INTERNATIONAL STANDARD

ISO 17687

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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

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*.

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.

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*.

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

3.22
on-board equipment
OBE
device on board or attached to the vehicle/equipment to perform the functionality of AVI/AEI

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

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.

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.

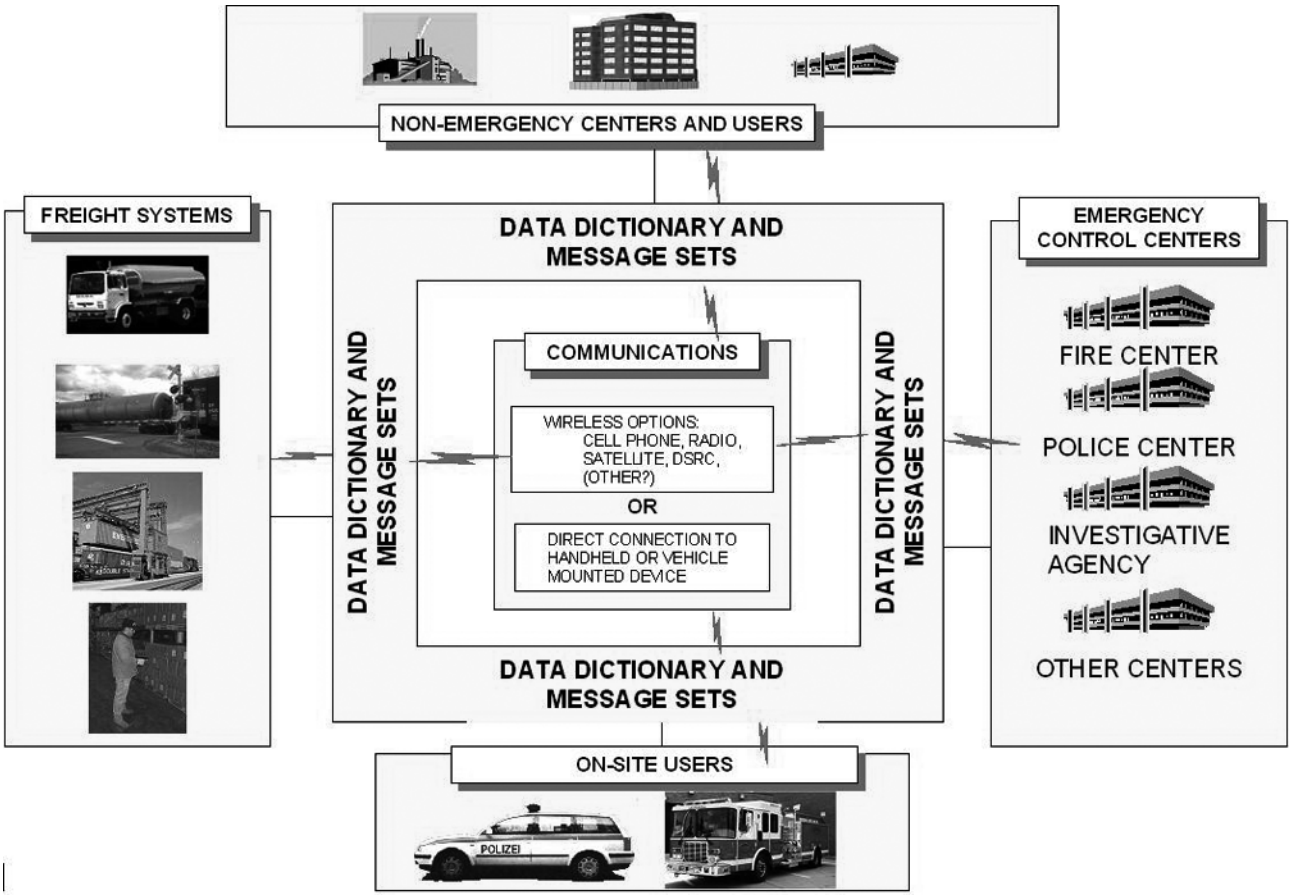
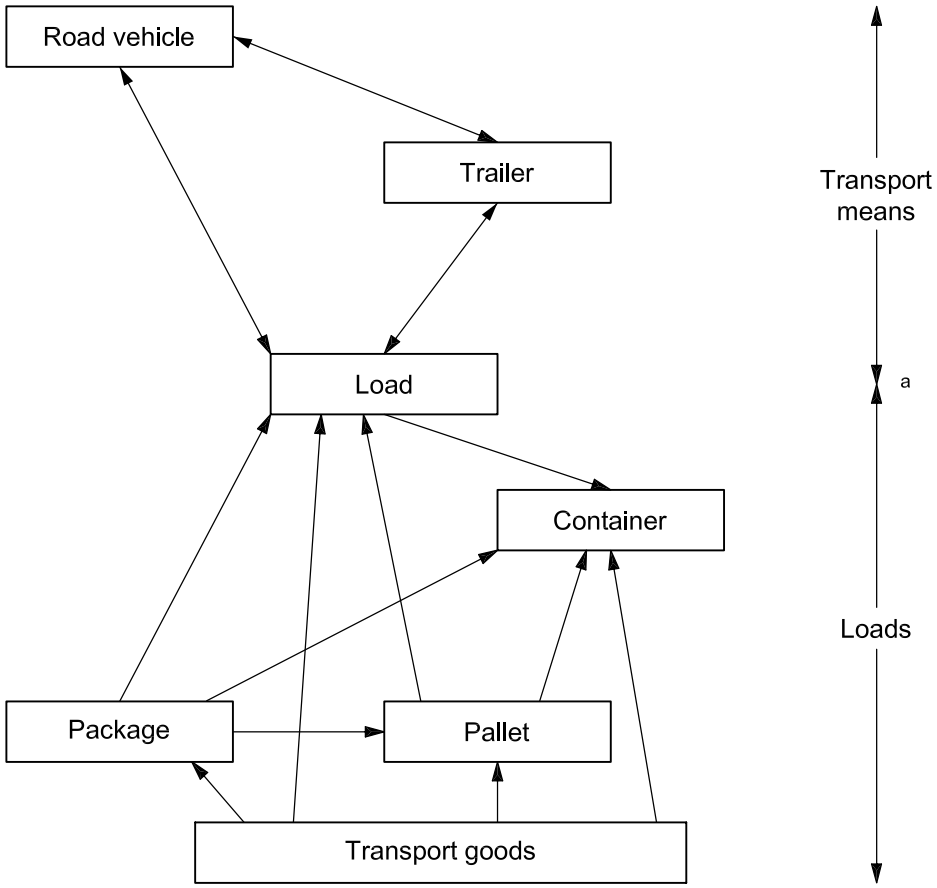


