



# THE TOP SIX MYTHS OF BUILDING COMMISSIONING

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*Figure 1 – Iberville Building in Louisiana.*

**N**obody ever set out to build a high-risk building doomed to fail. On the contrary—the goal is generally to create a LEED®-certified, sustainable building that’s as low-risk as possible. How does one reconcile designers and builders with the best of intentions on the one hand, with increased risk of green building failures on the other?

Our belief is that certain decisions during the design phase will virtually guarantee failure, whereas other choices will almost always lead to success. These predictive deciding factors are generally determined by the architect and the mechanical engineer—but usually not in concert. And therein lies the problem. The building envelope and mechanical system are the primary elements that determine successful building moisture control. If an architect designs the building envelope absent from the engineer’s input, or if an engineer formulates the mechanical system in a vacuum, there’s a distinct possibility—some might even argue, a certain probability—that the building will experience an early, perhaps dramatic, failure.

Unfortunately, building failure usually can’t be detected until construction is complete and commissioning is under way. At that point, it’s too late to make fundamental design changes. There’s no way to commission oneself out of problems like air leakiness, dew point control issues, or faulty product selection that stem from a flawed design. In fact, even if the design phase is up to par, failure could still occur if proper sequencing does not take place during the construction phase.

As the saying goes, an ounce of prevention is worth a pound of cure. Unfortunately, many building owners, architects, engineers, and contractors still hold onto certain myths about building commissioning that make problem avoidance difficult at best—and in many cases, impossible. We’d like to point out the inherent flaws in these myths, using real-life examples from projects we’ve worked on to back up our arguments.

**Myth #1 - Architects and mechanical engineers are fully integrated in their efforts when designing buildings (or conversely, they are experts in their fields and therefore shouldn’t need to collaborate or peer review with any other parties).** Neither statement is anywhere

near the truth. Although it is true that architects and mechanical engineers tend to know their areas very well, they are only feeling one part of the elephant when it comes to whole-building design and performance. They cannot design in a vacuum apart from each other; their disciplines are too closely related. It is incredibly important that they understand how intricately one’s work impacts the other’s. Building design is a complex process that must involve input from many people. For example, buildings have varying levels of humidity, depending on which part you measure. The mechanical engineer is the one who develops the heating, ventilating, and air conditioning (HVAC) system that determines dew point. The architect tends to go by prescriptive rules of thumb when considering the thermal perspective. Both need to be on the same page during the design phase for the building to ultimately work.

**Myth #2 - Interjecting peer reviews will increase the cost of construction and needlessly drive the project beyond best practice.** Sadly, this assumption is shared by many business owners, keeping them from taking important steps early on that could actually save them quite a bit of money down the road—not to mention prevent building failure. For some inexplicable reason, a majority of those in the building industry think that getting a second opinion isn’t critical when it comes to construction cost savings. If they got a diagnosis from a doctor, however, they wouldn’t think twice about getting a second opinion. Architects sometimes recommend more expensive components than are necessary, primarily because they don’t understand what is really needed to meet the standard of care. If someone with expertise looked over the plans prior to the start of construction, he or she could easily have pointed out that a more cost-effective component could be used instead, potentially saving the building owner millions. (This happened with a state building in Louisiana, where a design peer review saved the owner \$7 million. See *Figure 1*.) This type of commissioning must be done during the design phase, however, to be effective.

**Myth #3 - Rating systems and standards should be universal rather than applied to specific climates.** Because different geographical areas of our country can be vastly different in terms of climate, build-



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Figure 2 – Spray foam insulation.

ing performance can vary widely. Although rating systems and standards consider regional differences on some matters, they ignore certain critical points that affect the performance of the building envelope and mechanical systems. For example, if we did a peer review of a General Electric HVAC unit in a building in South Dakota, we would likely get completely different results from a similar review of the same unit

being used in a building in Miami, Florida. Whenever building standards, rating systems, or product specs are being interpreted and applied, careful attention must be paid to the region of the country. This is especially the case with hot and humid climates, where mold and moisture issues abound. When emerging or early versions of rating systems and standards are incorporated into codes, they often are not adapted

individual components more than they test the performance of the building as a whole. However, this is a classic case of the parts not adding up to the whole. The successful performance of individual components does not translate into the guaranteed success of the entire building. Just because you successfully test a window for water intrusion (or test air pressure, vapor, or thermal barriers, for that matter) does not mean that

geographically. For example, early versions of LEED® were incorporated into code through standards developed by organizations like ASHRAE (e.g., ASHRAE 189 – building flush-out, water-based products, and ductwork protection methods), without including geographical application of all of the new requirements. This tendency results in several generations of code being adopted before these risky requirements are adequately modified for a particular geography.

