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BUILDING ENERGY CONSERVATION PROGRAMS

—— A PRELIMINARY EXAMINATION OF REGULATORY ACTIVITIES AT THE STATE LEVEL

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Prepared for
Federal Energy Administration
Office of Conservation and Environment
Washington, D.C. 20461

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U.S. DEPARTMENT OF COMMERCE, Juanita M. Kreps, *Secretary*

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NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Acting Director*

BUILDING ENERGY CONSERVATION PROGRAMS -- A PRELIMINARY EXAMINATION OF REGULATORY ACTIVITIES AT THE STATE LEVEL

Contents

GLOSSARY OF ACRONYMS

ANSI..... American National Standards Institute

ASHRAE..... The American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

ASHRAE 90-75..... ASHRAE Standard Energy Conservation in New Building Design

ASHRAE 90-P..... ASHRAE Standard Energy Conservation in New Building Design (proposed version of ASHRAE 90-75)

BBC..... Basic Building Code, model code promulgated by BOCA

BCMC..... Board for the Coordination of the Model Codes

BOCA..... Building Officials and Code Administrators International, Inc.

CABO..... Council of American Building Officials

ERDA..... Energy Research and Development Administration

FEA..... Federal Energy Administration

HB..... House Bill

HUD..... The United States Department of Housing and Urban Development

HVAC..... Heating, ventilating and air conditioning

IAPMO..... International Association of Plumbing and Mechanical Officials

ICBO..... International Conference of Building Officials

kwh..... kilowatt hour

MPS..... Minimum Property Standards issued by HUD. The MPS are issued in various volumes including:

a) Document 4900.1 for One- and Two-Family Dwellings
b) Document 4910.1 for Multi-Family Dwellings (1973)
c) Document 4930.1 Manual of Acceptable Practices (1973)

NBS..... National Bureau of Standards

NCSBCS..... National Conference of States on Building Codes and Standards, Inc.

OPEC..... Organization of Petroleum Exporting Countries

PL..... Public Law

SB..... Senate Bill

SBC..... Standard Building Code, model code promulgated by SBCC

SBCC..... Southern Building Code Congress International, Inc.

UBC..... Uniform Building Code, model code promulgated by ICBO

Editorial Note

The reader may wish to refer to two other reports which document studies of regulatory activities at the county and city levels of government. These reports are:

1. National Association of Counties; "Impact of State Mandated Thermal Efficiency Standards on Counties;" Washington, D.C.; March, 1977.

2. National League of Cities; "Impact of Thermal Efficiency Standards in City Building Codes" Washington, D.C.; March, 1977.

ABSTRACT

Background information on the current regulatory status and degree of implementation of building energy conservation programs at the State level are described, including those programs dealing with solar energy. The objective of the study is to provide the Federal Energy Administration (FEA) with a data base of standards implementation experience. This data base can be drawn upon to promote utilization of building thermal efficiency standards on a uniform basis throughout the country. From information collected in a survey of twenty-one selected States, the survey report presents the current state-of-the-art on common problems experienced at the State level in the promulgation and implementation of building energy conservation regulations. Based on these findings, several types of assistance that could facilitate the orderly adoption and implementation of uniform standards are identified.

Key Words: Buildings; energy conservation; enforcement; legislation; regulations; solar energy; standards; state-of-the-art study.

EXECUTIVE SUMMARY

In support of the efforts of the Federal Energy Administration to provide assistance to the States in the development of programs for the orderly implementation of building energy conservation regulations a state-of-the-art study was conducted of existing building energy conservation programs in twenty-one selected States. The States included in the study are:

- California
- Colorado
- Connecticut
- Florida
- Georgia
- Illinois
- Massachusetts
- Michigan
- Minnesota
- Nevada
- New Jersey
- New Mexico
- New York
- North Carolina
- Ohio
- Oregon
- Pennsylvania
- Texas
- Virginia
- Washington
- Wisconsin

The intent of this study was to identify State regulations in place and the extent of their enforcement, and to provide an initial overview of the successes and difficulties encountered in the implementation of various energy conservation programs. Personal interviews were conducted with State building regulatory and energy conservation officials, as well as with representatives of three of the model building code organizations (Building Officials and Code Administrators International, Inc., Southern Building Code Congress International, Inc. and the International Conference of Building Officials).

The study identified the following major problems being faced by the States:

- A lack of funding for the State building regulatory agencies to develop and implement energy regulations. Local enforcement agencies within the State were concerned about the additional inspection services which may be required, their respective costs, and the level of expertise which would be needed to carry out the intent of regulations.

- A lack of sufficient education and training of code enforcement personnel. Although a number of states conducted frequent seminars for building officials there was no assurance that the information would be transmitted to the various levels of local enforcement staffs.

- Inadequate product certification and labeling of HVAC and insulation materials. Current approval systems in use for product certification and labeling were viewed as inadequate to deal with energy related regulatory criteria (e.g., energy efficiency ratios) contained in existing voluntary standards for traditional and recently introduced building materials and equipment.

Types of assistance needed by the States in this area are:

- A uniform, acceptable energy conservation code based on ASHRAE Standard 90-75.

- An educational program for all levels of regulatory personnel, with sufficient information to permit enforcement officials to instruct local contractors and designers.

- Research into the cost of implementation by local agencies of an energy code including types of personnel needed to enforce such a code.

- Integration of energy conservation products and equipment into the existing product acceptance systems of the States and of the model code organizations.

- Better communications among and between the States for both the building regulatory agencies and the energy agencies.

- Uniform standards for solar equipment, and legislation dealing with preservation of solar easements to protect sun rights of users.

1. INTRODUCTION

This state-of-the-art study presents an overview of existing building energy conservation programs in twenty-one selected States to provide a data base of standards' implementation experience which can be used to promote utilization of building thermal efficiency standards throughout the country.

Considerable impetus was given to the development of energy conservation standards by the passage of the Energy Policy and Conservation Act of 1975 (P.L. 94-163). Title III, Part C of this Act provides for Federal technical and financial assistance for development and implementation of State energy conservation programs. Authority to issue guidelines for acceptable State programs is vested in the Federal Energy Administration (FEA), providing an opportunity for adoption of component performance standards. Title III of the Energy Conservation and Production Act of 1976 (P.L. 94-385) provides for the promulgation of energy conservation performance standards for new buildings, and for support to the States in implementing such standards.

Further incentive for the implementation of energy conservation standards is provided by the growing public awareness of the national energy problem, of the need for conservation, and of the need for development of non-depletable energy sources.

The development and implementation of effective energy conservation legislation has proved difficult. The development of effective conservation standards is only one step in the process. The actions within the States and the understanding of these standards by local enforcement officials ultimately determine success in the field. In addition, the understanding of these standards by the designer, the contractor, and the materials supplier has a significant impact on the implementation in the field. Further problems with a standard may develop due to deficiencies in product rating and certification programs, or because some performance-type energy standards may not be backed with sufficient applicable solutions and, thus, may be poorly understood by both the building designers and enforcement officials.

In order to identify possible problems and constraints in the adoption of any new regulation, this study reports the experiences of twenty-one selected States with laws, procedures and regulations in effect or pending, relative to energy conservation in new building construction.

The approach used for data collection was personal interviews with individuals within each State office responsible for energy conservation in building contruction, and those individuals involved in building regulations.

The exact title of the State energy office varies from State-to-State. It may be cited as "Governor's Energy Council," or the "State Energy Office," or some similar title. In all cases, it is the office which is responsible for the development of an overall energy plan for the State, as well as

liaison with the Federal government. Energy proposals for three of the four model building codes also were studied. Information relative to local enforcement experience was obtained and is included, where appropriate. The report is based on the information provided by the various State agencies and it is generally current as of January 1977.

In most cases, the individual State interviews were conducted on behalf of the National Bureau of Standards by private contractors. These contractors are:

Melvyn Green and Associates
Consulting Engineers
El Segundo, California

Small Homes Council - Building Research Council
University of Illinois
Champaign, Illinois

In other States the interviews were conducted by NBS project personnel. The survey information was then compiled by NBS project personnel.

2. METHODOLOGY

Information regarding the status of building energy conservation regulations was obtained through interviews with State officials responsible for the regulation of building construction and with those responsible for the administration of statewide building codes and standards. Based on previous studies undertaken by NBS, it was possible to identify those States which have been most active in the promulgation of statewide building codes as well as energy conservation regulations for buildings. Some States were selected for inclusion in the study primarily on the basis of the existence of statewide building code authority and building energy regulatory activity. Others were chosen on the basis of population and on the extent of building activity as indicated by housing starts. The study, therefore, covers the ten most populous States as well as the ten states with the most housing starts based on 1975 data. Also, at least one State was included in the study for nine of the ten FEA regions of the country.

The States selected for the study are as follows (see Figure 1, page 7):

- California
- Colorado
- Connecticut
- Florida
- Georgia
- Illinois
- Massachusetts
- Michigan
- Minnesota
- Nevada
- New Jersey
- New Mexico
- New York
- North Carolina
- Ohio
- Oregon
- Pennsylvania
- Texas
- Virginia
- Washington
- Wisconsin

The energy conservation proposals for the Basic Building Code (BOCA), the Uniform Building Code (ICBO), and the Standard Building Code (SBCC) also were studied. This was done since these three model codes frequently make up the technical basis for building regulations adopted by the States and other local jurisdictions.

An Interview Guide was used to conduct the interviews. The Guide is divided as follows:

A. Legislative and Regulatory: Existence of legislation for energy standards; means of amendment; promulgation of new standards. Relationship of existing and proposed standards to other sources such as the Department of Housing and Urban Development (HUD) Minimum Property Standards, ASHRAE 90-75, Board for the Coordination of the Model Codes (BCMC) energy conservation regulations, etc. Identification of problems and code conflicts.

B. Scope of Regulations: Identification of exceptions to regulations as well as special incentives for compliance.

C. Administration and Implementation: Means of enforcement, including technical and financial impacts on local enforcement agencies.

D. State Program: Personnel, budget, and administrative questions.

E. Product Acceptance and Certification System: Methods of product acceptance, testing, and existence of reciprocity agreements with other States.

F. Education: Availability, scope, and output of training programs in energy conservation.

G. Status of Solar Energy Standards/Regulations: Existence, type, and scope of solar energy standards and regulations.

A sample Interview Guide is included in Appendix C.

In addition, the following types of information were collected for each State surveyed:

A. Laws in effect: Where possible a copy of the complete text of each law was obtained.

B. Laws pending: Summarizing provisions under consideration, status and nature of modifications, and effect on enacted provisions.

C. Administrative Regulations in Effect: Including scope and implementation methods, and procedures relevant to program operation such as budgeting and staffing.

D. Documentation required for product certification.

E. Educational and public relations material, as appropriate.

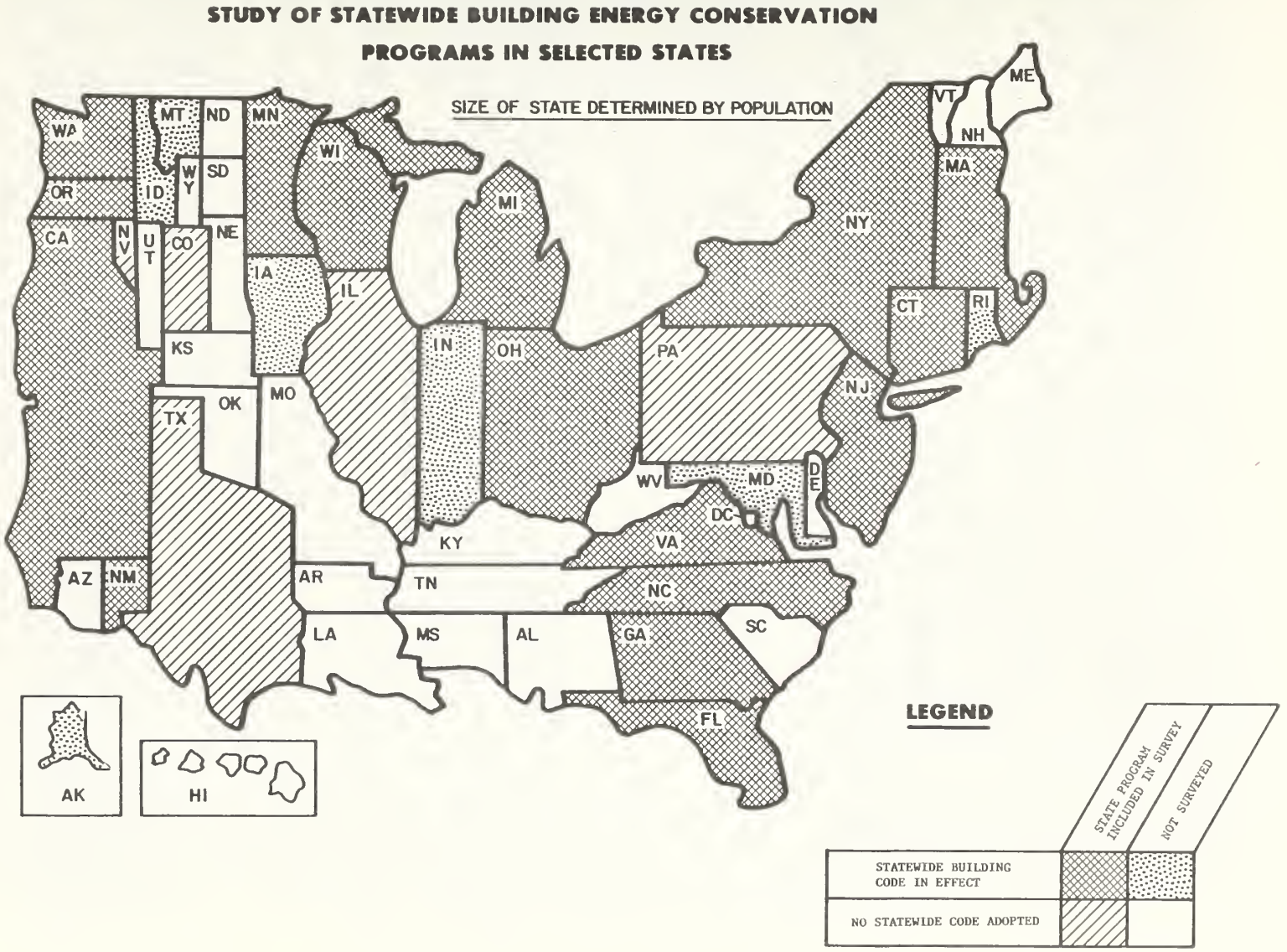
STUDY OF STATEWIDE BUILDING ENERGY CONSERVATION
PROGRAMS IN SELECTED STATES
SIZE OF STATE DETERMINED BY POPULATION
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
VA
NC
SC
GA
FL
PA
NY
MD
DC
DE
NJ
CT
RI
VT
NH
MA
ME
AK
HI
LEGEND
STATE PROGRAM INCLUDED IN SURVEY
NOT SURVEYED
STATEWIDE BUILDING CODE IN EFFECT
NO STATEWIDE CODE ADOPTED
TOTAL
21
29

Figure 1

3. SUMMARY OF FINDINGS

The results of the data collection for each State are contained in the individual State reports (Appendix A). This section summarizes those findings and presents certain aspects of the regulatory difficulties encountered by the various States surveyed. These findings are structured similar to the Interview Guide (Appendix C). Certain key elements characteristic of building energy conservation regulatory programs for each of the States surveyed have been further summarized and are presented in tabular form on page 25 .

3.1 LEGISLATIVE AND REGULATORY

3.1.1 General Discussion of Findings.

All of the States have had energy conservation bills proposed in their legislatures or had existing authority which covered energy conservation. None of the States had a legislature in session at the completion of the survey; thus, no pending legislation is included.

The regulatory pattern regarding energy is varied among the States examined. Those States with statewide building codes in effect have modified (or are in the process of modifying) their building codes to accomplish some degree of control over energy usage. However, this is often limited to residential structures. In those instances in which the State code is of a voluntary nature its coverage is limited to those jurisdictions within the State which have adopted the code.

States with energy provisions in effect generally have had them adopted by a State commission based upon legislative authorization. In this way the adopted standards may be changed without legislative action. *CONNECTICUT, MINNESOTA, NEW JERSEY, NEW MEXICO, NORTH CAROLINA, VIRGINIA* and *WISCONSIN* have broad building regulatory authority and do not require special legislative authority to make changes. States that have adopted regulations include *CALIFORNIA, CONNECTICUT, MICHIGAN, MINNESOTA, NEVADA, NEW MEXICO, NEW YORK, NORTH CAROLINA, OREGON, VIRGINIA,* and *WISCONSIN.* The *WASHINGTON* regulations relate to electric resistance heating only. *TEXAS* is developing recommended standards for voluntary adoption by its cities. *COLORADO* has adopted regulations relating to manufactured housing and multi-family dwellings in jurisdictions with no code. Most States reported having regulations for publicly-owned buildings and some of these regulations are extremely sophisticated.

The majority of States report they are awaiting a nationally-recognized enforceable code they can adopt by reference. Until this is available, some States are adopting standards they feel are compatible with their needs. *NEVADA* and *NEW MEXICO* have adopted the proposed Uniform Building Code (UBC), Chapter 53 - Insulation Requirements, anticipating that this will become a portion of the UBC. *OREGON* reported that it may double its insulation requirements over those that were adopted prior to the Organization of Petroleum Exporting Countries (OPEC) embargo. *MASSACHUSETTS* has authority to promulgate, but is awaiting the code-compatible version of ASHRAE Standard 90-75, which is being developed by the National Conference of States on Building Codes and Standards, Inc. (NCSBCS).

The organizational relationship between the various State agencies varied widely. The State energy offices, frequently a part of the Governors' Office, tended to assert significant authority. This is no doubt related to their better budgetary position due to Federal funding and State and Federal legislative mandates. Many energy offices have had little experience with the building regulatory process and are "learning their way."

Many States, including *CALIFORNIA*, *COLORADO*, *MINNESOTA*, *OREGON*, and *WISCONSIN*, reported a good working relationship between the building regulatory agency and the energy office, and have good communication between regulatory agencies. Within a State there may be more than one agency involved in building regulations. *NEW MEXICO* has the Construction Industries Commission, which regulates the Electrical, Mechanical and Construction Boards. Although the traditional building code liaison is with the National Conference of States on Building Codes and Standards (NCSBCS) Inc. delegate, who heads the Construction Board, energy regulations have been developed by the Mechanical Board and the Governor's Energy Office. A number of enforcement problems could occur if these two agencies do not clearly understand field enforcement procedures. *TEXAS* had similar problems which resulted in regulations being adopted by the Building Commission and opposed by the Energy and Community Affairs Agencies, who felt the proposed regulations did not reflect national standards and may not be enforceable. (The *TEXAS* regulations are voluntary for use by cities.)

Some of the States have a very fragmented procedure for the development of design standards and for the procurement of construction services for State buildings. *NEW MEXICO* has public building construction standards vested in individual agencies. Thus, the State Supreme Court is responsible for all courthouse construction in the State, and there are similar arrangements for other agencies. A number of States exempted State-owned buildings from the regulations affecting private buildings. In some cases legislation requiring such standards has passed, and is in the process of being implemented. For example, *WASHINGTON* has imposed stricter standards on public buildings, including a life-cycle cost analysis.

The process of adoption of standards was fairly similar in all States, with provisions adopted by a State commission board, or agency through a public hearing process.

Changes to adopted standards generally followed a five-phase procedure:

1. Proposed change is submitted to agency or commission. This change may be suggested by an individual, by an enforcement official, by industry, or by the State agency.

2. Notice is given of a public hearing regarding changes. The proponents and opponents to the proposed change are heard at the public hearing. In addition, the State agency may make a recommendation to pass, modify, or oppose the proposed changes. The majority of States (except *WISCONSIN*) reported that all proposed changes are heard by their commissions.

3. The State commission takes the testimony under advisement and votes on the proposed changes.

4. The change, if adopted, becomes a portion of the regulations after a certain specific time period, which varies from State-to-State.

5. If the regulations are adopted on an emergency basis, they are in force for a specific period, usually 180 days, during which permanent regulations may be developed.

3.1.2 Findings Representative of States with Mandatory Regulations.

CONNECTICUT has mandatory energy regulations in force which cover all buildings. The rules and regulations on energy conservation were added to the State Building Code on April 28, 1976. These regulations largely include exterior envelope requirements for residences and are generally less restrictive than the Department of Housing and Urban Development (HUD) Minimum Property Standards (MPS) requirements; for example, up to 33% of the wall area may be glazed with single glass. Maximum allowable "U" values are .12 for roofs or ceilings, for walls, and for floors over unheated spaces. The regulations also specify certain minimum temperatures and minimum ventilation rates for occupied spaces.

NEW YORK will enforce new minimum insulation standards for all residential construction through regulations issued by the Public Service Commission. Public Service Commission Opinion No. 76-16, Case 26913 Opinion and Order Requiring Insulation Standards for New and Expanded Electric Service, requires that builders and owners of buildings must certify that minimum insulation standards are met before the utility can provide new or expanded electric service. Since all residential buildings require electric service, the regulations will cover all residential construction regardless of the type of energy used. This ruling was issued on August 13, 1976, and it will be enforced beginning April 1, 1977, for one- and two-family structures, and on July 1, 1977, for multi-family structures. Provisions are made to exempt larger multi-family buildings in those cases in which plans and/or financing have been substantially completed prior to the date of implementation.

