
**Transport Information and Control
Systems (TICS) — General fleet
management and commercial freight
operations — Data dictionary and
message sets for electronic identification
and monitoring of hazardous
materials/dangerous goods
transportation**

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*Systèmes de commande et d'information des transports (TICS) —
Gestion générale de la flotte et opérations commerciales de fret —
Dictionnaire de données et jeux de messages pour l'identification
électronique et la surveillance du transport des marchandises à
risque/matières dangereuses*



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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 17687 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

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Introduction

This International Standard supports the automated identification, monitoring and exchange of emergency response information regarding dangerous goods carried on board road transport vehicles. Such information may include the identification, quantity and current condition (such as pressure and temperature) of such goods, as well as any relevant emergency response information. Reporting this information may occur prior to or during transportation of the goods in a manner that allows all interested parties to access and interpret the information correctly. When equipped with appropriate electronics and communications capabilities, vehicles carrying dangerous goods may respond to queries regarding their status or self-initiate a message.

This International Standard does not specify nor even imply that any particular on-board or off-board systems should be capable of performing such monitoring, data retention or communications. However, where such capability does exist, then this International Standard does apply. This International Standard does not intend to affect any country's laws and regulations regarding dangerous goods transportation, but offers means to electronically support emergency response practices by providing a standard for electronic identification and monitoring messages.

The provisions of this International Standard cover four contextual situations:

- a) general requirements;
- b) on-board systems;
- c) roadside recipient to emergency control centres;
- d) emergency control centres to emergency control centres.

It is intended that the information defined here be carried on board the transport vehicle and may then be transferred to interested roadside systems by whatever communications means are appropriate to that roadside system.

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Transport Information and Control Systems (TICS) — General fleet management and commercial freight operations — Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation

1 Scope

This International Standard supports the application of automated identification, monitoring and exchange of emergency response information regarding dangerous goods carried on board road transport vehicles. Such information may include the identification, quantity and current condition (such as pressure and temperature) of such goods, as well as any relevant emergency response information. When equipped with appropriate electronics and communications capabilities, vehicles carrying dangerous goods may respond to queries regarding their status or self-initiate a message.

The information defined here, electronically carried on board the road transport vehicle, may be transferred to interested roadside systems by whatever communications means are appropriate to that roadside system. The primary intent of this International Standard is not trade, economic or commercial, but to help save lives by facilitating emergency response. This International Standard supports local on-site needs in the same manner as conventional visual placards do, but with an optional, complementary, enhanced and more versatile electronic version.

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.

The reader is advised to pay careful attention to 5.5, "Important implementation recommendation".

ISO/IEC 8824 (all parts), *Information technology — Abstract Syntax Notation One (ASN.1)*

ISO/IEC 8825 (all parts), *Information technology — ASN.1 encoding rules*

ISO 14817, *Transport information and control systems — Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries*

IEEE 1512.3, *IEEE Standard for free hazardous material incident management message sets for use by emergency management centers*

NFPA 704, *Identification of the Free Hazards of Materials for Emergency Response*

SAE J2313, *On-board land vehicle mayday reporting interface*

SAE 2540.ITIS, *ITIS phrases list*

3 Terms and definitions

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

3.1

address

data element designating the originating source or destination of data being transmitted

3.2

automatic equipment identification

AEI

process of identifying equipment or entities that uses the surface transportation infrastructures by means of on-board equipments (OBEs) combined with the unambiguous data structure defined in this International Standard

NOTE Within this series of standards, “equipment” indicates large equipment that is carried in, or forms an integral part of, a trailer or trailer mounted unit.

3.3

air interface

conductor-free medium between an OBE and the reader/interrogator through which the linking of the OBE to the reader/interrogator is achieved by means of electro-magnetic signals

3.4

ASN.1

abstract syntax notation (number) one, as defined in ISO 8824 and ISO 8825

3.5

automatic vehicle identification

AVI

process of identifying vehicles using OBE, a subset of AEI

3.6

compatibility

ability of two or more items or components of equipment or material to exist and/or function in the same system or environment without modification, adaptation or mutual interference

3.7

container

receptacle for the transport of goods, especially one readily transferable from one form of transport to another

3.8

consignee

receiver

party to which goods are consigned

3.9

consignment

separately identifiable amount of goods items available to be transported from one consignor to one consignee via one or more modes of transport and specified in one single transport document

3.10

dedicated short-range communication

means of effecting local (short-range) transactions between fixed equipment and OBE(s) using an “air interface” comprising inductive or propagated signals between the fixed equipment and OBE(s)

3.11

diamond ratings

(slang, see NFPA 704)

3.12**goods provider**

party that provides the goods for transport

NOTE Transportation documents carry more precise terms such as consignor, shipper and sender, which are defined as, "party which, by contract with a carrier, consigns or sends goods with the carrier or has them conveyed by him".

