

Increasing Energy Efficiency Through Improved Enforcement of Building Energy Codes

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The U.S. Government has developed a series of performance standards to improve the energy efficiency of buildings in the United States. Building code officials are central to the implementation and enforcement of the building energy standards. This paper gives survey results that show that building code officials need additional staff, training, and tools to do their work more effectively.

Introduction

Buildings in the United States account for 36% of our total primary energy consumption. To help reduce the significant amount of energy used by buildings, the U.S. government has developed a series of performance standards to improve the energy efficiency of residential and commercial buildings in the United States. The standards provide energy performance requirements that are mandatory for federal buildings and voluntary for private sector buildings.

Many different groups are involved in ensuring that the building codes are implemented. The primary groups include those that design, construct, and inspect buildings. The more secondary groups include the policymakers, manufacturers, regulators, energy suppliers, developers, insurance companies, universities, and distributors. Central to the implementation and enforcement of the building energy standards are the building code officials. It is the job of the building code officials to ensure that the standards are met.

Purpose and Scope

This paper describes one aspect of a study conducted by Pacific Northwest Laboratory to determine what information and tools building code officials need to conduct their jobs more effectively. The original research and accompanying report deal with the needs of all the groups listed in the introduction. However, this paper focuses and expands on the needs of the group essential to the enforcement of the standards (i.e., the building code officials). It is important to note that this paper presents the results of a survey. Because the survey responses guided this paper, some information is not developed here (for example, none of those questioned mentioned the need for improved architect and engineering documentation). However, included here is self-reported information from building code officials.

Research Approach

Information was gathered by using a combination of mail and telephone questionnaires. Initially a questionnaire was sent by mail to 66 building departments located in jurisdictions throughout the United States. Of those, 14 (21%) were completed and returned (some of the jurisdictions that responded included San Francisco, California; Jacksonville, Florida; Albuquerque, New Mexico; New York City; Dallas, Texas; and Seattle, Washington). An additional 42 jurisdictions were contacted by telephone to gain more detailed information. Those contacted by telephone represented large, medium, and small jurisdictions. (For example, in California personnel were contacted from building departments in the cities of Anaheim, Irvine, and Reedley, respectively.) Of those contacted by telephone, 40 (95%) completed the questionnaire.

Data Gathering

The mail questionnaire focused on the types of training materials and programs used by building code officials and what types they would like to have access to in order to facilitate their enforcement of building energy codes. Specifically, the questionnaire inquired about whether building code officials are required to receive training on the enforcement of building energy codes, types of training programs they have attended, who offered the programs and any associated costs, the usefulness of the programs, what they liked best and least about the programs, and how they learn about upcoming training programs. The questionnaire also asked about training materials they have used, who offered them and their associated costs, usefulness of the materials, what they like most and least about the materials, and whether they would like to receive computer-based training materials.

In terms of training needs, the questionnaire asked whether additional training on building energy codes would be helpful, what topics they would like covered and the preferred level of detail, who they would like to teach

training programs, methods of instruction they would prefer, how far they are willing to travel, and what a reasonable cost would be for materials and programs. The telephone questionnaire again inquired about their training needs; however, additional questions were asked to gain more in-depth knowledge about what is needed to better facilitate their enforcement of building energy codes.

Results

The results from the mail and telephone questionnaires are integrated to provide an overall picture.

Staffing

Understaffing is a major problem stated by many of the respondents. This problem was exemplified by the answers given to the question of how much time is generally spent reviewing for energy code compliance during the plan review and the field inspection. Approximately 20% of the code officials said no time was spent inspecting for energy codes at all, while another 10% stated that only minimal time was allocated. The reasons given were limited amount of time and staff constraints. Respondents also indicated that because of understaffing and time limitations they must decide what to review in detail. Overall, greater attention is placed on enforcing codes related to life and safety issues.

The problem of time and staff constraints was more frequently mentioned by building code officials from large cities. Of those officials doing more than "spot checks" for energy code compliance, the average time mentioned for conducting plan reviews was 15 minutes for large cities to 20 minutes for small and medium cities. The average time mentioned for conducting field inspections was 20 minutes for large cities to 30 minutes for small and medium cities.

Training

Sufficient training is an essential and often lacking necessity for the building code official. Ideally, building code officials should have adequate engineering background prior to being hired. However, very few building code officials reported having enough engineering or technical background to adequately understand building energy codes. This lack of background also means, as one building code official indicated, that "we don't have enough knowledge to tell contractors how to correct a problem." Although correction is not part of the code officials' job, many indicated the desire to be able to respond to such questions. Statements, such as the one

quoted above, highlight the need for improved and on-going training.

Training on the enforcement of energy codes was not required by any of the building departments contacted. However, most of the code officials contacted had received some energy code training as part of the certification process or with the updating of building codes. Most frequently training programs are offered by a State agency such as State Energy Offices. To a lesser degree, professional organizations and energy consulting firms offer training programs. Most of the training programs attended by building code officials have no or minimal charge (e.g., \$150). Various organizations were mentioned as offering excellent training programs (e.g., the Southern Building Code Congress International, local offices of the Illuminating Engineering Society, and the International Conference of Building Officials).