Figure 1 — Electronic identification and monitoring concept

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.



Key

a Any of these loads or transport means may be identified or monitored as a separate entity.

Figure 2 — Representative types of transport units

There are multiple options for the on-board transport unit systems and capabilities. Vehicles may be equipped with any of a variety of trip recorders, navigation systems and electronic tachographs that can be used to record and report vehicle location and the occurrence of an accident, including accident severity. No assumptions are made regarding which of these may or may not exist. A basic on-board system might consist solely of data memory containing information entered when the cargo was loaded. More complex systems might include active cargo monitoring systems such as temperature, pressure, volume or weight sensors, depending upon the cargo involved. This International Standard does not specify nor require such systems, but their use in conjunction with the basic electronic DG data is anticipated for the future. This International Standard applies only to the transfer of such information to or from the transport unit and not to the manner in which the information is generated, stored or used on the transport unit. The specifications provided herein are intended to support such future systems when they do come into use.

The transport unit may have multiple options for communicating with the roadside systems. In some cases, the local roadside system may be a person standing beside or in close proximity to the transport unit. For access by emergency service personnel at an incident scene, a direct-wired connection with on-board data networks or devices may be used to obtain the information. With the ability to transmit the information over wireless RF devices, there is an expanding range of options available. If the radio frequency (RF) device is “Dedicated Short-Range Communications” (DSRC), the local system is truly local, being either a hand-held reader or a reader mounted nearby. It is also possible to use RF transmissions over long-range communication devices such as cell phones or satellite systems, sending the data to a facility very far away. In such a case, the local roadside system may be a trucking fleet dispatcher or a remote emergency control centre. Even though the primary intent of this International Standard is to support local on-site needs in the same manner as conventional visual placards do, the long-range reporting is also supported.

