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Organization of information about construction works — Framework for management of project information

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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.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 22263 was prepared by Technical Committee ISO/TC 59, *Building construction*, Subcommittee SC 13, *Organization of information about construction works*.

Introduction

The aim of *quality management* has expanded from the control of final products and services to the achievement of a number of managerial objectives. It has been widened from meeting customer requirements to fulfilling an array of requirements, including legal requirements with respect to health and safety, conservation of natural resources and other societal requirements. It covers all parts of the construction process, from inception to production or demolition, as well as the final product. Furthermore, it includes fulfilling of corporate requirements on continual improvement of effectiveness, efficiency, development of know-how, personnel satisfaction, etc. Consequently, the quality concept should be seen as an "umbrella" covering all stated requirements to an organization and the products/services it delivers. "Quality management" should thus be understood as the overall management of all these requirements.

The creation, alteration or demolition of a building or other component of the constructed environment is a one-off undertaking, a project which is carried out by a *project organization.* A *project organization* is a temporary constellation of agents, e.g. client, architects, engineers, contractors, suppliers, workers, etc., who are specialists in different fields.

The *project organization* is faced with a great number of requirements from various stakeholders as to function, quality, environment, health and safety, etc. Other important factors to consider are building regulations, time and cost restraints, etc. The key function of the *project organization* is *project management*, i.e. planning, organizing, monitoring and controlling the project work so that all project requirements are fulfilled.

The members of the temporary *project organization* are a number of permanent *agent organizations* that cooperate on the basis of contractual agreements, with the joint task of producing, altering, rebuilding or demolishing a construction entity. The *agent organizations* are normally simultaneously engaged in a number of parallel projects with varying requirements.

The project activities are carried out in a *construction process*, in which input (e.g. customer needs, drawings), information and resources are transformed into output (e.g. technical solutions) to meet the project requirements. Therefore, one key function in the management of *project organizations*, as well as *agent organizations*, is the management of the different parts of the construction process. Another important function of the *project organization* is to transfer relevant information about the construction entity to other processes in its life-cycle, e.g. facility management, maintenance, use and possible later construction projects. Easy access to such information is beneficial to the performance of all these processes.

Traditional paper-based filing systems do not allow comprehensive overviews and multidimensional interlinking of information. However, today, information management by interoperability and product models offers new possibilities for integrated handling of all types of information. Standardized data-based tools for the management of project information are beneficial to all agents engaged in the construction process, and in the building life-cycle as a whole, in fulfilling their aim to achieve the required quality of the construction entity.

Organization of information about construction works — Framework for management of project information

1 Scope

This International Standard specifies a framework for the organization of project information (process-related as well as product-related) in construction projects. Its purpose is to facilitate control, exchange, retrieval and use of relevant information about the project and the construction entity. It is intended for all agents in the project organization in management of the construction process as a whole and in coordination of its sub-processes and activities.

This framework consists of a number of generic parameters that are applicable to projects of varying complexity, size and duration and is adaptable to national, local and project-specific variations of the construction process.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
acceptance criteria
evidence required for considering that requirements have been fulfilled

2.2
conformity
fulfilment of a requirement

NOTE Adapted from ISO 9000:2005, 3.6.1.

2.3
construction element
construction entity part which, in itself or in combination with other such parts, fulfils a predominant function of the construction entity

NOTE Adapted from ISO 12006-2:2001, 2.7.

2.4
construction entity
independent material construction result of significant scale serving at least one user activity or function

EXAMPLE Building, bridge, road, dam, tower, sewer, museum (if a single structure), sports field, sewage settlement tank, cycleway.

NOTE Adapted from ISO 12006-2:2001, 2.4.

2.5
document
information and its supporting medium

NOTE Adapted from ISO 9000:2005, 3.7.2.

2.6
information
meaningful data

[ISO 9000:2005, 3.7.1]

2.7
organization
group of people and facilities with an arrangement of responsibilities, authorities and relationships

NOTE Adapted from ISO 9000:2005, 3.3.1.

2.8
procedure
specified way to carry out an activity or a process

NOTE Adapted from ISO 9000:2005, 3.4.5.

2.9
process
set of interrelated or interacting activities which transforms inputs and outputs

NOTE Adapted from ISO 9000:2005, 3.4.1.

