The Washington State Non-Residential Energy Code: A New Model Process for Code Development

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Consistent with the National Energy Policy Act of 1992 (NEPACT), the State of Washington recently adopted a Non-Residential Energy Code (NREC), based on ASHRAE/Illuminating Engineering Society (IES) Standard 90.1-1989. This process encompassed significantly more effort than simply adopting the entire Standard 90.1. Evaluations indicated less than satisfactory compliance with the previous code, and suggested that the code was too complex and did not incorporate the most cost-effective technologies. Evaluations also showed that funding for enforcement, training, and technical assistance was inadequate. In a political climate where unfunded mandates create widespread discontent, solutions to these problems are essential. The state adopted a simplified NREC, fundamentally based on Standard 90.1. Simplifications include basic format changes, fewer exceptions, and more technology specific requirements. The NREC contains some requirements that are more stringent than Standard 90.1. These were shown to be cost-effective through regional conservation programs. A separate implementation committee addressed the issue of inadequate financial support. Out of this committee, a gas and electric utility consortium was formed that is funding enforcement through a third party inspection pool, assisting smaller jurisdictions, and providing technical assistance through a separate industry group consortium. This approach is a radical departure from traditional implementation programs for energy codes in Washington. Another difference is that industry groups will assume the responsibility of technical assistance for the NREC.

Introduction

Codes in the Pacific Northwest

Historically, energy codes have played an important and unique role in the development of the conservation resource in the Pacific Northwest. Oregon and Washington were some of the first states in the country to adopt statewide energy codes in the 1970s. Even then, when "power was plentiful and cheap, there was an acknowledgment that new buildings represented long term energy investments for the region.

This acknowledgment was formalized by the passage of the Pacific Northwest Electric Power Planning and Conservation Act in 1980. In addition to officially defining conservation as an energy resource, the Act established the Northwest Power Planning Council (NWPPC) to develop a long range least cost power plan for the region. The Act also required the NWPPC to develop Model Conservation Standards (MCS) for new residential and commercial buildings. Given this background, it is not surprising that one of the highest priorities of the NWPPC's first regional power plan (published in 1983) was to accomplish region-wide adoption of the MCS by 1986.

Although the Act provided a number of tools to accomplish this goal, the NWPPC quickly discovered just how difficult the task would be. By 1986, Oregon and Washington had adopted codes that went only half way to the residential MCS. It would take another five years before the adoption of full MCS equivalent residential codes. During those eight years, the region would spend over $100 million on demonstration programs, early code adoption efforts, utility marketing programs, and a host of training and educational efforts. One of the main effects of all this expenditure was to increase the market share of homes built to the MCS until they became a significant fraction of the new construction market. This led to the development of the general principle that 'codes follow good practice." In other words, at least some significant fraction of the population must already have adopted the practice before it can be placed into codes.

On the bright side, the residential process proved that a large market could be effectively transformed through utility programs handing off to a code. A WSEO study (Schwartz et al. 1993) indicated that this represents a tremendously cost-effective acquisition strategy from both a utility perspective and a societal perspective. The utility cost of conserved energy for the entire code effort in Washington State was less than $0.003/kWh and, the societal cost was only $0.020/kWh.

Setting the Stage

With residential MCS code adoption close at hand in Oregon and Washington, attention turned to the commercial MCS. Although both states had adopted the NWPPC's first MCS for commercial buildings in 1986, good practice in the sector had long since exceeded the code. In addition, there' were a number of significant events that led to the process to revise the Washington commercial energy code.

The 1990 Commercial MCS

As the final draft versions of the ASHRAE/IES 90.1 were being circulated in 1988, the NWPPC began a public involvement process requesting feedback on a new commercial version of the MCS. The overwhelming response from the professional community was to adopt the ASHRAE/IES standard when the final version was adopted and published. Others suggested that the lighting provisions from the 1993 Federal Standards be adopted in place of the ASHRAE/IES numbers since they were actually less stringent than the current codes in Washington and Oregon. Following publication of 90.1 in the summer of 1989, the NWPPC formally revised its MCS to adopt the envelope and mechanical provisions of 90.1 and the 1993 lighting provisions of the Federal nonresidentia.I building standards.