This International Standard does not require nor support any specific operational scenario, though the following are examples of what may exist:

— periodic reporting;

— request by dispatcher;

— one event, either a dangerous goods situation (e.g. exceeding temperature or pressure threshold) or a transport unit situation (accident);

— on-site information gathering by emergency services personnel; and

— deviation from route, different route, loss of contact, theft.

5.3 Roadside recipient to emergency control centres

Once the message has been received by a roadside system, it may be transferred to any/all other appropriate monitoring or response centres. In non-emergency situations, this may be from a trucking fleet dispatcher to the local police or fire department, or to any other control centre that has been identified as responsible for the immediate situation.

Such communications are beyond the scope of this International Standard, but the data dictionary/message sets defined in it are intended to be compatible with known standards that would apply (one example being IEEE 1512.3). If no such standards exist or apply to the situation, then the data dictionary/message sets defined herein should be used.

5.4 Emergency control centres to emergency control centres

There will be a need to send data between centres. In addition to incident-related data, this may also include pre-shipment data. An example of such communications is when a trucking company needs to obtain permits and pay fees to a government organization in advance of the trip itself. After an incident has occurred, there will be the need to transfer pertinent data to the appropriate investigative agency.

Such communications are beyond the scope of this International Standard but there are other standards that may apply. Every attempt has been made to ensure that the definitions and message sets defined herein are fully compatible with those defined in the complementary standard IEEE 1512.3.

5.5 Important implementation recommendation

For those who intend to implement this International Standard's optional codes that refer to IEEE 1512.3, it is recommended to pay particular attention to the latest IEEE version. Compatibility was done with a "snapshot" of IEEE 1512.3/D11 (issued 01-12-21). No effort was made to keep up with the IEEE standard under revision. Although it is not believed that the IEEE revisions affect the core implementation of this International Standard, it is the intention of the working group to coordinate this International Standard with the latest stable IEEE version at the normal revision time of this International Standard.

6 Requirements

6.1 Standard messages

6.1.1 Messages introduction

Messages are defined for multiple levels of identification and monitoring implementation:

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.

There will be many situations in which it is desirable to transmit information regarding the vehicle's/transport unit's location. Such messages are defined in other standards and are not included here. The appropriate applicable standard should be used for location messages.

The following messages are intentionally neutral with respect to the communications technology to be used and the nature of the source and destination systems. The message set definitions are created to allow common data and message definitions to be used for each of these multiple purposes and multiple communications media. As such, instead of having a single message, multiple messages are defined, while only the applicable ones need to be used.

Messages, data frames and data elements in this International Standard are defined in accordance with ASN.1 (ISO 8824). Data concept attributes for these data messages, data frames and data elements are defined in accordance with ISO 14817.

When ASN.1 encoding rules are applied, the ASN.1 PER octet-aligned encoding rules shall be used.

The following are messages to help with the implementation of this International Standard :

— CargoDocs;

— CargoUnits;

— CommercialVehicle;

— PlacardsAndLabels.

6.1.2 Message: MSG_CargoDocs

Use: A summary of cargo shipping papers and container manifest data. Commercial carriers (and some others) are required to carry paperwork describing the nature of the load and highlighting dangerous goods.

This message allows a one-to-one capture of that information. A header section allows capture of key data about the shipment, while a shipping entry section allows a line-by-line capture of the shipped contents. As with the other messages, the use of arbitrary ID fields allows the CAD to connect relationships between various cargoes, vehicles and data obtained from differing sources.

NOTE While this DF is called "Cargo", it can be used equally well in situations not involving a commercial carrier where cargo must still be described.

