



SLOVENSKI STANDARD

SIST EN 16247-2:2014

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Energetske presoje - 2. del: Stavbe

Energy audits - Part 2: Buildings

Energieaudits - Teil 2: Gebäude

Audits énergétiques - Partie 2 : Bâtiments

Ta slovenski standard je istoveten z: **EN 16247-2:2014**

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NORME EUROPÉENNE
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English version

Energy audits - Part 2: Buildings

Audits énergétiques - Partie 2 : Bâtiments

Energieaudits - Teil 2: Gebäude

This European Standard was approved by CEN on 27 May 2014.

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EN 16247-2:2014 (E)**Foreword**

This document (EN 16247-2:2014) has been prepared by Technical Committee CEN/CLC/JWG 1 “Energy audits”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2014 and conflicting national standards shall be withdrawn at the latest by November 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This Part provides additional material to Part 1 for the Buildings sector and should be used in conjunction with Part 1.

This European Standard is part of the series EN 16247 “*Energy audits*” which comprises the following:

- Part 1 General requirements;
- Part 2 Buildings;
- Part 3 Processes;
- Part 4 Transport;
- Part 5 Competence of energy auditors.

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According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

0 Introduction

An energy audit can help an organization to identify opportunities to improve energy efficiency. It can be part of a site wide energy management system.

The use and operation of buildings requires the provision of services such as heating, cooling, ventilation, lighting, domestic hot water, transportation systems (e.g. elevators, escalators and moving walkways) in buildings and processes. In addition, energy is used by appliances within the building.

The energy consumption depends on:

- local climatic conditions;
- the characteristics of the building envelope;
- the designed indoor environment conditions;
- the characteristics and settings of the technical building systems;
- activities and processes in the building;
- occupant behaviour and operational regime.

Dealing with buildings, the audited objects are sometimes similar, technically simple and numerous (as in the residential sector) but can also be unique, complex and highly technical (such as hospitals, swimming pools and spas, etc.).

Energy audits in buildings may include the whole building or parts of the building or some technical system.

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Energy performance indicators (benchmark values, if available) or average statistical specific energy consumption data are usually published nationally for different building types and ages. This information can be used in the analysis to provide comparative energy performance evaluation.

NOTE The energy audits covered under this standard might be independent from building energy performance certification and other legislative requirements.

EN 16247-2:2014 (E)**1 Scope**

This European Standard is applicable to specific energy audit requirements in buildings. It specifies the requirements, methodology and deliverables of an energy audit in a building or group of buildings, excluding individual private dwellings. It shall be applied in conjunction with, and is supplementary to, EN 16247-1, *Energy audits — Part 1: General requirements*. It provides additional requirements to EN 16247-1 and shall be applied simultaneously.

If processes are included in the scope of the energy audit, the energy auditor may choose to apply EN 16247-3, *Energy audits — Part 3: Processes*. If on-site transport on a site is included in the scope of the energy audit, the energy auditor may choose to apply EN 16247-4, *Energy audits — Part 4: Transport*.

NOTE This standard may cover multi-dwelling apartment blocks where communal services are supplied from a landlord. It is not intended for individual dwellings and single family houses.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16247-1, *Energy audits — Part 1: General requirements*

EN 15603, *Energy performance of buildings. Overall energy use and definition of energy ratings*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 16247-1 and the following apply.

3.1**building**

construction as a whole, including its envelope and all technical building systems, for which energy may be used to condition the indoor climate, to provide domestic hot water and illumination and other services related to the use of the building and the activities performed within the building

Note 1 to entry: The term can refer to the building as a whole or to parts thereof that have been designed or altered to be used separately.

Note 2 to entry: The building could include its site location and related external environment.

3.2**system boundary**

boundary that includes within it all areas associated with the audited object (both inside and outside the audited object) where energy is consumed or produced

Note 1 to entry: Inside the system boundary the system losses are taken into account explicitly, outside the system boundary they are taken into account in a conversion factor.