In order to translate these two design standards into a single code document, the NWPPC contracted with Seattle office of the International Council of Building Officials (ICBO) to draft a new version of the Northwest Energy Code (NWEC) (the NWEC is the codified version of the MCS). The draft document was reviewed by both code officials and industry during a series of public hearings. The process exposed many of the difficulties of taking a design standard as the base document. For example, the ASHRAE standard includes a requirement for transformer loss calculation estimates in large buildings. While an excellent idea for design of building electrical services, this requirement was deemed to be ineffective in a code setting and ultimately unenforceable. This experience clearly indicated that adoption of any code based on ASHRAE's standard would involve a public debate to determine which provisions are enforceable and applicable to the design and construction practices in that state.

The Code Compliance Study

The principle of codes lagging good practice discovered in the residential code process turned out to be even more true in commercial. Even though the current commercial codes in Washington and Oregon were considerably less stringent than the new MCS, anecdotal evidence suggested that compliance with these codes was generally poor. In order to arrive at a more analytical answer, Bonneville Power Administration (BPA) and the state energy offices sponsored a study of compliance with the existing commercial energy codes in Washington and Oregon. The study revealed a number of crucial problems with both the structure and enforcement of the codes.

On the basis of a randomly drawn sample of roughly 200 buildings in the two states, the study (Baylon et al. 1992) concluded that compliance with the commercial energy codes was roughly 50 percent in both states. While this was based on a fairly strict test (non-compliance was defined as failing in any one of the nine code items investigated) follow-up interviews strongly supported the idea that compliance occurred almost in spite of the code. Because of the complexity of the code and the number of calculations required, many building departments simply accepted a professional engineer's stamp as certification of compliance. For the most part, lighting was simply not inspected due in part to unresolved conflict over which department, building or electrical, was responsible. While there was reasonably good compliance for mechanical systems, this appeared to be due primarily to the limited availability of non-complying equipment from suppliers. The envelope portions of the code appeared to be the only part that were regularly inspected, yet compliance averaged only 65 percent across the two states.

There was one jurisdiction that stood out as a notable exception in the study. The City of Seattle, Washington, had a 100 percent compliance rate on all aspects investigated. Given the amount and scope of commercial project activity in Seattle, this was surprising by itself but there were other findings that made this exception even more interesting. Seattle was the only jurisdiction with a dedicated energy code surcharge on permit and inspection fees. There were also energy code plans examiners and inspectors who worked in the building department. The overall program was partly supported by a grant from Seattle City Light and BPA. This combination of features was unique to Seattle. Yet some lessons could be learned that might raise the rest of the state from 50 percent compliance to something higher.

The resulting picture of current commercial code implementation provided a useful set of recommendations for future code development. The study clearly pointed out the need for simple, straightforward code requirements that could be easily inspected in the field. While the flexibility of a calculation approach would always be necessary, the study challenged the notion that a prescriptive code couldn't work in the commercial sector. It also pointed out the need for clear, consistent, energy code compliance documentation. Someone would have to take responsibility for looking at lighting equipment. Finally, it appeared that jurisdictions with a partnership with the local utility would have the best chance for high compliance.

Getting to Code: Taking the Long Way Home

With a revised MCS code and a new understanding of the. problems in the enforcement sector, the NWPPC began to push for revisions of the commercial energy codes for each of the four states in the region. Washington, with well over 60 percent of the new commercial floorspace in the region was the first state to be seriously targeted for adoption.

