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Intelligent transport systems — Freight land conveyance content identification and communication —

Part 3: Monitoring cargo condition information during transport

Systèmes intelligents de transport — Identification et communication du contenu des marchandises transportées par voie terrestre —

Partie 3: Suivi des informations sur l'état de la cargaison durant le transport

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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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 204, *Intelligent transport systems*.

A list of all parts in the ISO 26683 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

This document establishes requirements for the transport and condition monitoring of agri-food and perishable goods through the applications, models, processes, and information bundles established in ISO/IEC 19845. It also focuses on both domestic and cross-border consignments and is mainly concerned with reliability, safety, and freshness of those goods as they move through the supply chain. Whenever the term “this document” is used, the reference is to ISO 26683-3.

The methods described in ISO/TS 24533 and ISO/TS 17187 are included by reference. Both Technical Specifications are being revised to international standard status, to be balloted in 2019.

Agri-food and perishable goods has seen the ratio of rejection at custom inspection increasing recently. In the case of US imported seafood inspection, where they inspected 1 % of the imported seafood, the rejection rate was up to 51 %. The reasons for rejection were disease and insect pest detection, residual chemicals exceeding acceptable limits, or heavy metal content exceeding permissible levels. In some countries, up to 60 % of agricultural and fisheries goods in transport have to be discarded, lost or wasted. Additionally, mislabelling of raw materials is possible and can cause health problems.

For safety and freshness, end users (consumers) want to have a comprehensive record of the consignment's status and its transportation history, both for the origin of raw material as well as the final product. Consumers and regulators want to know whether or not the original produce or its final product may still have other types of contamination or degradation. A transport information model and related business processes are needed to provide a foundation to track transport activities.

The transport information model prescribed in this document is focused on the movement of goods by service provider by air, sea, road, and railway. The expectation is that the movement and storage of agri-food and perishable goods can be checked for cargo status and condition at any point on its path to its end destination.

Therefore, additional features are necessary to ensure reliable food product and transparency on transport processes between transportation events (or transport nodes). Based upon the ISO/IEC 19845 library of documents (messages) and information elements, this document establishes an enhanced model containing status information for transporting and storing agricultural food and perishable goods, including historical information and transaction information.

The basis for this document has its foundation in ISO/IEC 19845:2015, ISO/TS 24533, ISO/TS 17187 and ISO 15638-17.

Intelligent transport systems — Freight land conveyance content identification and communication —

Part 3: Monitoring cargo condition information during transport

1 Scope

This document establishes requirements for transport and condition monitoring of transported consignments such as agri-food and perishable goods, through applications, models, processes, and information bundles. This document applies to both domestic and cross-border transport of transported consignments, and incorporates the methods described in ISO/IEC 19845, ISO/TS 24533 and ISO/TS 17187 which are transport domain specific, as discussed in the Introduction. Specific extensions include additional actors in the model related to, in particular, the agriculture transport sub-domain, with extended specific processes, and additional information items and/or information bundles for consignment conditions.

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 19845:2015, *Information technology — Universal business language version 2.1 (UBL v2.1)*

3 Terms and definitions

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

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

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

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

3.1
agri-food business
business of producing food agriculturally

3.2
agroterrorism
agriterrorism
malicious attempt to disrupt or destroy the agricultural industry and/or food supply system of a population through the malicious use of plant or animal pathogens to cause devastating disease in the agricultural sectors

3.3
business area
category of decomposable business areas or *process areas* (3.17) (on the lowest level of a business area hierarchy)

Note 1 to entry: This means that a business area collates either other business areas, process areas, or business process use cases

3.4
business entity
business significance that is shared amongst two or more business partner types in a collaborative business process, e.g. product, order, account

[SOURCE: Business Requirements Specifications (BRS) — Documentation Template V2.0.1 — May 2012]

3.5
business process
collection of related, structured activities or tasks that serves a particular business goal

Note 1 to entry: Complex business processes may involve many participants and can be made up of other business processes. The simplest business process involving two participants is known as a business transaction.

