

China

Building Code Implementation - Country Summary

Prepared for the IPEEC Building Energy Efficiency Taskgroup – Project 3: International Collaboration for Building Energy Code Implementation

Section I: Code Development

History

Start year

In 1986, the Ministry of Urban and Rural Construction and Environmental Protection (renamed after 2008 as Ministry of Housing and Urban-Rural Development, also known MOHURD) issued China's first building energy code – the Design Standard for Energy Efficiency of Residential Buildings (for heated residential buildings) (JGJ 26-86). This Design Standard only covered buildings in the Northern heating zone and required a 30% cut in energy consumption for space heating compared to reference buildings from 1980.

Timeline/ road map

China has mandatory building energy codes for urban residential and commercial buildings and a voluntary energy code for rural residential buildings (see table below). Existing building energy codes do not cover lighting requirements; lighting is covered in a separate code called "Standard for Lighting Design in Buildings". China also has a code for energy code implementation and enforcement, called "Code for Acceptance of Energy Efficient Building Construction" (i.e. Acceptance Code). There are additional technical standards supporting code implementation, such as "Technical Standard for Ground Source Heat Pump System", "Technical Code for Solar Water Heating Systems in Civil Buildings", "Technical Standard for Energy Efficiency Retrofits in Public Buildings", "Technical Standard for Energy Efficiency Test of Residential Buildings", "Technical Standard for Energy Efficiency Test of Public Buildings" and others (Yu et al., 2014). Some comparatively developed provinces or cities may develop local standards for building energy efficiency, based on local development requirements. These specifications may be stricter than the national standards.

Since the development idea of "total energy consumption control" is proposed at the macro level, China has shifted its focus from specific technical requirements to building energy performance control. The standard for energy efficiency of residential buildings has started being finalized since 2013 under the guidance of Ministry of Housing and Urban-Rural Development and with the participation of major research institutions for building energy efficiency from all over the country. The standard is based on

large amount of statistical data and will be issued in August 2015 to regulate building energy efficiency throughout the whole process of planning, design, and operation.

Building Type	Climate Region			
	SC	C	HSCW	HSWW
Urban Residential	Design Standard for Energy Efficiency of Residential Buildings in Severe Cold and Cold Zones (JGJ 26); Years of Enactment: 1986, 1995, 2010 (Mandatory)		Design Standard for Energy Efficiency of Residential Buildings in Hot Summer and Cold Winter Zone (JGJ 134); Years of Enactment: 2001, 2010 (Mandatory)	Design Standard for Energy Efficiency of Residential Buildings in Hot Summer and Warm Winter Zone (JGJ 75); Years of Enactment: 2003, 2012 (Mandatory)
Commercial	Design Standard for Energy Efficiency of Public Buildings (GB 50189); Years of Enactment: 1993, 2005, 2015 (Mandatory)			
Rural Residential	Design Standard of Energy Efficiency of Rural Residential Buildings (GB/T 50824); Year of Enactment: 2013 (Voluntary)			

Note: The table only shows the design standards for different building types. However, there are other building-related national standards including the *Technical Standard for Ground Source Heat Pump System* and other technical specifications mentioned above, which are regarded as an indispensable part of the national norms for building energy efficiency.

Existing codes

Structural coverage

	Scale (National, regional, local, etc.)	Building threshold size
<i>Residential buildings¹</i>		
New buildings	National codes for urban buildings based on climatic zones	None
	National code for rural buildings	
Existing buildings for retrofits	National code based on climatic zones for urban buildings	None
	National code for rural buildings	
<i>Commercial buildings-</i>		
New buildings	National	None

Existing buildings for retrofits	National	None
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The building energy codes for urban residential and commercial buildings are mandatory with some voluntary provisions. The rural residential building energy code is voluntary. Available compliance pathways include the prescriptive approach with trade-off option and the performance-based approach. Enforcement mechanisms include design review, construction inspection, pre-occupancy inspection and compliance checks. An acceptance code was also developed on building code implementation and enforcement in the building projects.

Measures covered

- Envelope
- HVAC
- Lighting [Lighting is covered by a separate code. Lighting energy efficiency is included as a part of the Design Standard for Energy Efficiency of Residential Building in some regions.]
- Renewable energy [Not included in all codes. The rural residential code encourages the use of new and renewable energy.]
- Domestic hot water [Guidelines for energy efficiency in domestic hot water system; covered in *Technical Specifications of Solar Water Heating System of Civil Architecture*]
- Maintenance
- Option for prescriptive approach
- Option for trade-off approach
- Option for performance-based approach

Correction/new codes

Motivation/policies for improving existing building energy codes

Codes are revised to keep up with the latest policy development and technological improvements, and to correct errors and/omissions in the previous version.