The minimum insulation standards are comparable to those in the HUD Minimum Property Standards (MPS), except that glass-to-wall area ratios are limited to 24% for one- and two-family residences, 33% for three-story or less multi-family buildings and 42% for four stories or more.

NORTH CAROLINA has a statewide mandatory minimum building code, which is a modified version of the Standard Building Code of the Southern Building Code Congress (SBCC). As amendment to the code was approved on January 1, 1975. This amendment specifies certain minimum insulation requirements for all new one- and two-family dwellings and all new multi-family dwellings three stories in height or less. By March 1977, the *NORTH CAROLINA* Building Code Council plans to submit a proposal to supplement the existing regulations. It was reported that the new proposal is based partially on ASHRAE Standard 90-75.

VIRGINIA'S statewide building code has energy regulations for one- and two-family dwellings only. These are stated as minimum total insulating factors in terms of resistance values as follows:

R-19 for ceilings
R-11 for exterior walls
R-7 for floors over crawl spaces with electric heat and air conditioning.

3.1.3 Findings Representative of States with Voluntary Regulations.

GEORGIA has a voluntary statewide code, which is a modified form of the Standard Building Code of SBCC. *GEORGIA* has adopted Appendix L, "Thermal Performance," of the SBC. Present regulations do not permit a systems analysis approach, but specify maximum heat transmission coefficients for various parts of the building.

The *MICHIGAN* Construction Code Act of 1972 (as amended) authorizes the Construction Code Commission to promulgate rules regarding building construction. Under this law, Part 10 of the General Rules, entitled "Energy Conservation in New Building Design," was filed with the Secretary of State on December 22, 1976, and will take effect June 22, 1977, in those areas in which the *MICHIGAN* code is in effect.

3.1.4 Findings in Various Other States.

In *FLORIDA* statewide building regulation is in a somewhat suspended condition and statewide energy conservation controls are non-existent. The Interim Building Code (State Building Code Act of 1974) remains in effect. However, the 1976 legislature chose not to fund either the Bureau of Codes and Standards (which was the administrative body until June 30, 1976), or the Board of Building Codes and Standards, with the result that there is no State activity. Energy regulations are not mandatory under the voluntary interim code, and, therefore, where energy regulations exist, they exist as the result of local action. In some cases, local jurisdictions have adopted "Appendix L" title of the Standard Building Code and thereby have established some local controls.

The Interim State Building Code Act of 1974, Section 553.87, requires that new plumbing installations in single-family residences be designed so that future installation of solar water heating equipment is possible.

FLORIDA Law 74-187, "Florida Energy Conservation in Buildings Act of 1974," provides that the Department of General Services obtain life-cycle cost analyses of the energy requirements for all State-financed and -leased buildings.

FLORIDA Law 74-134, "Educational Facilities Construction Act," provides for the Department of Education to require roof construction have a U-factor not to exceed 0.075 and opaque wall sections of student-occupied spaces have a maximum U-factor of 0.35.

ILLINOIS had no statewide energy conservation regulations. Any controls which do exist have been established at the local level.

MASSACHUSETTS had no energy conservation code for building construction. The State Building Code Commission has appropriate authority in the Statewide Building Code Law, as amended, and is awaiting the building energy-conservation code based on ASHRAE Standard 90-75 now being developed by NCSBCS.

OHIO had no State regulations for energy conservation in buildings at the time of this report. However, Chapter BB-48 of the Ohio Building Code has been developed and adopted, but had not been put into effect. Amended Senate Bill 299 (August 27, 1976), empowers the Board of Building Standards to establish, promulgate, and enforce energy conservation standards in the buildings under control of the Board. This includes all buildings except 1-, 2-, or 3-family dwelling units, certain agricultural buildings. Factory-built dwellings are included in the Board's authority. However, on the same date, House Bill 317 called for a remodification of all building regulations by December 30, 1976. Thus, energy regulations are in abeyance at present. Several cities in the Cleveland area and the City of Columbus have adopted energy regulations, primarily with regard to residential construction.

3.2 SCOPE OF REGULATIONS

Agencies have adopted regulations mandated by the legislature, but these regulations may contain elements which are unenforceable because of the unavailability of complying HVAC equipment; e.g., *MINNESOTA* and *CALIFORNIA*, which have adopted modified versions of ASHRAE 90-P and 90-75, respectively. Provisions, other than insulation requirements, are difficult to enforce since complying HVAC products are not readily available in the marketplace. Certain types of water heaters are reportedly unable to comply with the ASHRAE Standard.

By Federal law, all States are preempted from regulating mobile homes. Some States also exempt certain buildings used "for agricultural purposes."

Several of the States have adopted equal regulations for construction of both public and private buildings. Others, such as *WASHINGTON*, have stricter standards for public buildings, including a life-cycle cost analysis. Most States have initially adopted only insulation standards: *CALIFORNIA* (residential), *NEVADA*, *NEW MEXICO*, *NORTH CAROLINA*, *OREGON*, *WASHINGTON*, and *WISCONSIN*. This reflects a conservative, but enforceable, code provision. *MINNESOTA*, in adopting a modified ASHRAE 90-P standard admitted that some of the provisions are not enforced locally. It feels, however, that it is still accomplishing energy conservation within the practical limits of construction.

Communication on building energy conservation measures between the various States was generally reported as poor. For example, the *OREGON* Building Division reported it was considering increasing the insulation requirements. However, it was not aware of the developments taking place in other States. When informed of the pending model code based on the ASHRAE Standard 90-75, it responded that it would

hold off on independent revisions. Regulations adopted by most States tend to follow the ASHRAE Standard 90-75 relative to U_o values for the building envelope based on degree days.

The *CALIFORNIA* non-residential regulations are essentially the same as ASHRAE Standard 90-75; *MINNESOTA's* regulations are based on ASHRAE 90-P, *WISCONSIN* permits ASHRAE 90-75 to be used for design. *WISCONSIN* also incorporates a total volumetric heat loss concept in its regulations. *NEVADA, NEW MEXICO,* and *OREGON* have insulation requirements of the same value specified in the ASHRAE Standard 90-75. *WASHINGTON's* public building requirements refer to ASHRAE Standard 90-75; *COLORADO* and *TEXAS* are based on a locally-developed and unique energy budget concept.

Of the States with statewide mandatory codes, only *CONNECTICUT* regulates all buildings. *NORTH CAROLINA* covers all new one- and two-family residences and all new multi-family housing three stories in height or less. Regulations in *VIRGINIA* cover one- and two-family dwellings only. *NEW YORK* is expected to require certain minimum standards for all housing.

Of the States with voluntary codes, *MICHIGAN* will regulate all buildings by referencing the ASHRAE Standard 90-75, and *GEORGIA* is using "Appendix L" - title of the Standard Building Code of the SBCC.

3.3 BUDGET

Budgetary problems were reported by several States.

Legislatures frequently did not include any funding for additional regulatory staff when requiring the development and implementation of energy standards by its building regulatory agency. The *NEVADA* situation provides an example: Neither the State Public Works Board nor the Public Service Commission were authorized funds to print and mail copies of the adopted standards to the various enforcement agencies. The final solution was for the Public Works Board to pay for printing copies and the Public Service Commission to pay for their mailing.

Some States, including *CALIFORNIA, MINNESOTA,* and *NEVADA,* reported that energy conservation standards' work was performed at the expense of some other project or program.

The staff authorizations varied widely. State Building regulatory agencies surveyed reported that from one-quarter to one- and one-half professional man-years was currently being spent working on energy conservation. During the development of regulations, staffing requirement may be higher - as in *CALIFORNIA* where four professionals and two clerical personnel were assigned. In addition, some State energy offices reported that one or more professionals were assigned to cover building energy conservation matters.

When contacted, some local enforcement agencies also commented on their budgetary problems. While permitted by States to raise fees to cover additional inspection responsibility, the local agencies frequently reported they were not permitted to hire additional personnel and often the additional fees received from permits were placed in the city's general fund.

In many of the States surveyed, the administration of energy regulations was in the beginning stages, and as a result there is no clear determination of the budgetary needs. No specific budget for energy-regulation activity was evidenced in several States and costs were absorbed within the operating budget already provided. In some States it was possible to absorb the additional costs due to the general decline in building activity which occurred coincidently with the adoption of building energy conservation regulations.

3.4 ENFORCEMENT

In most States, enforcement of energy regulations is or will be accomplished by the local building code administration offices. As far as the State offices are concerned, they, too, have added energy-regulation enforcement to the duties of their existing building code enforcement staffs. These activities are regarded as just one more task added to current plan review and inspection duties. A major exception to this policy is *NEW YORK*. In *NEW YORK*, the enforcement will be by builder/owner certification to the public service utility. Since the program is yet to get under way, it is not known how effective this system may be.

Only one State, *WISCONSIN*, had a statewide building code enforcement agency. As such, this agency will receive firsthand reports from its plan review and inspection personnel. *OREGON* has a combination of State and local enforcement. Other States reported an informal feedback system from the field and encouraged local inspectors to call State offices for assistance. State officials admitted that the local inspectors often have problems enforcing the State regulations, but believed that ongoing educational efforts will improve the situation.

The *CALIFORNIA* non-residential standards require compliance certification at job completion, signed by the design engineer and the contractor. This requirement poses certain implementation difficulties. Without sufficient HVAC equipment certified to meet the coefficient of performance specified in the standards, no one could certify compliance and, as a result, construction could cease when the regulations become effective. Currently the State is enjoined under court order from implementing these regulations.

In some States, problems have been encountered with statewide programs mandated by the legislature. In *MINNESOTA*, a statewide building code is mandated in a city or county which has adopted building regulations. However, where the locality has not chosen to establish regulations, there are no local inspectors. Since the State does not have enough inspectors, there remain statewide energy conservation regulations which are not enforced. Although *NEVADA* does not have

a statewide building code and several of its counties do not regulate building construction, the legislature adopted mandatory statewide regulations. Moreover, *NEVADA's* Public Works Board is not a building regulatory agency, it is the agency for construction of State-owned buildings. This agency now finds itself in the difficult position of mandating regulations to local agencies with which it has never had a relationship, in a role which it has never played, and with no inspection personnel for implementation.

TEXAS is a very strong home rule State. That is, building regulations traditionally are promulgated and enforced by the local jurisdictions rather than the State. However, with regard to energy conservation, the legislature chose to have the State develop recommended standards for voluntary adoption by cities. These recommended standards were developed by the State Building Commission, an agency normally responsible for construction of State-owned buildings. The regulations are quite sophisticated and the Commission anticipated the need for a computer analysis for each building. In some cases, however, this may prove to be excessively cumbersome and delay construction.

CALIFORNIA requires a certification of compliance to be provided by the insulation installer. A number of local enforcement agencies are of the opinion that this certification relieves them of inspection responsibility. This certification of compliance applies to *CALIFORNIA's* residential regulations only, although this was not the intent of the State in requiring such a certificate. In addition, the certificate of insulation has tended to direct the attention of inspection and educational efforts toward insulation installation, and away from other building envelope requirements, such as windows that limit infiltration (ANSI A134.1), weatherstripping around doors, and the caulking of joints.

For buildings other than single-family, two-family, and low-rise multifamily, *MICHIGAN* has reported that it will rely on the professionals working on the design of the building; otherwise the administrative pattern will follow the usual process. That is, public entities covered by the code and having code enforcement offices will review plans, etc. in the usual manner, while areas having no code administration system will refer administration to the State office.

3.5 EDUCATION

Some States with energy regulations are conducting seminars for enforcement officials. These seminars usually are designed for the building official with the assumption that he will then train his own personnel. *CALIFORNIA* plans one two-day seminar in several locations within the State to meet the legislative training mandate. There is no plan for continuation or extension of this seminar. *WISCONSIN* has more specific regulatory personnel training than the other States surveyed. The University of *WISCONSIN* (UW) Extension has a very active building inspector education program with yearly one-week classes, plus many special energy courses. The survey revealed a close working relationship between the State Division of Safety and Buildings and UW Department of Engineering Extension.

In *PENNSYLVANIA*, even without statewide energy regulations, considerable emphasis has been given to energy conservation training by the Bureau of Local Government Services utilizing the Pennsylvania State University.

GEORGIA, *NORTH CAROLINA*, *OREGON* and *VIRGINIA* have provided training programs for local building officials; *OHIO* expects to do the same. The Fuel Emergency Office has done some educational work in *NEW YORK*.

MINNESOTA developed an enforcement manual for local agencies. It found that the manual was used instead of the code, apparently causing some problems, so the State chose to recall and destroy these manuals. *CALIFORNIA* has prepared a manual for designers and enforcement officials for residential construction and is preparing one for non-residential construction. The non-residential manual proposes a standardized calculation format for ease of submittal and plan review.

MICHIGAN prepared a "Clarification" document for the "Emergency Rules on Energy Conservation," but the Rules never were promulgated. The format of this document will be useful in future educational efforts.

The regulatory offices of other States have done little or nothing in the way of education or training manuals. However, some larger universities in States such as *ILLINOIS* and *MASSACHUSETTS* have offered educational programs to architects, engineers, and the general public.

Educational efforts to date have concentrated on the installation of insulation and the several variables or trade-offs possible, such as increased roof and floor insulation, less insulation in the walls, or the addition of more windows. In the analysis of energy usage in buildings, HVAC and lighting are significant factors. Yet, minimal educational efforts have been directed toward the HVAC system requirements, and the illumination power budget concept of Section 9 of ASHRAE Standard 90-75.

The local enforcement official frequently becomes the conduit for information to local builders, designers and homeowners, regarding new laws and regulations. The understanding of energy conservation principles as well as building materials and products is of significant importance if complete energy conservation is to be accomplished not only in new buildings but in retrofit and adaptive reuse of existing buildings.

3.6 PRODUCT ACCEPTANCE

The product approval and acceptance system relative to building construction products that are currently regulated by building codes is well established and accepted. Three of the model code organizations, (Building Officials and Code Administrators International, Inc. (BOCA), the International Conference of Building Officials (ICBO), and the Southern Building Code Congress International, Inc. (SBCC)) have formed a National Research Council to provide a method of nationally approving products.

In addition, each model code organization has its own research approval program to provide regional approval of building products. Research reports published by model code organizations generally are accepted by State and local regulatory agencies. Some States will approve products on a statewide basis. This frequently relates to products distributed within the specific State. *OREGON* has such a system for product approval. In addition, some major cities such as *LOS ANGELES* and *NEW YORK* have their own product approval systems. Thus, today, opportunities for product approval are available at any level of product distribution desired by a manufacturing firm, national or local.

Projects relating to building energy conservation traditionally have been "labeled" under a voluntary program by the various industry groups. These industry groups such as insulation manufacturers, equipment manufacturers, etc., now will come under the regulatory process, many of them for the first time. No one interviewed appeared to understand this problem, or its enforcement implications. Personnel in the *CALIFORNIA* Energy Office stated, "we understand the model codes take care of this." This has not been dealt with by the model codes organizations. However, they report that their ongoing programs are prepared to accept new products as the demand occurs.

An example of this is insulation. The standard only required the manufacturer to label the product with its "R" value. There is no requirement for durability. In addition, there is no requirement for independent testing and certification. Many new products, including shredded paper, are being offered in the market and regulatory officials report that similar appearing materials with different "R" values for the same thickness are being introduced.

3.7 SOLAR ENERGY SUMMARY.

None of the States surveyed have adopted standards and regulations for solar energy equipment and installation. The only identified code, entitled Uniform Solar Energy Code, was published by the International Association of Plumbing and Mechanical Officials (IAPMO) in September 1976. This Code relates to the plumbing aspects of solar devices rather than to solar equipment. Also, several States have adopted tax exemptions to encourage solar utilization.

State actions are summarized as follows:

CALIFORNIA: *CALIFORNIA* has the authority to develop solar regulations, and numerous bills are pending or proposed. Senate Bill 218 (Chapter 168) allows a corporation or individual a deduction from net income tax for the installation of a solar energy device. One of the most pressing problems in this area in *CALIFORNIA* is the development of product evaluation and certification systems, and future regulations may address this issue.

COLORADO: Senate Bill 75 (Chapter 344, Laws of 1975) provides for solar installations to be assessed at five percent of actual value for property tax purposes.

Senate Bill 95 (Chapter 326, Laws of 1975) provides for the establishment and transfer of easements for the purpose of exposure of a solar energy device. Consideration is being given to permitting power companies to charge a "standby rate" for buildings using solar energy. Opponents charge that this would have a negative effect on the development of solar energy by limiting the possible financial incentives for installation of solar equipment.

CONNECTICUT: Senate Bill 652 (Public Act 76-409) provides that a locality may provide an assessment exemption for a building or addition equipped with a solar energy heating or cooling system. The Act also provides for the establishment of standards for solar energy systems.

FLORIDA: The *FLORIDA* State Building Code Act of 1974, Section 553.87, requires that new plumbing installations in single-family dwellings be designed so that future installation of solar water-heating equipment will be possible. The *FLORIDA* Solar Energy Center also has authority to set standards for solar energy systems and conduct testing, as well as promote solar research and development.

GEORGIA: A solar equipment sales tax refund has been approved in *GEORGIA*, as well as a constitutional amendment allowing local governments to exempt solar energy heating and cooling systems from ad valorem taxation.

ILLINOIS: HB 164 (Public Act 79-943) allows owners who are installing solar energy systems as an improvement to real property to claim a value for the improvement equal to a conventional heating or cooling system for tax purposes.

MASSACHUSETTS: A law [HB 6813, (Chapter 734)] providing a property tax exemption for solar or wind-powered systems has been enacted.

MICHIGAN: Laws providing exemption of solar or wind energy devices from real property, tangible property, and gross receipts' taxes were passed in the 1976 legislative session.

MINNESOTA: Solar regulations incorporating some features of HUD Intermediate Minimum Property Standards for Solar Heating and Domestic Hot Water Systems along with other criteria and some economic analysis provisions are being developed.

NEVADA: Research is being conducted in *NEVADA*, but no laws are in effect or pending relative to solar energy.

NEW JERSEY: The legislature in *NEW JERSEY* was in the first year of a two year session in 1976 and several solar related bills carried over into 1977.

NEW MEXICO: *NEW MEXICO* has a substantial tax break for solar installations, whereby a property owner is allowed to deduct twenty-five percent of the cost of such an installation from his personal income tax. Where this deduction exceeds the liability, a rebate is paid to the property owner. The Construction Industries Commission has authority to adopt solar regulations.

NEW YORK: Although a number of solar bills were pending in *NEW YORK* no action was completed on them in 1976.

NORTH CAROLINA: The State Building Code Council has authority to regulate solar energy systems. No bills relating to solar systems have been enacted.

OHIO: No special laws relating to solar energy have been enacted in *OHIO*.

OREGON: Property equipped with solar installations may not be taxed more than a property equipped with a conventional heating or cooling system (HB 2202, Chapter 460, Laws of 1975). In addition, HB 2036, (Chapter 153, Laws of 1975) adds solar energy considerations to comprehensive planning.

PENNSYLVANIA: No solar related laws have been enacted in *PENNSYLVANIA*.

TEXAS: *TEXAS* offers a diversified tax exemption package for solar installations, incorporating the following provisions:

- Solar equipment is exempt from the five percent State sales tax;
- Businesses engaged exclusively in the manufacture, sale, and installation of solar equipment are exempt from the State franchise tax; and
- Solar equipment is excluded from the taxable capital of any business.

VIRGINIA: In 1976, *VIRGINIA* voters approved a constitutional amendment to allow a locality to provide a tax incentive for solar energy installations.

WASHINGTON: Research projects are under way, but no laws are in effect or pending.

WISCONSIN: The State has authority to regulate solar energy, but no regulations have been adopted. *WISCONSIN's* Attorney General ruled that the State constitution required equal valuation of real property and, therefore, property tax exemptions for solar installations could not be granted.

4. TYPE OF ASSISTANCE NEEDED

Based on the findings of this survey, several types of assistance to the States appear to be necessary. Some States that are administering energy regulations, however, are still deeply involved in the early stages of their programs and have not developed administrative documents, nor are they sure of the type of assistance that might be useful to them. The needs cited herein were typical of several States, thus, indicating the desireability of assistance. In this context, recommendations in the Regulatory; Implementation; Education; Product Acceptance Systems; Interstate Communication Networks; Solar Code, Solar Easements, and Solar Tax Incentives areas are offered for consideration.

Recommendation No. 1 - Regulatory: A reasonably uniform, nationally acceptable and enforceable code based on ASHRAE 90-75 should be developed.

If such a code were adopted, industry could respond with appropriate conforming products, administrative regulations could be developed, and a response could be made to other implementation needs. Such a code would permit States to develop State plans with confidence that these plans could be implemented in the field.

Recommendation No. 2 - Implementation: To insure adequate enforcement, States should develop a good interface with local enforcement agencies.

