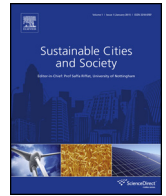




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1 Introduction of the standard for energy efficient building evaluation

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52 A R T I C L E I N F O

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7 Energy efficiency building

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A B S T R A C T

This paper presents the basic background and status of energy efficient building evaluation standards in China and abroad. It introduces the main technical contents, evaluating index system of the energy efficient building renovation in China and then summarizes the characteristics. In the end, the evaluating results of five evaluated projects using this standard were compared with those using the evaluation standard for green building. Though similar results were obtained, the comparison indicates that this standard has good scientificity and operability.

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13 1. Background

14 During the thirty years of China's reform and opening up,
15 increased consumption of energy and resources accompanies the
16 city's development and the urbanization promotion. Nowadays,
17 the annual building energy consumption in China accounts for
18 about 25% of the total social energy consumption, and the pollu-
19 tion caused by construction activities occupies about 1/3 of all the
20 pollution. The decrease of both building energy consumption and
21 greenhouse gas emissions contributes a lot to the goal that our
22 unit GDP carbon dioxide emissions would have been reduced to
23 40%–45% by 2020.

24 In order to implement the basic national policy of energy
25 resources conservation, it is important to establish an energy effi-
26 cient building evaluation criteria that both accords with China's
27 national condition and base on some international experiences of
28 building energy conservation. The mature energy efficient building
29 evaluation system is expected to guide the application of advanced
30 energy saving technologies and promotes the sustainable construc-
31 tion development.

32 Take a look of building evaluation criteria in the world. British
33 Building Research Establishment (BRE) established the BREEAM
34 evaluation system for green building, which focuses on building
35 energy efficiency earliest in 1990. And then the United States
36 released LEED for green building assessment in 1998, which has
37 extensively influenced green building and energy efficient build-
38 ing evaluation worldwide. In addition to those, other countries also

39 have begun to compile assessment systems. Evaluation Standard
40 for Green Building (GB50378-2006) which is jointly issued in
41 China is one of them, by the Ministry of Housing and Urban-Rural
42 Development and General Administration of Quality Supervision,
43 Inspection and Quarantine of the People's Republic of China in
44 2006.

45 Green building evaluation standard system itself is not specifi-
46 cally assessed for the energy saving of buildings. However, it
47 concentrates on building efficiency so that construction can be
48 improved with qualified rate and therefore truly achieves the goal
49 of energy conservation. Although there are already plenty of tech-
50 nical standards for designing, construction, inspecting, testing and
51 other aspects for the building sector, it is still necessary to estab-
52 lish a standard to cover all the stages of from designing to operation
53 management.

54 According to the requirements of Document Jian Biao [2006]
55 NO.77 issued by the Ministry of Construction (MOC) – “Notice
56 on Printing the Development and Revision Plan of National Engi-
57 neering Construction Standards in 2006”, energy efficient building
58 evaluation standard was drew up by China Academy of Building
59 Research, with the participation of other development organiza-
60 tions including China Southwest Architectural Design and Research
61 Institute, Shenzhen Academy of Building Research, Architecture
62 Design and Research Institute of Shanghai, Chongqing University,
63 the Harbin Institute of Technology, Henan Institute of Building Sci-
64 ence, Green Building Research Center of China Society of Urban
65 Studies, Heilongjiang Building Science Research Institute, Shanxi
66 Province Building Science Research Institute, Tianjin University.
67 On April 2, 2011, energy efficient building evaluation standard
68 was jointly issued by the Ministry of Housing and Urban-Rural
69 Development and General Administration of Quality Supervi-
70 sion, Inspection and Quarantine of the People's Republic of China
(GB/T50668-2011), and then implemented on May 1, 2012.

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Table 1
Related standards for energy efficiency of buildings.