3.13**hazardous materials identification system****HMIS**

North American product labelling system developed by the national paint and coatings association (NPCA) and similar in many respects to the NFPA 704 system

NOTE HMIS labels always appear as a rectangle-shaped block of four colour bars with a blue "health" bar on top, a red "flammability" bar below that, followed by a yellow "reactivity" bar and a white "PPE" bar. At times there may be additional space on the label for other information, including product name, supplemental warnings, manufacturer information or additional information. HMIS is touted by its owner as "designed to aid employers and their employees in day-to-day compliance with OSHA's hazard communication standard." The rating criteria used for categories of flammability and reactivity is identical to that used by NFPA 704. The ratings in the health category differ as HMIS is also concerned with chronic as well as acute health hazards. The presence of an asterisk indicates a chronic health hazard. Recently, the label was redesigned to give the asterisk a box of its own on the label. In older labels (which are expected to be prevalent for many years), the mark is combined with the numerical rating value.

3.14**item**

item of goods to be moved

NOTE An item may be a single unit, such as a letter, a bundle or box of units or other units that will be bundled into a receptacle which will be carried in equipment (such as an ISO intermodal container) as a subcomponent of an AEI item. Items are not defined in this family of standards and are defined by the standards of ISO/IEC Subcommittee SC 31, *Automatic identification and data capture techniques*.

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3.15**international traveller information systems****ITIS**

term commonly associated with the standard for incident phrases developed by the SAE ITIS committee in conjunction with ITE TMDD and other standards

NOTE This work contains a wide variety of standard phrases to describe incidents and is expected to be used throughout the ITS industry. The codes found there can be used for sorting and classifying types of incident events, as well as creating uniform human-readable phrases. In the capacity of classifying incident types, ITIS phrases are recommended for use in many areas. ITIS phrases can also be freely mixed with text and used to describe many incidents.

3.16**journey**

physical movement of goods from the goods provider to the receiver

3.17**load**

that which is to be transported from the goods provider to the receiver

NOTE A load comprises the dangerous goods, packages, pallets and/or containers.

3.18**load unit**

package

container

cargo transportation unit which may be loaded on a transport means

**3.19
manifest**

document/message specifying the contents of particular freight containers or other transport units, prepared by the party responsible for their loading into the container or unit

**3.20
NFPA 704**

as used in this International Standard, referring to the four-diamond legend found on buildings and objects, which reflects the hazard degree of the contents.

NOTE Properly called NFPA (National Fire Protection Association) diamonds and based on the 704 standard developed by the NFPA, these symbols are used to provide a gross indication of flammability, instability and other data. They are similar in intent to the class-divisions numbering found on dangerous goods placards and labels. The four sections contain ratings (ranging from one to four with four as the most severe) as follows:

- The upper triangle (red) is the fire hazard and flash point rating.
- The left triangle (blue) is the health hazard rating.
- The right triangle (yellow) is the reactivity rating.
- The lower triangle (white) is used to reflect any specific hazard indication.

**3.21
NFPA diamond**
see NFPA 704

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**3.22
on-board equipment
OBE**

device on board or attached to the vehicle/equipment to perform the functionality of AVI/AEI

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**3.23
package**

load unit
container
discrete individual containers which may be accumulated in a larger package

**3.24
packed encoding rules
PER**

standardized determination of data encoding to conform to the requirements of ISO 8824 ASN.1 data notation.

NOTE 1 The packed encoding rules are given in ISO 8825.

NOTE 2 There are alternate forms of encoding, such as basic encoding rules (BER). Within ITS standards, reference to ASN.1 also implies the use of packed encoding rules as specified in ISO 8825.

**3.25
pallet**

wooden, plastic or metal platform that enables a bundle of goods to be moved around by a fork-lift truck or similar platform-moving device that will be carried in equipment (such as an ISO intermodal container) as a subcomponent of an AEI item

NOTE Pallets may be referred to but are not defined in this family of standards; they are defined by the standards of ISO/IEC Subcommittee SC 31, *Automatic identification and data capture techniques*.

3.26**placards**

graphic warning devices designed to give the hazard class or division of the dangerous goods carried in a vehicle or railroad car

NOTE There are different placards for each class or division. Placards are colour coded and are at least 10,8 in (273 mm) on a side and must be displayed on all four sides of the vehicle. Placards display the hazard class number in the bottom corner. Some vehicles are required to display more than one placard; some will display three or more.

