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Building automation and control systems (BACS) —

Part 1: Project specification and implementation

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Systèmes de gestion technique du bâtiment (SGTB) —
Partie 1: Spécifications et mise en oeuvre d'un projet

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 205, *Building environment design*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 247, *Controls for mechanical building services*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 16484-1:2010), which has been technically revised.

The main changes are as follows:

- updating of normative references;
- updating of terms and definitions;
- mention of cyber security measures and wireless communication.

A list of all parts in the ISO 16484 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

The ISO 16484 series is aimed at the design of new buildings and the retrofitting of existing buildings for an acceptable indoor environment, practical energy conservation and efficiency.

The ISO 16484 series is applicable to building automation and control systems (BACS), as follows:

- The environmental design for all building types requires complex methods of automation and control. The functional integration of services other than heating, ventilating and air conditioning (HVAC) is a general task for all parties employed to develop an integrated multi-application system. The integration comprises, for example, lighting and electric power distribution control, security control, transportation, maintenance management or facilities management. This system integration allows the user to take advantage of synergies between the different applications. The ISO 16484 series gives guidance to architects, consultants and contractors as well as guidance to users on how to share such resources.
- The innovation cycles between devices, systems and networks vary. In order to make it possible to add and to change existing devices and extend the building automation and control network, several interfaces, both proprietary and standardized, are defined between the BACS network and the other systems. A manufacturer can design a product, both to meet their specific marketing objectives and to give the option to integrate that special device into a multi-application BACS. Interfaces are also defined in appropriate parts of the ISO 16484 series along with the necessary communications protocol and conformance test required to support the interworking of devices.
- A manufacturer, a systems house, or an electrical or mechanical contractor can assemble the implementation of a building automation and control system.
- The application of the ISO 16484 series is not to standardize the hardware and software design or the architecture of a system, but to define the process for the creation of project specifications, where the functionality and the quality of the solution are clearly defined.

The ISO 16484 series is intended for use by those involved in the design, manufacture, engineering, installation, commissioning, operational maintenance and training of BACS when contracted, i.e.

- as a guideline to the terminology of the building automation and control trade. Unambiguous terminology is required for a complete and accurate conveyance of the intent and details of the ISO 16484 series;
- in product development, to avoid unnecessary duplication of function or terminology, but not necessarily placing a restraint on the evolution of new products, systems or applications;
- as a basis for interfacing products and systems. In order to interoperate, the elements of a BACS require a unified data communication protocol and information model;
- as a basis for drawing up a project specification for procurement;
- as a code of practice for expert commissioning;
- by educational establishments wishing to train people in the field of BACS.

Building automation and control systems (BACS) —

Part 1: Project specification and implementation

1 Scope

This document specifies guiding principles for project design and implementation and for the integration of other systems into the building automation and control systems (BACS).

This document specifies the phases required for the BACS project, including

- design (determination of project requirements and production of design documents including technical specifications),
- engineering (detailed function and hardware design),
- installation (installing and commissioning of the BACS), and
- completion (handover, acceptance and project finalization).

This document also specifies the requirements for as-built documentation and training.

This document is not applicable to operation and maintenance, nor is it applicable to retro or continuous commissioning, including a commissioning authority.

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/IEC 14763-2, *Information technology — Implementation and operation of customer premises cabling — Part 2: Planning and installation*

ISO 16484-2, *Building automation and control systems (BACS) — Part 2: Hardware*

ISO 16484-5, *Building automation and control systems (BACS) — Part 5: Data communication protocol*

ISO 16484-6, *Building automation and control systems (BACS) — Part 6: Data communication conformance testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16484-2, ISO 16484-5, ISO 16484-6 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
acceptance**

decision and act of signing the *handover* (3.10) document during the *completion* (3.6) phase

Note 1 to entry: The transfer of the responsibility for the system(s) from the supplier to the customer or their representative can be a legal act.

**3.2
building performance**

set of measurable building characteristics

Note 1 to entry: This includes e.g. energy efficiency, indoor air quality, moisture management and thermal comfort.

Note 2 to entry: This is also influenced by building construction and utilization, installed technical services and their operation.

**3.3
building automation and control system (BACS) commissioning
BACS commissioning**

project and system-specific process of calibrating field devices, testing data points, adjusting parameters, verifying sequences of operation and other functionalities for the various elements of a BACS application

Note 1 to entry: The BACS commissioning is a part of the *engineering* (3.7) services and includes commissioning activities at the installation phase.

Note 2 to entry: Commissioning reports are proof of the completeness of tasks and work.

Note 3 to entry: There are country variations in the naming of the term “commissioning” and variations in the tasks covered by this term.