Implementation of statewide regulations is dependent on several factors; most especially local efforts. Simply adopting regulations does not necessarily result in implementation in the field. It depends on the development of workable codes and standards and on the presence of sufficiently trained personnel. State agencies responsible for implementation of building regulations must be adequately staffed and budgeted to accomplish their mission. State agencies should develop plan checking and inspection aids as well as educational programs. This assistance would be provided for State, as well as local personnel and include those who are responsible for plan review as well as field inspection. (Also see following recommendation on Education). This would include development of checklists, guides, inspection aids, and necessary documentation.

The State should provide information to the local agencies concerning anticipated increased costs of the required services, type of staff required, and suggestions relative to fee schedules. Although some local jurisdictions have apparently been able to handle residential energy regulations primarily containing insulation and workmanship provisions, the more complex energy regulations for other than light frame construction will be more difficult to enforce. States that have not adopted a statewide building code must establish entirely new relationships between themselves and their local agencies. States should be sensitive to traditional State/local relationships.

Implementation of State standards, however, is only possible through the local building regulatory agencies. These local agencies have been in existence for much longer than the State energy offices, and often are resistent to direction from the State. In some cases, communication between the State energy office and the State regulatory agency has not been adequate to effect the transmittal of information. Where full cooperation and communication between State and local agencies does not exist, implementation of the State's energy conservation plan may prove very difficult.

Recommendation No. 3 - Education: A well conceived, ongoing educational program for all personnel involved in the program is needed.

State educational programs generally have been directed toward the State Building Official. Often no specific programs have been developed for the plan reviewer or the field inspector. (NCSBCS is currently developing such course materials in conjunction with the model code groups under ERDA contract). State legislatures often mandate a training program, which is generally offered once, and the requirements of the legislation are considered accomplished. An ongoing program repeated on a two- or three-year frequency would reinforce the earlier effort, as well as train new personnel entering the regulatory field.

For local contractors, architects, and designers, the local building department often is the source of information concerning new regulations. Course material should include sufficient information to provide local builders and regulatory officials adequate understanding of energy conserving regulations and concepts. It will be necessary to update local officials on the requirements embodied in the code and to explain these requirements in practical terms. Since building officials lack previous experience in this area of regulation, they will need instruction in basic thermodynamics with respect to buildings. Educational programs will have to explain the meaning and use of terms and symbols such as "R," "U," "resistance," "conductivity," etc. Class material should develop an "energy ethic" understanding of good principles for design of buildings for minimum energy usage.

The role of the State energy office relative to education is dependent on the specific State programs. These offices should be made aware of the traditional relationships and fragmentation within the building industry.

Recommendation No. 4 - Product Acceptance Systems: An effort to identify, review, modify, adopt, and implement product standards should be undertaken.

A number of new industry groups will fall under the purview of the regulatory process with the adoption of energy conserving regulations. ASHRAE 90-75 refers to many voluntary standards; most of which do not require independent testing and inspection. Some means is needed to properly provide for products which will be acceptable onsite as meeting the

intent of the adopted code, as well as the needs of the nation.

This is readily seen in the area of solar products where there are no standards, but it is equally true for more traditional products.

Recommendation No. 5 - Interstate Communication Networks: Regular channels of communication should be developed between States, particularly between State energy offices.

Very little communication between States was noted in the study. Consequently, each State is developing regulations with little knowledge of other States' experiences.

Recommendation No. 6 - Solar Code, Solar Easements, and Solar Tax Incentives: Uniform standards for solar equipment and its performance are necessary; laws regarding solar easements are needed as are Federal tax incentives.

To develop an industry to manufacture solar products, uniform standards are required. Laws in the areas of easements and tax incentives will promote investment in solar equipment.

5. STATUS OF REGULATORY DOCUMENTS FOR ENFORCEMENTS OF ENERGY CONSERVATION STANDARDS

Adoption of building energy conservation standards requires the development of appropriate regulatory documentation (i.e., standard forms, submittal documents, evaluation guides, acceptance labels, etc.) that will facilitate adoption of such standards. The findings of this survey indicated that because the administration of energy regulations was in the beginning stages, the development of regulatory documentation and formats was not very advanced. In most States such documents had not yet been developed at the time of the survey. In others, they were in the process of being proposed.

Appendix D of this report contains documents from five of the States surveyed - *CALIFORNIA, NEW YORK, NORTH CAROLINA, OHIO* and *WASHINGTON*. These exhibits are given simply to illustrate the approach being taken in various States at this stage of development and implementation. Certain of the exhibits are in fact only proposed formats and may not necessarily be officially adopted at this time.

The Certificate of Compliance for installation of insulation may be used in California. Acceptance of Certificate of Compliance in lieu of inspection is a common practice. Many local agencies that accept the certificate, however, have reported they still inspect to varying degrees for compliance, which would include labeled windows. But some agencies felt the signing of the certificate was for the total job, whereas in reality, no one certifies compliance with glazing, weatherstripping, piping and ducts requirements.

TABLE 1

CHARACTERISTICS OF BUILDING ENERGY CONSERVATION REGULATORY PROGRAMS IN 21 SELECTED STATES

STATE	Has authority to regulate building energy	Statewide bldg. code is in effect	Energy regulations adopted	Regulations based on or similar to ASHRAE 90-75	Regulations based on or similar to HUD-MPS	Energy regulations apply to all bldgs.	Level at which State energy regs. are enforced	State educational programs conducted on energy regs.	SOLAR			NOTES
									State has solar tax incentive program	State has authority to regulate solar applications	Specific solar regulations are in effect	
CALIFORNIA	Yes	Yes	Yes	Yes(1)	Yes	No	Local	Yes	Yes	Yes	No	(1) Regulation based on ASHRAE 90-75, however California regulation is reported to be more restrictive.
COLORADO	Yes(1)	No	Yes	Yes	No	No	State	Yes	Yes	No	No	(1) Limited to manufactured buildings, multi-family residential in uncoded areas and public buildings.
CONNECTICUT	Yes	Yes	Yes	No	No	Yes	Local	No	Yes	Yes	No	
FLORIDA	Yes	Yes(1)	No	N/A	N/A	N/A	N/A	No	No	Yes(2)	No	(1) Florida's activity in statewide building codes was not funded for 1976-77. Interim codes are in place. (2) Authority to write solar equipment and testing standards.
GEORGIA	Yes	Yes(1)	Yes	No	No	Yes	Local	Yes	Yes	No	No	(1) The Georgia code is voluntary.
ILLINOIS	No	No	No(1)	N/A	N/A	N/A	N/A	N/A	Yes	No	N/A	(1) ASHRAE 90-75 has been adopted for factory-built modular construction.
MASSACHUSETTS	Yes	Yes	No(1)	N/A	N/A	N/A	N/A	No	Yes	Yes	No	(1) Massachusetts had adopted ASHRAE 90-75 effective 1-1-76 for all bldgs., but on 12-23-75 the State Bldg. Code Commission placed an indefinite moratorium on that action.
MICHIGAN	Yes	Yes(1)	Yes	Yes	No	Yes(2)	Local & State	No	Yes	Yes	No	(1) Under prescribed conditions some cities may opt for their own code. (2) State bldgs. are excepted.
MINNESOTA	Yes	Yes	Yes	Yes(1)	No	Yes	Local	Yes	No	Yes	In process	(1) ASHRAE 90-P.
NEVADA	Yes	No	Yes	Yes	No	Yes	Local	Yes	No	No	N/A	

TABLE 1 (continued)

CHARACTERISTICS OF BUILDING ENERGY CONSERVATION REGULATORY PROGRAMS IN 21 SELECTED STATES

STATE	Has authority to regulate building energy	Statewide bldg. code is in effect	Energy regulations adopted	Regulations based on or similar to ASHRAE 90-75	Regulations based on or similar to HUD-MPS	Energy regulations apply to all bldgs.	Level at which State energy regs. are enforced	State educational programs conducted on energy regs.	SOLAR			NOTES
									State has solar tax incentive program	State has authority to regulate solar applications	Specific solar regulations are in effect	
NEW JERSEY	Yes	Yes	No(1)	N/A	N/A	Yes	Under consid-eration	No	No	Yes	No	(1) Selection of code under consideration.
NEW MEXICO	Yes	Yes	Yes	Yes	No	Yes	Local/ State	Yes	Yes	Yes	No	
NEW YORK	Yes	Yes(1)	Yes	No	Yes(2)	No(3)	Local public service	No	No	Yes	No	(1) New York State code is voluntary. It has been adopted by 642 local jurisdictions in the State. (2) Modified by State. (3) Applied to residential buildings only.
NORTH CAROLINA	Yes	Yes	Yes	Under consid-eration	Yes	No(1)	Local/ State	Yes	No	Yes	No	(1) Applies to residential buildings three stories or less.
OHIO	Yes	Yes(1)	(2) Yes	No	No	No(1)	Local	Yes	No	Yes	No	(1) 1, 2 & 3 family residential are excepted. (2) Adopted but not effective.
OREGON	Yes	Yes	Yes	Yes	Yes	No(1)	State & Local	Yes	Yes	Yes	No	(1) Applies to residential three stories and less, applicability to others is pending.
PENNSYLVANIA	No	No	No	N/A	N/A	N/A	N/A	Yes(1)	No	No	N/A	(1) Voluntary Training Program in Conjunction with Pennsylvania State University.
TEXAS	No(1)	No	No	No	No	No(1)	N/A	Yes	Yes	No	N/A	(1) Texas had authority to write a code for State financed building that may be adopted by cities.
VIRGINIA	Yes	Yes	Yes	No	Yes	No(1)	Local	Yes	No	Yes	No	(1) Residential only, others pending.
WASHINGTON	Yes	Yes	(1) Yes	No	No	No(1)	State	No	No	Yes	No	(1) Regulations apply to electrically heating buildings only.
WISCONSIN	Yes	Yes	Yes	No	No	No(1)	State	Yes	No	Yes	No	(1) 1 & 2 family dwellings are not yet covered although authority has recently been legislated.

APPENDIX A

STATE REPORTS

APPENDIX A

STATE REPORTS

State of California

Legislative and Regulatory

Legislative and regulatory action has been divided into residential and non-residential standards.

Senate Bill 277, Chapter 11, November 22, 1972, required the Commission of Department of Housing and Community Development to adopt energy insulation regulations for residential occupancies. Regulations for residential energy standards are promulgated through Title 25 of the State Administrative Code, of the State Housing Act. Such regulations are required to meet or exceed HUD-FHA Minimum Property Standards in effect at the time of their enactment, and to include special provisions for residential buildings over three stories in height. Regulations are mandated as a minimum; cities may adopt more stringent regulations, if desired.

Senate Bill 144, February 7, 1974, requires the Department of Housing and Community Development to develop energy conservation standards for new non-residential buildings and makes local building departments responsible for enforcement of the standards.

Assembly Bill 1575, May 21, 1974, established the State Energy Resources Conservation and Development Commission. This agency now has primary responsibility for development and adoption of energy regulations.

Non-residential standards were adopted in February 1976 and are scheduled to be effective in February of 1977. Current litigation has placed a stay on implementation of these regulations.

Senate Bill 753, Chapter 877, approved September 26, 1973, amends the Government Code to require the development of energy conservation standards for government buildings. It is anticipated that the State Architect will propose standards equal to those adopted by the Energy Commission.

Senate Bill 218, signed September 1976, Solar Energy Device (personal income tax exemption). Senate Bill 1524, passed by voters in November 1976, Residential Energy Conservation Bond Act provides for State loans for residential energy conservation installations and solar devices.

Numerous bills are pending dealing with energy conservation, alternative energy sources (geothermal, solar, and nuclear), energy aspects of land use, State agency policies, tax incentives, pipelines, oil, gas, tankers, offshore drilling for oil and gas, environmental quality, and bonds and loan programs, as described in the legislative summary of the State Energy Resources Conservation and Development Commission, July 8, 1976.

No conflicts with other legal requirements for buildings have been noted. The primary implementation problem is that no system of independent certification of energy conserving products is in effect. The result is an inadequate level of consumer protection.

Scope of Regulations

Regulations cover all buildings, including those agricultural buildings which exceed a specified energy utilization rate. Non-residential regulations cover heat transmission rates for exterior envelope, as well as all mechanical and electrical devices and systems which consume energy. Insulation standards do not vary for different fuels, although some attention is being given to development of policies to discourage use of inefficient systems, such as electric resistance space heating. Residential regulations control insulation only.

Tax incentives for use of solar and other non-depletable energy sources are among those pending, as enumerated by the July 8, 1976, legislative summary of the State Energy Resources Conservation and Development Commission.

A mechanism for appeal from local enforcement procedures exists in theory but is not implemented.

Regulations do not include special provisions for retrofitting existing buildings. Administrative rulings state that the regulations apply to new buildings only.

Administration and Implementation

Statewide energy regulations are enforced through plan check and inspection at the local level. While no structured feedback system exists, questions from the local level are handled through the Department of Housing and Community Development. Energy requirements have added to administrative costs at the State level. At the local level, administrative costs have resulted in increases of up to twenty percent in plan check fees. A survey of local building departments conducted in late 1975 by the State Energy Resources Conservation and Development Commission, revealed that many departments lack necessary personnel with the technical competence needed for enforcement of energy standards; costs for plan checking will be further increased if they are required to provide such expertise.

State Program

The Energy Resources Conservation and Development Commission employs four full-time professionals in energy standards development for buildings. Two full-time clerical workers are employed. one of which is solely for the purpose of handling the paperwork for advisory committees. Consultants are employed as needed.

The Department of Housing and Community Development employs the equivalent of one-half person full-time to deal with energy standard enforcement. Many cities will have to add personnel for this purpose, but considerable uncertainty exists as to the source of funds for such additional staff.

The Energy Resources Conservation and Development Commission has approximately $600,000 budgeted for building energy conservation. The Department of Housing and Community Development has no specific budget for energy conservation.

Product Acceptance and Certification System

Major problems with product certification exist because products are rated by manufacturers according to a voluntary standard. It was remarked that some cases of substandard performance and durability of insulation materials have been experienced. Certification procedures probably will have to be developed through the State or through an independent authority.

No formal reciprocity exists with other States, but active communication exists with Minnesota, Oregon, and Washington.

Education

Educational programs are mandated by law. Seminars were offered to design professionals and building officials throughout the State, and a residential energy manual was developed by the Department of Housing and Community Development. This manual is distributed by the Department of Housing and Community Development at a nominal fee which covers publication costs.

A manual for designers, with a chapter on plan review and inspection, is under development for the non-residential standard. This manual has a proposed standard calculation submittal. A meeting of local officials was held to obtain feedback regarding this proposed manual. The most common concern expressed by the local enforcement officials was staffing. They stated that any increase in fee they charged went into the general fund for the city and they did not receive authorization for additional personnel. The State conducted a poll of enforcement agencies and the personnel shortage was identified twice as often as the next mentioned item. Other concerns expressed were; personnel training, increased inspection time, and economic impact on builder.

References

1. AB 1575, Chapter 276 - State Energy Resources Conservation and Development Commission

2. CEAC Newsletter re court injunction holding up non-residential standards

3. Survey of local enforcement officials re energy standards and implementation

4. Legislative Summary - July 18, 1976

5. SB 144 - Non-Residential Standards

6. SB 277 - Residential Insulation Standards

7. SB 753 - Standards for State Buildings

8. SB 218 - Solar Energy - Personal Income Tax Exemption

9. SB 1574 - Residential Energy Conservation Loan Fund (Bond Issue)

10. Non-Residential Standards

11. Residential Energy Design Manual

State of Colorado

Legislative and Regulatory

There are no statewide regulations for energy conservation in private buildings currently in effect, except for buildings regulated by the Division of Housing. These regulations apply to all manufactured buildings and multi-family dwellings in areas without a local enforcement agency. The State regulations are the same as those adopted in Colorado Springs. These generally are prescriptive in nature and are based on a total volumetric heat loss concept.

Regulations were adopted for public buildings within Senate Bill 22. This Bill requires the Division of Budgeting to develop construction standards which provide for envelope insulation.

Two bills relative to solar energy were passed. Senate Bill 75 provides that solar energy devices be assessed for tax purposes at five percent of their value. Senate Bill 95 establishes the concept of solar easements, and grants these easements legal standing similar to other real property easements. The State anticipates adoption of regulations based on the ASHRAE Standard 90-75 when authority to adopt statewide regulations is granted.

Scope of Regulations

Regulations deal primarily with heat transmission coefficients for the exterior envelope. Other than a program for retrofit of State buildings for energy conservation, there is no application to existing buildings. It was reported that implementation of these regulations were intended to generate employment more than to effect energy conservation.

Administration and Implementation

Regulations are enforced through plan check and inspection at the State level. It has not been determined that energy regulations have added to administrative costs. It was estimated that only two or three multi-family buildings were constructed in over a one year period in State regulated areas.

State Program

One-tenth of the time of one licensed professional is spent on energy standards activities within the Division of Housing. Approximately one-third of an attorney's time is devoted to building energy conservation within the Governor's Energy Office.

Product Acceptance and Certification System

There is no product acceptance and certification system in effect for current standards, except required labeling of insulation.

Education

The State reported that it had conducted short, in-house training for individuals working with energy standards. The training was of an informal nature designed to familiarize staff with the regulations.

Commentary

The State Energy Office reported that energy legislation often failed to pass due to lack of support by rural legislators. Frequently, rural legislators are chairmen of committees and their support is critical to passage of legislation.

References

1. SB 22 Creates the Office of State Planning and Budgeting and describes its functions

2. SB 75 Valuation for Assessment of Solar Heating and/or Cooling Devices

3. SB 95 Concerning Solar Easements

4. Colorado Springs Energy Code

5. Colorado Springs Advising Committee Report

State of Connecticut

Legislative and Regulatory

Section 19-395 of the General Statutes of Connecticut establishes the office of the State Building Inspector and the State Building Code Standards Committee, which have control of all buildings in Connecticut relative to design, construction, and use.

Energy conservation rules and regulations apply to all buildings. Pursuant to authority granted in Section 19-395 of the General Statutes of Connecticut, the rules and regulations on energy conservation were developed, adopted, and promulgated in the State Building Code on April 28, 1976. These rules and regulations were put into effect by an amendment to the State Building Code. Energy conservation features of these rules pertain to minimum temperature to be maintained within certain occupancies, and minimum quantity of outside air for mechanical ventilation related to the type of space being ventilated. The maximum allowable "U" value for all heated structures is .12 for roofs or ceilings, for walls, and for floors above non-heated spaces, and the maximum allowable "U" value for glazing is 1.13. The maximum allowable "U" value for the edge of a slab on grade is .24. Vapor barriers are required for walls and ceilings. When glass area exceeds thirty-three percent of exterior wall area, windows with a "U" value of .65 shall be used. The maximum glass area is limited to fifty percent of the exterior wall.

To date, no conflicts with other legal requirements for buildings have been noted.

Scope of Regulations

Regulations cover all buildings, and insulation standards do not vary for different fuels.

SB 652 (Substitute), passed in 1976, as Public Act 76-409 allows municipalities to exempt solar equipment from assessed real property valuation for 15 years.

Regulations apply to rehabilitation of existing buildings when such rehabilitation exceeds fifty percent of the value of the building, in which case the entire code applies.

Administration and Implementation

State energy regulations are enforced through plan check and inspection at the local level. Communication and feedback between local officials and the State office are carried out by State monthly meetings of all local building officials, by telephone, by correspondence, or in person, and also by monthly newsletters. Energy requirements have not added to administrative costs. The only added costs in fees are to cover the increased dollar value of the building for insulation materials and labor. The energy conservation regulations

are easily understood by the inspectors and builders and no new technical skills were required.

The mechanism for appeal is to the Building Board of Appeals in each municipality, then to the State Building Code Standards Committee, and, finally, to the courts.

State Program

There are no budget or special personnel for the development of energy standards for buildings. From 350 to 500 persons in the State are involved in building inspection and building regulation enforcement.

Product Acceptance and Certification System

The State Board of Materials and Review approves all methods and modes of construction for new construction procedures. Acceptance standards are developed by third-party or approved associations. The only reciprocity agreement is for mobile homes, which are controlled by Federal regulations. Modules must have the Connecticut Code label, and the label of another third-party agency, such as Underwriters' Laboratories, Inc.

Education

There is no formal educational program in energy conservation. However, energy conservation has been widely promoted by newspapers, television, power companies, and various programs in schools.

Solar Energy Standards/Regulations

Regulations for solar energy systems will be written by the State Building Code Standards Committee, in cooperation with the State Building Inspector. SB 652 (Substitute), 1976, allows municipalities to exempt solar equipment from assessed evaluation for 15 years, and provides that the Commissioner of Planning and Energy Policy will establish standards for solar energy systems. The local building inspector may refer the builder of a solar system to the Board of Materials and Review for approval.

References

1. Section 19-395, "General Statutes of Connecticut," establishes the Office of State Building Inspector and State Building Codes Standards Committee.

2. Amendments to the State Building Code on Energy Conservation Standards, April 28, 1976.

State of Florida

Legislative and Regulatory

Until June 30, 1976, the Bureau of Codes and Standards had jurisdiction over building energy regulations. The 1976 legislature funded neither the Board of Building Codes and Standards nor the Bureau of Codes and Standards and, as a result, both exist at this time, but are inoperative.