Responding to the Challenge

Despite a desire to move ahead, some serious institutional obstacles lay in the way. In Washington state, the authority to revise the energy codes was vested in the state legislature. Considering the difficulty in passing the last residential code change, it seemed unlikely that something as complex as a commercial code would ever make it through the political process. Having had intimate experience with implementing the residential code change mandated by the legislature, the outgoing chairman of the State Building Codes Council (SBCC) submitted legislation to the 1991 legislature that would authorize the SBCC to administratively revise the energy code for commercial buildings. This legislation was the key to allowing the necessary level of technical debate to occur before adoption of the code. The legislation even specified what professions needed to be represented in the development of the code (e.g., architects, building owners, etc.). It also established the basic requirements of the code process by stipulating that code provisions must be "technically feasible, commercially available, and cost effective to building owners and tenants." (State of Washington 1991)

Shortly after the governor signed the legislation, a consortium of interested parties headed by the NWPPC petitioned the SBCC to enter into rule making to revise the commercial energy code based on the new MCS. While the new chairman of the SBCC had 60 days to respond, reality once again impinged on the process. Because 1991 was the year that the uniform codes must be revised to accommodate the new national changes, the consortium was asked to delay their petition until the fall of 1991. By the time the final rule making for the uniform codes was completed, it was the end of 1991 and the chairman of the SBCC only had time to appoint members to the Technical Advisory Group (TAG).

Building a New Code

The TAG was chosen to represent a broad range of interests including some public interests not normally represented in these proceedings. Table 1 lists many of the participating organizations in the TAG process and their various interests. In January of 1992, the TAG began meeting and continued to meet at least once every week until the end of June.

The TAG was given the unenviable task of sorting through all of the technical issues raised by ASHRAE 90.1. As a starting point, the TAG agreed to use the NWPPC's NWEC as the base document. The TAG literally looked at every line of every page with the intent of producing a document that was the best possible technical code, but one that could be easily implemented and enforced as well.

By the end of June 1992, the TAG had produced a draft code to be voted on by the SBCC to go out for hearings. The draft included a number of innovative features including prescriptive envelope and lighting options. However, both the size of the draft and the fact that it was a complete revision of the old code caused serious consternation on the part of some members of the SBCC. In the end, the SBCC determined that while the code was technically a good document, it was still too complex and raised serious questions about enforceability. At the same time, the SBCC recognized that the scope of the TAG could not address the fundamental question of how to ensure adequate implementation of the new code.

Molding the Code to Meet the Challenges of the Real World

To respond to these issues, the SBCC set up two additional committees: the first would focus on simplifying the code language without reducing its energy efficiency, the second would develop an implementation plan that would ensure that the promise of the new code was fulfilled in practice. In March 1993, after six weeks of intense effort, the Simplification Committee delivered a new draft code that was roughly 50 percent smaller than the original draft. (See the section, Making It Simple.) From March until August, the Implementation Committee, chaired by the western Washington Power Council member, wrestled

Table 1. Code Interest Groups

Organization	Issues(s)	Solution
Code Officials	Complexity and Enforceability	Simplification
Local Governments	Cost of Enforcement	Utility Payments
Building Code Council	Simplicity	Simplification Committee Rewrite
	Implementation	Implementation Committee Plan
Contractors	Fees	Utility Payments
Utilities	Accountability for Payments	Special Inspector Program
	Length of Commitment	3 Year Code Cycle
Public Interest/ Environment	Energy Savings	Stringent Code Requirements (especially for lighting)

with the many thorny issues surrounding implementation. The final product included many innovative approaches to improving the efficacy of the enforcement process. The plan included recommendations and funding mechanisms for education and training, a new third-party plans-examiner/inspector service, and a model for cooperation between utilities and local jurisdictions. (See the section, Getting Consensus...)

Finally, following the completion of the implementation plan, the SBCC voted to adopt the simplified code and implementation plan in September 1993, with an effective date of April 1, 1994. The remainder of this paper describes in more detail the technical and implementation aspects of the code.

