# FINAL DRAFT
# International Standard

# ISO/FDIS 50002-2

# Energy audits —

## Part 2:
## Guidance for conducting an energy audit using ISO 50002-1 in buildings

ISO/TC **301**

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# Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 301, *Energy management and energy savings*.

A list of all parts in the ISO 50002 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

# Introduction

An energy audit can help an organization identify opportunities to improve energy efficiency. It can be part of a site-wide energy management system (EnMS). Energy audits in buildings can help to achieve improvements such as:

— energy conservation;

— energy efficiency;

— improved occupant comfort, health and well-being;

— sustainability goals and targets;

— climate resilience.

The benefits to the organization can include:

— reduced energy and operating costs;

— improved information for asset management;

— wiser investment strategy based on energy audit results;

— meeting organizational goals related to greenhouse gas (GHG), emissions reduction net zero, materials use, productivity and occupant satisfaction.

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, moving walkways) in buildings, information systems and processes. In addition, the operation of buildings typically involves other energy end uses such as appliances or plug loads within the building.

A building's energy consumption depends on:

— local climate conditions;

— the characteristics of the building envelope;

— the age and typology of the building(s)

— 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.

When dealing with buildings, the audited objects are sometimes similar, technically simple and numerous (e.g. 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, parts of the building or some particular technical system.

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. Where this information is not available, comparable data can be found for similar climates through international sources (e.g. the International Energy Agency (IEA)).

NOTE The energy audits covered by this document can be independent from building energy performance certification.

Energy audits and energy saving opportunities identified in energy audits are best implemented in the context of an EnMS, such as one consistent with ISO 50001. Whether or not an organization has an EnMS in place, organizations are more likely to achieve the intended outcomes of an energy audit when their top management supports the audit objective(s) and agrees to provide sufficient resources for the audit process and post-audit activities.

# Energy audits —

# Part 2: Guidance for conducting an energy audit using ISO 50002-1 in buildings

## 1 Scope

This document gives guidance on how to apply ISO 50002-1 to carry out energy audits of a building or group of buildings (new or existing). It is intended to be used in conjunction with, and is supplementary to, ISO 50002-1.

This document does not apply to other areas such as process audits (see ISO 50002-3), specific energy systems (e.g. compressed air) or transport.

This document is applicable to buildings and can be used independently or in conjunction with ISO 50002-3.

## 2 Normative references



The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 50002-1, *Energy audits — Part 1: General requirements with guidance for use*

## 3 Terms and definitions



For the purposes of this document, the terms and definitions given in ISO 50002-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

**3.1**
**building**
construction as a whole, including its envelope and all *technical building systems* (3.5), for which energy can be used to condition the indoor climate, and to provide domestic hot water, 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 can include its site location and related external environment.

Note 3 to entry: Processes within the building (e.g. chilling of food in supermarkets) are addressed in ISO 50002-3. To the extent that the energy use of such processes affects, or is affected by, the building, they can be included in the scope of the energy audit process described in this document.

**3.2**
**building envelope**
elements of a *building* (3.1) that enclose conditioned spaces through which thermal energy can be transferred to or from the exterior, or to or from unconditioned spaces

**3.3**
**building fabric**
all physical elements of a *building* (3.1), excluding *technical building systems* (3.5)

EXAMPLE Roofs, walls, floors, doors, gates and internal partitions.

Note 1 to entry: It includes elements both inside and outside of the thermal envelope, including the thermal envelope itself.

Note 2 to entry: The fabric determines the thermal transmission, the thermal envelope airtightness and (nearly all of) the thermal mass of the building (apart from the thermal mass of furniture and technical building systems). The fabric also makes the building wind and water tight. The building fabric is sometimes described as the building as such, i.e. the building without any technical building system.