Revision schedule

As stipulated in the *Regulations for Implementation of Standardization Law of the People’s Republic of China*, the review period shall not last more than 5 years and suggestions on revision (if any) will be proposed after review.

Key methods used to engage stakeholders in the code development process

The China Academy of Building Research (CABR) is one of the major research institutes to develop design standards for energy efficiency of buildings. Some universities, local research institutions and companies also participated in the enactment of standards.

Section II: Code Implementation

Administration

Administrative/enforcement structures

Government agency

Ministry of Housing and Urban-Rural Development (MOHURD) is responsible for macro-level construction-related strategic planning and policy development.

Local construction departments are local branches of MOHURD at provincial, city and county levels. A local construction department is in charge of local compliance and enforcement activities, such as issuing permits for construction and occupancy, organizing training and outreach activities for local stakeholders, and developing local policies and regulations to promote building energy codes.

Local quality supervision stations are semi-governmental agencies, working for local construction departments. They supervise the work quality of third parties, especially construction companies and construction inspection companies. Their work activities include inspecting construction sites during key construction phases, and collecting, reviewing and approving documents related to construction and code compliance.

Testing centres and labs are semi-governmental entities, working for local quality supervision stations. Staffed by technicians and engineers, the testing centres and labs are responsible for testing building materials and construction components as required by the Acceptance Code.

Private sector/third party

Building design companies consist of architects and engineers. They are required to follow all design standards at the design stage and any requirements set by developers.

Design inspection companies often consist of senior technicians retired from building design companies and local research institutes. Their responsibilities are to assess the compliance of building designs to design standards at the design stage.

Local centres for plan review consist of technicians. A key responsibility of the centres is to review the calculation sheet for building energy efficiency.

Construction companies are required to follow the approved building design and the Acceptance Code in the construction phase of a building project.

Construction inspection companies consist of technicians and engineers. They are required to determine whether the construction complies with the approved building designs, construction codes and the Acceptance Codes, as well as any additional requirements presented by developers (such as cost control).

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

	Design	Construction	Pre-occupancy check
The role of federal/central government	None	None	Annual nationwide compliance assessment
The role of state/provincial and local government	Issuing permits for construction and approval of the start of construction	Inspecting construction sites during key construction phases; collecting, reviewing, and approving documents related to construction and code compliance	Completion acceptance; issuing permits for occupancy
Involvement of third parties and their role	Reviewing building designs; assessing compliance of building designs to design standards	Construction inspection and compliance checks	Pre-occupancy inspection and compliance checks

Requirements for commissioning before occupancy

According to the rules stipulated in Code for Acceptance of Energy Efficient Building Construction (GB50411-2007), it is required that the system energy performance test and the system joint commissioning and debugging shall be carried out to confirm that the projects meet the acceptance criteria before moving towards next steps.

Requirements for energy audits after occupancy

None

Tools used for compliance checking

Software used for compliance checking

Chinese codes do not require using software to demonstrate and verify code compliance, and architects can choose other approaches to demonstrating compliance. However, building projects are required to use real-time energy consumption simulation software with hourly weather data of 1 year

(8760 hours). Energy consumption models before and after retrofits shall use the same inputs of conditions. PKPM-Energy (i.e. PKPM HEC, CHEC, WHEC and PBEC) is one of the leading energy efficiency analysis software for code compliance, with around 70% market share in China. PKPM includes building codes and design standards at the national, provincial and local levels, as well as technical specifications for technologies at the local level.

Other tools used to check compliance

There are other tools for compliance checks like the air tightness testing equipment for doors and windows, for example.

Tangent-BEC and THS-BECS

Capacity building and education

Education and capacity building programs that support code implementation

MOHURD conducts training programs to introduce the new version of a building energy code when it is first released.

Target groups for programs

Programs target designers, engineers, and government officials. There are separate training programs for third-party inspectors who want to obtain their licenses.

Best-practice example of capacity building

Section III: Compliance & Enforcement

Penalties, incentives and other mechanisms for improving compliance

Penalties for non-compliance with energy provisions in codes

- Fine
- Refusal of permission to construct
- Refusal of permission to occupy
- Suspension/Loss of license [License suspension of third-party inspectors in the case of fraud or severe fault. A building design company that fails to correct flaws three times

over the course of two years shall be suspended until rectification, and its qualification certificate will be downgraded or revoked].

- Publication of names of property owners who fail to comply

Incentives/rewards to go beyond minimum required performance level

The Chinese Government has issued a series of tax incentives, including a fixed asset investment regulation tax, an income tax and a value-added tax. These tax incentives apply to both new energy efficient buildings construction and new wall materials production and use.

In terms of government procurement, Ministry of Finance and the National Development and Reform Commission issued the "Government purchasing list of energy efficiency products". Governments shall prioritize or be mandated to purchase products from the list when making procurement of energy-efficient products.

