
**Earth-moving machinery and mobile road
construction machinery — Worksite data
exchange**

**Part 1:
System architecture**

iTeh STANDARD PREVIEW
*Engins de terrassement et machines mobiles de construction de
routes — Échange de données sur le chantier*
(standards.iteh.ai)
Partie 1: Architecture du système

ISO 15143-1:2010

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

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

ISO 15143-1 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 3, *Machine characteristics, electrical and electronic systems, operation and maintenance*.

ISO 15143 consists of the following parts, under the general title *Earth-moving machinery and mobile road construction machinery — Worksite data exchange*:

— *Part 1: System architecture*

[ISO 15143-1:2010](#)

— *Part 2: Data dictionary*

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Introduction

Rapidly advancing information technology and measuring technology are being used to develop worksite information systems to support control of the finished form of work performed by machinery used in the construction industry. The introduction of such systems into construction projects, including earth-work and road construction work, has begun.

To use these worksite information systems, it must be possible for data to be easily and reliably exchanged between the machinery, measuring equipment and site information systems. When a construction project supported by a worksite information system begins, the system is introduced with specifications suited to the machine and the measuring equipment used at the project, and after this system has been used during the limited duration of the project, it is moved to another project. Therefore, an essential condition for the use of such a worksite information system is that it be possible for the system to exchange electronic data with the construction machine and measuring equipment.

In addition, the many concerned parties, which include not only site managers and machine operators, but also companies contracted to execute the work, machine owners, and project owners, must all have the measurement data, completed work data, machine control data, and so on, used and created during a project. Different information systems are also expected to be able to exchange electronic data.

Achieving data exchange using such electronic data is hampered by the fact that the names and definitions of data and data formats normally differ between worksite information systems, construction machines, and measuring equipment in use: a problem that severely obstructs the development and use of worksite information systems.

ISO 15143 is intended to resolve the above problems and guarantee the interoperability of data.

NOTE It includes the definition of data describing the real-time status of a machine in operation. These data are not intended for real time control of the machine (but such use is not prohibited).

The benefits of its use include greater freedom for product developers and users. Manufacturers of construction machinery, measuring equipment and information systems will benefit from the ability to expand the range of their customers and reduce their product development risk by designing products in compliance with ISO 15143, and to lower their costs by shortening product development periods and establishing more efficient development and maintenance systems. Without this standard it is difficult to connect equipment made by different makers for use in such information systems and system development is an extremely risky undertaking, thus making it difficult for manufacturers to begin to sell their products to users of systems made by other manufacturers. Another cause of high costs is the need to continuously employ many technicians to develop and maintain products after delivery, including the introduction of new versions.

However, application of ISO 15143 can be counted on to expand the range of customers of all makers by allowing them to develop and sell products that can be linked with systems from other companies. And the development of products that comply with ISO 15143 will achieve great cost savings by allowing each maker to sell products to many users, at the same time as it increases the efficiency of maintenance work.

It will benefit contractors by expanding the range of products that they can select and use from a single supplier to many suppliers, lowering costs and improving product quality. Systems development in the past was characterized by a general absence of competitiveness, because each user could introduce only products that satisfied the specifications of its existing system and had to continue to rely on its developer for maintenance. The application of ISO 15143 will enhance competition between makers, lowering costs and raising the level of the systems developed.

Expanding the use of information systems on worksites will permit the use of new more advanced products equipped with information technology. For manufacturers of construction machinery and measuring equipment, this will expand the market by developing new business opportunities. One example is stakeless earthwork,

the replacement of finishing stakes that indicate the targets of construction machines with support systems that use electronic data to indicate target positions to operators. Another is the development of construction machinery with automated blade control.

Owners of construction projects, including the national government, regional administrations and private sector users will enjoy the benefits of lower construction costs and higher quality. These benefits will result from greater competition, improved geometrical tolerances, increased data transfer and the precise control of finished products.

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Earth-moving machinery and mobile road construction machinery — Worksite data exchange

Part 1: System architecture

1 Scope

This part of ISO 15143 specifies system architecture for the exchange of data related to the use of earth-moving machinery, as defined in ISO 6165, and mobile road construction machinery, as defined in ISO 22242 when used for work similar to earth-moving, in worksite data-controlled construction operations. It also applies to worksite data exchange for the purpose of services related to machine use (see Clause 4) and gives definitions of terms related to worksite data exchange.

