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

**Part 1:
System architecture**

*Engins de terrassement et machines mobiles de construction de
routes — Échange de données sur le chantier*

Partie 1: Architecture du système



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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*
- *Part 2: Data dictionary*

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:

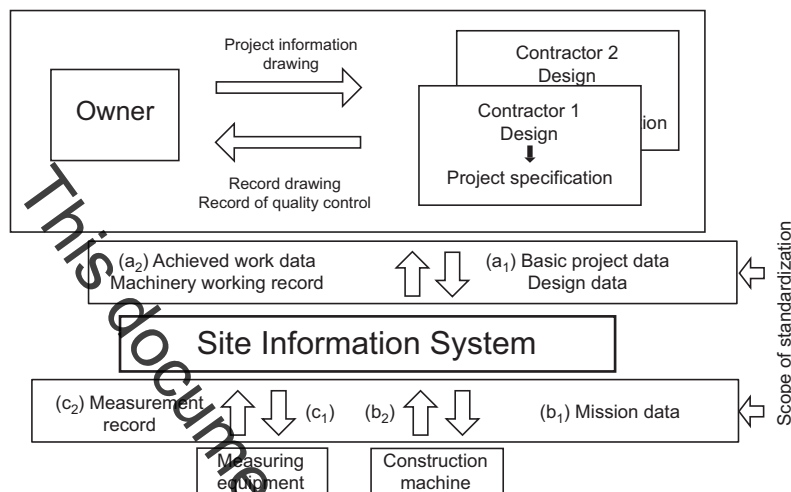
- a) information exchanged between contractor and site information system (execution phase):
 - 1) information from contractor to site information system, such as basic project data, design data, operational conditions;
 - 2) information from site information system to contractor, such as achieved work 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.

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*