Florida Law 74-187 "Florida Energy Conservation in Buildings Act of 1974," provides that the Department of General Services obtain life-cycle cost analysis of the energy requirements for all State-financed and state-leased buildings.

Florida Law 74-374 "Education Facilities Construction Act," provides for the Department of Education to require that roof construction have a U-factor of 0.075, and that opaque wall sections of student-occupied spaces have a U-factor of 0.35.

The Standard Building Code, Appendix L, "Thermal Performance" is applicable in those jurisdictions within the State where it has been adopted.

The Interim State Building Code Act of 1974, Section 553.87, requires that new plumbing installations in single-family residences be designed so that future installation of solar water heating equipment is possible.

HB 776 (Chapter 76-246) "Solar Energy Standards Act of 1976," passed in June 1976, provides for the establishment of standards for equipment, and testing of equipment for solar energy systems. These are to be established by the Florida Solar Energy Center.

The 1974 Florida legislature directed the Board of Building Codes and Standards to submit to the 1976 legislature its recommendations for a State minimum building code. The 1976 legislature did not act on this recommendation; therefore, the Interim State Building Code remains in effect. Under the Interim State Building Code, it is not mandatory for any local jurisdiction to adopt energy conservation standards in building construction.

New regulations are developed and approved by authority of enabling acts from the legislature. There are no administrative regulations in effect or being developed. Present standards and regulations are based on Appendix "L" to the Standard Building Code, where local authorities have adopted this Code (including the Appendix).

The State Energy Office (Dr. Carlos Warren, 904-488-5623) is in the process of attempting to gain the responsibility for promulgating energy standards for the State. If this Office is given the responsibility for energy standards, it most

likely would adopt the ASHRAE 90-75 standard with modifications to accommodate the unique energy requirements for cooling necessary in the State of Florida. There is nothing in progress officially at this time.

The State Energy Office has the responsibility for State energy conservation plans.

There are no data available on whether or not individual cities have adopted their own regulations. However, the City of St. Petersburg may have adopted "Appendix L" of the Standard Building Code which regulates energy conservation.

The General Services Administration regulates State Buildings. The Department of Education regulates all school buildings. Up until June 30, 1976, the Bureau of Codes and Standards had the responsibility for the State Building Code, and its energy conservation regulations.

No conflicts have been noted between energy standards and other code provisions.

Scope of Regulations

Currently all buildings are regulated the same except for Federal buildings, which are exempted from State regulations. At the present time each agency (General Services Administration, Department of Education) sets its own standards. The General Services Administration regulations permit the use of a system analysis approach patterned after the ASHRAE 90-75 standard. These regulations, in general, cover minimum heat transmission coefficients for various parts of the exterior envelope using either a "U" value requirement or a systems analysis approach. Heating, ventilating, and air conditioning systems and units are regulated under General Services Administration regulations. Hot water heating systems are not covered by any particular regulation except, as noted earlier, the law requiring that single-family residences be equipped to permit the later installation of solar water heating equipment. Regulations do not impose different standards for different fuels.

At present, the State has no tax incentive program or other program for energy conservation. Tax credit bills were introduced into the State legislature, but were never discussed or acted on.

Under the Bureau of Codes and Standards, an appeals system existed under the State Board of Appeals. This system does not exist at the present time.

Administration and Implementation

Rules and regulations for the implementation of the standards have been formulated by local administrations and are enforced on the local level. Plans and specifications are examined on the local level only and on-site inspection is the responsibility of the local building inspector. There are no means or processes at the State level for handling questions and problems of plan review and field

inspection. However, a local official can get help from the State Energy Office. At the present time, energy requirements have not added to administrative costs. No forms or checklists have been developed.

State Program

Under the present organization, in effect since June 30, 1976, no personnel are involved in energy standard enforcement. Budgeting has been provided only for the State Energy Office. This Office has made energy studies on a limited basis and these studies are available from the Florida Energy Office, 108 Collins Building, Tallahassee, Florida 32301.

Product Acceptance and Certification System

Legislation was introduced but was not passed for a certification system for building products and equipment related to energy conservation. New products are certified through the model code product approval process. Appliances and equipment are certified and accepted through third-party testing agencies such as American Gas Association (AGA), Underwriters' Laboratories, Inc. (UL), etc.

Education

Prior to June 30, 1976, a certification program for building inspectors was in the planning stage and the State Energy Office has held seminars. Since that date, with the abolishment of the Bureau of Codes and Standards, no educational programs have been offered or are planned.

The Status of Solar Energy Standards/Regulations

The State of Florida has no authority to regulate solar energy systems, and there are no legislative or administrative programs or bills pending. With the exception of the Interium State Building Code requirement on solar water heating for single-family residences, no solar energy regulation or standards are in effect.

References

1. Excerpt from Florida Law 74-374, "Educational Facilities," Section 6A-2.67, "Thermal Insulation."

2. Excerpt from Interim State Building Code, Section 553.87, "Single-Family Residences Solar Water Heating Requirement."

3. Excerpt, House Bill 776, "Solar Energy Standards Act of 1976."

State of Georgia

Legislative and Regulatory

At the time of the interview, the State of Georgia was using a modified Standard Building Code and had adopted Appendix L, "Thermal Performance." The use of the Code is at the option of the cities and counties. In the regulatory process at that time was an energy conservation section that was to be proposed to the State Building Administrative Board. The State Building Administrative Board was formed by legislative action in 1968, and presently is under the Bureau of Community Affairs. This proposed section, Chapter 30, would regulate the design and construction of the exterior envelope and the selection of heating, ventilating, and air-conditioning systems and equipment required for the purpose of effective use of energy. The chapter is modeled after ASHRAE Standard 90-75 and a provision of it states that compliance with the ASHRAE Standard 90-75 is deemed to meet the requirements of the energy conservation chapter. It is anticipated that the Governor will ask the State legislature to draft an Energy Code that would be mandatory throughout the State.

The State Building Administrative Board has authority to promulgate new standards and regulations without subsequent or enabling legislative action. As stated above, the present State code is not mandatory for all municipalities, although most of the larger cities do use the Standard Building Code or the Basic Building Code.

The State Energy Office is responsible for the State Energy Conservation Plan, and the State Building Administrative Board coordinates its work with the State Energy Office.

To date, no city has adopted regulations of its own that are either more stringent or cover occupancies not covered by the State regulations. The State Energy Office is the only other agency involved in building energy regulations. To date, no conflicts have been noted between energy standards and other code provisions.

Scope of Regulations

The present regulations cover all buildings except Federal buildings, and, all buildings are regulated the same, including publicly-owned buildings.

The present regulations do not permit a system analysis approach, but with the adoption of ASHRAE Standard 90-75, this approach will be allowed. Present regulations cover minimum heat transmission coefficients for the various parts of the building. The proposed changes to the code will cover the balance of the systems as described in ASHRAE Standard 90-75. There is a possibility that different regulations will be imposed for different types of fuel.

At the present time the State has no tax incentive program or other incentive programs for energy conservation.

There are no provisions for appeal from local enforcement, except for factory-built housing. Conflicts at the local level are handled by a local appeals board and then are referred to the courts if necessary.

Regulations do not cover the retrofitting of existing buildings.

Administration and Implementation

The present regulations are enforced at the local level. However, the State is organizing a staff for State monitoring of the regulations. Plans and specifications are examined and evaluated on a local level, except for factory-built housing. The local inspector is responsible for on-site inspection. It is anticipated that in the future a State inspector also may be used for on-site inspection.

Questions of plan review and field inspection are handled at the states level only for factory-built housing. All other reviews are held at the local level. A local official can get help from the State office should he request it. There is no structured feedback or communication with local enforcement agencies. No guides, manuals, or checklists have been developed.

To date, energy requirements have not added to the administrative costs of the State, nor have local agencies increased fees to cover energy conservation plan review. It is possible that as more review is required, fees might be added in the future. It is not anticipated that energy requirements will require any new technical skills or increase the number of total staff needed for plan review. Also, it is not anticipated that the builder/developer will have any difficulty in complying with the new regulations.

State Program

At present, there are no staff involved in energy standards enforcement. With the proposed addition to the State code, it is anticipated that one licensed professional and two paraprofessionals will be needed.

There is no separate line item in the State budget for building energy conservation. It is not anticipated that the cities will have to add personnel to administer State-adopted energy conservation regulations, and no administrative problems have been encountered to date.

The School Board Authority is collecting information on energy consumption.

Product Acceptance and Certification System

There is no certification system for building products or equipment related to energy conservation. New products will be certified by a third-party such as the model codes, Underwriters' Laboratories (UL), American Gas Association (AGA), etc. Efforts are being made with neighboring States for coordination of certification programs, but there are no reciprocity agreements in effect.

Education

Georgia is just beginning to conduct education programs on energy conservation. The audience to which these programs are addressed are the local building inspectors and officials; however, the programs are extended to builders, and others. No new textbooks, charts or aids have been developed. The Building Inspectors Manual of the Standard Building Code is used as a textbook. At present these programs are offered at two locations. It is anticipated that the programs will be brought to more local areas. This is a pilot program and is offered through the University of Georgia/Center for Continuing Education in Athens.

In addition to the educational programs 22 Area Planning Commissions offer technical assistance to local governments in their respective areas.

Status of Solar Energy Standards/Regulations

The State of Georgia has no authority to regulate solar energy systems. House Bill 1480, passed in March of 1976, amends the Georgia Retailers and Consumers' Sales and Use Tax Act to provide a refund of sales and use tax paid on machines and equipment used directly in the conversion of solar energy for heating or cooling, water heating, or drying agricultural products.

Senate Resolution 284 proposes an amendment to the Constitution which would allow local governments to exempt from advalorem taxation all or part of the value of any device which has been installed as a solar energy heating or cooling system. The Constitutional amendment passed in the general election on November 2, 1976.

To date, no solar inspection aids or manuals are being considered or used, nor is any training related to solar systems being conducted or considered. If outside sources are needed for the evaluation of solar systems, the State will rely on State colleges and universities, as well as Federal laboratories.

At present, when testing laboratories are needed for the accreditation and certification of solar equipment, the State would prefer that this be done by private laboratories rather than by State-supported or State-run laboratories.

References

1. Senate Resolution 284
2. Fact Sheet: House Bill 1480
3. House Bill 1480
4. Excerpt, Proposed Building Code, Chapter 30-76, "Energy Conservation."
5. House Bill 273
6. Program: Building Inspectors' Course, University of Georgia Center for Continuing Education

State of Illinois

Legislative and Regulatory

There is no legislation in effect or pending to adopt standards for energy conservation in building construction. The State of Illinois has no State building code. The State Energy Conservation Plan is the responsibility of the Division of Energy, Department of Business and Economic Development. Some cities (Naperville, Springfield, Champaign, Urbana), have considered energy conservation standards to be incorporated into their city building code. The Department of Public Health has adopted ASHRAE Standard 90-75 for all factory-built, modular construction, single-family or multi-family housing.

Scope of Regulations

There are no State regulations on energy conservation in buildings in force, except for factory-built modules which comprise a small market. There is a tax incentive program for utilization of solar energy.

Administration and Implementation

There is no statewide administration of building codes. Local building officials and power companies give advice to consumers on energy conservation and construction practices in buildings.

State Program

The Energy Division of the Department of Business and Economic Development has three full-time professionals involved in energy conservation. The State has an advisory committee on weatherization. Through the Nielsen Company, the State has conducted an extensive survey of energy usage in single-dwelling units. This survey was funded by the Institute of Environmental Quality. The survey report includes date on house insulation, windows (number, type, and orientation), storm windows, adaptability to solar heating, and certain demographic data. This data has been collected for three climatic zones of the State, with a very broad matrix of information. The survey includes zone 3 (4000 x -5400 degree days), with an estimated 2.4 million single-family dwelling units, about 1.7 million have storm windows or double glass, about 1.4 million have 150 mm (6 inches) or more of insulation in the attic, about 1.9 million have insulation in the side walls, and about 1.2 million have some insulation in the basement or crawl space. The State now is surveying the homebuilders within the State to determine present energy conservation practices in residential construction.

Product Acceptance and Certification System

Product acceptance and certification is by stipulations of local governments and cities which have adopted building codes. Mobile home standards are nationally enforced. There is no reciprocity with other States.

Education

Several power companies, colleges, and universities have conducted energy conservation programs. For example, the Small Homes Council-Building Research Council has conducted programs on house construction for builders, architects, and building loan officials for thirty years, including good insulation practices, solar orientation, passive solar heating, and efficient heating and cooling systems. Several circulars on these subjects have been widely distributed throughout the State and the nation, beginning with circulars on storm windows and solar orientation. Power companies are promoting insulation for electrically-heated homes which exceeds the Department of Housing and Urban Development-Minimum Property Standard.

Solar Energy Standards/Regulations

There is a tax incentive program for solar energy systems, Illinois Public Act 79-943, 1975, amending the Revenue Act of 1939. Under this program, the County Assessor evaluates the solar heating system of a residence for building at the cost of a conventional heating system. Educational programs related to solar systems were conducted.

The Illinois "Energy Conservation Feasibility Report," prepared by the Division of Energy, Department of Business and Economic Development, was submitted to the Federal Energy Administration, in August, 1976. A valuable part of this report is the references, pages 310-317.

State of Massachusetts

Legislative and Regulatory

The State of Massachusetts has no energy conservation code for building construction. The State Building Code Commission will develop and approve such a code. This Commission is awaiting a building energy conservation code compatible with the ASHRAE Standard 90-75. This is being developed by the National Conference of States on Building Codes and Standards. The State Energy Conservation Plan is the responsibility of the Energy Policy Office.

Scope of Regulations

The State Building Code applies to all buildings. Appeal of a decision by local enforcement agencies is through the State Building Code Appeals Board, and any rulings of a local building code appeals board must be approved at the State level. Legislation for a tax incentive program for energy conservation was filed but not passed. HB 6813, Chapter 734, signed December 11, 1975, provides property tax exemption for solar and/or wind-powered systems.

Administration and Implementation

Any energy conservation code adopted would be administered as part of the State Building Code through the local agencies. State building supervisors work through district inspectors to oversee local enforcement officials. Local officials handle questions related to plan review and inspection. There is a structured feedback system from the State office through the district inspectors to the local official. Communication is through district offices, by telephone, letter, and the supervisor of each district.

State Program

All building officials will be involved in energy standards enforcement. There are about 500 building officials, of whom about 10% are architects or engineers. There is one architect and one engineer on the State staff, and two engineers and one architect on the State Building Code Commission. There is no specific budget for energy conservation. Information on energy consumption was gathered by the Conserve Program, conducted by the Energy Policy Office in 1976. This program contacted every homeowner in the State as to the use of energy in his/her home and for those that responded provided a free analysis and recommendations for improvements.

Product Acceptance and Certification System

The State Construction Materials Safety Board recommends building products and equipment for approval to the State Building Code Commission. New products are

certified by third parties, approved by the State Building Code Commission. Communication with other States is through NCSBCS, Inc.

Education

No funded educational programs in energy conservation have been conducted. Energy conservation has been promoted widely through various media and schools.

Solar Energy Standards/Regulations

For several decades, solar research has been extensive in universities of the State, especially at the Massachusetts Institute of Technology. Several solar-assisted space heating and hot water heating systems for buildings have been tested. There are no solar energy standards in effect. HB 6813, Chapter 734, December, 1975, exempts solar and/or wind-powered systems from property tax.

References

1. Chapter 802 (1972) establishes the State Building Code Commission for the adoption and promulgation of a State Building Code.

2. Chapter 1233 (1973) empowers the State Building Code Commission to include energy conservation in the State Building Code.

State of Michigan

Legislative and Regulatory

During 1976, there was a considerable amount of activity in the energy regulation area. This culminated in the filing of the document "Energy Conservation in New Building Design," General Rules--Part 10 (See Draft No. 2 dated February 25, 1976) with the Secretary of State on December 22, 1976. This rule-making action was taken in accordance with the authority conferred on the Bureau of Construction Codes (Department of Labor) by Section 6 of Act No. 230 of the Public Acts of 1972, as amended, being Section 125.1506 of the Michigan Compiled Laws. Under the terms of Michigan Law, the regulation will take effect six months after filing, which is June 22, 1977. Part 10 references the ASHRAE Standard 90-75 as follows:

> "Rule 1001. (1) Rules governing the exterior building envelope, heating, ventilating and air conditioning systems and equipment, service water heating, electrical distribution systems, lighting power budget determination procedure, energy requirements for building designs based on system analysis and requirements for buildings utilizing solar, wind or non-depleting energy sources in new building design shall be those contained in the standard for Energy Conservation in New Building Design, ASHRAE 90-75, incorporated herein by reference except the definition of mobile homes in section 3 and those exceptions as noted in Rules 1010 through 1055."

The rules changes are primarily concerned with certain definitions, with the removal of mobile homes from the referenced standards, and with establishing climatic conditions for Michigan.

A number of other bills submitted to the 1976 Michigan legislature were not acted upon. Among these was House Bill 6315, a proposed amendment to the Construction Code Act, which included a specific reference to energy regulations. Senate Bill No. 1175 (introduced October 30, 1975) "A bill to require energy consumption analyses on facilities owned by the State or a political subdivision," was not passed.

In August 1975, the Construction Code Commission prepared Draft #1 of "Energy Conservation Emergency Rules," but these were never filed with the Secretary of State. Therefore, they did not take effect.

Scope of Regulations

The Michigan Construction Code applies only to those areas which have not chosen to adopt their own code; therefore, it is not statewide. The regulations exempt Federal buildings, State buildings, mobile homes, and certain buildings used for agricultural purposes.

Administration and Implementation

In most instances, regulations will be administered by local code authorities. Where there are no local jurisdictions, the State will administer the regulations. For buildings other than residential, the State will rely primarily upon the professionals that design the buildings.

State Program

At present, a licensed mechanical engineer and a technician are involved in the program at the State office level. It is thought that perhaps more help will be needed once the program is fully under way. However, this activity is not separately budgeted.

Product Acceptance

Michigan will accept national testing sources recognized by the Building Officials and Code Administrators International, Inc., and also national organizations such as the American Gas Association, etc. At present there are no State reciprocity agreements.

Education

The State office has issued a "Clarification Document for the Emergency Rules on Energy Conservation." This document includes certain definitions, figures, and examples as an "attempt to clarify the Exterior Envelope Requirements" and to explain the procedures involved in typical problems. The document also establishes basic climatic data for different locations in the State. However, since the Emergency Rules were not promulgated, the "Clarification" document is not directly applicable. It can, however, serve a useful purpose as a base for developing explanatory materials for the energy rules as finally promulgated.

Solar Energy

House Bills 4137, 4138, and 4139 were signed into law by the Governor of Michigan on May 27, 1976. House Bill 4137 provides for the elimination of tax on the "sales of tangible property for a solar, wind, or water-energy conservation device... on a new or existing residential or commercial building."

House Bill 4138 similarly eliminates "excise tax on the storage, use, or consumption..." on the same items, while House Bill 4139 exempts solar, wind, or water-energy conversion devices from property tax assessment.

House Bill 4241 (introduced February 6, 1975), "A bill to provide for the study, development, and demonstration of solar heating and combined solar heating and cooling; and to establish a State Solar Energy Coordinating Council," was not acted upon. It may be re-introduced in 1977.

References

1. Michigan Construction Code Act of 1972 as Amended (printed January, 1975)

2. Excerpt from News Service Michigan Report #104, Friday, May 29, 1976.

3. State of Michigan 78th Legislature, Regular Session of 1976

   a) House Bill No. 4137 (relieves business and sales tax on solar, wind, etc.)
   b) House Bill No. 4138 (relieves use tax on solar, etc.)
   c) House Bill No. 4139 (relieves property tax on solar, etc.)

4. Senate Bill No. 1175 (1975). (To require energy analysis on State-owned buildings.)

5. House Bill No. 4598 (1975). (Certain portions of State building projects to have solar energy.)

6. House Bill No. 4241 (1975). (Study development and demonstration of solar heating ...etc.)

7. Draft #3 "Clarification Document for the Emergency Rules on Energy Conservation." (1975)

8. Draft #2 "Department of Labor, Bureau of Construction Codes, Energy Conservation in New Building Design." (1976)

9. Draft #1 "Department of Labor, Construction Code Commission, Energy Conservation Emergency Rules." (1975)

10. House Bill No. 6315 (1976). Expands authority of Building Code Commission with regard to energy regulations.)

State of Minnesota

Legislative and Regulatory

Legislative requirements, as provided in Minnesota Laws of 1974, Chapter 116H.12, Subdivision 4, provide for the establishment of building design and construction standards regarding heat loss control, illumination, and climate control; and for the promulgation of such standards through the Commissioner of Administration. Standards are part of a mandatory statewide building code, and apply both to new buildings and remodeling. It is further provided that any standard promulgated be cost-effective; i.e., that the energy savings exceed the cost of the requirement amortized over the life of the building. Regulations are based on ASHRAE 90-P (draft version of ASHRAE Standard 90-75), but use a temperature differential approach rather than degree days. The Code is kept current through proposals for code changes, which may be submitted by anyone. Each proposal must be subjected to public hearing, after which it may be either accepted or rejected by the Building Commissioner. Adoption of ASHRAE Standard 90-75 is being considered.

