# The Enforcement of ASHRAE Standard 90.1

By David Handwork, P.E.

he most influential unenforced code of our time is ASHRAE 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings.* This statement comes with boldness in light of the current federal policies being shaped and delivered via the current economic stimulus act. Facilities managers need to be aware that the popular benefits of 90.1 could inadvertently expand the reach and impact of this code far beyond the basis of design and construction of building energy efficiency.

#### THE ROOTS OF ASHRAE 90.1

So how did 90.1 become this influential national policy? The roots begin with the energy crisis of the 1970s. Standard 90.1 was first introduced by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers in 1975 as a building engineering design response to national energy conservation. The early success of 90.1 became evident as it stood nearly alone as the benchmark design and construction standard regarding energy efficiency of commercial buildings.

Through the 1980s and 1990s, 90.1's prominence emerged as other influential building code organizations, such as NFPA and ICC, either referenced or fully adopted 90.1 as their energy conservation standard. But nationally, issues emerged using a document crafted as best design practices for the purpose as an enforceable state and local energy code. These issues became highly visible with 90.1's reference in the Federal Energy Policy Act (EPACT) of 1992. The format subsequently evolved in the 90.1-1999 version to reflect code friendly language, and concurrently received ANSI (American National Standards Institute) approval and IESNA (Illumination Engineering Society of North America) co-sponsorship. This historic milestone facilitated states and municipalities to fully adopt 90.1 as their energy code for commercial building construction. This milestone coupled with 90.1 case studies documenting building energy reduction enabled acceptance by facilities management organizations, and obvious endorsement by the U.S. Department of Energy.

Further success of 90.1 was achieved when it was fully integrated into the 2004 revision of EPACT. This EPACT revision invoked a federal mandate for state energy codes to meet or exceed 90.1-2001. Alas, the ASHRAE document originally crafted as best design practices matured to the nationally recognized energy conservation building code.

ASHRAE deserves the highest of recognition for the positive impact 90.1 has realized. Facilities managers appreciate that the value added aspects of their buildings constructed under the standard, even before 90.1 became code. Building envelopes have better insulation values and are more airtight to unwanted infiltration. Window construction provides lower solar heat gain during the cooling season, but allows and encourages the building designer to provide natural sunlight in lieu of, or supplement to, electric lighting.

Interior and exterior lighting was finally defined as to provide adequate lumens for occupants while minimizing energy use and reducing the total number of maintained fixtures. Lighting controls were finally part of building design, not an energy efficiency amenity subject to the value engineering process when the budget was exceeded. The standard provided minimum energy efficiency requirements of major HVAC equipment including boilers, chillers, cooling towers, and other rotating equipment. The HVAC system design provides for variable air volume (VAV) with individual occupant control. Energy management control strategies were defined for designers and building managers. All of these features are undoubtedly desired by building owners and occupants.

However, before the existence of 90.1, the burden of ensuring these features as part of the basis of design rested completely upon the building owner. As 90.1 became code, the burden shifted as the sole responsibility of the design professionals and code enforcement authority. Prior to this paradigm shift, energy efficient buildings existed only as a result fiscally responsible building owners and at the influence of the design professional. Pre-90.1, it could be questioned if a building was designed and constructed with energy efficiency in mind. Today, the only questions are to what extent energy efficiency best practices are incorporated in building design, and how effective the code was enforced during design and construction.

#### **ENFORCING THE CODE**

As a direct question to education facilities managers, how effective is 90.1 being enforced as code on your campus? Anecdotally, responses to this question have ranged from "Enforcement does not exist" to "The state/local code official is highly engaged on 90.1 enforcement." The main premise of this article is that the former response is more common than the latter. This premise is primarily based upon this author's discussions with facilities managers and engineers at state, regional, and international APPA meetings over the past eight years. However, a January 2007 report sponsored by the Lighting Controls Association presented survey results from building owners and design professionals that validate this presupposition. For example, 67 percent of the respondents indicated the documentation or intent to comply with 90.1 is required in order to obtain a building permit. However, 83 percent of these responses indicated inadequate or no code enforcement/inspections occur relating to 90.1. This can be interpreted that 90.1 is generally not a code enforcement priority.

