SQUARE - A System for Quality Assurance when Retrofitting Existing Buildings to Energy Efficient Buildings

Suggestions of rules for a future European Energy management standard for the building sector

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SQUARE

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Internal report

Work Package 4 Adoption of a Quality Assurances System

Deliverable 4.2 Suggestions of rules for a future European Energy management standard for the building sector

Preface

This internal report is part of the work carried out within the SQUARE project (EIE/07/093/SI2.466701), which stands for A System for Quality Assurance when Retrofitting Existing Buildings to Energy Efficient Buildings. The project is co-funded by the European Commission, supported by its Programme Intelligent Energy Europe (IEE). The SQUARE project aims to assure energy efficient retrofitting of social housing with good indoor environment, in a systematic and controlled way.

The partners of the SQUARE project are:

- AEE Institute for Sustainable Technologies, Austria
- EAP Energy Agency of Plovdiv, Bulgaria
- TKK Helsinki University of Technology, Finland
- Trecodome, Netherlands
- TTA Trama Tecno Ambiental S.L, Spain
- Poma Arquitectura S.L., Spain
- SP Technical Research Institute of Sweden, Sweden
- AB Alingsåshem, Sweden

Summary

This report is part of the work in the SQUARE projects' work package 4, where a Quality Assurance (QA) system for ensuring energy efficient retrofitting of social housing with good indoor environment is being further developed and adopted to national conditions.

The report gives suggestions on rules for a future European Energy management standard for the building sector. Such a standard could be developed on the basis of the recently approved Energy management standard EN 16001 and for clarity reasons, the exact structure of the latter has been used to illustrate how this could be achieved with a limited effort, at least in terms of editorial work. The key features of the SQUARE system i.e. co-optimizing the indoor environment and the energy performance when retrofitting multifamily houses, are thus in principle transferred to the European standardization work. Here it could play an important role in the development of new standards in the coming years. The joint working group of CEN TC:s 163 and 205 "Energy performance of buildings using a holistic approach" is well in line with the SQUARE work and could hopefully benefit from this report.

The two main reference documents for this report are the SQUARE QA system report and the Guideline for the implementation of the system, including checklists, templates and links to useful additional resources is currently under development.

The main target group for this report are people involved in standardization work related to energy efficiency and indoor environment in multifamily houses.

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Introduction

This report gives suggestions on rules for a future European Energy management standard for the building sector. Such a standard could be developed on the basis of the recently approved Energy management standard EN 16001 and for clarity reasons, the exact structure of the latter has been used to illustrate how this could be achieved with a limited effort, at least in terms of editorial work. The key features of the SQUARE system i.e. co-optimizing the indoor environment and the energy performance when retrofitting multifamily houses, are thus in principle transferred to the European standardization work. Here it could play an important role in the development of new standards in the coming years. The joint working group of CEN TC:s 163 and 205 “Energy performance of buildings using a holistic approach” is well in line with the SQUARE work and could hopefully benefit from this report.

Other interesting tracks in standards development are:

- The work on an international Energy management standard, ISO 50 001. The current EN 16001 is expected to have a significant effect in the development of this international standard, the work being led by the United States and Brazil and expected to be completed in 2011. In the process of developing the ISO 50 001 a main objective is to achieve consistency with ISO 9001 and 14001 in the structure with a view to simplifying the coordination of management within an organization's activities. This way a good foundation is also laid down for an international (ISO) Energy management standard for the building sector.

- CEN/CLC/JWG1 has just started drafting a new set of standards for Energy audits wherof one will be dedicated to buildings. This work is under UK lead and the date for an available standard (DAV) is set to March 2013.

The two main reference documents for this report are the SQUARE QA system report and the Guideline for the implementation of the system, including checklists, templates and links to useful additional resources is currently under development. The main target groups for this report are people involved in standardization work related to energy efficiency and indoor environment in multifamily houses.

In the following paragraphs, the original text from the EN 16001 has been indicated where it is considered that it could be kept as it is with minor or no changes, using the normal report font. Where it is considered relevant, additional text has been included. These parts of the text have been underlined for clarity. Some potential inclusions of texts referring to indoor environment have also been included. These parts are also underlined but written within brackets.