Scope of Regulations

All buildings are covered under regulations, except buildings using less than 1 watt/.093m^2 (1 Watt/ft^2). One - and two-family dwellings are regulated only with respect to heat transmission of exterior walls.

Regulations do not impose different insulation standards for various fuels. Market forces, however, have recently exerted pressure to curtail the use of natural gas.

No tax incentives pertaining to energy conservation are in effect, nor are any being considered (since the legislature is not in session). Action of local officials may be appealed to the state, but must go through local building officials.

Administration and Implementation

Enforcement is delegated to inspectors at the local level. Structured feedback between local and State levels does not exist, but local enforcement personnel can get help or information from the State at any time without charge. Periodic code letters and newsletters are sent from the State to officials of local jurisdictions. It has been reported the energy requirements have added to administrative costs at both State and local levels, but the impact on plan check and permit fees at the local level has not been determined.

Problems have occurred in prescriptive interpretation for general field use, with many contractors and other builders being unable or unwilling to use performance criteria. Additionally, conflicts have occurred with the State's mechanical, plumbing, and HVAC requirements, and with referenced ASHRAE

standards. It has also been necessary to accept the state-of-the-art for water heater efficiency, thus, compliance with regulations is not completely achieved.

State Program

The State of Minnesota employs one full-time licensed professional, three clerical workers, and approximately one half-time paraprofessional in energy standard enforcement. Other administrative personnel have been added to city staffs. Approximately five percent of the budget for the Department of Administration is used for regulation of energy conservation in buildings.

Product Acceptance and Certification System

No systems for product approval or reciprocity with other States have been developed.

Education

Publications, as well as seminars at twelve selected locations around the State, have been used to disseminate information about energy conservation. Seminars have been given to building official groups, some industries, and to personnel of homeowner do-it-yourself retail outlets.

Commentary

Personnel from both the Energy Agency and the Building Code Division appeared to have a close working relationship and a good understanding of code enforcement. Some of this results from an Energy Research and Development Administration-funded education projects currently underway. Building Code Divison personnel acknowledged that, except for insulation, its regulations were not enforced where standards are incompatible with the available performance levels of products, as is the case with water heaters.

The State produced a Building Official's Guide to assist in implementation of the energy code. This guide was frequently misused in the field and became the "code." As a result, the State recalled all copies and destroyed them.

References

1. State Energy Regulation History Chart

2. Building Code Letter

3. House File 500, includes Energy Survey and Standards for Existing Buildings and Solar Standards

4. Calculation Sheet

5. Building Official Guide to Energy Conservation. This manual was recalled by the State and most copies destroyed.

6. Energy Agency Enabling Legislation

7. Building Code Division Energy Conservation Regulation

State of Nevada

Legislative and Regulatory

Chapter 515 of the 1975 Statutes of Nevada provides for building insulation standards, to be promulgated by the State Public Works Board in conjunction with the Public Service Commission of Nevada, effective July 1, 1976. Standards may be modified by approval of petitions by both the Board and the Commission. Anyone may submit a petition by filing three copies with the secretary-manager of the Board. Hearings may be held, but are not requisite. If a petition is denied, the Board and Commission must notify the petitioning party in writing within thirty days, stating the reasons for denial.

Regulations are based on the Uniform Building Code proposed Chapter 53 (Insulation Requirement), which in turn is based on the values of ASHRAE 90-P. Special provisions are in effect for buildings where heat is used primarily to keep the temperature above the freezing level, such as warehouses, aircraft hangers, etc. In such cases, the stated thermal transmittance values may be adjusted provided the calculated heat loss for the building at an inside design temperature of 5° C (42° F) does not exceed that resulting from conformance to the standard with an inside design temperature of 21° C (70° F).

These regulations are a mandatory, minimum statewide requirement. There is no statewide building code in Nevada. Several cities had adopted standards prior to the passage of the State standard. All of the city standards were less restrictive than the State standard, and, therefore, have been superseded. Cities may adopt more restrictive standards if they choose.

Scope of Regulations

Regulations apply to all buildings except the following:

Agricultural buildings classed as UBC group J division - three occupancies; buildings where the objective of heating is only to maintain above-freezing temperatures, as discussed above; and mobile homes, which are covered by Federal standards. Prescriptive criteria are provided for optional use in residential buildings of three stories or less. Petitions for variances to the standards may be requested in writing from the Board, which may act with or without public hearings on the matter. Buildings using non-depletable energy sources are specifically suggested as eligible for variances.

Administration and Implementation

The Public Works Board is the enforcing agency for the standard. Enforcement authority is delegated to "governing authorities in the city, county, township, or other political subdivision for which they are appointed." Local

authorities check plans for conformance to the standard, and inspect work on-site. Local officials can get help from the State on a relatively informal, one-to-one basis which is extremely effective. This is due to Nevada's population being small enough for the State officials to maintain personal contact with local officials.

State Program

Approximately ten percent of the time and effort of one licensed professional is required for energy standard enforcement. No budget exists for this function, and time must be taken from other projects.

Product Acceptance and Certification System

New products are certified for compliance with standards by independent testing laboratories. Reciprocity with other States is handled on the basis of Model Code approvals.

Education

Seminars for building officials were conducted and others are planned. Such programs were developed at the request of local building officials.

Solar Energy

The legislature passed SB 552 in 1975 to fund a solar energy research laboratory to be constructed in Boulder City, Nevada, as a portion of the Desert Research Institute, a division of the University of Nevada system.

Commentary

The Nevada Public Works Board is responsible for implementation and enforcement of energy conservation regulations. This placed the Board in a unique position, as traditionally, it has been involved in public works projects only, and has no code enforcement personnel. The State has no statewide building code and some areas of the State do not have building regulations. It has delegated enforcement responsibilities to local enforcement agencies, creating a new relationship between State and local enforcement agencies. The result of this arrangement is that some rural areas without codes have no enforcement.

Another problem faced by the Public Works Board was that no funds were appropriated for this effort. Personnel assigned to develop the regulations were used at the expense of other assigned duties and projects.

References

1. Chapter 515 - Regulation Authority

2. Chapter 636 - Solar Research Laboratory

3. Building Insulation Standards Regulation

State of New Jersey

Legislation and Regulatory

On October 7, 1975, Assembly Bill 1299 (PL 1975 C.217) was signed into law. This law established the authority for a State uniform construction code. The code is to consist of six specific subcodes, one of which is to be an energy subcode. An energy subcode advisory committee has been established and is considering the possibility of recommending ASHRAE Standard 90-75. Hearings may be held in the summer of 1977. The earliest date for adoption of the energy subcode would be the fall of 1977.

Administration and Implementation

Various enforcement procedures are under consideration. These include State, local and third-party enforcement, or a mix of these.

State Program

The State is in the process of adopting subcodes at this time, and no details are available relating to the costs, staffing, education, etc. State officials expect to provide training, perhaps in cooperation with community colleges and other education institutions. They expect that energy code requirements will need extra skills and that perhaps ten percent of their time will be spent on energy-related activities. They plan to develop a newsletter, as well as other mailings and a formal interpretation service. The State will rely on the model code product approval system although it may also establish a State product approval system.

Solar Energy

No solar energy-related legislation has passed in New Jersey. Three bills are active in the 1977 legislature. These are SB 1426, providing a property assessment exemption relating to solar systems; SB 1427, providing a sales and use tax exemption; and, AB 1801, similar to SB 1426.

References

1. State Uniform Construction Code Act (PL 1975, C.127)

Additional Interview

Interviewer also contacted Charles Richmond, Executive Director, State Energy Office. Mr. Richmond indicated that building energy conservation matters would be handled through the statewide code.

State of New Mexico

Legislative and Regulatory

In 1974, a Senate Memorial was passed instructing the Construction Industry Board to review and revise the State Building Code to incorporate energy conservation provisions. Administrative promulgation of insulation standards derived from the proposed Uniform Building Code Chapter 53 followed in September 1976. Appeals during the transition period are heard by a special three-member appeals board, which has an expert on solar energy. New regulations are developed through public hearings before the Construction Industry Commission, whose members are appointed by the Governor. Regulations comprise a statewide mandatory minimum standard. No changes are being proposed at this time; the primary problem seems to be the possibility of funding shortages when the current Federal funds are exhausted. Numerous State agencies are concerned with the promulgation of in-house energy standards, including the State School Board, the State Supreme Court; the Department of Finance and Administration, and the Legislative Counsel Service.

Scope of Regulations

All buildings are covered by the current regulations. Publicly-owned buildings are regulated through the Department of Finance and Administration, which has established standards on 624,000 $kJ/m^2/yr.$ (55,000 Btu/sq.ft./yr.) limit for all buildings funded by the State. But the different agencies may adopt different standards for their own buildings. Regulations do not vary with fuel used.

A significant tax break is provided for solar installations, whereby a residential property owner is allowed to deduct twenty-five percent of the cost of such an installation from his personal income tax. Where this deduction exceeds the tax liability, a rebate is paid to the property owner.

Administration and Implementation

Enforcement is basically by local inspection. Cities may elect to inspect only part of the work, in which case the State assumes responsibility for the remainder. Buildings are evaluated for compliance with standards through both plan check and inspection. Questions and problems from the local level related to this are referred to the Construction Industry Commission.

State Program

Two full-time professionals are involved in energy standard development with the State Energy Office. Approximately twenty-five percent of the time of one clerical employee is devoted to such work. Energy consumption information is currently being gathered for all State buildings and public schools.

Product Acceptance and Certification System

There is no product acceptance and certification system in effect.

Education

One-day seminars have been held by the Energy Resources Board for architects and engineers.

Solar Energy Regulations

Research is being conducted in the solar energy area, but no regulations have been developed except those that relate to a tax break for installation of solar collectors (Chapter 12, Laws of 1975). Under this regulation, an individual's State income tax is credited with twenty-five percent of the cost of equipment used in the individual's principal residence for solar heating and/or cooling, up to a limit of $1,000. Where twenty-five percent of the cost of such a solar installation is greater than the individual's State income tax liability, a rebate is issued in the amount of the difference.

References

1. Chapter 12 of Laws of 1975, Tax Credit for Solar Energy Systems

State of New York

Legislative and Regulatory

Since January 1, 1975, standards for building insulation (Case 26286, Public Service Commission) have applied to all new residential buildings for which new gas service was to be used for space heating. The standards are the same as the Department of Housing and Urban Development-Minimum Property Standard for insulation of residential buildings, except that no insulation is stipulated for slabs-on-grade. There is no limit on window area.

Energy conservation regulations in all residential construction have been promulgated and will be enforced beginning on April 1, 1977, for one- and two-family residential units, and on July 1, 1977, for all multi-family units. These regulations and their enforcement are by the State of New York Public Service Commission, and such regulations are set forth in Opinion No. 76-16, Case 26913, Proceedings on motion of the Commission as to Insulation Standards, Opinion and Order Requiring Insulation Standards for New and Expanded Service, issued August 13, 1976. The standards set forth in this opinion are the same as HUD-MPS for insulation of buildings, with the added stipulations of window area percentages, which are twenty-four percent of wall area for one- and two-family dwelling units, thirty-three percent for three-story buildings or less, and forty-two percent for four stories or more. The jurisdiction of the Public Service Commission to promulgate and enforce these standards is discussed on pages 22 to 28 of the Opinion. While Section 14 of S10719 specifically empowered the Commission to regulate insulation standards, this Section was repealed by S10765. Governor Carey stated that the provision was unnecessary, since the Public Service Commission possessed such authority to promulgate thermal insulation standards for buildings under existing law. Therefore, the Commission is persuaded that it has the power to promulgate and enforce such standards. No conflicts with legal requirements for buildings is expected.

Scope of Regulations

The standards of Case 26286 have had little energy conservation impact because little natural gas has been available for new service since January 1, 1975, the effective date of the standard.

The regulations of Case 26913, Opinion 76-16, to be enforced in 1977 cover all residential construction. Standards do not vary for different fuels. There are no tax incentives for use of solar or alternative energy sources. Mechanism for appeal from local enforcement procedure would be to the State Appeal Board. The Commission will review any cases where unusual circumstances might impose an unreasonable hardship by compliance with standard. The regulations will apply to any rehabilitation of an existing building which, in the opinion of the Commission, is a substantial remodeling or addition to the building.

Administration and Implementation

The insulation standards are enforced through a certificate of compliance to the local power utility. This certificate of compliance is signed by the builder and the owner of the building. There is no inspection of the building required, although occasional checks are recommended for compliance with the standard. If it is discovered from these occasional inspections that the insulation standards are not being followed, the Commission may take further measures to enforce the regulations. The certificate of compliance is shown on the last page, Appendix C of Opinion No. 76-16.

State Program

The development of an energy efficiency construction code was authorized by S9451, 1974. This code was to be prepared by the State Building Code Council, but additional legislation would be required for its mandatory promulgation and implementation. No details are available for numbers of persons involved in energy conservation regulations.

The State of New York Emergency Fuel Office is responsible for the State Energy Conservation Plan, address: 20th Floor, Tower Building, Empire State Plaza, Albany, NY 12223. This Office was not interviewed as part of this study.

Product Acceptance and Certification System

New products are certified by third-party associations and agencies. Communication with neighboring States is by letter and telephone, and the National Conference of States on Building Codes and Standards (NCSBCS), Inc. No formal reciprocity agreements with other States were cited, although some reciprocity exists in mobile homes and in manufactured housing.

Education

Education and research in energy conservation has been supported in the colleges of the State University of New York. Several energy conferences and workshops were conducted throughout the State, and energy conservation has been widely promoted in newspapers and other media. The Emergency Fuel Office conducted energy conservation programs, and further details can be obtained from this Office.

Solar Energy Standards/Regulations

There are no current or pending regulations in solar energy. Some experimental work in solar utilization has been conducted by private individuals and at colleges and universities.

Additional Interview

In addition to the interview with Milton Duke, Mr. Richard Furman, Energy Division of the Public Service Department, Albany (Phone: 518-474-1931), was interviewed at length by telephone, February 25, 1977, for details of current status of Cases 26286 26913.

References

1. Public Service Commission, State of New York, Opinion No. 76-16, August 13, 1976, opinion and order requiring insulation standards for new and expanded electric service.

2. Public Service Commission, State of New York, Opinion No. 76-16(A), November 9, 1976, opinion and order requiring insulation standards for new and expanded electric service.

3. Public Service Commission, State of New York, Case 26286, April 16, 1974, Proceeding on motion of the Commission as to the standards of building insulation used in conjunction with gas space heating equipment.

State of North Carolina

Legislative and Regulatory

The Department of Justice of the State of North Carolina determined on December 4, 1973, that the North Carolina Building Code Council has the authority to amend the Building Code (GS 143-133) to require insulation of buildings, private residences, etc. and to provide minimum efficiency standards for heating, cooling, and ventilating equipment for the purpose of conserving energy. Energy conservation standards can be promulgated administratively without the necessity of specific legislation. The new regulations are developed and approved through the State Building Code Council. At present, North Carolina uses a modified version of the Standard Building Code which has been amended to require minimum insulation requirements for all new one- and two-family dwellings and all new multi-family dwellings three stories in height or less. This amendment was approved January 1, 1975, and is a mandatory minimum statewide standard.

The North Carolina Building Code Council has submitted a proposal to supplement the existing legislation. The new proposal is partially based on ASHRAE Standard 90-75, and the HUD Minimum Property Standards. It is expected that the final draft will be submitted to the Building Code Council in March 1977 and will be incorporated into the State Building Code in September 1977.

The Energy Division, a part of the Department of Military and Veterans Affairs, is responsible for the State Energy Conservation Plan (Mr. Culbreth, 919-829-2230). The Engineering and Building Codes Division of the Department of Insurance has jurisdiction over the State Building Code and coordinates its efforts with the Energy Division of the Department of Military and Veterans Affairs.

No city in the State of North Carolina has adopted any regulations of its own. State law does not allow cities to do this. The current standard has not generated any particular problems nor have any conflicts been noted between energy standards and other code provisions. It is anticipated, however, that the requirements for additional insulation in the proposed changes to the State Building Code, may change existing fire test data.

Scope of Regulations

At present, regulations cover only residential-type buildings. They do not cover Federal buildings on Federal property. All buildings are treated the same and publicly-owned buildings must meet codes. The present regulations do not permit a systems analysis approach. This will be allowed under the proposal now in progress.

Presently regulations cover only heat transmission coefficients for various parts of the exterior envelope. Under the proposed regulations heating, ventilating, and air-conditioning units and systems will be covered under regulations, as will hot water heating, electrical distribution systems, and lighting. There are no proposed regulations covering solar energy or other non-depletable energy sources. The proposed standards will treat all fuels the same. No tax incentive programs are included in the proposal, but they are under discussion to be sent to the legislature.

Appeals from local enforcement of the energy regulations can be made to the State Department of Insurance by formal written notice. These are then sent to the Building Code Council for review. Further appeal is possible through the Superior Court of the State of North Carolina.

Administration and Implementation

Rules and regulations that have been formulated by the utilization of the present standards provide for local enforcement. Plans and specifications are examined and evaluated at the local level for compliance with the standards. Certain buildings --for example-- schools, require a State review in addition to local review. Local people can request State review on any building at no fee to the local enforcing agency. On-site inspection is the responsibility of the local inspector and is also possible by certification of the installer. The State Electrical Inspector can be requested for additional help. No new forms or check lists have been developed for this purpose.

Questions and problems of plan review and field inspection are handled at a local level, but it is possible to get State help by request.

Communication with local enforcement agencies is implemented by periodic mailings and meetings of the State Inspector's Association.

So far energy requirements have not added to direct administrative costs at either the State level, building department level, or builder-developer level. Local agencies may increase their fees to cover energy conservation plan review and inspection services. No new technical skills have been required to implement these standards.

State Program

Six licensed professionals and three paraprofessionals are involved in energy standards enforcement as on a part-time basis in conjunction with their other duties. There is no specific budget line item for building energy conservation. The cities have not had to add personnel to administer the State-adopted energy conservation regulations. No administrative problems have been encountered with energy-conservation regulations.

Information on energy costs and consumption is being collected by the Energy Conservation Subcommittee of the Building Code Council. The School Board is also collecting data for distribution among the various State agencies.

Product Acceptance and Certification System

The State of North Carolina plans on using national labeling standards and systems for the certification of building products and equipment. New products are currently certified by third-party testing and use of existing standards. No reciprocity agreements exist between neighboring States.

Education

Educational programs concerning energy conservation were conducted for building inspectors and officials. This is part of an overall building inspector training program held at North Carolina University. Training programs also are provided for builders and others at builders' meetings.

Several publications have been issued by various divisions of the State in an effort to educate the general public, as well as, State officials on energy conservation. These include an energy conservation program developed by the Energy Division of the Department of Military and Veterans Affairs; a manual on Energy Conservation in North Carolina Public Schools, prepared by the North Carolina State Board of Education; a citizens' action guide to energy conservation, prepared by the Citizens' Advisory Committee on Environmental Quality; and, an Energy Conservation Plan proposed by the North Carolina Department of Education. These programs are still on a voluntary basis but offer State aid and implementation management, etc. to the various divisions of the State.

Solar Energy Standards/Regulations

The State of North Carolina has authority to regulate solar energy systems through the State Building Code Council. There are no legislative or administrative proposals or bills at this time.

When outside sources are needed for the evaluation of solar systems, the building officials will rely on universities and model code groups for this purpose. It is anticipated that some type of testing laboratory accreditation and certification will be necessary for solar equipment. The present building officials prefer that this be done by private laboratories, rather than by Federal or State laboratories.

References

1. State of North Carolina, Department of Justice, Ruling on Authority of North Carolina Building Code Council to require insulation of buildings, private residences, etc.

2. Accumulative supplement to the North Carolina State Building Code, Volume I, "General Construction," amendments adopted January 1, 1967, to January 1, 1976.

3. Accumulative supplement to the North Carolina State Building Code, Volume III, "Heating, Air Conditioning, Refrigeration and Ventilation," 1976 edition.

4. 1969-1975 amendments to 1968 edition of North Carolina Uniform Residential Building Code.

5. "Energy Conservation for the State of North Carolina," Department of Military and Veteran Affairs, dated November 20, 1974.

6. "Energy Conservation in North Carolina Public Schools and Institutions of the Community College System," prepared by North Carolina State Board of Education, dated 1974.

7. "Citizens Action Guide to Energy Conservation," distributed by the North Carolina Energy Information Program, dated September 1973.

8. North Carolina Department of Education, "Energy Conservation Plan," dated 1976.

9. "Energy Conservation Guidelines for Buildings, Heating, and Cooling Systems Central Plants," prepared by State Government Energy Conservation Council, dated December 9, 1975.

10. Proposed draft, Chapter 1 of "Energy Conservation Building Code, Prescriptive Standards," revised June 29, 1976.

11. Draft copy: Subcommittee on Electricity; The Energy Conservation Council in Government, dated May 6, 1975.

12. The State of North Carolina Department of Military and Veterans Affairs, Energy Division, "Energy Conservation Report," dated February 9,1976.