**3.4
commissioning process**

systematic application of processes and procedures designed to ensure that the project objectives are achieved and maintained throughout the building lifetime

Note 1 to entry: The commissioning process begins at project conception and continues through to the pre-design, design, construction, start-up, turnover and occupancy to the operation phase.

Note 2 to entry: Details of how to conduct the commissioning process are outside the scope of this document.

**3.5
commissioning authority**

entity identified by the owner who leads, plans, schedules and coordinates the commissioning team to implement the *commissioning process* (3.4)

Note 1 to entry: In some countries, there are “certified commissioning authorities”.

**3.6
completion**

project phase where, when *handover* (3.10) and *finalization* (3.8) are achieved, the implementation of the building automation and control system (BACS) project can be considered as completed

**3.7
engineering**

acquiring and applying technical knowledge to design and implement devices, systems and processes that realize the desired objective

Note 1 to entry: This includes project and system-specific services for planning, configuring and commissioning of the various parts of a building automation and control system (BACS).

3.8**finalization**

task during the project *completion* (3.6) phase where the supplier resolves outstanding items

3.9**functional description**

overall description that explains how each part of the system/plant is expected to operate, interact and be interacted with

Note 1 to entry: The description covers material energy and signal flow of a plant or a system. Functions/operations are described as: storing, transmitting, converting, transforming and interlinking.

3.10**handover**

formal process that transfers a system or part of a system usage from the supplier to the customer or their representative

Note 1 to entry: The transfer of the operational responsibility for the system from the supplier to the customer can be a legal act or be agreed by contract.

3.11**installation instruction**

document that explains how to install a technical device

Note 1 to entry: There can be several installation instructions for a device, e.g. mechanical, electrical.

Note 2 to entry: Installation instructions can be found from many sources, e.g. directives, standards, guidelines, professional recommendations, manufacturer's instructions for products.

3.12**interoperability**

seamless interworking of devices and functions in a system and ability of a system to work with or use the parts or equipment of another system

Note 1 to entry: Functions may be, e.g. data sharing, event and alarm management, scheduling, trend and event logging, device and network management.

3.13**migrate**, verb

modernize the implemented software or the hardware under extensive utilization of the present infrastructure

3.14**system integration**

bringing together subsystems into one system to function together as a system

4 Abbreviated terms

For the purposes of this document, the symbols, abbreviations and acronyms given in ISO 16484-2, ISO 16484-5, ISO 16484-6 and the following apply.

BACS	building automation and control system
EMC	electromagnetic compatibility
EMP	electromagnetic pulse
HVAC	heating, ventilating and air conditioning
LEMP	lightning electromagnetic pulse

UPS uninterruptible power supply

VPN virtual private network

5 Requirements and recommendations

5.1 Overview

5.1.1 General

The BACS project normally commences after the client appoints a BACS consultant or supplier.

The quality of the implementation of a BACS is dependent on the design of building systems and the specification of the commissioning process. In order to produce and maintain the required quality of building performance after the implementation has been completed, application of a commissioning process for review and improvement of commissioned values is recommended. Retro or continuous commissioning, including a commissioning authority, is not within the scope of this document.

5.1.2 Phases of the BACS project

5.1.2.1 General

[Subclause 5.1.2](#) specifies the main actions and decisions required in order to implement a project in the different phases (see [Figure 1](#)). It serves for all the parties involved in the different phases of a project. The phases of a project associated with the implementation of a BACS are as follows. For all cybersecurity measures, IEC/TS 62443-1-1 should be taken into account.

5.1.2.2 Design phase

The design phase consists of

- a) the determination of project requirements,
- b) the project planning and organization,
- c) the technical specification, and
- d) the establishment of a contract.

5.1.2.3 Engineering phase

The engineering phase consists of

- a) project planning and coordination,
- b) detailed function and hardware specification design,
- c) engineering design approval,
- d) hardware configuration,
- e) control strategy and processing functions configuration,
- f) management and operator functions configuration, and
- g) system testing.

5.1.2.4 Installation phase

The installation phase consists of

- a) installing, and
- b) BACS commissioning.

5.1.2.5 Completion phase

The completion phase consists of

- a) system demonstration,
- b) operator training,
- c) handover,
- d) acceptance,
- e) finalization, and
- f) completion decision.

5.1.3 Documentation

Work done during the engineering, installation and completion phases serves as a basis for providing as-built documentation (see [5.6](#)).

5.1.4 Training

Work done during the engineering, installation and completion phases serves as a basis for providing training (see [5.7](#)).