[SOURCE: Business Requirements Specifications (BRS) — Documentation Template V2.0.1 — May 2012]

3.6
carrier
public or privately-owned firm or corporation that transports the goods of others over land, sea, or through the air, for a stated freight rate

Note 1 to entry: By government regulation, a common carrier is required to carry all goods offered if accommodations are available and the established rate is paid.

[SOURCE: Exel Glossary International Freight Terms]

3.7
cold chain
temperature-controlled supply chain

Note 1 to entry: An uninterrupted series of storage and distribution activities which maintain a given temperature range. It is used to help extend and ensure the shelf life of products such as fresh agricultural produce, seafood, frozen food, photographic film, chemicals, and pharmaceutical drugs.

3.8
export consignor
person who consigns goods himself or to another party in a bill of lading or equivalent document

Note 1 to entry: A consignor can be the owner of the goods, or a *freight forwarder* (3.9)who consigns goods on behalf of his principal as presented in ISO/IEC 19845:2015 (reformatted).

3.9
freight forwarder
arrangement of transport of goods on behalf of either the seller or buyer

Note 1 to entry: In many cases the freight forwarder will also consolidate several small shipments into one larger one to take advantage of better freight rates. In most cases the freight forwarder will assume the legal liabilities of acting as a carrier.

[SOURCE: Glossary of International Shipping Terms]

3.10
import consignee
person bringing overseas cargo to a country through a contract with transporters, e.g. shipping companies, forwarders

Note 1 to entry: See *export consignor* (3.8).

3.11
information model
abstract, formal representation of many kinds of real-world objects, e.g. business documents, orders, transportation mechanisms, e.g. trucks, containers, ship bays, and/or abstract objects, e.g. for the entities used in a billing system

Note 1 to entry: The objects have a name, properties and relationships to other objects. An information model provides a means to describe the information in a domain of interest without constraining how that description is mapped to an actual implementation in software.

[SOURCE: Business Requirements Specifications (BRS) — Documentation Template V2.0.1 — May 2012]

3.12
inspection service provider
person who does counting and status checking against cargo when cargos are loaded to or unloaded from transport means

3.13
inspection and quarantine agency
organization that brings overseas cargo to a country through a contract with transporters, e.g. shipping companies, forwarders

3.14
loading/unloading company
company that conducts loading or unloading of cargos on behalf of importers, exporters and shipping companies

3.15
logistics point
particular space established as a basic facility for transport

Note 1 to entry: Logistics can be classified into transport route, end point and point; logistics points are points and include terminal, ICD and bonded warehouse.

3.16
perishable goods
goods such as food products that must be used within a short period of time

3.17
process area
category of common business process use cases

[SOURCE: Business Requirements Specifications (BRS) — Documentation Template V2.0.1 — May 2012]

3.18
producer
person, company, or country that makes, grows, or supplies goods or commodities for sale

3.19
service repository
person or organization making the information regarding the web service available to any potential requester

Note 1 to entry: Whoever implements the broker decides the scope of the broker. Public brokers are widely available, but private brokers are only available in limited amounts to the public.

3.20
shed
place for temporary storage of cargo including terminal and bonded warehouses

3.21
shipping agent
independent person or corporation acting as a representative, usually in a foreign market, who attempts to sell products for an overseas seller (principal) and earns a commission on successful sales

Note 1 to entry: Agents are not normally involved in delivery or servicing of product.

3.22
shipping company
company that regularly runs ships between ports and provides shipping services for cargo transport in return for fees

3.23
transport service provider
carrier (3.6) (domestic or cross-border)

3.24
transport service user
producer, consignor, consignee, warehouse, terminal, CFS/CY, *inspection service provider* (3.12), manufacturers or another individual or legal entity making use of services (works) provided (performed) by transport enterprises

4 Abbreviated terms

BC	Business Collaboration
BP	Business Process
BT	Business Transaction
CFS	Container Freight Station
CY	Container Yard
EA	Enterprise Architecture
HTTP	Hyper Text Transport Protocol
IEC	International Electrotechnical Committee
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
IT	Information Technology
SMTP	Simple Mail Transport Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
UML	Unified Modelling Language
WEB	World Wide Web
XML	Extensible Markup Language

5 General requirements

5.1 Supply chain scenario

Figure 1 shows cargo movements transported by domestic carriers and includes cross-border. These carriers deliver consignments from producer (farmer or fisheries) or manufacturer to customer side through a logistics base in the global supply chain. The boundary of this document encompasses from producer or manufacturer through customer, origin to destination.