13. Program: Energy Conservation Subcommittee Meeting, February 5, 1976.

State of Ohio

Legislative and Regulatory

No regulations for energy conservation in building construction are legislated or in force in the State of Ohio. The State Board of Building Standards is empowered to develop and enforce building standards for all buildings, except one-, two-, or three-family dwelling units and certain agricultural buildings. The standard also applied to factory-built dwelling units. The Revised Code of the State of Ohio, Section 3781.07, is the enabling act for the State Board of Building Standards. On August 27, 1976, Amended Senate Bill 299 specifically empowered the Board of Building Standards to establish, promulgate, and enforce energy conservation standards in the buildings under its control. However, on the same date, House Bill 317 called for a remodification of all building regulations by December 30, 1976. While the proposed energy conservation standards of Chapter BB-48 for the Ohio Building Code could have been promulgated and enforced, BB-48 will not become part of the Ohio Building Code in its present form. The Uniform Building Code of ICBO is being considered to replace the Ohio State Building Code. The Appendix of the Uniform Building Code has an energy conservation standard patterned after ASHRAE Standard 90-75. Whether the State will adopt this energy conservation code (Appendix of ICBO) or some modification of BB-48 is yet to be determined.

Chapter BB-48 is essentially an energy budget approach which allows certain connected energy loads, in Btuh per square foot, of various amounts for various occupanices and uses of buildings. To comply with the budget for a particular building, some 56 items for areas, and loads for lighting, cooling, heating, water heating, equipment, etc. must be calculated, and then entered on a form by the engineers and architect for the building. From this data, the total connected energy load for the building can be calculated and totaled. The total connected energy load for heating, cooling, hot water, lighting, etc. is divided by the square footage of floor space of the building. The basic energy allotments vary from 20 Btu per sq. foot for lodging houses, 27 for motels and hotels, up to 70 for hospitals, 80 for gyms, etc.

A supplemental sheet also includes the "U" values for roof, ceiling, floors, and walls, and for infiltration. In general, if the "U" value of the thermal shell, excluding window values, is .10, the building probably will meet the energy budget stipulated. This supplemental information is not mandatory but gives some guidance to the Board of Building Standards as to the thermal efficiency of the shell and the detailed energy budget.

There has been some voluntary use of the energy conservation standard, particularly in evaluation of school buildings.

In Ohio, the State Energy Conservation Plan is the responsibility of the Ohio Energy and Resource Development Agency (ERDA). The City of Columbus has a residential insulation codes, and other cities may have.

Scope of Regulations

Under present law, any energy conservation regulations which would be established by the State Board of Building Standards would apply to all buildings, except one-, two-, or three-family dwelling units and certain agricultural buildings. There would be no different standard for various fuels. The State has no tax incentive program for energy conservation. Any appeal from local enforcement is to the State Board of Building Appeals. When there is any change of usage of a building, the building must comply with the standard.

Administration and Implementation

The State Board of Building Standards has certified 147 building departments in various cities and counties, as agents for the Board of Building Standards. There are approximately 1,100 building inspectors in the State. When energy conservation regulations are finally adopted, they will be included in the instruction book on the Ohio Building Code, and seminars will be conducted for educational purposes.

State Program

All building inspectors will be involved in energy standard enforcement, when such standards are put into effect.

Product Acceptance and Certification System

New products are certified by a third-party. There are no reciprocity agreements with other States.

Education

Educational programs were conducted, including seven seminars for architects and engineers, in major cities during the period of the formulation of the energy conservation code BB-48. After a code is adopted, code officials and building professionals will attend seminars to become knowledgeable about the code.

Solar Energy Standards/Regulations

No solar energy standards or regulations were cited. The Ohio State University has conducted extensive research in solar energy and in demonstration projects, and University staff are engaged in public education and consultation on solar energy.

References

1. Proposed Chapter BB-48, Ohio Building Code, "Energy Conservation."

2. Amended Senate Bill No. 299 amends Sections 3781.10, 4101.083, and 4104.02 of the Revised Code relative to the Authority to Adopt Building Regulations to Conserve Energy.

State of Oregon

Legislative and Regulatory

Oregon Revised Statute 456.750-456.885 required the Director of the Department of Commerce to establish a uniform building standard for the State, including building energy conservation standards. The legislation was developed in July 1973 due to an energy shortage due to lack of water for hydroelectric facilities. The standards became effective July 1, 1974.

Under the State Building Code, the Director appointed an Energy Conservation Committee to advise the Structural Codes Advisory Board relative to energy conservation. This committee developed an insulation standard for residential buildings three stories or under, as of May 1974. This standard, which became Chapter 53 of the State Structural Specialty Code, requires residential buildings three stories or under which are heated or cooled mechanically, to have at least R-9 in floors; R-18 ceiling, R-11 walls, or a total BTU loss factor. Double glazing is required for areas having greater than 5,000 annual heating degree days. Standards for non-residential buildings are under study. It is anticipated that these standards will be modeled after the ASHRAE Standard 90-75, as contained in Appendix Chapter 53 of the Uniform Building Code.

Regulations may be modified by the Director upon the approval of the Advisory Board, after public hearings under Oregon's Administration Procedures Act. Amendments to regulations may be proposed by anyone, either for uniform application or to fit particular local circumstances. Such amendments must be no less restrictive than the provisions of the State building standard. Amendments are reviewed by the Board and may be adopted, modified and adopted, or denied. The person proposing the amendment must be informed in writing of its disposition within 210 days.

Standards are based on California's residential energy standards, with numerous modifications. Further modifications are being considered to increase residential insulation requirements beyond those of the present standard. Local jurisdictions may not institute requirements in excess of State standards without State approval. Conflicts have occurred between energy standards and fire regulations, because certain types of insulation may cause serious potential for fire propagation and smoke toxicity. Moreover, there is concern that regulations concerning insulation and closure of crawl spaces may result in increased likelihood of dry rot in wooden framing members in the moist areas of western Oregon.

Scope of Regulations

All dwellings, including seasonal dwellings, are covered by present regulations. Pending non-residential regulations will treat all buildings uniformly. Publicly-owned buildings are not excepted from regulations.

Tax incentives for solar energy (in Chapter 460, Laws of 1975) are provided by limititations on tax assessment which prohibit taxation on the difference between the value of a solar installation and that of a conventional heating or cooling system. This exemption is available for ten years.

Administration and Implementation

Energy regulations are enforced by local agencies where local agencies exist. Where there are no local enforcement agencies, regulations are enforced by the State. Plans and specifications are reviewed for compliance with regulations; construction is inspected on-site; and, installer certification is required for insulation materials.

The State provides information to the local level through newsletters, and published meeting minutes, and through personal contact between local officials and a State official who is assigned to answer questions by mail or telephone. Structured feedback exists through the "Product, Policy, Procedure Interpretation "PPPI Manual," which is published in loose leaf form on an ongoing basis. This Manual contains administrative rulings concerning code interpretation which have resulted from questions raised by officials, contractors, building associations, and other interested parties, as well as product approvals.

Energy requirements have added to administrative, local, and builder's costs, but State law prohibits fee increases except as approved by the State legislature.

State Program

One full-time licensed professional in the Building Code Division and one in the Energy Office handle energy standard enforcement for the State. Approximately twenty-five percent of the time of one clerical employee in the Building Code Division is devoted to energy. The Building Code Division uses about five percent of its budget for building energy conservation. So far, local governments have been able to handle enforcement of State energy standards without additional personnel.

Product Acceptance and Certification System

ICBO approvals are accepted, or a product may be submitted to the Director of Commerce and the Structural Codes Advisory Board for approval. The State has approved energy conserving products, such as insulated ducts. Local jurisdictions may not reject products approved by the State. No reciprocity agreements presently exist with other States. Meetings have been held and an agreement between Oregon, Washington, and Idaho is being drafted on reciprocity for manufactured buildings. The target date for this agreement is July 1, 1977.

Education

Oregon conducts an annual short-course for code officials at Oregon State University. Seminars involving energy standards are presented during these sessions, more so in 1974 when energy regulations had just been passed than now. Education in standards is financed by a one percent surcharge on permit fees. A training course on Chapter 53 also is available.

References

1. Magazine Article on Oregon Statewide Code

2. Building Division Newsletter

3. HB 2036 (Chapter 153) Comprehensive Planning for Solar Energy Consideration

4. HB 2022 (Chapter 460) Tax Exemptions for Solar

5. SB 483 (Chapter 606) Creation and Organization of the Department of Energy

6. Energy Agency Annual Report

7. Department of Energy Laws - 1976

8. Product, Policy, Procedure Interpretation Manual

9. Energy Proposal Copy (contains regulations)

   SB 283 Establishes Energy Conservation Committee
   SB 73 Energy Regulations in State Building Code

State of Pennsylvania

Legislative and Regulatory

No legislative authority exists in Pennsylvania for either a statewide building code or statewide building energy conservation regulations. Statewide Fire and Panic Regulations are enforced by the Department of Labor and Industry. These Fire and Panic regulations apply to occupancies defined as follows: permanent or continuous occupancy for group habitation, assembly, business, educational, high hazard, industrial, institutional or storage purposes, and includes all buildings containing over 10,000 square feet of floor area. One-and two-family dwellings are not included.

HB 1344, known as the Building Energy Conservation Act, was introduced by Representative Musto et al on June 3, 1975. The bill was referred to the Committee on Mines and Energy Management and died at the end of the session in 1976. The bill provided for both performance and procedural (perscriptive) standards, and a manual, and that standards be applied by the Department of Labor and Industry in a manner similar to the Fire and Panic Regulations.

It was estimated that only twenty-twenty-five percent of the municipalities have reasonably adequate building codes, and perhaps only 10% have adequate enforcement.

State Program

The Governor's Energy Council (GEC) was created by Executive Order on February 11, 1974. The Council has the authority to control and coordinate the proper management of energy use and conservation throughout the Commonwealth. The Council consists of Secretarial level State officials, academic leaders, the Governor's Science Advisor, and the Lt. Governor who is the Chairman. The staff numbers 22 and the budget is about $500,000. Conservation is one of five major program areas. A Building Systems Task Force was established and a series of meetings held during the Winter of 1976-1977. Recommendations of the Task Force will be included in a Report of the Council, which is in preparation as of March 1977. The report most likely will include the recommendation of the adoption of a statewide building code for Pennsylvania as the vehicle for energy conservation regulations.

Education

The Municipal Training Division, Bureau of Local Government Services, Department of Community Affairs, conducted a two-phase Energy Conservation in Buildings Works] in the Fall of 1976. This program conducted in conjunction with the Pennsylvania State University, was offered as phase I in three locations, with phase II at University Park. Pennsylvania State University also includes building energy conservation in its Code Enforcement Certification Programs provided at a number of locations throughout the Commonwealth.

Other education activities include an Energy Council Newsletter, and the energy conservation consultation service which is available through the Pennsylvania Technical Assistance Program, known as PENNTAP.

Solar Energy

Several bills providing tax incentives for solar energy utilization were introduced in the Pennsylvania legislature in 1976. These died at the end of the session. SB 136, providing for a sales and use tax exemption for parts and installation costs of new or retrofit solar systems, has been introduced in the 1977 legislative session. Both residential and commercial applications qualify. The bill has been referred to the Committee on Environmental Resources.

In November 10 1975, the Department of Community Affairs and Commerce and the Governor's Energy Council conducted a workshop in Pennsylvania for innovators called The Henry Fords of Solar Energy.

Commentary

Although Pennsylvania has a great deal of interest and activity taking place in the building energy area, it is just now addressing the problem of mandatory conservation in new building construction. Provided that a strong proposal is forthcoming from the Governor's Energy Council and that it can be enacted into appropriate authority, building energy conservation activities can be advanced.

References

1. House Bill 1344, Building Energy Conservation Act

2. Folder - Code Enforcement Officers Training Program 1967-1977

3. Folder - Energy Conservation in Buildings Workshop

4. Pennsylvania Energy Management Program, State-owned Buildings and Facilities (DRAFT)

5. The Henry Fords of Solar Energy - Folder and Contents, including HB 421 and SB 979 which relate to exclusion of solar equipment for the sales tax

6. Folder of information on the Pennsylvania Technical Assistance Program (PENNTAP)

7. Energy Instruction Handout

8. Executive Order Relating to the Governor's Energy Council

9. Pennsylvania Energy Council Newsletter

10. Pennsylvania's Energy Conservation Policy Booklet (includes description of Building Programs and Lists Energy Council Membership)

State of Texas

Legislative and Regulatory

Texas has no overall building energy authority in existence, nor is there a Statewide building code.

Texas has a major piece of legislation related to energy conservation in buildings.

The "Energy Conservation in Buildings Act of 1975" (SB 516), authorizes the State Building Commission to write energy conservation standards and codes which would apply to state-financed buildings, and be available as model energy conservation codes for use by Texas cities.

Standards applying to State-owned buildings were to be adopted by the State Building Commission and governing bodies of State institutions by January 1, 1977, but adoption has been postponed until May 1, 1977.

The Act requires the State Building Commission (SBC) to publish an energy conservation manual for use by designers, builders, and contractors of residential, as well as apartment and non-residential, buildings. The manual contains guidelines for energy conservation. These guidelines closely follow portions of ASHRAE Standard 90-75 (mechanical and lighting sections), and include an energy efficiency index for the complete shell of new buildings. These guidelines are intended to be more architecturally-oriented than those contained in ASHRAE Standard 90-75.

The law requires the SBC to develop model energy conservation building codes for voluntary use by cities in enacting or amending their own ordinances. The State has established citizen advisory committees both for State standards and for model codes.

House Bill 546 (Chapter 719, Public Laws of 1975) permits an exemption from State and local sales taxes for solar energy devices; an exemption from the franchise tax for companies engaged exclusively in the business of manufacturing, selling, and installing solar energy devices; and, a deduction from taxable capital of the amortized cost of solar energy devices for any corporation doing business within the State.

The Governor's Office of Budget and Planning is responsible for the State Energy Conservation Plan under the Energy Policy and Conservation Act of 1975.

Scope of Regulations

The energy conservation standards to be adopted by the SBC on May 1, 1977, are mandatory for State buildings only. Regulations cover HVAC, hot water, electrical, exterior envelope insulation, and lighting. The standards are not retroactive.

The State Board of Control is studying the energy usage of State agencies in order to make retrofitting recommendations, and is cooperating with the Governor's Energy Advisory Council and the University of Texas to analyze energy usage in selected buildings within the Capitol Complex.

Administration and Implementation

Since regulations are not statewide in scope, the State has no role in implementation. Where regulations are adopted at the local level, they also are enforced at the local level. Counties have no legislative authority to adopt ordinances, thus the recommended regulations would be usable only in cities.

State Program

The State employs one and one-half professionals and one-half of one paraprofessional full-time to deal with building energy matters.

Product Acceptance and Certification System

There is no product acceptance and certification system in effect.

Education

The Energy Advisory Council currently participates in training local inspectors, providing information on energy conservation building techniques, and on proposed energy conservation codes. Additional statewide educational programs are planned for the next year.

Commentary

The Texas model energy code will be recommended for adoption by cities. This code is being developed by the State Building Commission, which is required to consult with the Energy Advisory Council and the Department of Community Affairs.

The Texas State building regulations for the building shell are unique, from other proposed or adopted standards. There is an ongoing debate relative to adoption of the Texas-developed provisions or a national standard. The Energy Efficiency Index (EEI), or energy allotment concept is quite innovative and appears to be a valid method.

References

1. Analysis of Texas Solar Tax Exemption

2. Energy Conservation in Buildings - State Report

3. HB 546 - Solar Sales Tax Exemption and Corporate Amortization of Solar Devices

4. Energy Conservation Manual Part 1, Residential Buildings
5. Energy Conservation Manual Part 2, Apartment and Non-residential Buildings
6. Energy Management for Commerce and Industry
7. Solar Energy Pamphlets

State of Virginia

Legislative and Regulatory

Current regulations are applied to only residential buildings and state the minimum total insulating factors in terms of resistance numbers. These resistance requirements are: R-19 for ceilings, R-11 for exterior walls, R-7 for floors over crawl spaces, and R-11 for floors over crawl spaces with electric heat and air conditioning. The regulations are part of the Virginia Uniform Statewide Building Code and cover one- and two-family dwellings only.

Changes to the State Code are originated in the Office of Housing, and are sent to the State Board of Review for technical review. They are then sent to the State Board of Housing, where they are given a public hearing and then, if passed, become a part of the Virginia Uniform Statewide Building Code. They do not need State legislative action or enactment bills to become part of the Code.

Article 21 of the BOCA Code and ASHRAE Standard 90-75 is presently in the process of a public hearing. The present Code provisions were approved in November 1975 and became effective in February 1976. They also are under review to update them in accordance with the new HUD Minimum Property Standards for housing.

The State Energy Conservation Plan is administered by the Virginia Energy Office (Mr. Louis Lawson, 804-770-8451). The Office of Housing is involved with the plan as it pertains to building.

The Virginia State Code is a statewide building code and is applicable in all cities of the State. No cities have adopted regulations of their own nor are they considering doing so. There are no known problems with the current standard.

State buildings and school buildings do not come under the Office of Housing. Offices having these buildings under their jurisdiction are working on their own studies with the Office of Housing. Retrofitting of existing buildings will be up to the individual agencies. No conflicts have been noted between energy standards and other code provisions.

Scope of Regulations

Current regulations cover one- and two-family dwellings. Proposed regulations will cover all buildings except Federally-owned properties. The proposed regulations will permit a systems analysis approach (energy budget). The regulations will state minimum heat transmission coefficients for the various parts of the exterior envelope. The proposed regulations also will cover heating, ventilating, air-conditioning systems and units, hot water heating

systems, electrical distribution systems and lighting as prescribed by ASHRAE Standard 90-75 and Article 21 of the Building Officials and Code Administrators International, Inc. (BOCA) Code. No regulations are proposed or in effect covering solar energy or other non-depletable energy sources.

The proposed and current regulations do not propose different insulation standards for various fuels, except as noted for houses over crawl spaces with electric heating. No tax incentive program or other incentive programs are offered by the State for energy conservation.

Appeal from local enforcement is provided by a Local Appeals Board and a State Appeals Board. If the conflict is not solved at either of these two levels, it is possible to go directly to the State Supreme Court from the State Appeals Board.

Regulations will not cover the retrofitting of existing buildings, except where repair work exceeds the code regulations and then the new insulation standards will come into effect.

Administration and Implementation

The State Building Code and all of its provisions are enforced at the local level through plan checking and evaluation for compliance with standards. The local building inspector is responsible for on-site inspection. The State holds a training program once a month to handle the questions and problems of plan review and field inspection. A local official can get help from the State office by application or by telephone call. Communications are kept open with local officials by monthly meetings and through periodic local contact by personal visits. No manuals, checklists, or other forms or aids have been developed for use by the enforcement officials.

State Program

The State provides no direct enforcement at the State level. There are approximately 300 agencies on the local level. When State enforcement is required, it is carried out through the Commonwealth Attorney's Office.

At present, there is no budget line item for building energy conservation. The various cities have not had to add personnel to administer state-adopted energy conservation regulations and no administrative problems have been encountered.

Part of a program that is not yet effective will be to collect information on energy consumption.

Product Acceptance and Certification System

There is no certification system in effect or planned for building products and equipment related to energy conservation. New products will be certified

by recognizing the results of tests performed in existing labs (third party), such as Underwriters' Laboratories (UL) the American Gas Association (AGA), etc. There are no communications set up with neighboring States nor are there reciprocity agreements. Reciprocity will be handled by third-party certification.

In the case of larger major buildings, a design professional will certify that the buildings comply with the energy regulations.

Education

Educational programs are provided to local enforcement people through monthly meetings. Local building code officials, builders, and others, are invited to attend the meetings which are held statewide. Suggested improvements to the current method of education are to formulate a textbook and teaching procedures, and to desseminate this information for code enforcement through community colleges. No other training is provided for particular groups, such as builders, except through the monthly meeting with local building officials, and an annual ten-day meeting held at Virginia Polytechnic Institute which addresses the general subject of building code enforcement.

There are currently no texts, charts, or other materials available.

Status of Solar Energy Standards/Regulations

It is not known at this time whether the State has the authority to regulate solar energy systems. There is no legislative or administrative authority pending, nor has the State adopted any solar energy regulations or standards. There was no opinion as to what type of standards or regulations are needed, as the State has not had much experience in this area. When questions concerning solar energy or solar energy usage have been asked, the State authorities have depended primarily on colleges and universities for evaluation and comment. There is a feeling that some type of testing laboratory accreditation and certification for solar equipment will be necessary, but private laboratories or model code groups, such as Underwriters' Laboratories (UL), and the Building Officials and Code Administrators International, Inc., (BOCA) respectively, will be used for this function.

References

1. 1975 Cumulative Supplement to Virginia Uniform Statewide Building Code, adopted November 17, 1975, effective February 7, 1976.

State of Washington

Legislative and Regulatory

The only Regulations for energy conservation in privately-owned buildings were adopted in the State Electrical Code. Section WAC 296-46-320 requires a heat loss analysis where electric heating is provided. These regulations apply to both residential and non-residential occupancies.

The State adopted the Uniform Building Code (UBC) as its statewide building code. It plans to utilize the energy conservation standards adopted in that code.