It covers only the application layer of the OSI reference model according to ISO/IEC 7498-1, and does not cover the presentation, session, transport, network, data link or physical layers of the model. Specific agreement (selection of applicable specifications, standards, etc.) relating to those layers will therefore be needed if data exchange is to be facilitated.

This part of ISO 15143 is applicable to the following construction worksite data exchanges:

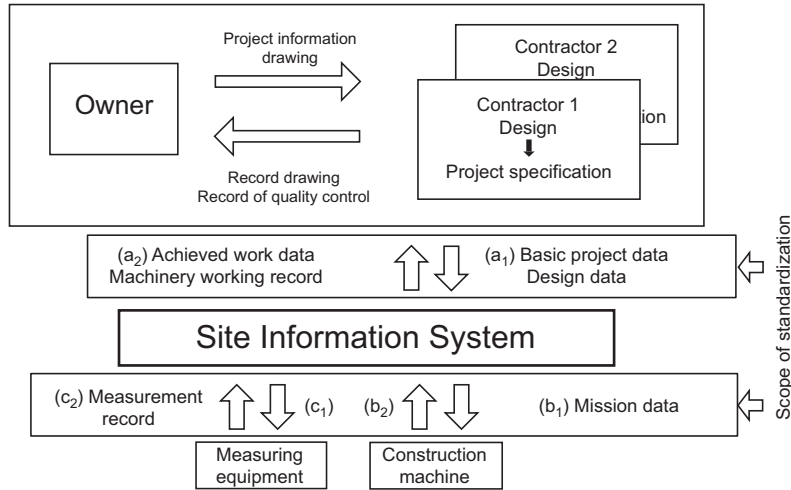
- a) information exchanged between contractor and site information system (execution phase):
<https://standards.iteh.ai/catalog/standards/sist/989637e7-bd22-4b5b-8ac2-e55911111111/iso-15143-1:2010>
- 1) information from contractor to site information system, such as basic project data, design data, operational conditions;
 - 2) information from site information system to contractor, such as achieved work data, machine working record;
- b) information exchanged between site information system and construction machine:
- 1) information from site information system to construction machine, such as mission data including target data;
 - 2) information from construction machine to site information system, such as machine working records (productivity) and machine running records (health).
- c) information exchanged between site information system and measuring equipment:
- 1) information from site information system to measuring equipment such as trigger data;
 - 2) information from measuring equipment to site information system such as measurement records including measurement data.

It is not applicable to information exchanged between project owner and contractor:

- information from project owner to contractor such as project information, drawing designed topographic data and survey data;
- information from contractor to project owner such as record drawing and record of quality control.

However, the possibility of its application to this area is not excluded.

See Figure 1.



The term *construction machine* is used here as a concept. The actual machine may contain measuring equipment and/or a data operation system. Construction machines are intended to be in the state in which they are delivered by the manufacturer.

ISO 15143 applies to open system data exchange and may be applicable to closed systems.

See Clause 4 for ISO 15143-applicable services.

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Figure 1 — Information exchange relating to worksite data exchange

2 Normative references

The following referenced documents are indispensable for the application 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 6165, *Earth-moving machinery — Basic types — Identification and terms and definitions*

ISO/IEC 7498-1, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*

ISO/IEC 11179 (all parts), *Information technology — Metadata registries (MDR)*

ISO/IEC 19501-1, *Information technology — Open Distributed Processing — Unified Modeling Language (UML) Version 1.4.2*

ISO 22242, *Road construction and road maintenance machinery and equipment — Basic types — Identification and description*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6165 and ISO 22242, and the following apply.

3.1 General terms relating to information processing

3.1.1

block transfer

process of transferring one or more blocks of data in one operation

NOTE A block transfer can be done with or without erasing data from the original location.

[ISO/IEC 2382-6]

3.1.2

collating sequence

specified arrangement resulting from collating

[ISO/IEC 2382-6]

3.1.3

configuration

manner in which the hardware and software of an information processing system are organized and interconnected

[ISO/IEC 2382-1]

3.1.4

data acquisition

process of collecting and entering data

[ISO/IEC 2382-6] <https://standards.iteh.ai/catalog/standards/sist/989637e7-bd22-4b5b-8ac2-e015608116ac/iso-15143-1-2010>

3.1.5

data collection

process of bringing data together from one or more points for use in a computer

EXAMPLE Collection of transactions generated at branch offices by a data network for use at a computer centre.

