



# LESSONS to be LEARNED

## from Building Code Systems in Other Countries

Brian J. Meacham, Ph.D., P.E.

**M**ost countries around the world have established building regulatory systems which facilitate the design, construction and operation of buildings to a level of safety and performance that is acceptable to their societal and cultural norms. Although varying in detail, scope and complexity by country, these systems typically include enabling legislation, a building code (or building regulation) and enforcement mechanisms.

In most cases, the country-specific building regulatory systems are supplemented by a wide range of materials, products and systems test and installation standards; a products approval framework; an education system; certification of professionals; and related consumer protection and market-driven mechanisms, including those generated by the insurance industry. In some places, regional harmonization is targeted across national borders through the use of these supplemental systems—such as within the European Union, where such mechanisms as the Construction Products Directive and Energy Performance of Buildings Directive seek to promote common technical measures without impinging upon individual countries' rights to set national policy.

Although some countries, such as the U.S., develop model codes that are adopted at a state, territorial, provincial or local level, those code development processes vary not only in the actual mechanics but also in terms of who runs them: the national government, intergovernmental entities or nongovernmental organizations. Outside of the U.S., code development is essentially a national government activity, but there may be subcontracts, stakeholder committees and/or consultation processes to obtain broad industry and society input.

A critical piece of a building regulatory system, enforcement most often occurs at a local level but, in some cases, national government agencies play a key role. More and more frequently, countries are including options for private, nongovernmental entities that have legal review, certification and/or approval authority with respect to compliance with the code. In some cases there is an

option to select a private firm or a governmental entity for approvals. Following this trend of having the market assume more accountability for building safety and performance, significant responsibility is placed upon the building owner and designer for design, construction and long-term maintenance.

In looking at different building code systems around the world and how they are evolving over time, there is significant opportunity to identify approaches that could be helpful at a variety of levels, from development to enforcement, and to learn from the challenges that other countries have faced.

### Getting the Code Right is Not Enough

Although it is widely recognized that the regulatory system includes much more than the building code itself, there is often more emphasis placed upon the code than on other aspects of the system. In some cases this can lead to unintended consequences. Consider the issue of design and construction quality. If a building design is inadequate or the construction is substandard and there are gaps in the review and enforcement mechanisms intended to address these shortcomings, significant impacts can result.

In the early 2000s in New Zealand, for example, there was a moisture problem with residential buildings, commonly referred to as the “leaky building syndrome” (New Zealand Ministry of Economic Development 2003). In brief, a market desire to have “Mediterranean-style” housing occasionally led to use of nontraditional building materials and techniques, which sometimes resulted in moisture penetrating the building, leading to rot, mold and other problems. Unfortunately, gaps in the regulatory system in place at the time, including ones related to the qualifications of builders, certification of alternative building methods and third-party certification of buildings—complicated by a lack of clear indications of accountability and responsibility of the many stakeholders in the building process—contributed to the problem (May 2003, Meacham et al. 2005). Although the full extent of this situation remains undetermined, various reports (e.g., the Hunn Reports) and newspaper coverage suggest that as many as 18,000 homes and several multi-unit buildings have been affected, and several changes to the building regulatory system have resulted. Similar

problems with weathertightness have also been experienced in North America (Meeks 1996), commonly caused by inappropriate use of products.

In a similar vein, Japan has recently been reviewing features of their building regulatory system in response to the falsification of data by a subcontracted architect/engineer (Kenchikushi) named Hidetsugu Aneha (Japan Ministry of Land, Infrastructure and Transport 2007). In this situation, structural calculations were falsified to cover up inadequate designs on a number of projects. Unfortunately, the falsification had not been discovered by others in the design process, including lead Kenchikushi, builders, building officials and private building inspectors, and the situation continued over some ten years. By the time what came to be called the “Aneha Scandal” came to light in November of 2005, about one hundred buildings, many of them high-rise condominiums and hotels, had been constructed based on inadequate designs. In the end, many had to be retrofitted or demolished for fear of collapse during an earthquake. Subsequent investigations conducted by the Ministry of Land, Infrastructure and Transport discovered that some other Kenchikushi had also provided inappropriate structural calculations, albeit much less serious in nature.