	Item no.	Standards
Basic standards	1	Standard of climatic regionalization for architecture, GB 50178-1993
	2	Standard for parameter of construction atmosphere, JGJ35-1987
	3	Classification and presentation of building energy use data, JG/T358-2012
	4	Standard for basic terms for energy efficiency of buildings, GB, under compilation
General standards	5	Standard for parameter of building energy efficiency atmosphere, GB, under compilation
	6	Design standard for energy efficiency of public buildings, GB50189-2005
	7	Code for acceptance of energy efficient building construction, GB50411-2007
	8	Design standard for energy efficiency of residential buildings in severe cold and cold zones, JGJ26-2010
	9	Design standard for energy efficiency of residential buildings in hot summer and warm winter zone, JGJ, under compilation
	10	Design standard for energy efficiency of residential buildings in hot summer and cold winter zone, JGJ134-2010
Professional standards (Engineering standards)	11	Standard for energy efficiency test of residential buildings, JGJ/T132-2009
	12	Standard for energy consumption survey of civil buildings, JGJ154-2007
	13	Technical code for the retrofitting of public building on energy efficiency, JGJ176-2009
	14	Standard for energy efficiency test of public buildings, JGJ/T177-2009
	15	Design standard for energy efficiency of rural residential buildings, GB, under compilation
	16	Technical specification for energy efficiency retrofitting of existing residential buildings, JGJ, under compilation
	17	Standard for building energy performance certification, JGJ, under compilation
	18	Technical code for energy efficiency of city heating system, CJJ, under compilation
	19	Technical code for regulation of energy consumed remote monitoring systems of public buildings, under compilation
Professional standards (product standards)	20	Standard for saving energy evaluation of urban lighting, under compilation
	21	The minimum allowable values of the energy efficiency and energy efficiency grades for unitary air conditioners, GB19576-2004
	22	The minimum allowable values of the energy efficiency and energy efficiency grades for water chillers, GB19577-2004
	23	The minimum allowable values of the energy efficiency and energy efficiency grades for multi-connected air-condition (heat pump) unit, GB21454-2008
	24	The minimum allowable values of the energy efficiency and energy efficiency grades for variable speed room air conditioners, GB21455-2008
	25	Technical requirements of measurement and verification of energy savings, heating system of residential buildings, under compilation
	26	Technical specification for the retrofitting of residential buildings on energy efficiency, under compilation

2. Related standards in China

The energy conservation design standard for new heating residential buildings, which issued in 1986, was the first design standard for energy efficiency of buildings in China. It marked the start of building energy-saving in China. The standard system of building energy-saving in China is continuously improving in recent years. The standards of building energy-saving, which basically covered architectural design, construction, acceptance, operation, test and energy-saving construction, have become one of basic works of building energy-saving in China. By 2012, there are 26 energy-saving standards that related to architectural engineering. They are shown in Table 1, which including 5 basic standards, 5 general standards, and 16 professional standards.

Although these standards have promoted the minimum requirements for energy efficiency design and building construction, it does not exist an evaluation standard for lower energy consumption buildings. So it is indispensable to develop the evaluation standard for the energy efficient buildings to regulate the market of high-energy efficiency building and solve the problem of asymmetry information, so that it can finally guide and promote the healthy development of high-energy efficiency buildings.

3. The main technical contents

Standards are applicable to the comprehensive evaluation for energy efficiency of building technology index which is constructed in accordance with regulations and codes, such as the design standard for energy efficiency of public buildings, the standard

for lighting design of buildings, the design standard for efficiency of residential building in severe cold and cold zones, the design standard for energy efficiency of residential buildings in hot summer and cold winter zone, the design standard for energy efficiency of residential buildings in hot summer and warm winter zone and the standard for energy efficiency inspection of heating residential buildings.

The main technical contents of standards can be categorized into five parts: (1) general provisions, (2) terms, (3) basic provisions, (4) residential building, (5) public building. The whole standard system consists of energy efficiency evaluation index system of residential building, energy efficiency evaluation index system of public building and classification rules of energy efficient building.

Energy efficiency evaluation index system of both residential and public buildings is composed of seven indexes, including construction planning, building envelope, heating ventilation and air conditioning, water supply and drainage, electrical and lighting, indoor environment and operation management. The assessment system comprehensively assesses the energy performance of building in these seven aspects, within indexes including prerequisite items, standard items and outstanding items.

The standard was formulated based on not only abundant worldwide references from relevant standards, but also widely related research results and experience of construction projects. It not only covers the stages of designing and operational management, but also gives full consideration on actual situation of energy saving in buildings, and establishes unified evaluation standard of energy efficient building. Therefore, this standard is regarded advanced because of its scientificity, innovative and practicability.

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