**Myth #4 - Successful performance of individual building components will ensure whole-building success.** Interestingly, most of those in the construction industry still test

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Figure 3 – Hale Koa Hotel in Honolulu.

the surrounding wall will pass with flying colors. Nothing replaces the complete building commissioning process. A “pen test” is a graphical tool used during the design phase that forces the project team to trace the planes of individual components within a wall section of a building. The intent is to check for continuity in the air, vapor, water, and thermal barriers. By tracing these planes on an architect’s drawings, members of the project team can better ensure that they will

remain continuous during the construction phase. Whether the building is partially or fully complete, any inspector walking through can identify whether the contractor’s work is indeed continuous on every plane. In order to be successful, a project team needs to make this shift in mindset from the outset. While it can be difficult to get the various members to think collectively, it is critical that they realize the project will not succeed if they focus only on their isolated task. Most building failures happen when multiple scopes of work by different subcontractors come together.

**Myth #5 – The commissioning of product selection is not important.** The goal should simply be to use products that help meet code and achieve green goals. While we’re all for green building when it’s done correctly, we believe that product selection is critical and directly impacts a building’s success or failure far more than many building owners and contractors realize. We encourage rigorous testing for each product that’s being considered to see how it handles moisture and air intrusion and also to observe how it might interact with other products. We’re primarily interested in the actual material that is being used

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(such as spray foam insulation, for example; see *Figure 2*). Many contractors are being told to use new “green” products, not realizing that such products are often still experimental and, as such, not yet tried and true in the field. While a single product may perform well on its own, its interaction with other products is an unknown variable and could pose significant risk. The only way to limit this risk factor is to thoroughly commission the products before they are used.

**Myth #6 - Building commissioning by checklist works.** When the only method of commissioning a building is to systematically check tasks off on a sheet, one is bound to encounter a number of oversights and misguided priorities. In actuality, quite often one building component could singly determine success or failure and should receive the majority of attention, while the other items on the checklist could have minimal impact and don't need much attention at all. The Army Corps of Engineers, known for heavily relying on checklists, found this to be the case with the Hale Koa Hotel in Hawaii. (See *Figure 3*.) The

agency conducted a number of intensive inspections throughout the hotel, including some of the smallest details that had little impact on the building's performance. These inspections did not give adequate quality assurance or control to the very critical elements of the building's performance, such as air infiltration, ductwork leakage, and fan coil unit installation. This was because the inspection effort was not tailored proportionately to items that were truly important and, instead, applied the same level of inspection to every element. While the checklists were extensive and the testing very thorough, the inspections missed many key elements. Rather than uniformly examining everything, it's best to instead focus quality control efforts on pressure points where they truly matter.

We should note that it's important to have the right kind of expertise on hand to point in the right direction. It's not unusual to have as many as 30 reviewers participating in an effective commissioning process, each specializing in a particular area. If only one agency is used, it is bound to miss

something. Generally, it's wise to use the same types of experts that attorneys use in litigation and building recovery. (After all, building forensics, following a failure, uses the same standards as building commissioning, at double the cost.)


As indicated earlier, problem avoidance is always preferable to remediation. While building failures can be virtually guaranteed when certain key elements are overlooked during the design phase, remembering and practicing the following points will help to ensure that a building project is a success:

- Both the architect and mechanical engineer must be on the same page from the start, collaborating rather than working independently during the design phase.
- Peer reviews not only do not typically add exorbitant cost to a project, but often, in fact, save money.
- Building standards, codes, and product specs should be interpreted by giving regional allowances for varying climates rather than being applied universally.
- Nothing replaces the complete



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building commissioning process—not even successful performance of individual building components. The parts do not always add up to the whole.

- Product selection is critical and directly impacts a building's success or failure. Each product should be rigorously tested prior to use and observed in interaction with other products. If the individual performance of a product is not understood, then its interaction with other products is even more uncertain.
- Rather than uniformly examining every part of a building with equal attention during commissioning, it's best to instead focus one's quality control efforts on pressure points where they truly matter. 



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## EPA PROPOSES NEW GUIDELINES FOR GREENER FEDERAL PURCHASES

The U.S. Environmental Protection Agency (EPA) is proposing draft guidelines that will help the federal government buy greener and safer products. In response to broad stakeholder interest, the EPA is seeking public input on these draft guidelines and a potential approach to assessing nongovernmental environmental standards and ecolabels already in the marketplace.

"As the largest purchaser in the world, the U.S. government is working to reduce its environmental footprint," said Jim Jones, assistant administrator for the Office of Chemical Safety and Pollution Prevention. "The government buys everything from furniture to lighting to cleaning products. These guidelines will make it easier for federal purchasers to meet the existing goal of 95% sustainable purchases while spurring consumers and the private sector to use and demand safer and greener products."

The draft guidelines were developed by EPA, the General Services Administration, and others following several listening sessions with a wide range of stakeholders on how the federal government can be more sustainable in its purchasing and how it can best meet the numerous federal requirements for the procurement of sustainable and environmentally preferable products and services. The draft guidelines were designed to assist federal purchasing decision makers in more consistently using existing nongovernmental products, environmental performance standards, and ecolabels. The draft guidelines address key characteristics of environmental standards and ecolabels, including the credibility of the development process and the effectiveness of the criteria for environmental performance. The draft guidelines were developed to be flexible enough to be applied to standards and ecolabels in a broad range of product categories. For more information on the draft guidelines, visit: [www.epa.gov/epp/draftguidelines](http://www.epa.gov/epp/draftguidelines).

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