3.1.6

data communication

transfer of data among functional units according to sets of rules governing data transmission and the coordination of the exchange

[ISO/IEC 2382-9]

3.1.7

data entry

process of putting data onto a machine-readable medium

EXAMPLE Entering data to a payroll file on a flexible disk from a terminal.

[ISO/IEC 2382-6]

3.1.8

data processing

systematic performance of operations upon data

[ISO/IEC 2382-1]

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3.1.9

data processing system

one or more computers, peripheral equipment, and software that perform data processing

[ISO/IEC 2382-1]

3.1.10

functional unit

entity of hardware or software, or both, capable of accomplishing a specified purpose

[ISO/IEC 2382-1]

3.1.11

index

list of the contents of a file or of a document together with keys or references for locating the contents

[ISO/IEC 2382-6]

3.1.12

information processing

systematic performance of operations upon information that includes data processing and may include operations such as data communication and office automation

[ISO/IEC 2382-1]

3.1.13

information processing system

one or more data processing systems and devices, such as office and communication equipment, that perform information processing

[ISO/IEC 2382-1]

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3.1.14

information system

information processing system, together with associated organizational resources such as human, technical, and financial resources, that provides and distributes information

[ISO/IEC 2382-1]

3.1.15

input, adj.

pertaining to a device, process, or channel involved in an input process, or to the associated data or states

NOTE The term "input" may be used in place of "input data", "input signal" or "input process" when such a usage is clear in a given context.

[ISO/IEC 2382-6]

3.1.16

input data

data being received or to be received by any component part of a computer

[ISO/IEC 2382-6]

3.1.17

input process

process that consists of the reception of data by any component part of a computer

[ISO/IEC 2382-6]

3.1.18**input-output**, adj.**I/O**

pertaining to a device, process, or channel involved in an input process and in an output process, concurrently or not, or to their associated data or states

NOTE The term “input-output” may be used in place of “input-output data”, “input-output signals” or “input-output process” when such a usage is clear in a given context.

[ISO/IEC 2382-6]

3.1.19**interface**

shared boundary between two functional units, defined by various characteristics pertaining to the functions, physical interconnections, signal exchanges, and other characteristics of the units, as appropriate

[ISO/IEC 2382-9]

3.1.20**interoperability**

capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units

[ISO/IEC 2382-1]

3.1.21**mask**

pattern of characters that is used to control the retention or elimination of portions of another pattern of characters

[ISO/IEC 2382-6]

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3.1.22**output**, adj.

pertaining to a device, process, or channel involved in an output process, or to the associated data or states

NOTE The term “output” may be used in place of “output data”, “output signal”, “output process” when such a usage is clear in a given context.

[ISO/IEC 2382-6]

3.1.23**output data**

data being produced or to be produced by any component part of a computer

[ISO/IEC 2382-6]

3.1.24**output process**

process that consists of the production of data from any component part of a computer

[ISO/IEC 2382-6]

3.1.25**packing**

operation performed when data are packed

[ISO/IEC 2382-6]

3.1.26

process

predetermined course of events defined by its purpose or by its effect, achieved under given conditions

[ISO/IEC 2382-1]

3.1.27

protocol

set of rules that determines the behaviour of functional units in achieving communication

[ISO/IEC 2382-9]

3.1.28

clear, vb.

to cause one or more storage locations to be set in a prescribed state, usually that corresponding to zero or that corresponding to the space character

[ISO/IEC 2382-6]

3.1.29

collate, vb.

to arrange two or more sets of data into a single one according to a predetermined order

[ISO/IEC 2382-6]

3.1.30

convert, vb.

to change the representation of data from one form to another, without changing the information conveyed

[ISO/IEC 2382-6]

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EXAMPLE Code conversion, radix conversion, analogue-to-digital conversion, media conversion.

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3.1.31

copy, vb.

to read data from a source data medium, leaving the source data unchanged, and to write the same data on a destination data medium that may differ from that of the source

EXAMPLE Copying a file from a magnetic tape onto a magnetic disk.

[ISO/IEC 2382-6]

3.1.32

decode, vb.

to convert data by reversing the effect of some previous encoding

[ISO/IEC 2382-6]

3.1.33

duplicate, vb.

to copy from a source data medium to a destination data medium that has the same physical form

EXAMPLE Copying a file from a magnetic tape to another magnetic tape.