3.3**energy need**

energy to be delivered to or extracted from a building in a defined time period by a technical system to provide a building service

3.4**energy carrier**

substance or physical phenomenon that can be used directly or indirectly to be transformed into useful energy

Note 1 to entry: The default energy content of fuels is gross calorific value.

3.5**delivered energy (final energy)**

energy, expressed per energy carrier, supplied to the technical building systems through the system boundary, to satisfy the uses taken into account or to produce electricity

Note 1 to entry: Delivered energy can be calculated for defined energy uses or it can be measured.

Note 2 to entry: Energy uses include heating, cooling, ventilation, domestic hot water, lighting, appliances, etc.

3.6**produced energy**

heat or electricity generated within the system boundary

Note 1 to entry: Produced energy can be used within the system boundary or exported.

3.7**exported energy**

energy, expressed for each energy carrier, delivered by the technical building systems through the system boundary and used outside the system boundary

Note 1 to entry: It can be specified by generation types (e.g. CHP, photovoltaic, etc) in order to apply different weighting factors.

Note 2 to entry: Exported energy can be calculated or it can be measured.

[SOURCE: CEN/TR 15615, 3.19]

3.8**building services**

the services provided by the technical building systems and by appliances to condition the indoor environment (thermal comfort, air quality, visual and acoustic quality) and other services related to the use of the building

3.9**technical building system**

technical equipment for heating, cooling, ventilation, domestic hot water, lighting and on-site energy production

Note 1 to entry: A technical building system can refer to one or a combination of building services (e.g. heating system include heating, domestic hot water system and controls).

Note 2 to entry: A technical building system is composed of different subsystems and includes controls.

Note 3 to entry: On-site energy production can include heat or electricity.

EN 16247-2:2014 (E)**4 Quality requirements****4.1 Energy auditor****4.1.1 Competency**

The energy auditor shall demonstrate that they have qualifications or experience covering the scope, complexity and thoroughness of the audit.

NOTE See prEN 16247-5¹.

4.1.2 Confidentiality

The energy auditor shall respect all the legal and commercial confidentiality requirements agreed with the organization, which cover all parties involved, such as tenants, maintenance organizations, building occupants.

4.1.3 Objectivity

Objectivity is defined in EN 16247-1, 4.1.3

4.1.4 Transparency

Transparency is defined in EN 16247-1, 4.1.4

4.2 Energy audit process (standards.iteh.ai)

When a sampling method is used, any selected sample of spaces, systems or equipment shall be representative of the whole building or of a group of buildings.

NOTE See Informative Annex A: A flow diagram of the energy audit process.

5 Elements of the energy audit process**5.1 Preliminary contact**

The energy auditor shall identify all parties/organizations and their roles in ownership, management, use, operation and maintenance of the building and their respective impacts and interests on energy use and consumption.

NOTE 1 See Informative Annex B: Examples of parties of an energy audit in buildings.

The scope of the audit should be agreed to cover technical interaction of the systems within the building, and the interaction of the systems with the building. Optimization of some specific sector to the exclusion of others may give misleading results.

The agreed aims of the energy audit may contain:

- a) reducing energy consumption and costs;
- b) reducing environmental impact;

¹ prEN 16247-5 is currently not yet published and is under development.

- c) complying with legislation or with voluntary obligations.

The energy audit scope and boundaries shall define what is included, in terms of:

- a) which buildings from a list of buildings or parts of a building;
- b) which energy services;
- c) which technical building systems;
- d) which areas and systems outside the building;
- e) which energy performance indicators could be used as appropriate to the audit.

The energy audit degree of thoroughness shall be agreed, taking into account that it will impact:

- a) time on site;
- b) choice of samples;
- c) level of modelling;
- d) requirements for measurements;
- e) level of metering, including sub-metering;
- f) level of defining the energy efficiency improvement opportunities;
- g) required auditor's skills.

NOTE 2 See Informative Annex C. Examples of the scope, aim and thoroughness of energy audits in buildings.