2.10
project
unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constraints of time, cost and resources

NOTE Adapted from ISO 9000:2005, 3.4.3.

2.11
quality
degree to which a set of inherent characteristics fulfils requirements

NOTE Adapted from ISO 9000:2005, 3.1.1.

2.12
record
document stating results achieved or providing evidence of activities performed

NOTE Adapted from ISO 9000:2005, 3.7.6.

2.13
requirement
need or expectation that is stated, generally implied or obligatory

NOTE 1 “Generally implied” means that it is custom or common practice for the organization, its customers and other interested parties, that the need or expectation under consideration is implied.

NOTE 2 Adapted from ISO 9000:2005, 3.1.2.

2.14
review
activity undertaken to determine the suitability, adequacy and effectiveness of the subject matter to achieve established objectives

NOTE Adapted from ISO 9000:2005, 3.8.7.

2.15
specification
document stating requirements

NOTE Adapted from ISO 9000:2005, 3.7.3.

2.16
task
set of activities normally under the responsibility of one agent

2.17
traceability
ability to trace the history, application or location of that which is under consideration

NOTE Adapted from ISO 9000:2005, 3.5.4.

2.18
validation
confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled

NOTE Adapted from ISO 9000:2005, 3.8.5.

2.19
verification
confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

NOTE Adapted from ISO 9000:2005, 3.8.4.

3 Generic requirements on management of project information

3.1 Identification of requirements

Management of the information in construction projects requires that all requirements and expectations regarding the process output be defined, reviewed and documented before project activities are started. This applies to the needs of the client, users, receivers of the process output, and other stakeholders, as well as legal requirements. Other requirements to be fulfilled are standards and trade agreements.

Management of the information requires that all requirements of the process input connected to the expectations regarding the process output be reviewed before the process activities are started to ensure that

— all applicable requirements have been identified and, when appropriate and possible, documented,

— all indistinct or contradictory requirements are identified and, when appropriate and possible, documented,

— the project has a documented ability to meet the requirements identified and documented.

Management of the information requires that acceptance criteria for the results of the control, verification and validation activities regarding the process output be established as process input to ensure that control, verifying and validation activities show that the process output conforms to the requirements.

3.2 Identification of interfaces

It is also important to determine the technical interfaces of the project and the borderlines between the agents' responsibilities.

3.3 Necessary information

When management systems are applied to the construction works and the necessary processes are identified, there are some general information issues that should be handled in all agents' commissions. They are given as follows.

a) **Orientation**: Information about prerequisites that are important to the realization of the commission, such as

- background, general objectives and user expectations, client organization,
- location, ground conditions, prerequisites of structural plans and decisions of the local authorities, environmental sensitiveness to disturbance, etc.,
- size of the project, complexity of the building/civil engineering work stating generic requirements of adjustment, generality, development potential.

b) **Contract**: Information about applicable client and suppliers' tenders and contracts, including protocols of contract reviews of requirements and expectations. These apply to customer and user needs as well as legal and trade requirements, and to the organizations' own requirements on acceptable processes and work results.

c) **Project objectives**: Information about project objectives giving all agents involved a direction for their actions in all decisions that may have an impact on the quality of the completed work.

d) **Management of activities**: Information about process control, such as

- resource plans, responsibility descriptions,
- master timetable,
- sub-timetables/sub-processes,
- requirements on material and components,
- requirements on equipment,
- procedures, job descriptions,
- information interfaces, compatibility, and
- process monitoring, meeting agendas, protocol templates, distribution lists.

e) **Design**: Information about aesthetic, technical and functional design, such as

- technical interfaces,
- references,
- brief,
- content of documents,
- technical approvals,
- cost approvals, and
- design stage approvals.

f) **Risk analysis**: Information for preventive management of critical aspects, e.g. safety and health, sustainability, etc., in

- activities,
- occurrences,
- design,
- materials,
- organization, and
- prerequisites in the surroundings

that can result in defects or risks in design and construction, and in deficiencies in delivered results.

g) **Review**: Information about reviews, such as

- identification, reporting, handling and approval of nonconformities and design changes,
- measurement of customer satisfaction,
- independent audits and corrective actions,
- review of process performance, and
- management reviews.

h) **Handling of results**: Information about how documents and digital media should be developed to fit their purpose as a ground for cooperation between the agents, to ensure that their content is adequate and correct and to ensure safe storage and easy retrieval, such as

- classification, identification of information,
- exchange of information,
- traceability,
- archive procedures,
- access to information, and
- protection of confidential documents.