Beginning of standards proposal

The overall aim of this European standard is to help organizations establish the systems and processes necessary to improve energy efficiency. This should lead to reductions in cost and greenhouse gas emissions…

….This standard applies to the activities under the control of an organization. It applies to all types of multifamily houses that are to be retrofitted and updated to present-day requirements concerning their (indoor environment and) energy use.

NOTE When applying this standard it is essential that the organization, either in parallel or as an integrated part of the energy management system define requirements for, and monitor the indoor environment in the concerned buildings. This is to ascertain that all predefined requirements on indoor environment and energy use performance are reached, i.e. that none of them is reached on too high expense of another. There is otherwise a significant risk that problems with the indoor environment or the building structure occur as a result of improved energy efficiency.

This standard for energy management systems can be used independently or integrated with any other management system. To facilitate its use, the structure of this standard is similar to the structure of ISO 14001….

1 Scope

This standard specifies requirements for establishing, implementing, maintaining and improving an energy management system related to retrofitting and management of multi-family buildings. Such a system takes into account legal obligations with which the organisation must comply and other requirements to which it may subscribe. It enables the organization to take a systematic approach to the continual improvement of its energy efficiency……

2 Terms and definitions

For the purposes of this European standard, the following terms and definitions apply.
FEA – First Energy Analysis.

Functional requirements – Technical requirements defining e.g. maximum or minimum allowed values of different parameters related to the indoor environment and/or the energy use.

Indoor environment – As used in this document/context, the concept of 'indoor environment' refers not only to the indoor environment that an organization provides for the occupants (light, thermal comfort etc.), but also to the information or instructions for occupation and use of the building.

Occupant – Tenant and/or resident.

Organization – Company / property manager / owner / purchaser / developer.

Retrofit action – Construction work on social housing (building components and building services) in order to met the present-day requirements concerning indoor environment and energy use.

TPI – Thorough Primary Investigation.

2.1 energy
electricity, fuel, steam, heat, compressed air and other like media

NOTE Energy is an abstract concept. The international unit for energy is Joule (J).

…..
…..
2.25
energy performance indicator
ratio chosen by the organization to monitor energy performance

3 Energy management system requirements

3.1 General requirements

The organization shall:

a) establish, document, implement and maintain …..

3.2 Energy policy

Top management shall establish, implement and maintain an energy policy for the organization. This energy policy shall state the organization's commitment for achieving improved energy performance. Top management shall ensure that the energy policy:

a) defines the scope and boundaries …….

3.3 Planning

New paragraph: Thorough primary investigation - TPI

The TPI consists of a survey and preparation of an inventory of the building, (and of a questionnaire to the occupants.)

The results from the TPI are the basis for preparation of the retrofit plan.

The indoor environmental status of the building is determined through *inspection and* measurement. This investigation may be carried out on one particular building, or on groups of buildings of the same technical design and with similar heating and ventilation systems. There must be a plan for the number or proportion of apartments or premises to be surveyed, covering not less than about 20 % of the total number of apartments etc. and comprising a representative cross-section of the apartments etc.

(A questionnaire survey on indoor environment conditions before retrofit should be carried out among the occupants.)

Shortcomings or faults identified through TPI must be dealt with. The presentation of results of the survey shall include the results of the inspection.

3.3.1 Identification and review of energy aspects

The organisation shall conduct an initial review of its energy aspects (FEA). The review of energy aspects shall be updated at predefined intervals. These reviews shall prioritise significant energy aspects for further analysis.

These reviews of energy aspects shall include the following:

a) past and present energy consumption and energy factors based on measurement and other data…….

3.3.2 Legal obligations and other requirements

The organization shall:

a) identify and have access to the applicable legal requirements and other ….