All of the building code officials were asked whether their departments have sufficient budgets for training. Departments in large cities appear to have the most critical budget problems in terms of training. Only 20% of the code officials from large departments felt they had sufficient budgets for training whereas 60% of the respondents from medium size cities and 80% of the respondents from small cities thought they had sufficient funds for training.

Due to time and staff constraints, many of those contacted said it was difficult to attend off-site training. Several building code officials suggested videotapes as one method to address this problem. Videos could be used to demonstrate plan reviews and field inspections. The most frequent drawback mentioned to use of videotapes was the lack of opportunity for discussion. In addition to videotapes, other visual aids were frequently requested, such as pictures and diagrams.

In general, building code officials find training programs to be useful. Most of those contacted mentioned the training programs as a helpful way to keep up-to-date with code changes. A frequent request was made for more information on new products, types of materials to use, and examples to follow. There was also a strong desire to better understand the reason for the changes or modifications. Understanding the "why" would allow building code officials to better explain their inspection results to contractors and better adopt their enforcement to innovative of "unusual" buildings.

Tools

Because most building code officials are not architects or engineers and at times are unable to understand the more

technical aspects of the code, they expressed the need to have access to simple tools and checklists that would allow them to quickly and easily determine if a building was in compliance with the energy code. Some of these tools may include manufacturer's booklets that discuss the newest technologies and their performance evaluation. Approximately 30% of those contacted reported using some form of a checklist or booklet that had been developed either by a state agency or in-house. Very few of the code officials reported using computer programs. Most code officials rely on their working knowledge and experience with the building code to ensure compliance.

Recommendations

The survey results overwhelmingly show the need for increased staffing, initial and on-going training, and enforcement tools. One way to ensure that all these occur is through a national training plan that is implemented at the state level. Key to this program is strong federal oversight. This federal oversight will help ensure consistency, reduce unnecessary redundancy, and promote implementation of building energy codes in all states. The government's latest generation of energy efficiency standards is being accompanied by the development of such a training plan. The results of this study need to be considered in the development of that plan.

Overall this national training plan should consider the differences between each state with regard to implementation of the standards and attempt to develop training materials that are generic but can be modified by each state. Essential to the success of this program is the involvement of groups in the design, construction, and inspection of buildings. To ensure this involvement, the government could form a steering committee to provide input into the planning, development, and implementation of the training programs.

The results of this survey suggest that at least the following needs to be considered in this plan:

Additional Staff. First, additional staff need to be hired, especially for the large cities, because training and tools are ineffective without sufficient staff. There is a current shortage of code officials in the United States, particularly in large jurisdictions. Without sufficient staff, there will be limited or no time for staff to receive training. In addition, code officials will continue to spend little time reviewing for energy code compliance during plan reviews and field inspections. One suggestion made by code officials is to hire consultants to inspect for energy code compliance.

Training. Training needs to be directed not only at building code officials but all groups involved in the building process. A common suggestion made by the building code officials was to better educate designers on the use of energy codes. As one code official commented, "it's better to educate the architects and engineers since it's almost too late when you get to enforcement."

Most of the building code officials contacted are not architects or engineers and reported difficulties at times understanding the more technical aspects of the code. Therefore, the training and supporting materials need to be understandable. To support this objective, training materials should incorporate more visual displays such as videos, slides, and diagrams.

The public needs to be educated on the importance of the energy code and why certain aspects of the energy code are required. If the public understands the benefits that can be achieved by using energy-efficient designs and technologies, they will place a demand on the architects, engineers, and contractors to incorporate the codes into building design.

Finally, a more simplified code is desired that includes checklists explaining the "why" behind the codes. This approach would better enable code officials to effectively enforce building energy codes. As one official commented, "don't just lay down the requirements."

Tools. For a number of reasons, building code officials spend very little time reviewing for energy code compliance. Therefore, useful tools must require very little time to use and provide clear and concise information.

The following are a few of the specific tools suggested by the building code officials:

- Development of computer-based training materials.
- Publication of a book from the insulation industry describing the specifications of different materials. One building code official indicated a publication like this would reduce the amount of time currently taken to obtain this information.
- Presentation and distribution of up-to-date information on new lighting technologies.
- Development of product labels for energy products so they are more visible and eye-catching.
- Publication of a handbook on the types of building materials to use and how to do structural calculations.

Conclusions

The amount of energy that buildings consume in the United States is significant. Building energy codes are essential to the conservation of this energy. However, the codes are only partially effective unless fully enforced. Building code officials are central to this enforcement. To effectively enforce the codes, they need training, tools, and a code that is understandable and easily enforced. Equally important, though, is the education on the importance of building energy codes to all groups involved in the design, construction, and use of buildings.

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