Such requirements shall be identified so that appropriate procedures can be established before activities are started. It is also necessary to ensure that the agents have a documented competence and ability to fulfil all requirements on the output.

i) **Verification, validation, inspection and testing**: At appropriate stages of the process, information about monitoring, control, verification and validation activities carried out to verify that requirements have been met shall be available in accordance with the planned arrangements. This information shall identify, for each relevant control, verification and validation activity,

- what shall be reviewed,
- when the reviews shall be carried out,
- who shall carry out the reviews,
- how the reviews shall be carried out,
- how the result of the reviews shall be presented.

It is critical to ensure that there is information showing that no process output is delivered until there is evidence of it fulfilling the acceptance criteria of the process output in order to verify that the process output meets all applicable requirements.

4 Framework for organization of project information

4.1 General

This framework should be applied in data-based tools for the management of project information to facilitate access to relevant information about the project and the construction entity, and to minimize the risk of losing quality-critical information in the phasing-in and -out of different agents as the project progresses.

There are some key concepts that are of basic importance in the management of information in construction projects. These concepts are parameters that vary and have different definitions, etc. in different cultures, but in principle they occur in all construction projects.

This framework specifies some parameters which are necessary in the organization of construction project information and its interrelations: construction process (including sub-processes and activities), input and output, agents and roles, resources, supporting information, records. See Figure 1.

More detailed information is given in Annex A.

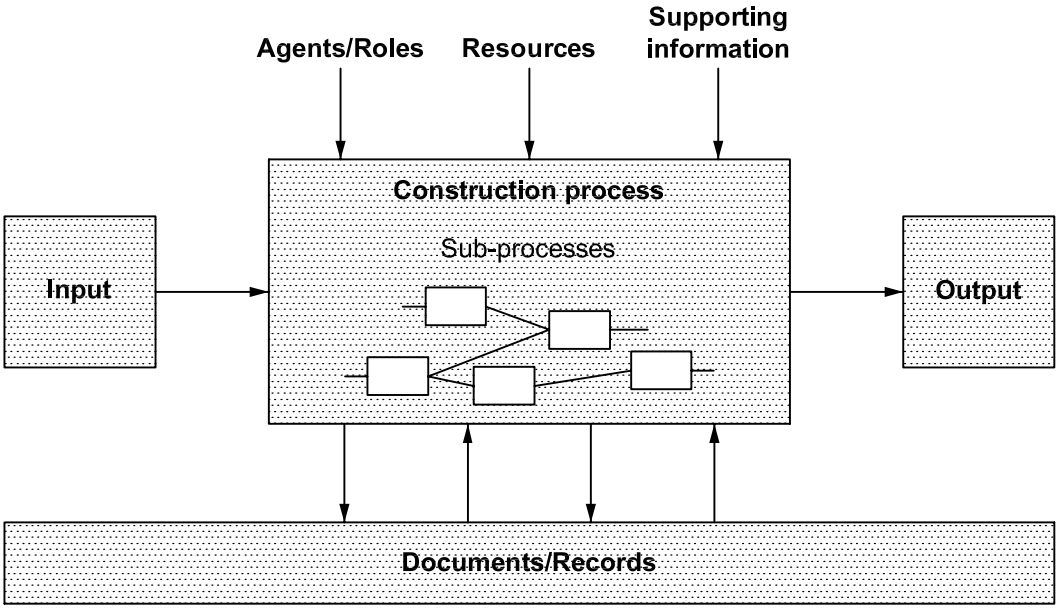

Figure 1 — Framework for the organization of project information

4.2 Construction process (main process)

4.2.1 General

The construction process is a process that normally occurs several times in the life-cycle of a construction entity, from its initiation to its termination. Each project adapts the construction process to meet specific goals within a frame of time, cost and quality.

The construction process includes many different types of activities carried out by different agents. This complexity necessitates a sub-division into sub-processes to make it more manageable.

The long-term character and complexity of the construction process has made it necessary to sub-divide the construction process into sub-processes to make it more manageable.

In this International Standard, the construction process is represented by a three-level model:

a) construction process (= main process);

b) sub-processes; and

c) activities.