Public Buildings: SB 2106, Chapter 177 of the Laws 1975, requires life-cycle cost analysis for publicly-owned or -leased facilities relative to energy conservation systems. Energy conservation standards for State-owned, -leased or -funded facilities were promulgated administratively. These standards establish an architectural approach to energy conservation, requiring consideration of siting, building geometry, landscaping, prevailing winds, and energy sources, as well as envelope, electrical system, and mechanical system design. Design criteria as contained in ASHRAE Standard 90-75 are approved but not required.

Scope of Regulations

Only publicly-owned, -leased or -funded buildings and private electrically-heated structures are covered by statewide building energy regulations. Cities may adopt more restrictive standards. Seattle and Vancouver have adopted the HUD Minimum Property Standards.

Administration and Implementation

Plans and specifications for State-owned, -leased or -funded buildings are reviewed in the Department of General Administration.

For private buildings, a heat loss analysis must be submitted and the required insulation shown on the plans. Except for certain major cities, electrical inspection is conducted by State inspectors. The remainder of the building is inspected by the local enforcement agency.

State Program

Approximately twenty-five percent of the time of one licensed professional and one hundred percent of the time of one paraprofessional is spent on energy conservation, primarily in giving advice to homeowners concerning retrofitting.

The State has attempted to effectuate energy conservation in the private sector through assistance, advice, and education. For both public and private sectors,

a cost/benefit approach has been used to determine desirable levels of energy conservation.

Product Acceptance and Certification System

The State would utilize the existing model code product approval system.

Education

Because standards are recommended rather than required for the private sector, education is needed to stimulate public interest in conservation. This occurs through a variety of channels such as a road show for the public at county fairs and home shows; and, a retrofit manual for buildings explaining cost analysis of energy conserving home improvements in laymen's terms. There is no educational program for building officials relative to energy conservation. A manual for homeowners' use in determining retrofit savings and procedures is under development.

Commentary

Washington is unique in that electrical energy costs are from 1-1/2 to 2 cents per KWH. This is due to the fact that 80% of its power is hydro power and usually from Federal projects. Washington is unique in that electrical inspection is handled by State personnel with nominal communication between State and local government apparent.

References

1. Department of General Administration memorandum re Life Cycle Cost Analysis

2. Department of General Administration memorandum re Energy Conservation Design Standards

3. Homeowners Guide for Computing Energy Conservation Savings

4. Electrical Code (contains insulation regulations)

State of Wisconsin

Legislative and Regulatory

The Wisconsin Administrative Code, Section 51.02(16) and 51.02(17) providing standards for thermal performance and infiltration respectively, were adopted on an emergency basis in January 1975. A significant number of protests were received from manufacturers and contractors, particularly those involved in masonry construction. As a result, the regulations were suspended in April 1975. After extensive public hearings, new regulations were adopted on August 1, 1976. These regulations include the January 1975 provisions and also include the opportunity to use alternative regulations. The new regulations also committed Wisconsin to development of a total connected energy budget concept which is now in the process of being developed.

Chapter 404 of the Laws of 1975 establishes a Dwelling Code Council with power to recommend a one- and two-family dwelling code including energy conservation provisions. Code adoption is provided for through the Department of Industry, Labor and Human Relations with local enforcement if the locality so elects. Chapter 405 of the Laws of 1975 extends the authority of the Dwelling Code Council to cover manufactured buildings.

Scope of Regulations

Regulations 51.02(16) are for building envelope insulation only. Regulations apply equally to all buildings, except one and two-family dwellings for which regulations are under consideration. There is no variation in standards for various fuel. No tax incentives for non-depletable energy use or development have been adopted. The Attorney General has ruled that any property tax exemption granted is unconstitutional as the State constitution requires equal assessment of all real property.

Administration and Implementation

Other than in Milwaukee, regulations are administered and enforced by the State for all buildings except one- and two-family occupancies. There are only sixteen inspectors to cover all aspects of code enforcement for the State and attention given to energy standards reduces time available for other required tasks. Much more staff time is required for plan review. Administrative costs have been increased by enforcement of energy regulations. Fees have not been increased yet, but it is anticipated some additional fees will be required. It is anticipated that both office and field staff will be trained to handle energy standards, and additional personnel with expertise in electrical and mechanical engineering may be needed as well. Energy regulations are now taking between five and ten percent of total staff time and effort; but funds have not increased to cover this, and resources have simply been shifted to meet the needs.

State Program

No new staff has been hired to deal with the Thermal Performance Standard. Work on such programs take place at the expense of some other project.

Funding suffers from analogous problems with additional expenditures for energy programs required, but with no additional funding available to support such programs. Staff has been added to do energy research on the total connected energy budget concept, which is being developed.

Product Acceptance and Certification System

To date, no independent standards or certification procedures for products exists.

Education

Enforcement training for energy standards is given to State inspectors. In addition, the University of Wisconsin offers extension courses that deal extensively with energy conservation. These courses are provided specifically for code officials.

State Report Contents

1. Chapter 404 - 1975 - One and Two-family Code Act
2. Chapter 405 - 1975 - Manufactured Building Act
3. Recommended Code Report
4. Standards Adoption Report
5. State Building Code

Model Code Organizations

The Building Officials and Codes Administrators International (BOCA), Southern Building Code Congress International (SBCC) and International Conference of Building Officials (ICBO), acting singly and together, have been active in adopting energy conservation regulations. Acting jointly, through the Council of American Building Officials (CABO) and the Board for the Coordination of the Model Codes (BCMC), these groups have prepared a short form version of ASHRAE Standard 90-75, generally called the "CABO Version."

This CABO adaptation specifically attempts to ease the implementation of energy conservation standards for "conventional" residential buildings of three stories or less. The "CABO Version" refers to ASHRAE Standard 90-75 for buildings other than residential.

The BOCA adopted the "CABO Version" at its June 1976 meeting; and the ICBO adopted this version at its October 1976 annual business meeting. The SBCC adopted this version at its November 1976 annual meeting. Both ICBO and SBCC have included energy regulations as an Appendix to their codes. Individually, the ICBO and SBCC have had other proposed energy standards.

SBCC reported that there was a strong feeling on the part of some of its members to adopt ASHRAE Standard 90-75 as part of their code. ICBO members were faced with a choice of two code change proposals. The first proposal was an "insulation only" requirement; the second choice was the CABO Version.

The initial ICBO code change hearing for insulation requirements was in 1974. The hearing was held for further study in 1974 and 1975. An ad-hoc committee was appointed to respond to the questions and concerns expressed by its members and by industry. A revised proposed code change was recommended for adoption at the 1976 annual meeting of ICBO. The CABO Version was recommended for further study by the code change committee. The ICBO Board of Directors was concerned over the need for uniformity among the model codes, and urged its membership at the annual meeting to adopt the CABO Version. After much discussion by members and industry, the CABO Version was adopted as an Appendix to the Uniform Building Code (UBC).

At the June 1976 BOCA meeting, an energy conservation proposal prepared by its Energy Conservation Committee, was presented to the BOCA membership. Much floor discussion occurred and amendments were proposed to bring the Committees' proposal into line with the CABO Version. Essentially, the BOCA membership adopted the CABO Version with the exception of the lighting requirements.

References

1. CABO Recommendation

2. UBC Insulation Standards - Chapter 53 Proposal

APPENDIX B

LIST OF RESPONSIBLE OFFICIALS AND AGENCIES

LIST OF RESPONSIBLE OFFICIALS

AND AGENCIES INTERVIEWED

CALIFORNIA

Wendell Bakken (916) 322-3964
Craig W. Hoellwarth
Donald Watson, P.E.
Energy Resources Conservation and
Development Commission
1111 Howe Avenue
Sacramento, California 95825

James M. Hicks, Jr. (916) 445-9471
Chief, State of California
Department of Housing
Community Development
Division of Codes and Standards
1807 13th Street
Sacramento, California 95814

COLORADO

Howard Gelt (303) 892-2507
Assistant to Governor
Energy Policy Council
1845 Sherman Street
Denver, Colorado 80202

Harold A. Knott (303) 892-2033
Director, Division of Housing
1313 Sherman Street
Denver, Colorado 80203

CONNECTICUT

Bernard E. Cabelus (203) 566-4036
State Building Inspector
Public Works Department
525 State Office Building
Hartford, Connecticut 06115

FLORIDA

Tom Cummins* (904) 488-3581
Bureau of Codes and Standards
Department of Community Affairs
2571 Executive Center Circle, East
Tallahassee, Florida 32301
*Contact: John H. Haslam

GEORGIA

George Bullock, Chairman (404) 543-3852
Jack Jacobs
State Building Administrative Board
Post Office Box 431
Athens, Georgia 30601

ILLINOIS

Jane Heron (designated by Edward Jackson) (312) 793-3113
Program Development Coordinator
Dept. of Local Government Affairs
160 N. LaSalle
Chicago, Illinois

MASSACHUSETTS

Pauline Stanton (designated by Dinezio) (617) 727-6916
State Building Code Specialist
State Building Code Commission
Room 135, John W. McCormick Building
1 Ashburton Place
Boston, Massachusetts 02108

MICHIGAN

Robert C. Hilprecht (517) 373-8187
Executive Director
Construction Code Commission
Michigan Department of Labor
7150 Harris Drive
Lansing, Michigan 48926

MINNESOTA

Norman R. Osterby (612) 296-7037
Assistant Commissioner
Department of Administration
50 Sherburne Avenue
St. Paul, Minnesota 55155

Robert F. Rogers (612) 296-4627
Assistant Director
Building Code Division
Department of Administration
Metro Square Building
7th & Robert Streets
St. Paul, Minnesota 55101

NEVADA

William E. Hancock, AIA (702) 885-4870
State of Nevada
Public Works Board
Carson City, Nevada 89710

NEW JERSEY

William Connolly (609) 292-6415
Administrator
Charles M. Decker (609) 292-6364
Assistant Chief
Bureau of Housing Inspection
Department of Community Affairs
363 West State Street
Trenton, New Jersey 08625

NEW MEXICO

Roger Easley (505) 827-2146
Director, Energy Conservation
Energy Resources Board
Post Office Box 2770
Santa Fe, New Mexico 87503

NEW YORK

Milton Duke (212) 488-7136
Assistant Commissioner
Division of Housing and Community Renewal
Two World Trade Center
New York, New York 10047

NORTH CAROLINA

Lee Hauser, P.E. (919) 829-7343
Chief Mechanical Engineer
Department of Insurance
State of North Carolina
Post Office Box 26387
Raleigh, North Carolina 27611

OHIO

Hershel D. Davidson, Executive Secretary (614) 466-3316
Board of Building Standards
Department of Industrial Relations
State of Ohio
2323 West Fifth Avenue
Columbus, Ohio 43216

OREGON

Walter M. Friday, P.E. (503) 378-8086
Chief, Structural Codes Engineer
William S. Strange
Structural/Mechanical Section
Building Codes Division
Department of Commerce
Labor & Industries Building
Salem, Oregon 97310

Michael D. Polansky (503) 378-8607
Rick Morgan
Department of Energy
State of Oregon
528 Cottage Street, N.E.
Salem, Oregon 97310

PENNSYLVANIA

Joseph Ferrer (717) 783-3963
Code Consultant
John M. Fox
Code Consultant
Bureau of Local Government
Department of Community Affairs
Post Office Box 155
Harrisburg, Pennsylvania 17120

William B. Harral (717) 783-9749
Executive Director
Raymond H. Holst
Assistant Executive Director
Randy Pickett
Assistant Conservation Coordinator
Gerald J. Ridzon (717) 783-8214
Solar Coordinator
Greg Shawley
Building Systems Task Force
Governor's Energy Council
State Capitol
Harrisburg, Pennsylvania 17120

TEXAS

Mike Hart (512) 475-7017
Tom Wright
Governor's Energy Advisory Council
State of Texas
7703 North Lamar
Austin, Texas 78752

Bill Bowen (512) 475-2941
Norm Kenney
Texas State Building Commission
Post Office Box 12427
Austin, Texas 78711

Vernon Beringer (512) 475-3383
James Williams
Division of Housing
Department of Community Affairs
State of Texas
Post Office Box 13166, Capitol Station
210 Barton Springs Road
Austin, Texas 78711

VIRGINIA

Joseph E. Bartell* (804) 786-7891
State Building Code Director
6 North Sixth Street
Richmond, Virginia 23219
*Replaced by Mr. Proctor (2/77)

WASHINGTON

Raymond G. Anderson (206) 753-4408
Deputy Director
State Energy Office
State of Washington
1000 S. Cherry Street
Olympia, Washington 98504

William E. Dell (206) 753-3074
Assistant Director
Department of Labor and Industries
Division of Building and
Construction Safety Inspection
Post Office Box 207
319 E. 4th Street
Olympia, Washington 98504

WISCONSIN

Rod Shaunessy (608) 266-8234
Assistant Director for Energy
Wisconsin Office of Emergency Assistance
State of Wisconsin
Madison, Wisconsin 53701

John Wenning, Jr. (608) 266-3531 or
Administrator (608) 266-1816
Division of Safety and Buildings
Department of Industry
State of Wisconsin
201 E. Washington Avenue
Box 2209
Madison, Wisconsin

MODEL CODE GROUPS

(BOCA)
Mr. Kenneth Schoonover
Building Officials & Code
Administrators International
1313 E. 60th Street
Chicago, Illinois 60637

(312) 947-2585 or
678-6666

(ICBO)
Mr. T. H. Carter
Executive Director
International Conference of
Building Officials
5360 Workman Mill Road
Whittier, California 90601

(213) 699-0541

(SBCC)
Mr. Bill R. Manning, P.E.
Director of Education
Southern Building Code
Congress International
3617 Eighth Avenue, South
Birmingham, Alabama 35222

(205) 252-8930 (office)
(205) 823-0008 (home)

APPENDIX C

INTERVIEW GUIDE

INTERVIEW GUIDE

STATE OF THE ART STUDY OF STATEWIDE IMPLEMENTATION OF ENERGY CONSERVATION BUILDINGS STANDARDS

STATE: _____

AGENCY: _____

PERSON INTERVIEWED: _____

TITLE: _____

ADDRESS: _____

_____

TELEPHONE: _____

DATE: _____

INTERVIEWER: _____

A. LEGISLATIVE AND REGULATORY

(Obtain good reproducible copies of all legislation and regulations.)

1. What legislation is in effect or pending, adopting standards for energy conservation in building construction?

   Legal Citation (of Act)_____; Bill Number, if pending_____

2. Have you promulgated energy conservation standards administratively? Explain.

3. How are new regulations developed and approved? How are changes in regulations made?

4. Upon what standard is your legislation or regulation based?

5. Are these energy regulations part of a statewide building code? If not, explain.

ASHRAE 90-75

Complete_____ Partial_____ Modified_____ Based on_____

HUD Minimum Property Standards (1974 Revision)

Complete_____ Partial_____ Modified_____

Other Source (Identify)_____

6. What date were regulations approved? _____ (If different for various occupancies, define.)

7. What date did the regulation go into effect? _____

8. Is this a mandatory statewide standard?

Mandatory Maximum_____ Mandatory Minimum_____ Voluntary_____

9. Are you currently proposing or considering any changes to the adopted standard?
If yes, Explain.

10. Are you familiar with CABO's Board for the Coordinating of the Model Codes (BCMC) and its effort in energy conservation regulations?

11. Are you waiting for BCMC "code compatible" version of ASHRAE 90-75?

12. Are you waiting for Model Code group code changes?

13. Do you expect to develop your own standards/regulations?

14. Who in your State is responsible for "State Energy Conservation Plan" under the Energy Policy and Conservation Act of 1975 (PL 94-163)? (This is an FEA activity and included lighting, thermal and insulation standards for new and renovated buildings.)
Name, agency and phone if known _____

_____

Is your agency involved with the above plan?

15. What cities that you know of have adopted regulations of their own? Or are considering?
    1) More stringent than State.
    2) In occupancies not covered by State.

16. What problems do you have with the current standard?

17. Is there more than one agency involved in building energy regulations? If yes, explain.

18. Have you noted any conflicts between energy standards and other code provisions?
    Briefly describe, if any.

B. SCOPE OF REGULATIONS

1. Do regulations cover:

All buildings? If not, how are exempted buildings covered?

Are all buildings treated the same?
If not, explain.

Publicly owned buildings?

2. Do regulations permit a system analysis approach (energy budget)?
Explain.

3. Do regulations cover:

Are minimum heat transmission coefficients or rates specified for various parts of the exterior envelope?

heating, ventilating and air conditioning systems?

heating, ventilating and air conditioning units?

service hot water heating?

electrical distribution systems?

lighting?

solar energy? (See last page for interview questions specific to solar energy standards/regulations.)

other non-depletable energy sources?

3a. Do regulations impose different insulation standards for various fuels?

4. Does your State have any tax incentive program or other incentive program for energy conservation? What type?

If so identify bill number, chapter number or legal citation. (Obtain copy.)
Appropriate contact?

5. Are any tax incentive proposals under consideration? Identify.

   Do they refer to standards? Whose?

6. Are there provisions for appeal from local enforcement? How is relief granted or deemed proper?

7. Any regulations covering retrofitting existing buildings?

   a) Addition_____

   b) Remodels_____

   c) Complete building_____

C. ADMINISTRATION AND IMPLEMENTATION

(Obtain copy of any and all procedural forms in use, also any forms proven to be unsatisfactory: include other guides, workbooks, etc.)

(Obtain copies of any internal instructions, newsletter, etc. to officials regarding regulation.)

1. What rules and regulations have been formulated for utilization of the adopted standard?

2. How are statewide energy regulations enforced?

   a) State level?_____ c) One or more?_____

   b) Local level?_____ Explain.

3. Are plans and specifications examined and evaluated for compliance with standard?

4. Who is responsible for on-site inspection?

   1. Local inspector_____ 3. Installer Certification_____

   2. State inspector_____ 4. Other_____

5. How are questions and problems of plan review and field inspection handled by your office?

   Is there a structured feedback system?

6. How can a local official get help from the State office?

7. How do you communicate with local enforcement agencies?

8. Have energy requirements added to administrative costs?_____

   To the building department?_____

   To the builder/developer?_____

   Indicate % increase in fees (if any) to cover energy requirements_____

9. May local agencies increase fees to cover energy conservation plan review and inspection services?_____

10. Have energy requirements required any new technical skills not easily provided?

    In the building department: 1) plan checking
    2) field inspection

    For the builder/developer

D. STATE PROGRAM

1. How many persons involved in energy standard enforcement? (Full time equivalent.)

   licensed professionals?_____

   para-professionals?_____

   clerical?_____

   other?_____

   consultants used?_____

2. What is your budget for building energy conservation? Estimate. Percent of total.

3. Have cities had to add personnel to administer state adopted energy conservation regulations?

4. What administrative problems have you encountered to date and how are they being resolved?

5. Are you currently collecting any information on energy consumption? If yes, explain.

E. PRODUCT ACCEPTANCE AND CERTIFICATION SYSTEM

1. What certification system for building products and equipment related to energy conservation do you have in effect? (or planned?)

2. How are new products certified?

3. How are acceptance standards developed?

4. How do you communicate with neighboring states?

5. What reciprocity agreements do you have with other states?

6. How is reciprocity handled - State agency_____

   - third party_____

   - Model Code Approval_____

F. EDUCATION

(Obtain copies of workbooks, etc.)

1. Have you conducted any educational programs for energy conservation?
   Do you have any pending?
   What technical levels of audience have you addressed?

2. By what means do you deploy these education programs statewide?

3. What changes would you suggest to improve completed courses?

4. Describe training program (availability of courses, length, number of locations given, planned.)

5. Is any training provided for builders, others? (specify.)

6. Have any training manuals, charts, aids or other materials been prepared?

7. Has a manual of acceptable practice been developed?

8. Where and at what cost is it available? (Obtain copy.)

INTERVIEW GUIDE

STATUS OF SOLAR ENERGY STANDARDS/REGULATIONS

STATE: _____

AGENCY: _____

PERSON INTERVIEWED: _____

TITLE: _____

ADDRESS: _____

_____

TELEPHONE: _____

DATE: _____

INTERVIEWER: _____

1. Does your State have authority to regulate solar energy systems (heating, cooling, hot water, photovoltaic, wind, etc.)?

2. If so indicate legal authority. Agency?

3. Is any authority pending; legislative or administrative?
   Bill No.
   Status

4. Have you adopted any solar energy regulations or standards?
   Approval date:
   Effective date:

5. If under consideration what is status?
   Agency responsible? Individual? Phone?

6. What type of standards or regulations do you feel are needed?

7. Does your State have any tax incentive program or other incentive program for solar energy systems? What type?

If so identify bill number, chapter number or legal citation.
Appropriate contact?