Technical Content of the Code: Making the Change from ASHRAE 90.1

Working on ASHRAE 90.1

The SBCC agreed that the new NREC would be based on the 1990 MCS, and that the TAG's mission was to start from this standard and transform it into a code. This detailed review of the MCS ultimately made the NREC a better document than the MCS due to four important factors:

- Additional analyses provided a more "robust" technical basis for the NREC.
- Significant involvement of Washington's builders, designers, enforcement personnel, and the general public addressed unique characteristics of Washington's non-residential construction.
- The TAG added additional requirements that had become practical after the MCS was published.
- Most importantly, MCS language that mainly served as "design recommendations" could be removed or reworded into good code language that was more easily enforceable as state law.

The TAG used ASHRAE's ENVSTD program to develop the thermal performance requirements for building envelopes. The TAG established prescriptive and component requirements using construction and internal load characteristics of typical Washington office buildings. Thermal performance requirements based on ENVSTD make the NREC substantially equivalent to ASHRAE/IES Standard 90.1 and, therefore, help to demonstrate Washington's compliance with the NEPACT. Other analysis included somewhat anecdotal polling of electrical engineers on the TAG to assess the-impact of proposed lower lighting power budgets. Generally, engineers agreed that the lighting power budgets ultimately contained in the code would require designs that utilize either electronic ballasts or T-8 lamps, but not both (Table 2). This research and conclusion, no matter how anecdotal, helped to establish a "comfort level" with the new code among all concerned individuals.

Input from Washington's design, construction, and enforcement professionals was essential to develop a code that reflects good common construction practices. The MCS is a regional conservation standard that does not necessarily reflect common construction practices in any particular state. Additionally, there is a "culture" in Washington that prefers prescriptive compliance over all other forms of compliance, regardless of the flexibility that other performance oriented compliance paths offer. The prescriptive paths provided in the 1986 code reflected only a small subset of typical commercial constructions.

Table 2. NREC: Selected Lighting Power Budgets

Use	Watts/ft²
Office buildings, office/administrative areas in facilities of other use types (including but not limited to schools, hospitals, institutions, museums, banks, churches)	1.20
Assembly spaces, auditoriums, gymnasia, theaters	1.00
Restaurants/bars	1.00
Retail A	1.00
Retail B, retail banking	1.50

Source: NREC, Table 15.1

As an example, the 1986 NREC and 1990 MCS prescriptive paths were oriented toward framed construction, yet tilt-up concrete and Concrete Masonry Unit (CMU) construction are increasingly popular for commercial construction. The TAG used the ENVSTD program to develop explicit prescriptive paths for concrete construction (see Table 3). As another example, the Code Compliance Study revealed a desire for an alternative to restricting installed lighting power (Baylon et al. 1992). The result was a true prescriptive lighting path that allows unlimited installation of specific energy efficient fixtures (see below).

NREC: Energy Code Prescriptive Interior Lighting. "Section 1521 Prescriptive Interior Lighting Requirements: Spaces for which the Unit Lighting Power Allowance in Table 15-1 is 0.80 W/ft² or greater may use unlimited numbers of lighting fixtures and lighting energy, provided that the installed lighting fixtures are one- or two-lamp (but not three- or more lamp) non-lensed, fluorescent fixtures fitted with type T-5, T-6, T-8 or PL type lamps from 5 to 50 watts and electronic ballasts.

Exception: Up to a total of 5 percent of installed lighting fixtures need not be ballasted and may use any type of lamp." (WA NREC, 1994)

Many additional requirements seemed essential to the TAG even though they were not included in the MCS. Generally, these types of requirements had developed after the publication of the MCS. They included:

- National Fenestration Rating Council (NFRC) testing for fenestration Products.
- Equipment efficiencies per the 1992 National Appliance Energy Conservation Act (NAECA) updates and NEPACT.
- More stringent economizer requirements that reflected Washington's favorable weather conditions.
- Elimination of lighting control credits.