New paragraph: Defining requirements for the retrofit

For buildings to be retrofitted, requirements shall be set and documented for each specific building or groups of buildings. The energy requirements shall be observed by the designers, architects and contractors working on the retrofit of the buildings. Examples of such requirements are:

- Energy requirements for the buildings under consideration of the indoor environment
- Quality requirements and targets for the construction process
- Performance requirements on critical components

The representative of the organization carrying the main responsibility for the retrofit shall make sure that these requirements are followed up through the design and construction process.

3.3.3 Energy objectives, targets and programme(s)

The organization shall establish, implement and maintain documented energy objectives and targets, at the relevant functions and levels within the organization.

The energy objectives and targets to be defined cover all forms of energy supplied to the building or type of building as needed in order to maintain the required functions in terms of indoor climate, building services systems and activities in the building. They shall be built upon any applicable building codes as a minimum level. It should aim at introducing additional, more strict requirements when such requirements are found technically feasible and economically or policy wise motivated.

The objectives and targets shall be consistent……

3.4 Implementation and operation

3.4.1 Resources, roles, responsibility and authority

Top management shall ensure the availability of resources essential to establish, implement, maintain and improve the energy management system. Resources include ……

The housing organization's organisational structure, with clear details of who is responsible, and who has authority, for each part of the organization, shall be defined, documented and communicated. Further, within each part of the organization, there shall be documentation defining who is responsible for the main part of the retrofit actions, (for the indoor environment) and for the energy use systems.

3.4.2 Awareness, training and competence

The person designated in 3.4.1 shall be appropriately competent and qualified in energy and energy efficiency improvements.

The organization shall ensure that its employees and all persons working on its behalf are aware of:

a) the organization's energy policy and energy management programmes……

NOTE A well prepared startup meeting involving the housing organisation and all contractors is important for achieving a common view on the work ahead. Regular meetings for sharing experiences and discussing upcoming problems is also essential in a major renovation project with tough requirements on (indoor environment and) energy performance.

Personnel performing tasks which can cause significant impacts on energy consumption ……

3.4.3 Communication

The organization shall communicate internally with regard to its energy performance and the energy management system. This shall ensure that all persons working for and on behalf of the organization, including the tenants, can take an active part in the energy management and the improvement of the energy performance.

NOTE Information about plans and achievements through newsletters and stakeholder meetings for information sharing and decision making are two ways of encouraging tenants to take an active part in the process.

The organization shall decide whether to communicate externally about its energy management system and energy performance. If the decision is to communicate externally, the organization shall establish, implement and document an external communication plan.

3.4.4 Energy management system documentation

The organization shall establish, implement and maintain information, in paper or electronic form, to:

a) describe the core elements of the energy management system …...

3.4.5 Control of documents

The organization shall control records and other documents required by this standard to ensure that:

a) they are traceable and can be located;

b) they are periodically reviewed …….

3.4.6 Operational control

The organization shall identify and plan those operations that are associated with the significant energy aspects and ensure consistency with its energy policy, energy objectives and energy targets. This includes:

a) preventing situations that could lead to deviation from the energy policy……

3.5 Checking

3.5.1 Monitoring and measurement

The organization shall establish and describe the monitoring, measuring and targeting requirements of its energy management programme. An energy metering plan shall be defined and implemented.

Extensive check measurements of air tightness and ventilation air flows are essential for assuring the quality of a building aiming for a high energy performance, (a good indoor environment) and a durable construction. The ventilation systems of a building must be designed so that check measurements of air flows, at least on the level of individual apartments, can easily be performed when the system is in operation.

At defined intervals, the organization shall monitor, measure and record significant energy consumption……

3.5.2 Evaluation of compliance

Consistent with its commitment to compliance, the organization shall periodically evaluate compliance with legal obligations and other requirements to which the organization subscribes that are relevant to the scope of this standard. The organization shall keep records of the results of the periodic evaluations.

3.5.3 Nonconformity, corrective action and preventive action

The organization shall identify and manage non-conformance, initiating corrective and preventive action ……

3.5.4 Control of records

The organization shall establish, implement and maintain records as necessary to demonstrate conformity to the requirements …….

