Building Code Implementation - Country Summary


Section I: Code Development

History

Starting year

The first model energy codes were developed in 1975, with the publication of the American Society for Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 90-75. However, there was prior effort to determine how buildings were being built so that the code could be set at a level corresponding to current practice, with the objective of eliminating poor practices.

Timeline/road map

In the United States, model energy codes are developed by two independent organizations. ASHRAE develops the commercial model energy code, which is entitled ASHRAE Standard 90.1 for Buildings except Low-Rise Residential Buildings, and the International Code Council (ICC) develops the residential model energy code, which is the International Energy Conservation Code (IECC).

ICC facilitates a public process and forum where individuals or organizations, including the U.S. Department of Energy (DOE), can propose code changes, and voting determines the content of the next code. This process is convened once every three years. The ICC does not follow a particular timeline or roadmap for improvements to the code. Many of the participating organizations have timelines or roadmaps of what they would like to see happen in the evolution of the codes, but there is no guarantee that these will be achieved.

In ASHRAE, the commercial code is developed by a standing committee of members, and anyone can apply to be a member. ASHRAE has a timeline/roadmap, “ASHRAE Vision 2020”, which lays out the ASHRAE goal to produce market-viable net-zero energy buildings by 2020 (available at www.ashrae.org/File%20Library/docLib/Public/20080226_ashraevision2020.pdf.) Even with this vision document, ASHRAE does not force the committees that develop codes to achieve particular levels of performance.

1 The IECC also contains a commercial chapter which is widely adopted but it is not an official model code.
Some States, including California, Washington, and Florida, develop their own codes outside of the ASHRAE and ICC processes. California began development of its Title 24 Energy Code in 1978 and has developed the code on its own since then. California’s public utility commission has a roadmap for achieving net-zero residential buildings by 2020 and commercial buildings by 2030 through Title 24. (www.cpuc.ca.gov/NR/rdonlyres/6C2310FE-AFE0-48E4-AF03-530A99D28FCE/0/ZNEActionPlanFINAL83110.pdf. Washington has also developed its own code since the 1970s. The state has a law requiring a 70% reduction in building energy use by 2031 which drives the code development process. Washington’s code is described at http://www.energycodes.gov/adoption/states/washington.

Existing codes

Structural coverage

<table>
<thead>
<tr>
<th></th>
<th>Scale (National, regional, local, etc.)</th>
<th>Building size threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential buildings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New buildings</td>
<td>State and local</td>
<td>None</td>
</tr>
<tr>
<td>Existing buildings</td>
<td>State and local</td>
<td>None</td>
</tr>
<tr>
<td>for retrofits</td>
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<td></td>
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<tr>
<td>Commercial buildings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New buildings</td>
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</table>

Residential and commercial model codes are developed at the national level by ICC and ASHRAE, respectively. Following their publication, states and local municipalities undergo separate processes to adopt the model codes with or without revisions, or undergo the process to develop their own, distinct codes. Typically local governments enforce the code both at the design and construction phases; in a few jurisdictions, private third parties also help with compliance. ASHRAE 90.1 and IECC allow for multiple compliance paths: prescriptive, trade-off or whole building performance.
Measures covered

- Envelope
- HVAC
- Service water heating
- Option for trade-off approach
- Option for performance-based approach.

- Lighting
- Electric power
- Maintenance

Correction/new codes

Motivation/policies for improving existing building energy codes

ASHRAE 90.1 and the IECC are revised based on a stakeholder driven process with the aims of improving the energy performance of buildings, improving pathways to compliance and enforceability, and to address errors or omissions in previous versions. States and local governments may adopt the latest version of the code based on factors such as the cost and energy savings or other policy goals.

Revision schedule

The national model codes are updated on a three-year cycle.

Involvement of stakeholders in the development of codes

Stakeholders are involved in the development of codes.

Key methods used to engage stakeholders in the code development process

There is rarely any problem with engaging a wide variety of stakeholders to participate in the code development process as they have a vested interest in the outcome. ICC and ASHRAE meetings on code development are open to the public. ICC and ASHRAE both have websites, newsletters and conferences where the development is discussed.
Section II: Code Implementation

Administration

Administrative/enforcement structures

Government agency

Administration and enforcement of energy codes is typically the responsibility of state or local governments. In the most common model, the state adopts a code through a legislative and/or regulatory process, and the local government enforces it at the building department level. However, in some cases the local governments have the authority to adopt and enforce its own codes independently from the state (also known as home rule), and in others the state is responsible for adopting and enforcing the code statewide (also known as Dillon’s rule).

Private sector/third party

In the United States, jurisdictions have the option of allowing private sector/third party enforcement. In addition, the 2015 IECC contains an Energy Ratings Index (ERI) compliance path which allows builders to demonstrate compliance by achieving a specified score on an approved ERI. This new path is not yet widely used. Its ultimate impact on the code and energy saving is unknown but is being closely monitored by many groups.

Self-certification to owner/government

Some states allow self-certification to the building owner or government. This typically occurs in areas of a state where there may not be code officials available to inspect and enforce the energy code. Rural portions of many U.S. states may fall into this category. Nationally this represents a very small fraction of buildings.

Mix of models

There is a very wide mix of models in the United States. Codes are adopted by both legislative and administrative processes and by the state as a whole or by local governments. Some states have strongly promoted energy codes while others have no codes or have shown little interest in them. For more information on the status of building codes in the United States refer to www.energycodes.gov/status-state-energy-code-adoption.