Table 3. NREC: Concrete Masonry Wall Provisions

Concrete Masonry Walls: If the area weighted heat capacity of the total opaque above grade wall is a minimum of 9.0 Btu/ft² • °F, then the U-factor may be increased to 0.19 for interior insulation and 0.25 for integral and exterior insulation for insulation position as defined in Chapter 12. Individual walls with heat capacities less than 9.0 Btu/ft² • °F and below grade walls shall meet opaque wall requirements listed above. Glazing shall comply with the following:

Maximum Glazing Area as % of Wall	0 to 10%			>10 to 15%			>15% to 20%			>20% to 25%		
	Maximum U-Factor		Max SHGC	Maximum U-Factor		Max SHGC	Maximum U-Factor		Max SHGC	Maximum U-Factor		Max. SHGC
	VG	OG		VG	OG		VG	OG		VG	OG	
1. Electric resistance heat	0.40	0.80	1.0	0.40	0.80	1.0	0.40	0.80	1.0	NOT ALLOWED		
2. All others including Heat pumps and VAV	0.90	1.45	1.0	0.75	1.40	1.0	0.65	1.30	0.80	0.60	1.30	0.65

VG = Vertical Glazing OG = Overhead Glazing SHGC = Solar Heat Gain Coefficient
Source: NREC, Table 13.1, Footnote 2

These requirements made the NREC more stringent, or at least more explicit, than ASHRAE/IES Standard 90.1 and provided additional assurance that the NREC met the requirements of NEPACT.

Standards such as the MCS and ASHRAE/IES Standard 90.1 typically take an approach of a design guideline; using this kind of language makes the code words such as "should" and phrases such as "shall be considered" nearly impossible to implement. Building codes are enforced by local building department personnel only at the time of inspection. Once the building is occupied, an inspector typically never returns to inspect for energy code items. Consequently, all code language must be explicit enough to require specific energy efficient technologies and construction practices that can be documented in building plans and verified by field inspection. Additionally, a building code will only ensure that a building or system has the capability to operate efficiently if all measures are .- -installed or constructed correctly.

When the final draft was released for public review in the spring of 1992, public testimony was generally negative; however, it seldom reflected a philosophical opposition to the code. Instead, testimony focused on shortcomings of the code based on issues raised in the Code Compliance Study. The comments included:

- The code is too long, complex, and generally foreboding.
- Requirements that apply only to residential or non-residential buildings are difficult to determine.
- Prescriptive paths need to be even more comprehensive to accommodate common construction practices.
- Many requirements add immense complexity with little, if any, impact on energy efficiency.
- Some requirements were not within the scope of enforcement activities and could not be documented on plans nor verified in the field.

Making It Simple

These comments formed part of the charge given to the Simplification Committee. Specifically, the SBCC asked the committee to:

- Reduce the overall volume of the code.
- More completely address common construction practices.
- Create a separate "stand alone" NREC with no mixing of residential requirements.
- Eliminate superfluous language, design related guidelines, and unenforceable requirements.
- Consider alternative, simpler approaches to achieve the same goal.
- Maintain the overall energy efficiency levels of the code.

One of the most fundamental changes made during the simplification process was to reformat the code into separate chapters for building envelopes, mechanical systems, and lighting. Accommodating this major change meant abandoning the requirement that all systems of a building must comply by a single approach, either prescriptive or component performance. This change aligned the code with typical design practices for non-residential buildings where architects, mechanical engineers, and electrical engineers work on individual portions of the building at the same time. It is no longer necessary for designers to communicate which compliance approach they are utilizing.

The committee placed systems analysis (compliance using computer simulation) into a separate reference standard. Systems analysis remains as the only compliance approach for which all portions of a building must be designed and shown to comply together. Actually, very few buildings use this method for compliance and separation into a reference standard outside the code seemed logical. This allowed the SBCC an easy method to update systems analysis requirements without having to enter into a formal rule making. The SBCC is now able to quickly adapt to changes in computer simulation technology and software development.

Within each chapter (envelope, mechanical, or lighting), the simplification committee made specific changes to address the concerns of the SBCC. The previous draft requirements for building envelopes included a more stringent path for small buildings, based on a conclusion that these buildings were typically heated with electric resistance. The simplification committee agreed that it was more practical to simply establish more stringent requirements for buildings that use electric resistance heat rather than estimate a typical size at which it occurs. Other simplifications included:

- More comprehensive prescriptive path for concrete masonry construction.
- Separate prescriptive glazing requirements for overhead versus vertical glazing to acknowledge the

varying effects of NFRC test methods on results for each type of glass.