3.5.5 Internal audit of the energy management system

At planned intervals, the organization shall carry out management system audits to ensure that

the energy management system:

a) conforms to the energy policy, objectives, targets and energy management programme…….

…..The selection of auditors and conduct of audits shall ensure objectivity and the impartiality of the audit process. The persons performing the audits shall possess the necessary knowledge of the particular working area concerned and of the associated management system functions. Such audits shall be performed at least once a year within each part of the organization.

The management responsible for the area being audited shall ensure …….

3.6 Review of the energy management system by top management

3.6.1 General

Top management shall review the organization's energy management system at planned intervals to ensure continuing suitability, adequacy and effectiveness. Records of management reviews shall be maintained.

NOTE: Reviews should be performed at least once a year

3.6.2 Inputs to management review

Inputs to the management review shall include:

a) follow-up actions from previous management reviews…….

e) Inputs from tenants through questionnaires, complaints etc

3.6.3 Outputs from management review

Outputs from the management review shall include any decisions or actions related to:

a) the improvement in the energy performance of the organization since the last review…..

Guidance on the use of this European standard

A.1 General requirements

The implementation of an energy management system specified by this standard is intended to result in improved energy efficiency in buildings, considering the retrofitting process as well as the long term facility management. Therefore, this standard is based on the …….

A.2 Energy policy

The energy policy is the driver for implementing and improving the organization's energy management system. The policy reflects the commitment of top management ……

A.3 Planning

A.3.1 Identification and review of energy aspects

The purpose of identifying the energy aspects of the organization is to understand the areas of significant energy consumption, i.e. which of the buildings in the stock which account for the greatest energy use or which offer the most potential for energy savings.

The organization should maintain a register of opportunities for saving energy, thereby reducing costs and carbon dioxide emissions. For each opportunity in the register……

A.3.2 Legal obligations and other requirements

The organization needs to identify the applicable legal requirements and other requirements to which the organization subscribes related to its energy aspects.

These may include:

a) national and international legal requirements…..

A.3.3 Energy objectives, targets and programme(s)

Setting objectives and targets provides the means for transforming policy into action. The organization should ensure that the objectives and targets are consistent with the energy policy…….

A.4 Implementation and operation

A.4.1 Resources, roles, responsibility and authority

The successful implementation of an energy management system calls for a commitment from all persons working for or on behalf of the organization.

This commitment should begin at the highest levels of management. Accordingly, top management should establish …..

A.4.2 Awareness, training and competence

The organization should identify the awareness, knowledge, understanding and skills needed by any person with the responsibility and authority to perform tasks on its behalf. Those persons identified by the organization……

A.4.3 Communication

Effective communication is essential to ensure the successful implementation and operation of the energy management system. Relevant and regular information on the energy management system contributes to motivating and committing ……

A.4.4 Energy management system documentation

The level of detail within the system documentation should be sufficient to describe the energy management system and the interrelation between its processes…...

A.4.5 Control of documents

The intent of Subclause 3.4.5 is to ensure that the organization establishes and maintains documents in a manner sufficient to implement the energy management system…..

A.4.6 Operational control

The organization should evaluate operations that are associated with its identified significant energy aspects and ensure that they are conducted….

A.5 Checking

A.5.1 Monitoring and measurement

Monitoring and measurement is the management of energy consumption by means of regular comparisons of actual and expected consumption.

Monitoring and measurement……

A.5.2 Evaluation of compliance

The organization should establish, implement and maintain procedures for monitoring the conformity …..

A.5.3 Nonconformity, corrective action and preventive action

The organization should ensure that non-conformances…..

A.5.4 Control of records

The purpose of recording is to ensure that the necessary documentation is provided to substantiate the achievement of targets, action plans and other requirements…..

A.5.5 Internal audit of the energy management system

The purpose of an internal audit is to carry out a systematic review of the energy management system and assess whether the system operates in accordance with the organization's own requirements together with those of the energy management system standard…...

A.6 Review of the energy management system by top management

The purpose of the management review is to ensure continual improvement and adaptation of the system so that the system operates in line with company energy policy. The review implies……

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