3.27**reader**

device that communicates with the OBE to read or write the information defined in this International Standard

NOTE The reader may then add time and location or other data and transfer the data to an application manager, which may reside at another location, such as an emergency control centre.

3.28**receptacle**

single unit, or a carrier of items and of smaller packets and items

NOTE A receptacle will normally take the form of a bag, box or roller cage that will be carried in equipment (such as an ISO intermodal container) as a subcomponent of an AEI item. Packets are not defined in this family of standards and are defined by the standards of ISO/IEC Subcommittee SC 31, *Automatic identification and data capture techniques*.

3.29**transport**

within the context of AVI and DG, the vehicles used to move a consignment from the goods provider to the receiver or returnables back through the system

3.30**transport documentation**

shipping papers
shipping documents
legal and commercial documents that accompany the transport means during a journey

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3.31**transport means**

vehicle used for the transport of goods, e.g. a vessel, train, aeroplane or road vehicle

NOTE These include vehicles, trailers, vessels, aircraft, or combination thereof, to perform the journey to deliver the consignment to the receiver or return returnables, together with the driver/pilot/crew physically conducting the journey.

3.32**transport unit**

combination of the load, transport means and transport documentation

NOTE This includes the modes of transport as well as the containment or storage systems used for the dangerous goods. A transport unit is an item that is separately identified. A transport unit may include or contain other transport units, examples being a road vehicle as a transport unit and multiple pallets loaded onto the road vehicle, each pallet being its own transport unit.

3.33**user**

vehicle/equipment or person carrying the OBE through the point of identification with the objective of unambiguous identification of the OBE being carried

3.34**workplace hazardous materials information system****WHMIS**

Canadian government regulation equivalent to the OSHA standard hazard communication standard (HCS) in the United States

NOTE In many ways, the WHMIS system of labelling is similar to the HMIS system and may be found as a set of labels and markings on goods being transported. Neither WHMIS nor HMIS is a substitute for proper shipping placards, labels and markings. Thanks to international harmonization, WHMIS is expected to be implemented worldwide by 2008.

4 Symbols and abbreviated terms

AEI	automatic equipment identification
AVI	automated vehicle identification
ASN.1	abstract syntax notation one
ATIS	advanced traveller information systems
BS	base standard
CAD	computer-aided dispatcher
CFR	code of federal regulations
COFC	container on flat car
DE	data element
DF	data frame
DG	dangerous goods
DOT	department of transportation
DSRC	dedicated short-range communication
ERG	emergency response guidebook
HMIS	hazardous materials identification system
ID	identification
IEC	International Electrotechnical Commission
IDX	incident description
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
NA	North America
NFPA	National Fire Protection Association (US)
NPCA	National Paint and Coating Association (US)
OBE	on-board equipment
OSHA	Occupational Safety and Health Administration (USA)
PPE	personal protective equipment
PSN	proper shipping name
RTTT	road transport telematics and telecommunications
RDS	radio data system
SAE	Society of Automotive Engineers
TICS	transport information and control systems
TMDD	transportation management data dictionary
TOFC	trailer on flat car
UN	United Nations
WHMIS	workplace hazardous materials information system (Canadian term)
XML	eXtensible markup language

5 Context

5.1 General context

This International Standard does not support any international freight trade documentation but does support emergency response information to be sent from a road transport vehicle to the roadside or to a centre. The original source of freight information, whether electronic or paper based, is referred to as manifest in this document. Depending on availability and origin, this might be a production plant document, a shipping manifest, a container manifest, a cargo manifest, a bill of lading, etc. These terms are used synonymously in this International Standard.

The definitions used in this International Standard are those commonly used in emergency response documentation in road transport at the time of writing this International Standard. The freight trade has since developed some more detailed, precise and multimodal definitions to be used in electronic trade documentation, namely the ISO 7372 published by CEFACT/United Nations. These directories define data elements and messages related to freight transportation, including dangerous goods, which are finding their way into commercial freight operations for most modes of transport. Other efforts include the so-called Core Component Technical Specifications (CCTS 2.01) being developed within the ebXML framework by CEFACT/United Nations.

When this International Standard is due for review in three to five years, serious efforts will be undertaken to update and harmonize the definitions with those that will have become of common use in the road mode. The primary intent of this International Standard is not economic or commercial, but to help save lives by facilitating emergency response. This International Standard supports local on-site needs in the same manner as conventional visual placards but with an optional, complementary, enhanced and more versatile electronic version.

