

How to Make Performance Codes Perform?

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**“Building science is just like space science only more complex”
Terry Brenner, Physicist and Forensic Expert**

For many years now, members of the building construction community, in both the private and public sectors, have looked to the time when performance-based codes would remove barriers to innovation and would make building designers stronger partners in ensuring compliance of buildings with codes and standards. That time has arrived - but are we and the communities we represent ready? Can we implement performance codes tomorrow and be certain that we are not adding substantial costs to already expensive permitting and construction processes and that the public is adequately protected?

I came into the Code enforcement profession almost 25 years ago and from the very beginning of my career have been hearing “the performance codes buzz.” I don’t think I would be giving away any state secrets if I were to say that the term “performance codes” still evokes a healthy amount of skepticism among both municipal employees and the industry we regulate. Municipal employees, such as me, question the sufficiency of our own credentials and the adequacy of our existing code enforcement infrastructure in the performance-based code environment:

- We know how to make certain that a new home has exterior walls built of 2x6 studs. We can verify whether or not the structural frame can withstand 70 miles per hour winds or whether or not the roof can safely support 30 lbs per square foot of snow load. But, in practice, in the absence of any prescriptive criteria, how will we verify that a building is structurally sound? *Will* there be any prescriptive criteria in our code texts?
- How do we define “structural soundness”? Or do we even need to ponder such questions? Should it be sufficient for us -- the plan reviewers and field inspectors -- that a designer, who is properly licensed in our State, certifies a building as “structurally sound “?
- Who should participate in establishing performance goals for buildings?
- How do we establish building performance goals when we don’t even have easily accessible building performance data? Can we have good performance codes without a solid base of knowledge of how our existing buildings perform?

- Are we prepared to determine whether or not the techniques and materials used in building design construction will make the project “sustainable”?
- How do we work together to address these challenges? What public policy and procedural mechanisms do we need to put in place to “get things right”?

Project developers, architects, engineers and contractors are, in turn, frightened by the prospect of more confusion and delays in the issuance of permits. Although we already have some guides to move us towards establishing performance-based code systems (performance standards for some building components are already included in the ICC International Building Code and the International Residential Code), we are still lacking explicit performance goals at the level of the building as a whole and we don’t have adequate infrastructure that supports this approach. In order to meet societal expectations such as affordability of housing, sustainability of development, and security and safety of our communities, our collective paradigm for structuring building codes and the processes by which we enforce the codes must be transformed.

In my opinion, two things are crucial for successful transformation from the existing system into a building performance-based system: engagement of all stakeholders, and the reexamination of the current allocation of responsibility and accountability for ensuring code compliance.

1. We must work together in developing the new performance-based codes.

The transition to performance-based codes requires active involvement of all of the stakeholders, including the meaningful participation of our communities and their leaders in formulating performance goals for buildings.

We are all accountable to the general public for the way we carry out our duties, whether those duties include design, construction, or fabrication of safe and durable construction materials. We need public support in funding code enforcement activities. It is the public who ultimately pays for building safety, and for failures of buildings to perform. It only makes sense, then, to involve the public in defining what constitutes an acceptable level of performance.

Since one of the stated goals for changing to performance-based code environment is to better meet the raised bar of societal expectations, involving the public is a responsibility we must fulfill. As was said in the introductory materials for this conference, “the question of how much protection to provide is not one for engineers to answer alone”.

Although, to the best of my knowledge, there is no widespread tradition in the US of involving the general public in shaping our building codes, there are some good models of public involvement in formulating comprehensive local land use plans for individual communities. For instance, in Fairfax County such public participation may involve series of focus group discussions, workshops with industry and elected officials etc. Similar approaches could be used to gain broadly based public input into the formulation

of performance goals for buildings. A series of local workshops and focus group discussions facilitated by a national group such as the ICC (who could also compile the input of many communities), would constitute a good basis for understanding public needs in this arena.