- Elimination of specific test methods, such as American Society for Testing and Materials (ASTM) requirements for air leakage of storefront doors and simply requiring that they "shall be sealed, caulked, gasketed, or weatherstripped to limit air leakage. "

- Greatly expanded tables of default U-factors for assemblies, reducing the need for complex individual calculations.

For mechanical systems, the simplification committee believed that performance oriented requirements should be eliminated since they are extremely difficult to document on plans or verify in the field. For example, calculations of fan power or system capacity are nearly impossible for a plans examiner to verify, short of performing the calculations again. The simplification committee therefore eliminated all of these types of requirements and substituted discrete efficiency requirements such as:

- NEPACT and NAECA minimum equipment efficiencies for full (and part) load for installed equipment, thus making a manufacturing standard also apply to installation.

- Motor efficiencies per ASHRAE/IES Standard 90.1 for complex mechanical systems.

- Prohibiting variable flow fan and pump controls that either bypass or "ride the curve."

The simplification committee also created a straightforward prescriptive path for "simple" mechanical systems so -that basic mechanical systems, no matter how large, could be permitted and inspected with no additional documentation. Simple systems must meet requirements for equipment efficiency, interlocked heating and cooling, duct insulation, set-back or shut-off, and air economizers, with no exceptions (see below). If a designer wishes to utilize "exceptions to specific requirements or has a "complex" system, then the complex systems approach must be used. This approach includes additional requirements for multi-zone systems, motor efficiency, and heat recovery; all are generally equivalent to ASHRAE/IES Standard 90.1.

NREC: Simple Mechanical Systems Description. "Section 1421 System Type: To qualify as a simple system, systems shall be one of the following:

a. Air cooled, constant volume packaged equipment, which provide heating, cooling, or both, and require only external connection to duct work and energy services.

b. Air cooled, constant volume split systems, which provide heating, cooling, or both, with cooling capacity of 54,000 Btu/h or less.

c. Heating only systems which have a capacity of less than 5,000 cfm or which have a minimum outside air supply of less than 70 percent of the total air circulation." (WA NREC 1994)

The main change to the lighting chapter was to reformat the lighting power budget table to reflect common lighting design practice. Historically, all lighting tables in Washington codes have set lighting levels for the various occupancy types of the Uniform Building Code (UBC). The simplification committee agreed that lighting power allowances should be based on the use of the space since different occupancy types can have the same uses and that assignment of UBC occupancy type largely depended on the local enforcement jurisdiction. Other simplifications and clarifications to lighting requirements include:

- Clearly listing what areas are exempt from lighting power budgets and what lighting equipment need not be included in the installed lighting power calculations.

- Requiring automatic shut-off to specific types of buildings in place of listing numerous exceptions.

- Eliminating "trade-offs" between exterior and interior lighting. (Eliminating the lighting compliance calculation program in ASHRAE Standard 90.1)

In summary, the code itself was made easier to understand and use while at the same time incorporating new energy savings provisions.

Getting the Code to Work

The preceding illustrates the technical and policy difficulties of writing a stringent yet usable commercial energy code. However, all of that effort is of little practical value without knowledgeable permit applicants, effective and efficient enforcement mechanisms, and good feedback on the effects of the code, (i.e., good code implementation).

Why Code Implementation Is Important

The importance of an implementation program is underscored by several factors. For more than ten years, Washington has provided substantial code implementation support for its residential and, to a lesser extent, its commercial energy codes. The support has ranged from the development of code compliance software, to numerous training courses, to a code hotline for building officials and the general public. These types of activities have clearly demonstrated a demand and a need for implementation support.