The information contained in an electronic identification and monitoring system and the use of this information includes that provided by the traditional "Dangerous Goods" (DG) visual placards, but can be expanded to include additional information and thus also to expand the uses of this information over time. Implementation of this International Standard does not replace or eliminate the existing placards, nor does it replace any existing standard. The following levels of identification and monitoring systems are possible:

- 1) direct supplement to existing product identification placards (which are visually oriented, non-electronic);
- 2) added data beyond that contained in existing placards;
- 3) interface with on-board systems;
- 4) intelligence to react to product or goods conditions.

With a suitable communications interface, it is possible to transmit the information to and between remote sites such as emergency service systems and centres. This information transfer may occur during normal operations or in emergency modes of operation.

This International Standard deals with the on-board information, not the media used for transmitting the information. However, every mobile communication requires system-dependent variables, such as a time stamp and a location stamp. Successive communications help determine additional information, such as vehicle/cargo direction, speed, etc. Location parameters are functions of the location technology used. Whether it is a reference to the fixed roadside equipment location, GPS or other, this International Standard does not define either the location technology to use or its parameters. The time stamp is automatically generated by the operating system and is normally captured as part of any communication. Therefore, neither variable is otherwise addressed in this International Standard. Time related to information, such as cargo data entry, is usually in generalized time. Sensor data as in-time stamp of when this data was last updated is an ASN.1 data type standard and is generally an optional entry in this International Standard.

Using this information, the classes of services in Table 1 may be provided in either normal or emergency modes of operation to control dangerous goods.

Table 1 — Classes of services

Services	Remarks
1. Gathering information on vehicle conditions when carrying dangerous goods. Such information may be obtained from on-board sensors.	Monitoring or tracking the dangerous goods in normal operations. Multiple tracking levels may be used.
2. Gathering information on dangerous goods load status in real time under emergency conditions.	During an emergency, the information must be obtainable automatically or on request during the event. In non-emergency situations, such capability is optional.
3. Contact emergency response authorities.	In case of emergency, appropriate authorities would be contacted automatically.

The overall concept is shown in Figure 1. This International Standard applies to the elements identified as “Data Dictionary and Message Sets”, which exist within the communications links between the various sources and users of the dangerous goods information. This illustration is not restrictive in any way; it is intended to reflect the potential uses for the information that will be available.

In order to facilitate the deployment of on-board compatible equipment (usually installed by the goods carrier) using this International Standard, it is important to maintain compatibility with emergency response application standards (usually deployed by the authorities) linking road sites and centres as well as the centres themselves. Often, the regulators or the emergency responders will not invest in purchasing additional software or hardware to service a small portion of the constituency (always the case when new equipment is deployed), but if existing software can receive the information anyway, the results are a smooth introduction and transition. Such strategy has been successful in easing the introduction of equipment linking public and private parties before.

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There is at least one other standard (IEEE 1512.3) that defines the data dictionary and message sets to be used between emergency control centres and between these centres and on-site emergency personnel. The scopes of this International Standard, and the IEEE standard are related but sufficiently different as not to be redundant with each other. Table 2 summarizes the critical differences between these two standards. Since the primary difference derives from who is communicating and the sources of the data, the majority of the data itself should be based on either common or compatible definitions.

Table 2 — Differences between ISO 17687 and IEEE 1512.3

	ISO 17687	IEEE 1512.3
Communicants	Within vehicle (between on-board systems) On-board to off-board	Centre to centre Centre to/from on-site personnel
Method of obtaining vehicle and load information	Automatic, either pre-entered or dynamically obtained sensor values	Previously entered Observation and manual entry by emergency personnel at site

While maintaining compatibility with other standards, such as IEEE 1512.3, there are occasional data elements within some of the messages that are included but not used. In each case, these data elements are identified as being “OPTIONAL”. When ASN.1 encoding rules are followed, this results in a bit being used (a flag is automatically inserted) to indicate the presence or absence of this data element within the message. By maintaining these unused data elements within the message, this bit is retained in the final encoded message. This will allow such messages to be directly transferred to a roadside system following these other standards. Then the system used by the emergency response personnel may provide such additional data to the message prior to forwarding it to control centres. If these fields were eliminated, it would necessitate re-coding the message prior to being forwarded to control centres.

This International Standard serves an international purpose, but can easily be adapted for internal use to meet local laws, regulations and deployed systems. Equipment used exclusively locally can have a local-only mode while equipment used both locally and crossing borders would have an international mode and a local mode. However, the local reading software should be able to also read the international mode adhering to this International Standard.