5.1.5 Reviewing and improving building performance

This phase has been included for completeness. It does not form part of a BACS project but, after completion, improved building performance (according to the actual use) can be achieved by the BACS if the commissioned values are reviewed and amended periodically, providing improved energy performance and reduced operating costs. This can be achieved through the commissioning process, which is not covered in this document.

5.1.6 Graphical overview

A possible sequence of the important decisions and activities in each phase is shown in [Figure 1](#). It is not prescriptive; some activities can be carried out earlier or later, depending on the project requirements, e.g. documentation and training.

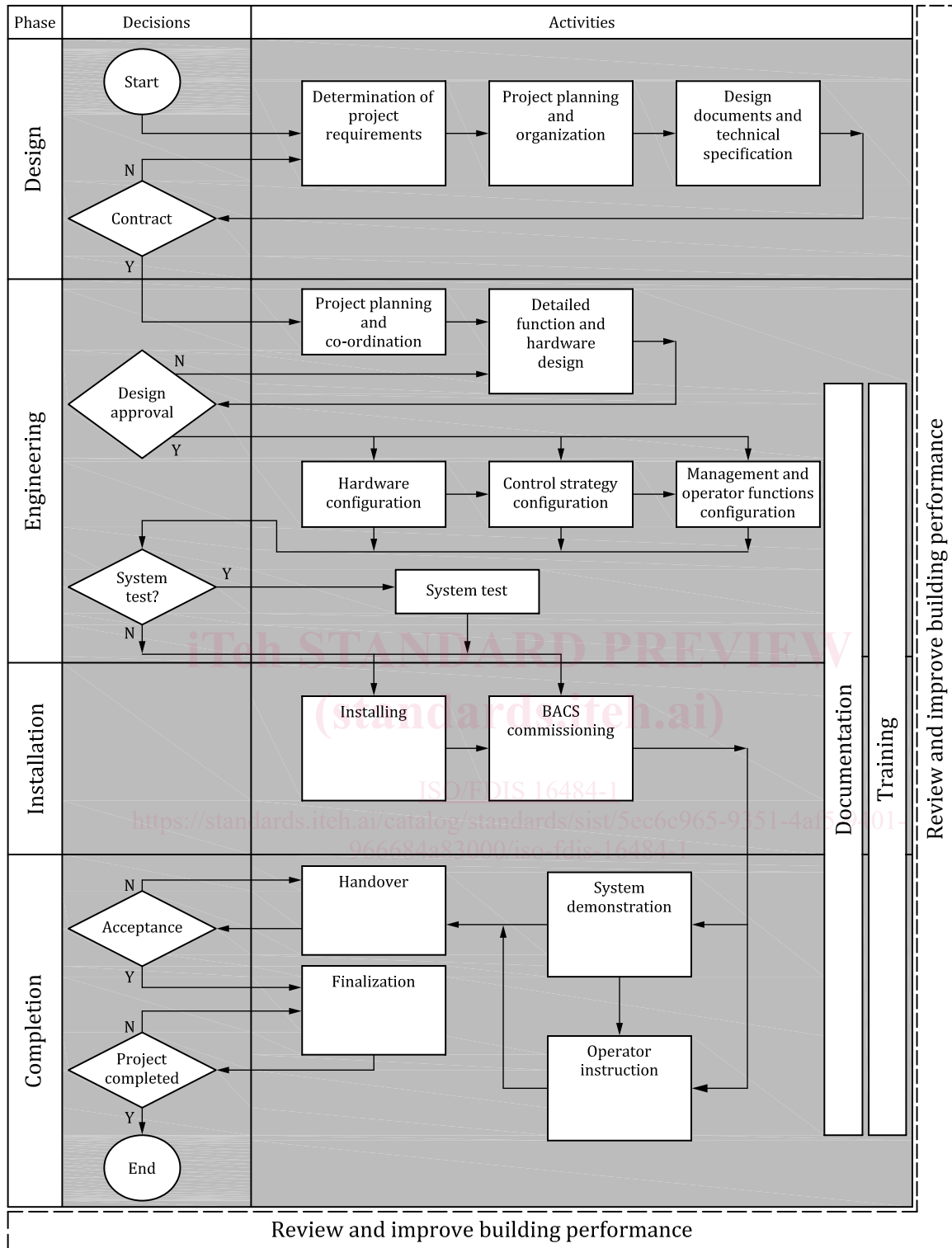


Figure 1 — Process and structure of BACS project implementation

5.2 Design phase

5.2.1 General

Subclause 5.2 specifies tasks to be carried out in the design process of the various parts of a BACS. It is assumed that at the start of the design process, the information necessary in order to accommodate a BACS is available. The tasks to perform are project and system-specific.