5.2 Start-up meeting

During the start-up meeting the energy auditor shall agree with the organization on:

- a) timing of site visits, e.g. whether within or outside normal working hours;
- b) level of occupant engagement;
- c) areas of restricted access;
- d) potential health hazards and risks.

The energy auditor shall, where available, obtain from the organization:

- a) set-points and operational limits of indoor environmental conditions (such as temperatures, air flows, illuminance, noise) and any seasonal variations;
- b) occupancy patterns for the different range of activities within the building;
- c) comments from any occupant or other party on operational performance of the building and the level of the building service;
- d) energy certificates prepared for the building;

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- e) whether any building occupant awareness or motivation programmes have been implemented.

5.3 Collecting data**5.3.1 General**

The data collection shall be appropriate to the scope of the energy audit.

5.3.2 Information request

The energy auditor shall collect with the organization the following data as required by the scope of the energy audit:

- a) energy carriers, present and available;
- b) energy related data:
- 1) delivered, produced and exported energy, for each energy carrier (for example identify the energy streams for a CHP unit, or for photovoltaic systems where production is used locally or exported);
 - 2) energy consumption data (or readings with related time and date) of any available meters or counters (e.g. heat meter, domestic hot water meter, fuel meter, burner hour counter);
 - 3) data from individual metering, if available;
 - 4) short-interval (e.g. hourly) energy demand / load curve, if available;
 - 5) relevant related measurements;

The frequency of the data should be appropriate to the scope and thoroughness of the energy audit. Building energy audits typically deal with monthly consumption data.

The energy related data should be recorded by the building and control system if available.

- c) adjustment factors affecting energy consumption:
- 1) climatic data (e.g. temperature, degree-days, hygrometry, lighting) from the local building automation and control system (BACS), if available;
 - 2) occupancy patterns;

Information for quantifying the adjustment factors affecting energy consumption should be recorded by the building control system if available (e.g. occupancy times, degree-hours etc).

- d) information on important changes in the past 3 years or the period covered by the available operational data, concerning:
- 1) the physical form of the building;
 - 2) the spaces – either in dimension and/or in use;
 - 3) the building envelope (renovation of windows, added insulation, etc.);
 - 4) the technical building systems and the areas they serve;
 - 5) the tenant arrangements;

- 6) occupancy of spaces (different occupancy times, extended hours behaviour and internal loads);
 - 7) set points and occupant behaviour;
- e) values to be used, adapted to the local /national performance indicators (if relevant):
- 1) floor area;
 - 2) building volume;
 - 3) others;
- f) existing design, operation and maintenance documents and information, such as:
- 1) as-built building plans;
 - 2) any external factors that may influence the energy performance of the building (e.g. shading by adjacent trees or buildings);
 - 3) indications of supplied building services (i.e. which rooms or zones are heated, cooled, ventilated) on the building lay-out plan;
 - 4) technical building system schematics, indicating the system zones, if any;
 - 5) control diagrams and settings;
 - 6) appliance and component data and ratings;
- g) the building information model (BIM) and/or design models of the building, if available;
- h) energy using equipment in the occupied spaces and other internal loads.

5.3.3 Review of the available data

The energy auditor shall review the information collected and provided by the organization.

The energy auditor shall review the scope and boundaries of the energy audit if it is deemed appropriate once initial information has been received.

The energy auditor shall judge whether or not the information provided by the organization allows the energy audit process to continue and the agreed objectives to be achieved.

Where there is missing data the client will be given a choice to produce the missing data or accept that the auditor will have to make assumptions (that will be clearly detailed).

The energy auditor shall, based on experience and competence, choose the energy using systems and items to be checked on site, depending on the aim, scope and thoroughness of the energy audit.

5.3.4 Preliminary data analysis

The energy auditor shall carry out an analysis of the data collected to:

- a) undertake a preliminary analysis of the audited object's energy balance on the basis of energy data;
- b) establish the relevant adjustment factors;