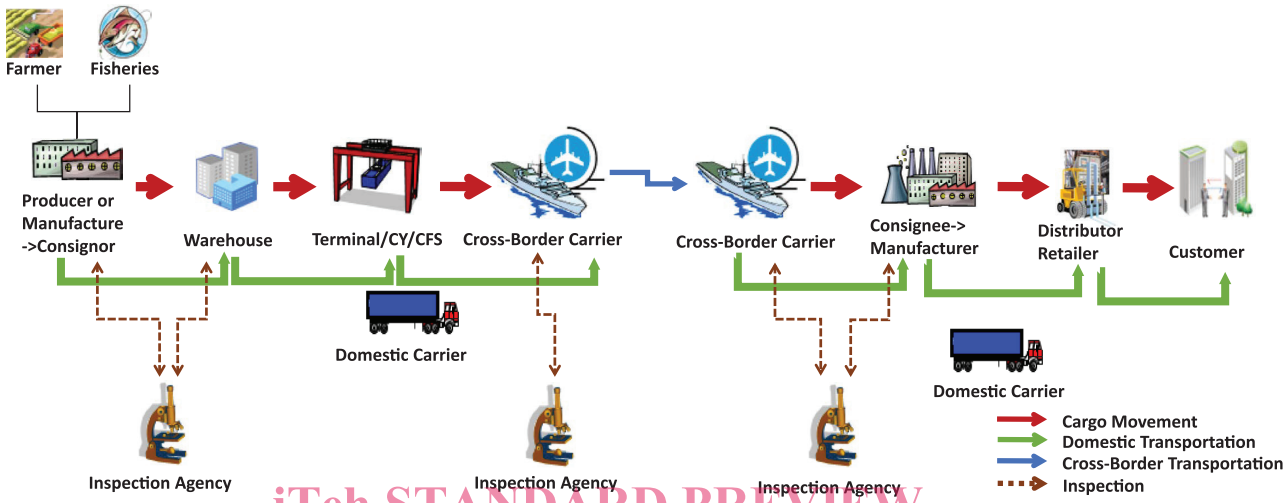

Figure 1 — Cargo movement from producer to customer in supply chain

This transport information will be shared among the relevant participating business entities (e.g. inspection service provider). Sharing information such as agricultural certificate of origin, agricultural goods and status, and integrity of produce (regarding agricultural chemicals or radioactive material) will improve visibility and reliability of the goods transported (regarding contained or non-contained goods). In contrast to packaged goods, agriculture and perishable goods are transported through non-standardized package units from consignor to consignee, and freshness and safety for agriculture goods is the most important factor regarding transportation. At food manufacturing industries, a company has to produce food products using raw agriculture material, e.g. corn or salmon. Consumers want to know detailed information about the raw material or product, whether or not residual agriculture chemicals or radioactive matter, which can remain in agriculture goods, was found in agriculture products or perishable food products, or are exceeding the acceptable limits. Once a standard is established, the global trade in food products will be enhanced and the logistics service such as cold-chain transportation will have increased value.

A cold chain is a temperature-controlled supply chain. An unbroken cold chain is an uninterrupted series of storage and distribution activities which maintain a given temperature range. It is used to help extend and ensure the shelf life of products such as fresh agricultural produce, seafood, frozen food, photographic film, chemicals, and pharmaceutical drugs.

In order to use information across internal systems, and to integrate with systems deployed by trading partners, that information needs to be semantically coherent and in a format that is recognizable and usable by all parties. The policy for operating under these rules is that all business entities wishing to engage with other business partners to facilitate electronic trade using the tools described herein shall follow certain standards of practice for information interchange. This document is envisioned to be the core standard for interoperability for all enterprises wishing to benefit from the resulting efficiencies as a member user. It includes transport data to satisfy the requirements of both businesses and governmental organizations.