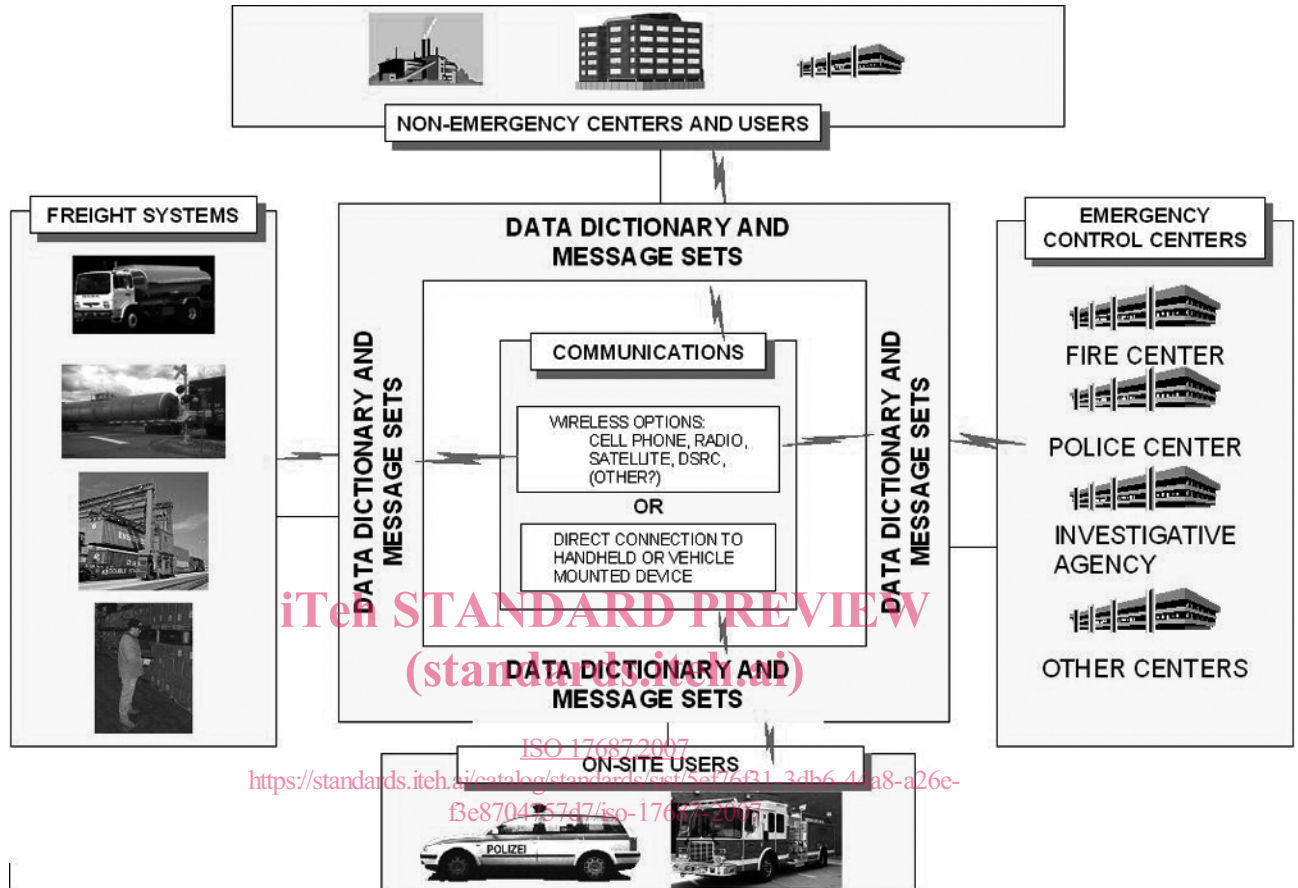


Figure 1 — Electronic identification and monitoring concept

5.2 On-board systems

In this context, the term “transport unit” refers to the transport vehicle as well as the containment or storage systems for the dangerous goods. The modes of transport include straight-trucks/lorries and road combination vehicles. Combination vehicles may have individual monitoring and/or reporting systems for the power unit (tractor) itself and for each trailer and/or container. Containment and storage systems can include containers as well as pallets, and even individual packages.

Figure 2 illustrates the range of potential transport units. As shown, they fall into two major classes, the loads or goods to be transported and the transport means themselves. Goods may be packaged in any of a variety of means, and each type of packaging may be contained in higher level packages to make up the complete load to be transported. The load is then transported by one or more transport means, such as trucks or trains.