2. We must be ready to allow design professionals to play greater role in ascertaining code compliance.

Notwithstanding that building designers are state-licensed professionals and that it is often state building codes that are enforced, local building officials often cannot rely on the designers to ascertain code compliance. However, under building performance-based codes, the judgment regarding code compliance is going to become extremely difficult to render without thorough examination of design assumptions, computer models predicting building behaviors, and engineering methods. As a result, if we are to avoid costly delays due to this increased complexity and drastic increases in the cost of code enforcement for local governments -- cost increases which are not likely to be funded in an era of shrinking governments and fiscal uncertainty -- we must start relying more on engineering and architectural seals for ascertaining code compliance. Design professionals must be ready and willing to accept such an increased role and responsibility. Placement of a professional engineer's or architect's seal should mean that the seal's owner applied the appropriate level of care in ascertaining that the project meets the performance standards of the Building Code. Although I expect that the current role building officials play would continue for simple projects utilizing prescriptive code criteria, the role of the local building departments in the performance-based code environment would be to make certain that submitting designers have the appropriate credentials and exercise the required level of care.

Such a change in roles and responsibilities of government regulatory agencies and those we regulate would need to be supported by public policy makers. We need to recognize, as a matter of public policy, that local governments should not be forced to hire an army of professional engineers, architects, testing laboratories and computer programmers in order to fulfill their duty of public protection in performance-based code environment.

The following actions would, in my opinion, facilitate redefinition of the roles and responsibilities of building officials and building designers in a performance-based system:

- Defining the expected level of care to be exercised by design professionals.

Failure to live up to the standard of care lies at the heart of many of our courts' decisions on the breach of duty by engineers and other professionals. With a distinction between validation of code compliance and design in performance-based regulatory system blurred, we will have no choice but to address more specifically what the expected standard of care is. Having a better defined standard of care would minimize, in my opinion, fears of undue liability that currently prevent professional engineers and architects from certifying code compliance. In addition to engineering

analysis, the expected level of care could include, for instance, the examination and use of actual building performance data, material testing data, and the use of approved computer models.

It is my hope that during the course of this conference we will glean what would be the desirable legal infrastructure that would allow us to fully reap the benefits of performance codes without making the regulatory processes even more burdensome.

- Developing, in collaboration with industry, appropriate tools to help the designers comply with codes including:
 - *Expanding and accelerating work by NIST in developing building performance metrics and creating a national clearing house of information pertaining to the performance of existing buildings.*
 - *Supporting and accelerating the development of more sophisticated computer-integrated knowledge systems that will make our predictions of building performance more reliable.* I envision that computer modeling will play a critical role in evaluating designs in the performance code environment. Furthermore, development of computer models that could be accepted and used internationally would facilitate global commerce and, I strongly believe, would increase the competitiveness of the American construction industry in foreign markets.
 - *Developing new technology to validate code compliance, such as automatic code checks and plan processing systems that are standardized, that could be used by both public sector employees of building departments, as well as by private sector professionals in ensuring that designs comply with the code before they are formally submitted for permits.*
 - *Utilizing a system of peer reviews by independent, third party engineers and architects to ascertain code compliance of complex projects.* The beginning of such a system is already in place in the form of the Special Inspection provisions of Chapter 17 of the International Building Code. A similar procedure could be established for peer review of building design documents.
 - *Developing and maintaining a national system of standard compliance approaches and solutions consistent with the performance goals of the building code.* It is expected that such compliance solutions would be used routinely for smaller projects. We do not want to create an environment where every project, no matter how small, would have to be engineered. Furthermore, pursuant to the principle of public disclosure, we must be able to demonstrate to the public that buildings, which construction we authorize, comply with codes.
 - *Including the knowledge and understanding of building codes and standards and the computer modeling tools in the curricula of engineering and architectural programs, in state licensing examinations, and continuing educational*

requirements. We must have commitment of institutions of higher education to prepare design professionals to play greater role in the code compliance validation process either as a design party or as peer reviewers.

- *Creating more college degree programs for code enforcement professionals which are better suited for the performance code environment.*

If we proceed on a collaborative basis, having taken the actions outlined above, the transition to building performance-based codes can be an opportunity for us to create a new regulatory system. Such new system would significantly decrease delays and government costs. Furthermore, it would give project owners and designers greater freedom to build buildings that meet not only our “traditional” expectations of safety but also the societal expectations of affordability of housing, sustainability of development as well as any additional goals that may emerge in the future.