8. Are any incentive proposals under consideration?
   Identify.
   Do they refer to standards? Whose?

9. Are any solar inspection aids or manuals being considered or used?

10. Is any training related to solar systems being conducted or considered?

11. What outside sources are being relied on for evaluation of solar systems by the building official if any?
    - Colleges, universities
    - Model Code Groups
    - Federal laboratories
    - Private laboratories
    - State Energy Office or other State agency

12. What are responsibilities of local plan reviewers and inspectors in regard to solar system installations?

13. Will some type of testing laboratory accreditation and certification of solar equipment be necessary?

14. What type would you prefer?
    - Federal
    - State
    - Private laboratories
    - Model Code Group

APPENDIX D

SAMPLES OF REGULATORY DOCUMENTS

RELATED TO ENERGY CONSERVATION

APPENDIX D - SAMPLES OF REGULATORY DOCUMENTS RELATED TO ENERGY CONSERVATION

This appendix contains samples of available regulatory documents in use or proposed for use by various States that were surveyed in conjunction with this study. They are provided herein for information and reference only.

Index to Documents Exhibited

EXHIBIT No.	STATE	DESCRIPTION
1	California	Insulation Certification - As required by the State regulations, both the builder and the insulation applicator must sign a card certifying that the proper "R" values for all insulation locations have been installed. An example of a certification card, which is furnished by the builder or insulation applicator is shown in Exhibit No. 1. Source: Energy Design Manual for Residential Buildings, State of California, Department of Housing and Community Development, Division of Codes and Standards.
2	New York	Type of form required by builders to certify to the electric utility that insulation standards have been complied with before attachment for electric service. Source: State of New York Public Service Commission Opinion No. 76-16, "Opinion and Order Requiring Insulation Standards for New and Expanded Electric Service."
3	North Carolina	"Thermal Envelope Criteria" Source: PROPOSED DRAFT, Chapter I of Energy Conservation Building Code, "Prescriptive Standards."
4	Ohio	Energy Analysis Report Source: Proposed Appendix to Chapter BB-48, Ohio Building Code, "Energy Conservation."
5	Washington	Project Energy Evaluation Sheet Source: State of Washington Energy Conservation Standards for State Facilities.

BN FORM 116
BIA FORM 1486

INSULATION CERTIFICATION

This is to certify that, in conformance with the current energy regulations (California Administrative Code, Title 25, State of California*) and approved plans, insulation has been installed in the building located at:

City _____ County _____

Street No. (If Available) _____ Street _____ Lot Number _____ Tract No. _____

DESCRIPTION OF INSTALLATION

ROOFS
Type of Material _____ Manufacturer _____ Thickness _____ R Value** _____

EXTERIOR WALLS
Type of Material _____ Manufacturer (Or Trade Name) _____ Thickness _____ R Value** _____

CEILINGS
BATTS:
Type of Material _____ Manufacturer (Or Trade Name) _____ Thickness _____ R Value** _____
Sq. Ft. Covered _____

BLOWN:
Type of Material _____ Manufacturer (Or Trade Name) _____ Thickness _____ No. Bags _____
Wt./Bag _____ Sq. Ft. Covered _____ R Value** _____

FLOORS
Type of Material _____ Manufacturer (Or Trade Name) _____ Thickness _____ R Value** _____

SLAB ON GRADE
Type of Material _____ Manufacturer (Or Trade Name) _____ Thickness _____ R Value** _____
Width of Insulation _____ Inches

FOUNDATION WALLS (if required)
Type of Material _____ Manufacturer (Or Trade Name) _____ Thickness _____ R Value** _____

REMARKS (if desired) _____

General Contractor (Builder) _____ License Number _____

By _____ Title _____ Date _____

Sub-Contractor (Insulation Applicator) _____ License Number _____
(Insulation, Masonry, Etc.) (State "SAME" if same as General Contractor)

By _____ Title _____ Date _____

(*California Administrative Code, Energy Insulation Standards, declares: "Compliance. Upon completion of the installation of insulation, a card certifying that the insulation has been installed in conformance with the requirements of these regulations shall be completed and executed by the insulation applicator and by the builder. This insulation compliance card shall be posted at a conspicuous location within the dwelling.")

(**R Value is the measure of the resistance of a material or building component to the passage of heat. The resistance value (R) of mass-type insulations shall not include any value for reflective facing.)

EXCERPT from Sec. 19875 of the Health and Safety Code of the State of California:

"No certificate of occupancy or similar certification that a newly constructed hotel, motel, apartment house, home or other residential dwelling is habitable shall be issued by such a building department unless the structure at least satisfies the minimum energy insulation standards established pursuant to this chapter."

Utility Name

Certificate of Compliance

For Electric Service to New Residential Construction

or

For Expansion of Existing Electric Service for the purpose of providing electric heat.

I certify that the:

/ / 1 or 2 Family Residences

/ / Multi-Family Residences

/ / Existing Dwelling

/ / Mobile Home

At _____
Location

is in compliance with the "Minimum Insulation Standards for the Residential Construction of Buildings".

It is understood that electric service will not be connected or will be disconnected upon inspection by an appropriate (utility name) representative if the structure is not found to be in complete compliance with the conditions setforth.

Dated _____ _____
Builder's or Contractor's signature

Dated _____ _____
Owner's signature

Address _____

_____

Received by (utility name) representative _____

PROPOSED DRAFT

CHAPTER I
OF
ENERGY CONSERVATION BUILDING CODE
"PRESCRIPTIVE STANDARDS"

SECTION 100 GENERAL

100.1 Scope: The intent of this section is to provide minimum requirements for building envelope construction for energy conservation. Any building or portions of a building classified according to its use or occupancy as Group B (Business), Group C (Schools), Group D (Institutional), Group E (Assembly), and Group G (Industrial) provided with heating and/or cooling shall comply with this section when not designed in accordance with the alternative "Performance Standards" chapter of this section. Group F (Storage) shall comply with this section when provided with other than spot heating and/or cooling.

100.2 Compliance: The "Thermal Envelope Criteria" form shall be included with the drawings and specifications to indicate compliance with the requirements of this section.

THERMAL ENVELOPE CRITERIA
STATE OF NORTH CAROLINA

PROJECT TITLE _____

LOCATION _____

_____

OWNER _____

_____

_____

DESIGNER _____

_____

_____

OCCUPANCY GROUP _____

PROJECT DATA:

Thermal zone number _____

Total exterior above-grade gross wall area, SF _____ (A_O)

Total glass area, SF _____ (A_G)

(1) Wall U-Factor _____ (U_W)

Glass type _____ U-Value _____ (U_G)

Overall wall U-Value

Net wall area _____ (A_W) = _____ (A_O) - _____ (A_G)

$$U_O = \frac{(A_G \times U_G) + (A_W \times U_W)}{A_O} = \frac{(\quad \times \quad) + (\quad \times \quad)}{\quad}$$

= _____

Roof area _____

Roof U-Factor _____ (U_R)

Floors over unheated spaces

Area _____ (A_F) _____ (U_F)

Slab on grade edge insulation "R" value _____.

Submitted by _____

Title _____

Date _____

1. Attach tabulation of thermal resistance of wall components showing derivation of wall U-Factor. (Uw)

APPENDIX E
ENERGY ANALYSIS REPORT

This Appendix of the Ohio Building Code is not a part of the code, but is provided for the benefit of users of OBC.

The Board of Building Standards has added a new chapter to the Ohio Building Code dealing with energy conservation. Chapter BB-48 is contained in amendments group XLIX and will become effective June 1, 1976. Because this is a relatively new area in building code regulation, the Board has determined that an interim data collection and analysis period should be established to allow ample opportunity to review the overall impact and effectiveness of Chapter BB-48. To this end, the Board has mandated in section BB-48-02.01 (amendments group L) that, effective March 1, 1975, an Energy Analysis Report must be submitted to the Chief Enforcement Official having jurisdiction prior to the issuance of final plan approval. The purpose of this Appendix is to provide users of OBC with a copy of the Energy Analysis Report form and a brief commentary.

Even though BB-48-02.01 is the only section in Chapter BB-48 which will become effective March 1, 1975, the remainder of the chapter has been published in amendments group XLIX for informational purposes. This will permit the users of OBC to utilize this chapter as a guide in completing the Energy Analysis Reports and will also allow ample opportunity to identify potential problems in the chapter prior to the time it becomes effective. The publication of this chapter should not be construed as imposing any requirements on buildings for which plan approval is obtained prior to June 1, 1976. The only provision which must be satisfied prior to that date is that the Energy Analysis Report must be submitted to the building department having jurisdiction prior to the issuance of final plan approval.

The Energy Analysis Report must be submitted in duplicate for all new buildings and for all additions to existing buildings included in the scope of Chapter BB-48 as specified in section BB-48-02. It is not necessary that a report be submitted when the occupancy of a building is changed or when alterations are made to an existing building. It is the intention of the Board that the Energy Analysis Report be completed by the person responsible for the design of the building's HVAC system.

The following is a copy of the form which must be used in submitting the required Energy Analysis Reports. Completion of the first three pages of the form is mandatory. The fourth page contains supplementary information only and may be completed at the option of the designer. While completion of the fourth page is optional, all designers are encouraged to supply this information since it will be invaluable to the Board in analysis of Chapter BB-48.

Following the Energy Analysis Report form is a brief commentary on the various items in the form. For clarification, the items in the form have been numbered and the commentary is cross referenced to the appropriate items. For further clarification, the designer should refer to Chapter BB-48. If the designer is uncertain as to how to complete any specific items in the form, he should exercise his best judgement. In these instances, a brief description of the item in question should be included in the comments section of page 4, Supplementary Information. The Energy Analysis Report form as contained in this Appendix to the Ohio Building Code may be reproduced as necessary.

ENERGY ANALYSIS REPORT
(Required by Section BB-48-02.01 Ohio Building Code)
(Effective 3-1-75)

Name of Project:_____

Location of Project:

County: _____

Street Address:_____

City:_____

Ohio Building Code Occupancy Chapter:_____

Purpose for which building will be used:_____

Owner:_____ Architect:_____

Street:_____ Street:_____

City:_____ City:_____

State:_____Zip:_____ State:_____Zip:_____

Registration #_____State_____

Mech. Engr._____ Elec. Engr:_____

Street:_____ Street:_____

City:_____ City:_____

State:_____Zip:_____ State:_____Zip:_____

Registration #_____State:_____ Registration #_____State_____

Name, company and title of the individual who completed this form:

Name:_____Title:_____

Company:_____

Signature_____Date:_____

EAR-1

ENERGY ANALYSIS REPORT
TOTAL CONNECTED ENERGY LOAD

Exhibit #4, Ohio

Gross Floor Area: _____ sq. ft. *** 1 KW = 3413 Btuh ***

Number of Stories: _____ Story Height(s): _____ ft.

1. Lighting Load _____ KW _____ Btuh

	COOLING LOAD		HEATING LOAD	
		Blowers		
2.	Supply Air _____ KW		17. _____ KW	
3.	Return Air _____ KW		18. _____ KW	
4.	Exhaust Air _____ KW		19. _____ KW	
5.	Others _____ KW		20. _____ KW	
6.	Total _____ KW _____ Btuh (Sum of lines 2 through 5)		21. _____ KW _____ Btuh (Sum of lines 17 through 20)	
		Terminal Unit Capacity		
7.	Air Coils _____ Btuh		22. _____ Btuh	
8.	Radiation _____ Btuh		23. _____ Btuh	
9.	Unit Heaters _____ Btuh		24. _____ Btuh	
10.	Radiant Panels _____ Btuh		25. _____ Btuh	
11.	Others _____ Btuh		26. _____ Btuh	
12.	Total _____ Btuh (Sum of lines 7 through 11)		27. _____ Btuh (Sum of lines 22 through 26)	
		Pumps (name plate rating) (Terminal Unit Recirculating Only)		
13.	Heating/Cooling _____ KW		28. _____ KW	
14.	Others _____ KW		29. _____ KW	
15.	Total _____ KW _____ Btuh (Sum of lines 13 and 14)		30. _____ KW _____ Btuh (Sum of lines 28 and 29)	
16.	Total Load _____ Btuh (Sum of lines 6+12+15)		31. _____ Btuh (Sum of lines 21+27+30)	

32. Total Connected Energy Load _____ Btuh
(Sum of line 1 and the greater of lines 16 or 31)

33. Total Connected Energy Load per sq. ft. = $\frac{\text{line 32}}{\text{Gross Floor Area}}$ = _____ Btuh/sq.

34. Adjusted Maximum Allowable Energy Load = _____ Btuh/sq/
(Refer to sections BB-48-06 and BB-48-06.01

ENERGY ANALYSIS REPORT
EFFICIENCY OF ENERGY CONVERSION SYSTEMS .

ENERGY INPUT TO COOLING EQUIPMENT
(Do not include standby equipment)

Cooling Equipment

35. Absorption Machines _____ lbs. Steam/hr. _____ Btuh

36. Electric Driven Machines _____ KW _____ Btuh

37. Condensers _____ KW _____ Btuh

Pumps (name plate rating)

38. Chilled Water _____ KW _____ Btuh

39. Condenser Water _____ KW _____ Btuh

40. Others _____ KW _____ Btuh

41. Total Cooling Input _____ Btuh
(Sum of lines 35 through 40)

42. Cooling EEC = $\frac{\text{line 16}}{\text{line 41}}$ x 100 = _____

43. Allowable Cooling EEC (TABLE BB-48-07) = _____

ENERGY INPUT TO HEATING EQUIPMENT
(Do not include standby equipment)

Boilers or Warm Air Heaters

44. Gas _____ Gas Rate cu. ft./hr. _____ Btuh

45. Oil _____ gph _____ Btuh

46. Electric _____ KW _____ Btuh

47. Converter _____ KW _____ Btuh

48. Burners _____ KW _____ Btuh

49. Others _____ KW _____ Btuh

Pumps (central circulating only)

50. Hot Water _____ KW _____ Btuh

51. Vacuum _____ KW _____ Btuh

52. Condensate _____ KW _____ Btuh

53. Boiler Feed _____ KW _____ Btuh

54. Total Heating Input _____ Btuh
(Sum of lines 44 through 53)

55. Heating EEC = $\frac{\text{line 31}}{\text{line 54}}$ x 100 = _____

56. Allowable Heating EEC (TABLE BB-48-07) = _____

ENERGY ANALYSIS REPORT
SUPPLEMENTARY INFORMATION

The information requested on this page may be supplied at the option of the designer and is not mandatory. Nevertheless, all designers are strongly encouraged to supply this information since it will be invaluable to the Board during this analysis period.

Occupant Capacity (refer to the commentary):_____

(1) Roof Area _____sq. ft. Average U value_____

(2) Floors
on grade_____sq. ft. Average U value_____

over crawl space_____sq. ft. Average U value_____

over unheated basements
or cellars _____sq. ft. Average U value_____

(3) Walls
(Gross Area) _____sq. ft. Average U value_____

(4) Glass Area _____sq. ft. Average U value_____

(5) Door Area _____sq. ft. Average U value_____

(6) Method of computing infiltration_____

_____

_____

(7) Brief description of HVAC system_____

_____

_____

(8) Comments_____

_____

_____

_____

_____

_____

COMMENTARY

Gross Floor Area

The gross floor area is the sum of the floor area of all stories and floor levels within the building. The gross floor area should include the floor area of mezzanines and similar intermediate floors. The floor area of basements and cellars should be included if the space is heated.

Line 1

The Lighting Load should include all permanently installed lighting within the building. Do not include exterior lighting or portable plug-in lights. Where patch boards are used, the normal load capacity shall be included in determining the lighting load.

Lines 2 through 5 and 17 through 20

Include the rated electrical input to all blowers required to move conditioned air through the building and to return it to the terminal unit or to exhaust it from the building. Refer to section BB-48-05, paragraph (D) for possible exclusions.

Lines 7 through 11 and 22 through 26

Include all terminal units used for conditioning the air in the interior of the building. Refer to section BB-48-01 for the definition of "terminal unit." Also refer to section BB-48-05 for further clarification and possible exclusions.

Lines 13 through 14 and 28 through 29

Include only those pumps which are used to control the output of the coil. Do not include pumps which circulate chilled or hot water from the energy converter to the terminal units.

Lines 16 and 31

The total cooling load on line 16 equals the sum of lines 6, 12, and 15.
The total heating load on line 31 equals the sum of lines 21, 27, and 30.

Line 32

The total connected energy load (Btuh) equals the lighting load (line 1) plus the total cooling load or the total heating load, whichever is greater (the greater of line 16 or line 32).

Line 33

The total connected energy load (Btuh per square foot) equals the total connected energy load (Btuh) divided by the gross floor area of the building in square feet.

Line 34

From TABLE BB-48-06, select the basic energy allotment and adjust this value in accordance with the formulae in section BB-48-06.01.

Lines 35 through 37

Include all of the energy input to compressors and condensers. The energy input to absorption machines shall be the pounds of steam per hour received from a central plant or self contained boiler.

Lines 38 through 40

Include all pumps required to circulate water to condenser units and terminal units. Do not include standby pumps.

Line 41

The total energy input for cooling equals the sum of lines 35 through 40.

Line 42

The cooling EEC equals the total connected energy load for cooling (line 16) divided by the total energy input for cooling (line 41).

Line 43

Select the allowable cooling EEC from TABLE BB-48-07. Where a value is not included in the TABLE for the particular equipment or level of system loading being utilized, enter NA on line 43.

Lines 44 through 49

Include all fuel input to boilers, warm air furnaces, converters and other heating equipment.

Lines 50 through 53

Include all pumps required to circulate the transfer medium from the energy converter to the terminal units.

Line 54

The total energy input for heating equals the sum of lines 44 through 53.

Line 55

The heating EEC equals the total connected energy load for heating (line 31) divided by the total energy input for heating (line 54).

Line 56

Select the allowable heating EEC from TABLE BB-48-07. Where a value is not included in the TABLE for the particular equipment or level of system loading being utilized, enter NA on line 56.

Occupant Capacity

When mechanical ventilation is provided and the outside air requirement under the Ohio Building Code is based upon occupant density, the occupant capacity should be that calculated for the purpose of determining the outside air requirement. For all other cases, the occupant capacity should be determined in accordance with section BB-23-09 OBC.

PROJECT ENERGY EVALUATION

Project #_____ Project Name_____

Agency_____ Location_____

A. General Information

1. Type of occupancy_____ 2. Average # of occupants_____

3. # hours occupied_____ 4. # of floors_____

5. Gross sq. feet_____ 6. Net usable sq. feet_____

B. Structure

Roof/Ceiling "U"_____ square feet_____

Wall "U"_____square feet N_____ S_____ E_____ W_____

Window "U"_____square feet N_____ S_____ E_____ W_____

Door "U"_____square feet N_____ S_____ E_____ W_____

Gross Wall "U"_____square feet N_____ S_____ E_____ W_____

Perimeter BTU/LF_____lineal feet_____Floor "U"_____Sq. Ft._____

Window infiltration BTU/foot of crack_____@25mph wind

Door infiltration BTU/foot of crack_____@25mph wind

C. Heating and Cooling

1. Heating degree days_____

2. Heating: Outside design temp._____^{o}F Inside design temp._____^{o}F

3. Cooling: Outside design_____^{o}F DB_____^{o}F WB Inside design_____^{o}F DB____%RH

4. Outdoor air:_____cfm per occupant

5. Air circulation:_____air changes per hour

6. Transmission heat loss (roof, wall, glass, floor)=_____Btuh

7. Transmission heat gain (roof, wall, glass, floor)=_____Btuh

8. Outside air loss_____Btuh

9. People gain_____Btuh sensible/person_____Btuh latent/person

Attachment #2

D. Water Heating

1. Entering water temp._____ 2. Leaving water temp._____

3. Designed at _____gal/day @ flow of gpm/lavatory

4. Recovery_____hour

E. Lighting and Electricity

1. Connected load_____KW 2. Demand occupied_____% 3. Demand unoccupied _____%

4. Lighting levels_____Equivalent sphere illumination office/classroom

_____Foot candles corridors

_____Foot candles other areas (specify)

F. Conclusions (Consultant to complete the following statements)

1. In our judgement, the design (includes) (does not include) all of the energy conservation features specified in the "Energy Conservation Standards for state facilities." (For negative statement provide the reasons for excluding conservation features.)

2. The design (includes) (does not include) energy conservation features over and above those specified in the "Energy Conservation Standards for state facilities." These features (can) (cannot) be economically justified (and) (but which) result in considerable reduction in fuel consumption. (Describe added features and provide cost and fuel savings data.)

Submitted by:

Architect	Mechanical Engineer	Electrical Engineer
_____	_____	_____
Signature	Signature	Signature
_____	_____	_____
Name	Name	Name
_____	_____	_____
Title	Title	Title
_____	_____	_____
Firm	Firm	Firm

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Patrick W. Cooke and Robert M. Eisenhard

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SUPPLEMENTARY NOTES

ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

Background information on the current regulatory status and degree of implementation of building energy conservation programs at the State level are described, including those programs dealing with solar energy. The objective of the study is to provide the Federal Energy Administration (FEA) with a data base of standards implementation experience. This data base can be drawn upon to promote utilization of building thermal efficiency standards on a uniform basis throughout the country. From information collected in a survey of twenty-one selected States, the survey report presents the current state-of-the-art on common problems experienced at the State level in the promulgation and implementation of building energy conservation regulations. Based on these findings, several types of assistance that could facilitate the orderly adoption and implementation of uniform standards are identified.

KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Buildings; energy conservation; enforcement; legislation; regulations; solar energy; standards; state-of-the-art study.

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