designs evolve

These platforms are often built on 3D geometry engines that allow for rich spatial modeling, making them well-suited to both early design phases and detailed engineering studies. More importantly, they support iteration, critical to performance-driven design.

Unlike traditional point solutions, whole-building platforms take a different approach, integrating key functions — energy, carbon, comfort, lighting, HVAC — into one model and environment. Here's what that means in practice:

» **Single Geometry and Data Model:** Users define building geometry, zoning, envelope construction, and usage profiles once, and reuse them across multiple analyses. This dramatically reduces setup time and ensures consistency across tasks like load analysis, daylight simulation, and energy modeling.

» **Integrated Load and Energy Simulation:** Modern platforms allow users to switch between detailed load calculations and dynamic simulations without jumping tools. Engineers can evaluate peak demands, explore HVAC system alternatives, and see how those choices impact overall energy use and occupant comfort.

» **Compliance and Rating System Support:** Whole-building platforms often come pre-loaded with regional energy codes and global rating systems like ASHRAE 90.1, LEED, BREEAM, and NECB (Canada), streamlining documentation and validation.

» **Interoperability with BIM and Other Tools:** While whole-building platforms aim to reduce tool fragmentation, they don't operate in isolation. Most offer imports from Revit, gbXML, and IFC, as well as exports for CFD analysis, lighting simulation, and other specialized tasks.

» **Lifecycle Performance Analysis:** Some platforms now support operational energy modeling and post-occupancy analytics, closing the loop between design intent and real-world performance. This capability is increasingly vital for asset owners and ESG reporting.

CHALLENGES AND CONSIDERATIONS

Of course, consolidation is not without challenges. Many engineers are understandably hesitant to abandon tools they've relied on for years, tools they know inside out and that have served them well across countless projects. In some cases, that means continuing to use long-established software that is no longer actively supported or updated. In others, it may involve custom-built spreadsheets that reflect a firm's unique processes or calculations.

This isn't a failure on the part of professionals. Far from it. Most are simply doing what they've always done or what they were trained to do and have built efficient routines around familiar tools. But as codes evolve, client expectations rise, and integrated design becomes the norm, those once-reliable tools can start to show their age. Maintaining them, especially when requirements shift, can add unexpected time, risk, and inefficiency.

With that context in mind, here are some of the most common concerns and how today's whole-building platforms address them:

"But I've always used [X tool] for loads."

Legacy tools are familiar, but many are no longer maintained. As they're deprecated or fall behind evolving standards, engineers are already facing the need to adapt. Whole-building platforms can replicate and extend traditional calculations, often with greater transparency and more robust scenario testing.

"Integrated tools are jack-of-all-trades, master of none."

This perception is increasingly outdated. Today's leading platforms are technically rigorous, validated against industry benchmarks, leverage the most sophisticated calculations, and used by firms on highly complex projects. In many cases, they offer deeper insights than older tools by unifying workflows that were previously isolated.

"The learning curve is too steep."

There is a curve, but it's manageable, especially with modern training resources, pre-built templates, and strong community support. And once adopted, these tools free engineers from much of the repetitive setup and rework that fragmented workflows demand. Additionally, integrated software often allows for far more flexibility in the "how" of getting things done. This means that once the learning curve is conquered, even greater workflow efficiencies can be realized.

"It's not just a technical shift, it's a cultural one."

Absolutely, and that can be one of the biggest hurdles. Successful adoption requires firms to rethink established workflows and retrain staff. Change management isn't easy, but the firms that embrace it tend to see faster turnaround, fewer errors, and stronger collaboration across teams.

"We can't justify the cost."

Compared to free or narrowly scoped tools, integrated platforms may seem expensive at first glance. But when factoring in time saved, reduced risk of errors, faster iterations, and improved design outcomes, the return on investment becomes clear. And while the benefits may appear to be most obvious on large, complex projects, real improvements are also seen on small, relatively simple projects.

"One model can't possibly do it all."

Some practitioners worry that using a single model across multiple simulations could compromise the specificity required in certain domains. But some modern platforms allow for high-fidelity control, domain-specific overrides, and detailed customization, giving users flexibility without fragmenting the workflow.

The goal is not to replace expertise with automation. Rather, it is to leverage automation to free up expertise to explore more creative alternatives that would otherwise be unavailable due to time, budgetary constraints, or limitations of only having "specialized" software tools.

REAL-WORLD IMPLICATIONS

Consider a mid-sized engineering firm working on a university science building. The project involves aggressive energy or energy reduction targets, laboratory ventilation requirements, and a LEED Gold mandate. Using a traditional workflow, the firm might:

» Build one model in a load calculation tool to size HVAC systems

» Rebuild that model in an energy simulation tool for LEED documentation

» Use a third tool for daylight analysis

» Engage an outside consultant for envelope optimization

Each step adds duplication, rework, and risk of misalignment. By contrast, with a whole-building platform, the team can:

» Build the model once (or import it from another design tool) and apply it across all simulations

» Iterate quickly as design evolves

» Generate consistent, timely results for informed decision-making throughout the entire design process

» Identify tradeoffs and synergies early, for example, how changes to glazing affect both daylight and cooling loads

The net result is a more coordinated project, a more robust understanding of the building design (which is better communicated to clients), and a better-performing building.

A STRATEGIC IMPERATIVE FOR FUTURE-READY FIRMS

Software consolidation is not just a technical decision, it's a strategic one. As building codes grow more stringent, project margins tighten, and clients demand higher levels of performance verification, firms need to deliver more value in less time. Fragmented workflows make that harder; integrated platforms make it easier.

The trend mirrors what we've seen in other industries. Financial analysts no longer use five different spreadsheets to track portfolios. Manufacturing engineers don't use separate programs for CAD, simulation, and production planning. AEC firms, too, must evolve.

In the long run, whole-building platforms offer not just efficiency, but insight. By linking decisions across disciplines and time horizons, they enable better design, fewer surprises, and buildings that perform as intended.

For engineers who want to spend less time duplicating data and more time solving problems, the path forward is clear: By embracing integrated platforms, the AEC industry can spend less time managing models and more time improving buildings.

About the Author

Nathan Kegel is a vice president of IES, a global climate tech company delivering innovative technology solutions and consultancy services to decarbonize the built environment. In this role, Nathan is focused on enabling the AEC sector to reduce the carbon emissions of the buildings they design, build, and operate.

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