The roles of stakeholders (what do they do at each stage)

<table>
<thead>
<tr>
<th></th>
<th>Design</th>
<th>Construction</th>
<th>Pre-occupancy check</th>
</tr>
</thead>
<tbody>
<tr>
<td>The role of federal/central government</td>
<td>Provides tools, develops training and resources, but no role</td>
<td>No role</td>
<td>No role</td>
</tr>
<tr>
<td>The role of state/provincial and local government</td>
<td>Reviews plans</td>
<td>Provides inspections</td>
<td>Provides final certificate of occupancy</td>
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<td>------------------------------------------------</td>
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<tr>
<td>Involvement of third parties and their role</td>
<td>In some jurisdictions, may assist with plan review</td>
<td>May provide inspections as approved by the state or local government; under IECC, third parties in some cases may assist with assessing buildings</td>
<td>May participate in commissioning</td>
</tr>
</tbody>
</table>

*Requirements for commissioning before occupancy*

The latest versions of both IECC and ASHRAE 90.1 have provisions requiring commissioning.

*Requirements for energy audits after occupancy*

There are no requirements in the national model codes.

**Tools used for compliance checking**

*Software used for compliance checking*

The U.S. Department of Energy’s software tools, COMcheck (for commercial buildings) and REScheck (for low-rise residential buildings), are maintained by Pacific Northwest National Laboratory (PNNL) and available at [www.energycodes.gov](http://www.energycodes.gov). The tools are not mandatory for demonstrating compliance, and their applicability varies from state to state. These tools are available at [https://www.energycodes.gov/software-and-web-tools](https://www.energycodes.gov/software-and-web-tools).

*Other tools used to check compliance*

Home energy raters may use the REMrate or REMdesign software for low-rise residential buildings. For commercial buildings, users of whole-building performance-based approaches may also use any building energy simulation tool of their choice as long as that tool has been tested according to ASHRAE standard 140 and meets the requirements listed in the code.

Few states have developed their own software. EnergyGauge, originally designed to support Florida’s energy codes (see [http://www.energygauge.com/](http://www.energygauge.com/) for a description). California also developed software for its Title 24 Energy Codes. (See [http://bees.archenergy.com](http://bees.archenergy.com) for a description of the CBECC-Com software for non-residential energy code compliance in California.)
Capacity building and education

Education and capacity building programs that support code implementation

The U.S. Department of Energy offers technical assistance resources through its [www.energycodes.gov](http://www.energycodes.gov) website. ICC and ASHRAE offer training through their websites. Many states and third-party organizations also offer training. (See [http://www.energycodes.gov/adoption/states](http://www.energycodes.gov/adoption/states) for a listing of individual states with links to individual state energy offices through which training is provided). There are also many organizations at the federal, state and local levels that promote more energy efficient buildings.

Target groups for programs

These programs typically target stakeholders who design and build buildings and those who enforce codes such as builders, architects and code officials.

Best-practice example of capacity building

In-person training directed to all design and construction professionals (builders/architects/engineers/tradespeople) and the code officials can be very effective, but can be more expensive than online training. California’s Title 24 code and the support of that code are considered exemplary. (See [http://www.energy.ca.gov/title24/index.html](http://www.energy.ca.gov/title24/index.html) for Title 24 code’s homepage and other related information.)

Section III: Compliance & Enforcement

Penalties, incentives and other mechanisms for improving compliance

Penalties for non-compliance with energy provisions in codes

- Refusal of permission to construct. In the United States, a code official can reject the plans submitted if they do not meet the code. In practice, however, it is more likely that the code official identifies areas of noncompliance and corrected plans are eventually resubmitted.
- Refusal of permission to occupy. In the United States, the primary penalty for not meeting the energy code would be that a code official would not issue a certificate of occupancy until the issue is resolved. In practice, this is almost never done.
- Fines: Some jurisdictions do this. For example, some jurisdictions use an increasing fee schedule for plan re-submissions to encourage compliance the first time.

Incentives/rewards to go beyond minimum required performance level

Incentive programs are sometimes run by utilities and offer financial support in exchange for energy improvements to buildings.
Other mechanisms to encourage compliance

Programs like property assessed clean energy (PACE) are available to help pay for renovations. Lower interest rate loans for energy efficient construction are also available. Rating and labeling programs like “Energy Star Commercial Buildings” offer recognition for improved building performance relative to similar peer buildings.

Compliance assessment

Assessments of rate and effectiveness of compliance

In 2010, the Department of Energy funded compliance studies covering 10 states. A summary report is available at

Publicly available information on compliance assessment

There are numerous studies available on the Web for individual states. See for example, the results of 4 compliance studies conducted for the Northwest Energy Efficiency Alliance (NEEA) in Montana, Idaho, Washington and Oregon at http://neea.org/initiatives/codes-standards/codes/code-compliance.

Lessons learned from compliance studies

The results are used to provide directed training.

Data on permits issued per year

The U.S. Census Bureau collects permit data from individual jurisdictions and tabulates that data at http://www.census.gov/construction/bps/; this data is not designed to distinguish between code compliant and non-code compliant buildings.

Assessment methodologies, protocols and statistics


Use of building energy simulation to comply with codes

Increasing over time, but no count is available. The number also varies by state, with states such as California using energy simulation for most buildings and some states making little or no use of building simulation.

Airtightness testing required prior to compliance
Airtightness testing is required in the latest version of the residential national model code. Airtightness testing is not required in every state or locally adopted codes. For commercial buildings, it is only required in a few states.

**Section IV: Building Materials & Energy Performance Certificates**

**Building materials (e.g. windows, insulation, HVAC, lighting)**

*Building materials rating and labeling*

Building materials are rated in the United States. Random sampling of materials is used with testing conducted by certified laboratories. There are labels for windows, and labels are required on some types of insulation.

**Energy Performance Certificates**

Energy Performance Certificates are not implemented.