4.2.2 Sub-processes

The construction process is sub-divided into sub-processes that are defined by their specific purposes and output depending on national and project-specific conditions. Normally, these sub-processes are inception, brief, design, production and demolition. The sub-processes can be merged or further divided to fit the size and complexity of the project.

Sub-processes are often related to specific phases, i.e. the chronological subdivision of the project time span. However, sub-processes are not necessarily sequential; they are often overlapping or “separated” in time, i.e. interrupted and reassumed or repeated at a later stage.

4.2.3 Activities

Each sub-process consists of a number of activities that vary depending on the complexity, size and duration of the project and on national or other variations of the construction process. It is on the activity level that the actual work is carried out and information is generated, collected and transformed. Each activity can be further sub-divided if necessary.

Like sub-processes, activities are not necessarily sequential but often overlapping or “separated” in time, e.g. interrupted and reassumed or repeated at a later stage.

An important set of activities in all sub-processes is project management that is carried out in parallel on the project level and agent organization level.

4.3 Input and output

In general, the input to a process or activity is everything that is required for its performance and for achieving its objectives. It can be drawings and specifications as well as material and components. Consequently, the output is the delivered work result that, in turn, can be the input to another process or activity.

In this framework, the input is all the project information required to carry out a process or activity successfully, e.g. plans and specifications. The input also consists of external project-specific specifications from authorities and other stakeholders.

The output, in terms of project information, determines the result of the process/activity in achieving the process objectives and the effectiveness and efficiency of the agent organization. It also determines a part of the input to other processes/activities.

Input and output for each activity should be clearly defined at an early stage of the project to ensure that they are complete, correct, adequate and applicable to the process. Any deficiency in input and output requires corrective actions.

4.4 Agents and roles

Project activities are allocated as tasks to agents. An agent is a person or a group of persons belonging to an organization that has been contracted for the project. Types and number of agents and distribution of tasks vary depending on national and project-specific conditions.

EXAMPLE 1 Financial advisor, civil engineer, sheet-metal worker.

On the project level in a construction project, the agents carry different roles depending on the tasks that they have been assigned. The roles define the interaction between the agents and the information that they handle. In some of these roles, the agent may handle information of no relevance to other roles. The role is thus a key concept in denying or allowing access to specific information in the project records.

EXAMPLE 2 Client, project manager, designer.

NOTE The term “actor” is synonymous with the term “agent”.

4.5 Resources

Activities are performed with the help of equipment, such as tools, hardware and software, machines, etc. Some of the project information relates to the resources in terms of specifications, validations, purchases, contracts, etc.

4.6 Supporting information

Supporting information is used as working tools in activities. Supporting information in itself is not part of the project information, but it is often integrated in project documents.

EXAMPLES Reference information, manuals, checklists and templates.

4.7 Documents/records

Relevant information generated in the project is collected in the project records by the agents involved in the process.

The project record normally contains a large amount of information that is difficult to overview while there is a need for quick access to specific project information in most activities. One way of achieving this is sorting and filtering the information by aspect.

4.8 Aspects

In many activities, there is a need to filter out relevant information by specific aspects. Some aspects are generic while others vary nationally or between projects. Filtering of construction information by aspect should be possible on all levels of detailing.

EXAMPLES Health and safety, environment, fire protection, site conditions, legal regulations.

4.9 Construction elements

In many activities, there is a need to filter out relevant information by construction element. It should be possible to combine this with filtering by aspect. Filtering by construction element is facilitated if the information system is linked to, or refers to, a digital product model.

EXAMPLES Slabs, windows.

5 Classification and designation

When the framework of this International Standard is applied, reference shall be made to this International Standard (ISO 22263).

Annex A
(informative)

Information on the construction process and its sub-processes

A.1 Introduction

This annex gives more detailed information on the construction process, its sub-processes and examples of activities, inputs and outputs.

A.2 Inception

A.2.1 General

Inception is the initial sub-process in which needs and prerequisites are identified, ideas are tested and feasibility preliminarily assessed.

A.2.2 Input

The input to the inception process is mainly the client's information on needs and prerequisites.

A.2.3 Activities

The inception activities consist mainly of surveys, analyses and evaluations.