Compliance assessment

Assessments on rate and effectiveness of compliance

MOHURD has performed an annual compliance assessment since 2005 (Yu et al. 2014).

Publicly available information on compliance assessment

This information is partially available. MOHURD has recently released annual compliance assessment results.

Lessons learned from compliance studies

Not publicly available. For details, please see Evans et al. (2010) and Yu et al. (2014).

Number of code compliant permits issued per year

Not publicly available

Airtightness testing required prior to compliance

Yes, based on the Acceptance Code

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 China, but this is not mandatory.

Tested by certified test labs

The Certification and Accreditation Administration (CNCA), under the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), manages the certification system of the testing labs for building materials.

Providing samples for the tests

After purchasing building materials, the manufacturers are obliged to send a sample of the materials to local test labs for the tests, and then provide test results to local quality supervision stations before construction.

Labels showing the ratings for building materials

- *Energy efficiency labeling system for windows and doors*

Ministry of Urban and Rural Construction and Environmental Protection started the energy efficiency labeling system for windows and doors in 2006. The labels are currently voluntary and valid for three years. The label includes information related to energy performance, such as U-factor, solar heat gain coefficient, visible transmittance and air leakage. MOHURD encourages all government procurements and government financed construction to use products with energy efficiency labeling.

- *Mandatory Certificate for building materials in China*

China launched the Mandatory Certificate for Architectural Safety Glass in 2001, and the Mandatory Certificate for Solvent-borne Wood Coatings, Porcelain Tile and Concrete Anti-freezer in 2004. (For name and number of companies obtaining the certificate, please refer to official statistical data as published by Certification and Accreditation Administration of China (CNCA)).

- *Certificate of energy efficiency and water conservation for building materials*

Authorized and managed by Certification and Accreditation Administration of China (CNCA), some certification authorities started voluntary product certification, such as energy efficiency and water conservation of building materials. China Quality Certification Center conducts energy efficiency and

water conservation certification for building materials covering over 50 categories, including windows, doors, curtain walls, aluminum alloy building insulation profile, inorganic insulation products, water injection well choke, toilet stool, shower, flashing valve, tubular product, valve, and cooling tower. A total of more than 6,000 certificates have been issued to more than 600 companies.

- *Eco-certification for building materials*

As authorized and managed by Certification and Accreditation Administration of China (CNCA), some certification authorities started the business of eco-certification for building products. China Quality Certification Center conducts eco-certification for building materials covering more than 40 categories, including ceramics, coatings, furniture, artificial board, non-asbestos building products, lightweight wall board, artificial stone block, building block, paving material, and products for integrated use of natural resources. Nearly 1,000 companies have obtained the eco-certification. A total of over 3000 certificates have been issued.

- *Low carbon certificate for building materials*

Regulations for Low Carbon Product Certification (interim) (FGQH [2013] No. 279) was announced on February 18, 2013. Certification and Accreditation Administration of China (CNCA) issued the code of practice for low carbon product certification covering the first batch of building materials (general-purpose portland cement, sheet glass, and aluminum architectural profile) on May 27, 2014. The awarding ceremony was held in Beijing on June 27, 2014. A total of 28 companies obtained the first batch of certificates, marking the establishment of China’s low carbon product certification system.

- *Evaluation of green building materials*

On May 21, 2014, Ministry of Housing and Urban-Rural Development and Ministry of Industry and Information issued the *Regulations for Evaluation of Green Building Materials* (JK [2014] No.75). Currently, the two ministries are working on the Implementation Rules on *Evaluation of Green Building Materials* and the *Guideline for Evaluation Techniques for Green Building Materials*, which are under consultation process now.

Energy Performance Certificates

Building codes and energy performance certificate

China has energy performance certificates that are issued based on both design and post-occupancy energy efficiency (while codes are design standards). The certificates are issued in compliance with the Standard for Building Energy Performance Certification JGJ/T288-2012 (voluntary), based on a series of building codes, such as the Standard for Energy Efficiency Test of Public Buildings JGJ/T177-2009, Code for Acceptance of Energy Efficient Building Construction GB50411-2007 and others. This energy

performance certificate refers to codes, and buildings applying for the certification need to comply with codes.

Codes and energy performance certificates are enforced separately. However, provincial or local Departments of Housing and Urban-Rural Development are also in charge of managing and guiding provincial or local energy performance certificates. There are one star, two stars and three stars for different levels of energy savings for both residential buildings and public sector buildings.

Number of certified buildings and the percentage

As announced by the Ministry of Housing and Urban-Rural Development, a total of 387 projects at 8 batches have obtained the building energy efficiency labelling by now, including 208 public buildings and 179 residential buildings, among which 35 are 3-Star projects and 122 are 2-Star projects. Some provinces and cities have also issued a number of provincial announcements. More than 1600 projects have obtained the energy efficiency labelling.

References

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