This document does not constrain the requirements of customs, regulatory, and safety bodies at border crossings but does include the data elements likely to be required by customs authorities, agriculture organizations, and other involved organizations.

This document is focused on transport of agriculture products as well as other products, and it is not intended to be confused with standards related to agriculture standards set by other standards organizations for regulation of food products. This document only focuses on the monitoring of cargo conditions of the safeness, freshness and reliability of the agri-food and perishable goods in transport.

5.2 Architectural framework

One of the first requirements for building a system to monitor cargo conditions and associated information during transport is to establish an architectural framework. The purpose of this framework is to provide an overall view of the elements that can be employed to evaluate the condition of the agri-food and perishable goods transported from origin to destination.

The requirements of the framework for monitoring cargo conditions is illustrated in Table 1, below.

There needs to be business and technological integration across the entire chain of events. Much of this can be helped through an enterprise approach to the architecture. Additionally, there needs to be horizontal and vertical integration to allow all parties access to the common information that will ensure the goods get to market in the expected condition, free of infestation and in an acceptable state of freshness.

The architecture needs to have a flexible structure and allow for integration into legacy systems, without disruption to those systems other than interface linkages.

The architecture needs to adhere to intelligent transportation systems models and be receptive to current architecture examples of big data and cloud technology to help keep the system viable for future adaptation.

The system will need the capability to be easily evaluated for performance. This will require key performance measures/indicators for determining the effectiveness of the condition monitoring system and will need the capability to adjust where needed to modify system components.

The performance indicators will also assist with monitoring and risk management indicators. Risks, such as tainted agri-foods and perishable goods passing inspections will need to be evaluated from a system perspective as well as from a human perspective.

Table 1 — The requirements of framework for monitoring cargo condition information during transport

Requirements of architecture framework		Details of activities on design
Business and technological integration across the entire chain	— Functional partitioning of a system into its constituent subsystem components — Specification of system-component and component-component relationships — Specification of component interfaces — Definition of Enterprise Information Infrastructure models	— Develops Common infrastructure (architecture framework) — Horizontal integration through value networks — End-to-end digital integration of engineering — Vertical integration and networked manufacturing systems — Communicate between human, machines, and resources — Conceptual/information models of important information entities specified at transportation of the supply chain
Flexible structure	— Specification of the business process at the inter-enterprise (e.g., supply chain), enterprise	— Dynamic business and engineering process — Ad-hoc networking - dynamic configuration — Easily application integration
Knowledge-based intelligent system	— Definition of mechanisms for data collection, data exchange, and data archiving — Definition of mechanisms for defining the context of, storing, accessing, and exchanging the results of analyses about the makeup, capabilities, and/or operation of the manufacturing enterprise	— Provides the optimized decision-making — Through simulation or data analytics (using big data, cloud technology) — Reduce unnecessary costs by simulation
Performance Assessment	— Definition of the properties of and interrelationships between enterprise resources to enable enterprise resource management	— Resource management — Sustainability: energy efficiency — Develops Key Performance Indicators
Rule-based Risk Management		— Problem detect and alerting — Auto detecting and Monitoring — Build risk repository: categorize error (problems, faults) and the reason

In principle, the architecture framework should be independent of the hardware system, scalable in its structure, and, to the extent possible, reusable. It must also define all the necessary business processes and low-level functions as simple service components. These components are stored in a service repository. They can be used as is or composed (assembled) into more complex services as needed. Users and other organizations can access this repository using standard communication protocols such as TCP/IP, HTTP, WEB Service, and SMTP. The set of services needed to process that data, and the sequence in which they are executed, are determined by additional external logic typically written in Java or any other object-oriented language. More discussion is provided on the definition of enterprise architecture in Annex A.

Figure 2 shows an architecture framework that can be helpful in the implementation of this document. The first column shows the key categories for the architecture. These include Business Processes, Data Analysis, Resource Data and Communications Infrastructure.