The Code Compliance Study (Baylon et al. 1992) provided not only a quantitative measure of the level of code compliance in the state, but also recommended specific areas that needed implementation support. For example, the study showed a large demand among all members of the code community (architects, engineers, building officials, and construction industry) for code training programs and training tools. Building officials in particular cited a need to provide training to the permit applicants so that they would not need to use the "red pen" training system—teaching the permit applicant by correcting mistakes on their submitted plans or red tagging their construction projects.

Most importantly, nearly all building departments have increasingly limited staff and financial resources and are primarily concerned with building code life and safety issues. Couple this with an inability or unwillingness on the part of the local jurisdiction to increase permit fees for energy code enforcement, and it becomes obvious why compliance levels are often low. In order for energy codes to receive attention there must be some "carrots" to support local enforcement activities.

Getting Consensus: Development of an Implementation Plan

During the entire code development process, there was a general awareness among the participating parties that the new code would require a training and enforcement support package. What such a package would contain and who would pay for it was uncertain. The 1993 simplification and implementation mandates from the SBCC forced the organizations to address these uncertainties. The committee developed a plan (Implementation Plan 1993) that described the critical elements for a successful implementation program and defined the roles and responsibilities of the participating organizations.

The on-going residential energy code implementation program provided important experience in the successes and pitfalls of a major statewide implementation process. The largest and most expensive part of residential implementation was the payment of cash incentives to builders of residential electrically heated homes to cover the additional cost of construction. The implementation committee determined from the onset that the commercial code did not need such incentives to succeed. Commercial code incentives would be very expensive and would not necessarily result in better code compliance. However, the implementation group did take many of the training and education, enforcement support, and quality assurance/evaluation concepts from the residential process.

From the beginning of the implementation planning process, Washington State's electric and gas utilities (both public and investor-owned) recognized the potential benefits of an effective energy code as an extremely cost-effective energy supply resource. The utilities formed a non-profit corporation in order to pool their money to pay for code training, enforcement support, and quality assurance/evaluation. This group, the Utility Code Group (UCG), is governed by a board of directors representing most of the major utilities in the state. The group has agreed to fully fund a massive training and education program for the first three years that the new code is in effect. The training program is estimated to total up to $4 million over the three year period. In addition, the UCG will fund all reasonable costs of energy code enforcement for the first 21 months of the code (April 1994 through December 1995) and will continue to fund 50 percent of the cost through April 1997. The cost of code enforcement depends on the level of permit activity. We estimate that an upper limit would be approximately $2.2 million per year based on high levels of construction activity (Jeff Harris, personal communication).

The design, engineering, enforcement, and construction industry organizations have formed a complementary non-profit organization to provide training and education to the industry-Building and Design 2000 (B&D 2000). The member organizations of B&D 2000 are local and state chapters of the Washington Association of Building Officials (WABO), IES, the Associated General Contractors (AGC), ASHRAE, the Building Owners and Managers Association (BOMA), American Institute of Architects (AIA), the Sheet Metal and Air Conditioning Contractors Association, the National Electrical Contractors Association, and the Mechanical Contractors Association. The membership includes representation from nearly all of the groups that must either enforce or comply with the new energy code.

This consortium of organizations is a unique combination of many groups that have often not supported commercial energy codes. B&D 2000 supports the code based upon having an effective and timely enforcement system, an ability to provide training to the building industry, and recognition of their unique capabilities to address specific industry needs. The active involvement of B&D 2000 also helps to increase the credibility and, by extension, the effectiveness of the code. industry professionals receive training sponsored and supported by their own organizations.

Putting the Plan Into Action

The implementation program has three major components: (1) training and education; (2) enforcement support; and (3) quality assurance and evaluation. This three part approach addresses all of the major components of a successful program.

Training and Education. The goals and objectives of the training and education program are:

- To provide consistent content in all training materials For example, if a training class presents a specific description of how to calculate a lighting power budget a training video, or compliance form should not contain a conflicting method.
- To provide effective evaluation and feedback. Such feedback insures that the training is high quality and allows adaptation or modification as questions or conterns arise from participants.
- To anticipate compliance and enforcement questions.
- To provide a shared vision of code intent.
- To address the specific needs of individual disciplines.
- To utilize other resources, as available. This has included such efforts as adding a commercial code course to the community college curriculum.
- To provide a tool kit of resources. Many individuals may not wish to attend training, but would benefit from standardized compliance forms, computer software, or other code assistance.