[ISO/IEC 2382-6]

3.1.34

encode, vb.

code, vb.

to convert data by the use of a code in such a manner that re-conversion to the original form is possible

[ISO/IEC 2382-6]

3.1.35**edit**, vb.

to prepare data for a later operation

NOTE Editing can include rearrangement, the addition or modification of data, the deletion of unwanted data, format control, code conversion and the application of standard processes such as zero suppression.

[ISO/IEC 2382-6]

3.1.36**extract**, vb.

to select and remove from a group of items those which meet specific criteria

[ISO/IEC 2382-6]

3.1.37**load**, vb.

to transfer data into storage device or working registers

[ISO/IEC 2382-6]

3.1.38**merge**, vb.

to combine the items of two or more sets of data that are in the same given order into one set in that order

[ISO/IEC 2382-6]

3.1.39**move**, vb.**transfer**

to send data from one storage location to another

[ISO/IEC 2382-6]

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3.1.40**pack**, vb.

to convert data to a compact form in a storage medium by taking advantage of known characteristics of the data and of the storage medium, in such a way that the original form of the data can be recovered

EXAMPLE Making use of bit or byte locations that would otherwise remain unused.

[ISO/IEC 2382-6]

3.1.41**read**, vb.

to obtain data from a storage device, from a data medium, or from another source

[ISO/IEC 2382-6]

3.1.42**sort**, vb.

to segregate items into groups according to specified criteria without necessarily ordering the items within each group

[ISO/IEC 2382-6]

3.1.43**transcribe**, vb.

to copy data from one data medium to another, converting them as necessary for acceptance by the receiving medium

[ISO/IEC 2382-6]

3.1.44

transform, vb.

to change the form of data according to specified rules, without fundamentally changing the meaning of the data

[ISO/IEC 2382-6]

3.1.45

translate, vb.

to change a portion of a program expressed in one programming language into another programming language or into some other representation suitable for execution

[ISO/IEC 2382-6]

3.1.46

transliterate, vb.

to convert data character by character

[ISO/IEC 2382-6]

3.1.47

write, vb.

to make a permanent or transient recording of data in a storage device or on a data medium

NOTE The phrases “to read to” and “to read from” are often distinguished from the phrases “to write to” and “to write from” only by the viewpoint of the description. For example, the transfer of a block of data from internal storage to external storage may be called “writing to the external storage” or “reading from the internal storage”, or both.

[ISO/IEC 2382-6]

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3.2 Terms specific to worksite data exchange

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3.2.1

agreement

mutual acknowledgement of terms and conditions under which a working relationship is conducted

[ISO/IEC 12207]

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3.2.2

clerk of works

person appointed to verify on behalf of a client that construction work is executed in accordance with drawings, specification of works and other contract documents

[ISO 6707-2]

3.2.3

client

customer

owner

person or organization that provides the plan of work, commissions the work and pays for it

[ISO 6707-2]

NOTE The term can be further qualified by the type of work undertaken, e.g. “building contractor client”, “roofing contractor customer”.

3.2.4

closed system

isolated system having no interaction with an environment

3.2.5**completion**

state of readiness for occupation of the whole works although some minor work may be outstanding

NOTE In certain contracts, the term “practical completion” is used.

[ISO 6707-2]

3.2.6**conditions of contract 1**

terms that collectively describe the rights and obligations of contracting parties and the agreed procedures for the administration of their contract

[ISO 6707-2]

3.2.7**conditions of contract 2**

document containing **conditions of contract** (3.2.6)

[ISO 6707-2]

3.2.8**construction plan**

construction plan concretely showing the basic policy for the construction work

NOTE Construction methods, construction sequences, ways of procurement, etc. are written to it.

3.2.9**contract**

legally enforceable agreement to supply goods, execute work or provide services

[ISO 6707-2]

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3.2.10**contract document**

document forming part of a contract

[ISO 6707-2]

3.2.11**contractor**

person or organization that undertakes construction work in accordance with a contract

[ISO 6707-2]

3.2.12**data set**

prioritized data element sets structured in accordance with the utilization purpose

3.2.13**drawing**

information presented in a graphical manner that may include annotations

NOTE The French term “*dessin*” is also used.

[ISO 6707-2]

3.2.14**engineer**

person who designs and/or superintends the execution of civil engineering works, building structures and services, and their maintenance

[ISO 6707-2]