



*Brief Description:* D White. Overall restructuring of energy-related portions of the Standard.

*Comment Type:* Substantive

*Section/Subsection Type:* General

*Section/Subsection Number:* Section 7, Section 8, etc.

*Supportive:* No

*Attachments:* None

*Comment:*

To make the most of the collective strength of our professional culture, Standard 189 should put as little restriction as possible on building professionals' approach to performance, and in stead hold them accountable to clearly defined, easily verified performance requirements.

*Substantiating Statements:*

The energy aspects of this standard are a modification of ASHRAE 90.1. This is not what is needed. ASHRAE 90.1, as the basis for governing the energy performance of standard construction as well as for high-performance buildings, has failed to effect the level improvement that we as a society need. Average new building stock effectively underperforms 90.1, and LEED buildings, by most estimates, save little or no energy compared to average construction.

Building upon 90.1 holds little promise to improve this situation. The prescriptive approach (especially with all its added features) fails because design conditions vary so much from one project to another that it is impractical to prescribe many design aspects, yet those same aspects strongly affect performance. Therefore a prescription is often made that will be inappropriate to many projects or, in the face of overwhelming complexity, no prescription is made at all.

The performative approach fails because it works against professional's motives. A team may be strongly motivated to make a great building, but not as strongly as they are to win a certain level of certification, especially when they are running an energy model – their fee, their reputation, the satisfaction of their client, and even their own sense of achievement may depend on favorable outputs. Because of its complexity and the absence of a reliable verification process, the approach is easily gamed, and in my experience it is gamed more often than not.

Neither approach ensures that the real building meets with the design intention. Neither can ensure continuity of the thermal barrier, air tightness, control of boiler flue losses, thermostatic control, and other details that account for the majority of operational energy consumption in many buildings, including (as per the above) most buildings in New York City.

Something completely different is needed. The writing of the standard should be thought of as a design problem that contends somewhat less with the physical conditions affecting building performance and much more with the cultural conditions affecting professional achievement. Three specific orientations that the standard can take to make better buildings are:

- 1) Capitalize on our national pool of talent and location-specific expertise. It is absurd to ask a handful of individuals to write a one-size-fits-all (or most) prescription for high-performance buildings on behalf of the rest of us. To achieve high performance, buildings must respond sensitively to the unique characteristics of their microclimate, program, codes, construction practice, budget, etc. To this end, the standard should leverage the diverse and immense creative power of our whole professional culture. Let them work out the details.
- 2) Understand that people do not take well to having their hands forced, but can be relied on to rise to a challenge. People enjoy working extremely hard under the right conditions, for instance in games and sports, where there is a clearly defined goal with unmistakable evidence of achievement or failure. Structure the standard to spur professionals to their best work.
- 3) Make accountability ineluctable by linking performance to professional liability. No professional would knowingly undersize heating or cooling equipment, because it would mean uncomfortable occupants and ensuing legal action. Yet it is typical in high-performance buildings for equipment to be grossly oversized relative to the predictions of the energy model. When it comes to energy performance, the design team does not typically put its money where its mouth is.

Nor can it. It's too difficult to ensure that facade insulation and air tightness, mechanical system efficiency, and so on are built or even designed as intended. When push comes to shove, to protect himself an engineer must safely size the equipment, and standard practice leaves him in the dark about the relationship between design intention and real performance. *Yet this is precisely where our buildings are failing. It is neither a prescription nor a prediction of building performance, but the performance itself to which we must turn our collective attention.*

This points to a number of specific approaches that will help to make the Standard more effective. These are presented separately but are intended to be combined however is most effective.

There are strong arguments in favor of mandatory standards, for instance for insulation and air tightness per climate. However, according to the first two of the three orientations listed above, mandatory and prescriptive requirements should be as sparse as possible. This improves motivation and supports innovation, truly enabling better solutions.

If a performative approach is allowed, it should be much more rigid in its structure and method. It should be accurate and transparent enough to be used for design optimization and equipment sizing, and prohibitively difficult to game. German building energy code has adopted extremely rigorous calculations that would be a good basis for precedent study. The calculations are very accurate, but meet with much complaint because they are laborious for designers as well as authorities; they also require a wealth of professional expertise to write the calculations, verify their correctness for each building, etc.

Any performative approach should be verified as unmistakably matched to the construction documents and the construction itself. This includes third party review of construction drawings, product specifications, and the construction site, including air tightness testing. The certification requirements for the German (and more recently American) Passive House Standard are an excellent example of quality assurance using standardized software in combination with various forms of verification. This type of verification is a distinct approach in its own right.

Perhaps of greatest importance is for building professionals to be held accountable for energy performance. Before the building is occupied, in the absence of measured performance, equipment capacities (for heating, cooling, and perhaps others) can be taken as a proxy for energy performance. This will require professionals to put their money where their mouths are, directing their attention to the performance itself. In any case, a disincentive on oversizing is desperately needed in this country. This is precedented in Germany, where it is legal and common for a client to sue an engineer for oversizing a system, on the grounds that the client's money was wasted.

This measure would be a *proxy* for energy performance, and somewhat imperfect in its accuracy. But the prescriptive and performative approaches aren't especially accurate, nor is high accuracy needed. What is needed are reliable, easily verified indicators of future performance. The empiricism and ease of this method are its great strengths; the accuracy is good enough.

And finally, building energy use, for space conditioning and/or all uses, should be publicly reported annually, and certification or other permit renewed or revoked, and excess impact offset at appropriately externalized cost.

The United States is home to the greatest technological innovations in modern history. To make the most of our collective strength, Standard 189 should put as little restriction as possible on building professionals' approach to performance, and in stead hold them accountable to clearly defined, easily verified performance requirements. The Standard should challenge professionals without overwhelming them, and become gradually more stringent as practice matures. This is a wise approach to nurturing a fledgeling culture of sustainable designers.