These training goals were translated into a large menu of tools and approaches. These include: training and resource manuals, uniform forms and software, videos, training classes, electronic bulletin board, code assistance hotline, field compliance manual, and information subscription services. None of these training approaches or tools are unique or untried. They have all been used for residential or commercial code support at one time. What is unusuaI is the of range of products being offered at one time, the attempt to make these products useful to many audiences, and the overall scale of the training program. Most of the previous training programs have reached only a small segment of the potential audience—no more than a few hundred individuals per year. This training effort is designed to reach thousands of participants in all of the relevant trades, associations, and organizations. And, the training support is being developed, administered, and offered by the target organizations themselves.

Enforcement Support. Training alone is clearly not sufficient to generate high compliance levels. Enforcement support is the second critical element. The enforcement support program embodies several other principles.

- Effective enforcement and good education are closely linked.
- Good code language aids enforcement.
- Utilities who pay for enforcement costs should expect cost-effectiveness and accountability.
- Enforcement costs can be substantial (10 to 20 percent of permit costs).
- Creative approaches to enforcement support are encouraged.

The utility funders preferred a Special Plans Examiner/ Inspector (SPEI) program as the main method for code enforcement in Washington. The SPEI program is based upon the special inspector requirements in section 306 of the Uniform Building Code (ICBO 1991). The SPEI program begins with a test and certification of individuals who are familiar with both the energy code and with the code enforcement process. Individuals who demonstrate mastery of the requirements are then registered by the WABO and can serve as SPEIS. If a jurisdiction chooses the SPEI program, the permit applicant would be given a list of qualified SPEI individuals. The applicant would contract with and pay for the SPEI. The SPEI would then perform all, or part of, the plans check and site inspection work, depending on the jurisdiction's policies and requirements. The permit holder could then send the proof of commercial energy code compliance and the SPEI bill to the UCG for reimbursement. (UCG 1994)

The SPEI program has some clear advantages over traditional code enforcement approaches. It assures the UCG that the individual SPEI is knowledgeable and accountable for his or her code work and the UCG is getting value for their money. The local jurisdiction does not have to hire new staff or provide extensive training for existing staff on the commercial code. The architectural, engineering, and buildings communities become more familiar with the code through their SPEI activities. Finally, since the SPEI is under contact to the permit holder, the turn around time for energy plans check or inspection should be faster than is now the case.

The enforcement plan also provides for alternative enforcement mechanisms based on agreement between a local jurisdiction and its utilities. These include building department enforcement paid by the utility, building department based SPEI, utility enforcement, or other alternatives.

Quality Assurance and Evaluation. Quality Assurance (QA) and evaluation form the third support for effective implementation. QA activities focus on providing quick, informative feedback to trainers, SPEIs and code enforcement personnel, and others about what works and what doesn't. The QA activities are designed to improve the quality of code implementation, and not to be punitive.

Evaluations focus more on the long term impacts of the code. They focus on the energy saving impacts of codes, the need for future code language changes, and the cost effectiveness of the training and enforcement activities. At this time, the details of quality assurance and evaluation are not completed.

Conclusions

What have we learned from the Washington commercial code process?

- Recognize that a comprehensive, well-funded implementation program is at least as important as a well written code.
- Write a code that is understandable and can be used by a wide range of audiences.
- Concentrate on those areas of code that yield the largest energy savings and can be enforced.
- Get all affected parties involved in the code writing and implementation planning process from the beginning.
- Acknowledge that there is no such thing as a "perfect code" and that even an imperfect code requires many years to develop and implement.
- Recognize that the electric and gas utilities can be a powerful ally, especially in code implementation.
- Utilize the building industry to provide training, technical assistance, and support to its own members.

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