[SOURCE: ISO 52000-1:2017, 3.1.5]

**3.4**
**building service**
service provided by the *technical building systems* (3.5) 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* (3.1) (such as escalators/elevators)

**3.5**
**technical building system**
technical equipment for heating, cooling, ventilation, humidification, dehumidification, domestic hot water, lighting, information systems including building automation and control, and on-site energy production



Note 1 to entry: A technical building system can refer to one or to several *building services* (3.4) (e.g. heating system including 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: Electricity and thermal energy production can include cogeneration, wind power, photovoltaic systems, district energy, heat pumps and other renewable energy sources, within the agreed scope of the energy audit.

Note 4 to entry: ISO 52000-1 provides definitions of specific technical building systems.

[SOURCE: ISO 52000-1:2017, 3.3.13, modified — “information systems including” added and “on-site energy” replaced “electricity” in the definition. Example changed in Note 1 to entry. Notes 2 and 3 to entry expanded. Note 4 to entry added.]

## 4 Principles of energy auditing

The principles of ISO 50002-1 apply.

## 5 Performing an energy audit

### 5.1 General

The general requirements of ISO 50002-1 apply.

## 5.2 Planning

### 5.2.1 General

When planning an energy audit for a building, the relationships between the owner, operator and tenant should be clarified. Their roles and responsibilities in a building can be different. For example, a building can be owner-operated, occupied and maintained by a single organization. A building can also be owned, operated, maintained and occupied by different organizations and/or tenants.

The audit client should specify the objectives of the energy audit, and the level of detail and thoroughness required.

Considerations for the energy audit objective(s) include:

a) reducing energy consumption and costs;

b) reducing environmental impacts such as GHG emissions;

c) checking or ensuring the indoor environment for quality of health and well-being (comfort, indoor air quality and illuminance levels);

d) awareness of relevant legislation and voluntary obligations and commitments;

e) limitations on improving energy performance in controlled buildings (e.g. historical or culturally significant buildings);

f) evaluating potential options for use of renewable energy and/or storage.

ISO 50002-1:—, Annex A, describes three different types of energy audit, each having a different level of detail and thoroughness. The level of detail agreed by the parties will have an impact on:



— application;

— business needs;

— data collection;

— analysis;

— opportunities identification;

— opportunities evaluation;

— outputs;

— the time on-site.

When planning for the energy audit, the audit client should identify all the interested parties, their roles in the building, their needs and expectations from the energy audit, and their respective influence on the energy audit. A breakdown of interested parties and their typical roles in an energy audit are shown in Table 1.

**Table 1 — Interested parties and their typical roles in a building energy audit**

| Interested party | Possible recipient of the energy audit | Data provider | Involved in the meetings | Involved in the field work |
|---|---|---|---|---|
| Building or apartment owner | X | X | X | |
| Property manager | X | X | X | |
| Facilities manager | X | X | X | X |
| Engineering services manager | | X | X | X |
| Operation and maintenance staff | | X | X | X |
| Security staff | | X | (x) | (x) |
| Occupant/tenant | y | y | y | y |
| Staff (who work in the building permanently) | | | (x) | Partly |
| Temporary occupants (patients, clients in a shop) | | | | |
| Contractors and safety personnel | | y | y | y |
| Commercial | X | Sometimes | No, unless the recipient | X |
| Residential | (x) | | No, unless the recipient | X |
| **Key**<br>X: direct involvement<br>(x): indirect involvement<br>y: as appropriate | | | | |



### 5.2.2 Energy audit scope and boundaries

The energy audit scope and boundaries should be defined and agreed between the energy auditor and the audit client. At a minimum:

a) the audit client should have operational control of, and have an ability to influence and seek the cooperation of, the tenants;

b) the energy audit scope should cover energy uses within the building and/or the interaction of energy uses with other energy use within the building (optimization of some energy use while excluding others can give misleading results);

c) where the scope of an audit includes only parts of a building, such as a tenancy, the audit scope may need to account for interactions with the base building (such as the building envelope) or technical systems (e.g. shared space heating or cooling systems).

Considerations for the energy audit scope and boundaries include:

— collection of buildings/campus, buildings from a list of buildings or parts of a building;

— interdependencies and interactions between the building fabric, energy use inside the building, and the building services and technical building systems;

— energy use outside the building affecting or impacting on those inside the building;