EXAMPLES

— Identification of needs

— Survey of local prerequisites

— Comparative studies of alternative solutions, such as different locations, rebuilding or new building

— Financial analysis and budgeting

A.2.4 Output

The output from the inception sub-process is the basis for the client's choice of project concept.

EXAMPLES

— Market analysis

— Preliminary project plan

A.3 Brief

A.3.1 General

This sub-process determines the functional, technical, aesthetic and economical basis for the project.

A.3.2 Input

The input to the brief sub-process consists mainly of the output from the inception sub-process.

A.3.3 Activities

The brief activities consist of surveys, identification of legal, technical and functional requirements and testing of different solutions to the client's needs and other requirements.

EXAMPLES

— Consultation with authorities and users

— Survey and studies of reference projects

— Survey of neighbouring buildings and environment

— Compilation of a functional and technical brief

— Drafting of layouts

A.3.4 Output

The output from the brief sub-process is all the information that is needed for the client's decision to proceed and serves as a basis for the design sub-process.

EXAMPLES

— Minutes from consultations

— Documentation of surveys

— Brief

— Drafts

A.4 Design

A.4.1 General

The design sub-process defines the intended construction entity and its realization by drawings and specifications.

A.4.2 Input

The input to the design sub-process consists mainly of the output from the brief sub-process.

A.4.3 Activities

The design activities consist of the assessment of requirements, testing of different solutions, production of drawings and technical specifications.

EXAMPLES

— Assessment of project objectives as to aesthetics, function, technical aspects and economy

— Consultation with authorities, client, users and other stakeholders

— Review of brief

— Production and review of models, drawings and specifications

— Handling of nonconformities and defects

A.4.4 Output

The output from the design sub-process is the information that is needed for the physical production of the construction entity.

EXAMPLES

— Updated project plan

— Notes from consultations with authorities, client, users and other stakeholders

— Updated brief

— Drawings and specifications

A.5 Production

A.5.1 General

The production sub-process contains the physical realization of the construction entity, including commissioning and handover. Production can contain some demolition activities, but major demolition work should be regarded as a special sub-process in accordance with Clause A.6.

A.5.2 Input

The input to the production sub-process consists of the output from the design sub-process.

A.5.3 Activities

The production activities consist of the procurement of material, goods and construction components, and production and/or demolition of the construction entity.

NOTE In rebuilding, demolition can be an activity within the production sub-process. This is not to be confounded with final demolition, which is a sub-process in itself.

EXAMPLES

— Detailed planning of the production as to time, economy, occupational safety and health, etc.

— Procurement, handling, storing and protection of material, goods and construction components

— Production and assembling of construction elements and installations, groundwork

— Commissioning

— Inspections and tests

— Production of as-built drawings and instructions for use and maintenance

— Compilation of records for client, authorities and insurance companies

— Handover

A.5.4 Output

The output from the production sub-process is the information that is needed for the maintenance of the construction entity.

EXAMPLES

— Documentation of verifications and validations

— Minutes from final inspections

— As-built drawings, instructions for use and maintenance, and other records for client, authorities and other stakeholders

A.6 Demolition

A.6.1 General

In this context, demolition is the total removal of the construction entity.

A.6.2 Input

Input is the documentation of the existing construction entity and its surroundings.

EXAMPLES

— As-built drawings

— Specification of hidden materials

— Facilities records

A.6.3 Activities

The demolition activities consist of preparation, decommissioning, demolition and dismantling of the construction entity.

EXAMPLES

— Technical analysis of the construction

— Inspection of neighbouring buildings

— Plan for reuse and recycling

— Production of demolition drawings

— Production of dismantling drawings

— Planning, taking and reviewing of environmental measures

— Planning and closing of media, etc. (water, electricity), including preventive safety measures

— Planning and dismantling (prefabricated components), including preventive safety measures

— Planning of handling and storing of components and debris for reuse and recycling or deposit

— Inspections on site

— Compilation of records for client, authorities and insurance companies

— Restoring of site

A.6.4 Output

The output of the demolition sub-process is all the information required for the records of the client and the authorities.

EXAMPLES

— Minutes from environmental survey

— As-built ground drawings

— Minutes from final inspection

Bibliography

[1] ISO 9000:2005, *Quality management systems — Fundamentals and vocabulary*

[2] ISO 12006-2:2001, *Building construction — Organization of information about construction works — Part 2: Framework for classification of information*

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