The Aneha Scandal highlights some important lessons for any country. Even with the relatively prescriptive Japanese building codes there was room for misunderstanding or arbitrary interpretation by designers, building officials and building inspectors. Difficulty keeping up with the rapid progress in building technologies also emerged as a factor, with critical aspects of the design process left to computational analysis and no confirmation that accurate data was input. Finally, the Japanese system did not take into account the unfortunate fact that professional ethics can be jeopardized under the pressure of market forces. In Aneha’s case, the result was a “perfect storm” that endangered hundreds of building occupants and has accrued as-yet uncalculated costs in ensuing investigations, building inspections, retrofitting or demolishing and rebuilding, litigation and legislation.

### A Quality-Based Approach

A quality-based method has been used in Norway for some years to help address some of these concerns (Meacham 2007). A 1994 report by the Norwegian

Building Research Institute concluded that as much as 5 percent of the total output of the country's construction industry was subject to defects. Design, execution, materials and product failures all contributed their fair share, but an estimated 60 percent of the defects had their cause in work done prior to construction. From the point of view of the building authorities, this was attributable to insufficient knowledge of the Building Act and building regulations within the building industry; incomplete, insufficient or incorrect design as basis for construction work; lack of systematic documentation of conformity with regulatory requirements; public control primarily concerned with site inspection, rather than design control; and that clients (primarily) and contractors (secondarily), but not the designers, were accountable to the building authorities.

These conclusions prompted the government to amend the Planning and Building Law and new regulations dealing with accountability toward public authorities, new building control systems and the qualifications

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of companies undertaking design and construction were introduced. This resulted in a major shift in emphasis from the previous trend of deregulation to building quality. The most important changes included:

- new requirements for documentation submitted with permit applications and verification of compliance with performance-based codes,
- a new control system of improved requirements for supervision and control of building works,
- new requirements for accountability to local authorities by the parties of the building process and new requirements for their qualifications,
- new procedures for the approval of plans by local authorities,
- new procedures for the authorities' use of penal clauses,
- a new division of roles between local authorities and clients,
- a drive to achieve uniformity in the work methods of all local authorities, and
- documentation and certification of the qualifications and competence of designers and contractors by building authorities.

Although these changes have not addressed all of the building-related concerns in Norway, the focus on quality and accountability have been helpful in reducing building defects.

### Summary

For all the differences in building regulatory systems there are also many similarities and building regulators around the world face many of the same challenges. Lessons from this brief look at a few countries and their systems include the need to consider the whole of the building regulatory system in assessing its functionality and robustness: what parts are needed to make it work, how well they work together and what checks and balances are in place.

Without adequate regulatory measures or practitioner accountability, placing too much faith on self-correction of the marketplace as a means of control and too little emphasis on accountability can lead to unintended consequences. Quality control measures, in addition to certification schemes and other mechanisms of checks and balances, can make the overall system perform much better. ♦

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**BRIAN J. MEACHAM, PH.D., P.E.**, is an Associate Professor in the Department of Fire Protection Engineering at Worcester Polytechnic Institute and a Principal of Meacham Associates. As a member of numerous national and international codes, standards and guidance development committees, he helps facilitate the transfer of knowledge between research, practitioners and policy-makers, and served as the lead author on the "Building Regulations around the World" chapter in the newly updated Building Department Administration book.

A licensed Professional Engineer in Connecticut and Massachusetts, Meacham is also currently Chair of the Inter-Jurisdictional Regulatory Collaboration Committee, an unaffiliated committee of eleven of the lead building regulatory agencies and organizations of ten countries; a Chartered Engineer Member of the Institute of Fire Engineers in the UK; and a Fellow of the Society of Fire Protection Engineers.