Subjectively, limited staffing and budget resources for code enforcement agencies places priority on building life safety issues; structural, emergency egress, fire alarm and fire protection, and ventilation. If resources are available post adequate enforcement of life safety, it can be argued the order of enforcement priority is likely local codes (parking densities, setbacks, utility right away) and ADA aspects, then 90.1. Therefore, 90.1 can be generally reasoned as an unenforced code for most locales.

Lack of code enforcement does not correlate to ineffectiveness of 90.1. Due to the positive outcomes of the 90.1 code, building owners and design professionals commonly practice self regulation. This is especially true on college and university campuses subject only to a state building authority for inspections and enforcement, or those empowered by state legislation for self inspection and enforcement. There have not been any metrics of the success of self regulation, but the economics provide owners heightened incentive for driving enforcement. Depending upon owner resources, this enforcement is via owner employees, directives to the design professionals, or contracted inspection official/commissioning agent.

A new age of 90.1 code enforcement may be upon the building industry. The American Recovery and Reinvestment Act of 2009 references 90.1-2007 under

Title IV Section 410 as a proviso for grant funding to states. Eligibility for the additional grant funding partially requires gubernatorial confirmation the state energy codes for commercial buildings meet or exceed 90.1-2007, the energy codes for residential buildings meet or exceed the International Energy Conservation Code (which references 90.1), and to provide "a plan for the jurisdiction achieving compliance with the building energy code or codes .... within 8 years of the date of enactment of this Act in at least 90 percent of new and renovated residential and commercial building space. Such plan shall include active training and enforcement programs and measurement of the rate of compliance each year." With \$16.8 billion at stake, there exists a significant incentive for states to enable and sustain a vigorous compliance and enforcement measure of the energy codes. Even for self-regulated entities, this will be a dramatic elevation of prior-



ity when inspecting building design and construction for compliance.

### DELIVERING ENERGY EFFICIENT BUILDINGS

Elevated compliance rates for 90.1 will be an overall improvement for delivery of energy efficient buildings. There is potentially a secondary consequence that could make continual compliance and enforcement an operational burden. In December of 2008, ASHRAE Standard 90.1 committee submitted for public comment and review Addendum 'aq'. The main purpose of 'aq' is revision of 90.1 purpose and scope statement from "design and construction" to "design, construction, operation and maintenance." The intent of this proposed revision is assurance the designed efficiency



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of the building remains for the full life cycle. On the surface, this intent is noble and acceptable to facilities managers.

However, the APPA Code Advocacy Task Force (CATF) quickly acknowledged that the inclusion of O&M scope of existing code will create significant resource challenges. In light of the proviso in the Recovery and Reinvestment Act, these challenges could be an eminent reality. The CATF provided a statement to ASHRAE endorsing the purpose and scope as currently stated, objecting to the proposed addendum. Furthermore, recommendations and alternatives were provided as measures to ensure, acknowledge, and award facilities and institutions that practice energy conservation as fundamental part of operation and maintenance. Energy conservation is a natural function for all facilities operations as a function of sustainable initiatives, and due to the attractive financial returns. Quick financial returns are typically a result of poor design in absence of the 90.1 code.

Granted, building re-commissioning or continuous commissioning is important and needed for the life cycle of any building. Regardless, code oversight for operational energy efficiency performance is not a desired path. Better alternatives include ASHRAE Standard 105-2007 Standard Methods of Measuring and Expressing Building Energy Performance, ASHRAE Building Energy Labeling Program (ABEL), US-GBC LEED-EB Operation and Maintenance, and Energy Star for Buildings and Manufacturing Plants. ASHRAE will be reviewing the CATF and other comments in the coming months. A committee vote could occur as early as June 2009.

In conclusion, the focus on national energy efficiency and independence has elevated Standard 90.1 as a powerful code whose eminence may soon be regarded equal to life safety codes. (5)

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