Format:

```
CargoDocs ::= SEQUENCE {

    uniqueConsignmentReference  UniqueConsignmentReference   OPTIONAL,
                    -- link to various detail pertaining to the shipment
    packageUnitID   PackageUnitID                            OPTIONAL,
                    -- link to which package unit this information refers
                    -- to this is WITHIN the cargo unit below
    cargoUnitID     CargoUnitID                              OPTIONAL,
                    -- link to which cargo unit this information refers
                    -- to, this is required on events involving trains
                    -- or other multi-cargo carriers
```

```
        powerUnitID     PowerUnitID                     OPTIONAL,
                        -- refers to which power unit, used only when there
                        -- is not separate cargo unit, such as the case of a
                        -- passenger vehicle or a small truck. In this case
                        -- there would be no cargoUnitID
        cargoCondition  UnitCondition                   OPTIONAL,
                        -- condition of cargo or power unit in general
        shippingHeader  ShippingHeader,
                        -- general information, emergency response number
        shippingEntry   SEQUENCE OF ShippingEntry       OPTIONAL
                        -- sets of entries about the cargo containing data
                        -- as required by CFR 49/172.202 for shipments
        source          FoundOn                         OPTIONAL,
                        -- what was the source of the above information
        other           UTF8Strings(SIZE(0..65000))     OPTIONAL,
                        -- free text information
        ...
        -- observe that it is the cargo or vehicle unit ID that
        -- provides the key to connect cargo information to a specific
        -- vehicle, trailer, container, etc. and any information on
        -- placards and vehicle or container condition
        }
cargoDocs IDX-PART-MESSAGE ::= {
        &name           "descriptions of cargo condition and shipping papers",
        &id             1000,
        &Type           CargoDocs
        …
        }
```

NOTE Contents and markings as per codes with various contact numbers.

6.1.3 Message: MSG_CargoUnits

Use: Data about the type of cargo units carried and their condition. Note that the “contains” structure allows for a complex description of the contents. This structure is used in the IDX message of the BS as a new type of sub-message.

Format:

```
CargoUnits ::= SEQUENCE {

        id              CargoUnitID,
                        -- the reference number for this unit / object(typically assigned
                        -- by the CAD)
        condition       SEQUENCE OF UnitCondition,
                        -- the overall condition of this cargo unit
        conditionText   UTF8Strings(SIZE(0..255))       OPTIONAL,
                        -- any free text condition of this cargo unit
        axleCount       AxleCount                       OPTIONAL,
        CargoTypes      SEQUENCE OF CargoPackageType OPTIONAL,
                        -- a list of common cargo types, includes one indicating free text in an associated
                        -- field
                        -- which follows below (e.g. Trailer, MC307, Hopper-Car, etc.)
                        -- observe that a single cargo unit may have more than one
                        -- type associated with it
        cargoUnitText   UTF8Strings(SIZE(0..30))        OPTIONAL,
                        -- text describing the type of cargo unit when the above
                        -- types do not fit
```

```
        contains        SEQUENCE OF Contents        OPTIONAL,
                        -- information on any specific packages and cargo found
                        -- here includes proper shipping name,
                        -- dangerous goods labels, and location within
        towingIssues    UTF8Strings(SIZE(0..255))   OPTIONAL,
                        -- any special issues with recovery or towing to be aware of
                        -- would be placed here
        -- see the CommercialVehicle submessage (which this structure is used in) for
        -- information about commercial registration values, see the Cargo submessage
        -- for information about contents
        …
        }
cargoUnits IDX-PART-MESSAGE ::= {
        &name           "descriptions of cargo and contents itself",
        &id             1000,
        &Type           CargoUnits
        …
        }
```

NOTE There is also another message dealing with the contents and shipping papers.

6.1.4 Message: MSG_CommercialVehicle

Use: Descriptions of a vehicle and/or cargo container used for commercial purposes. The header section allows an overall characterization of the vehicle. The registration area allows the capture of many commercial registration data elements. The “power units” allow capture of one or more power units. Typically, a roadway vehicle will have one power unit, whereas a train or barge may have several. In a similar fashion, there may be none, one or more cargo units (each with cargo contents inside). It is typically not vital to fill out this data structure to the Nth degree of cargo package detail, unless this is a pertinent supported application. For example, the towing free text section (which allows the description of any unique requirements or plan which are to be followed) would also be left blank unless some unusual situation called for providing data. In practice, it is expected that only the important top level data will be provided and the message will be updated (using the update methods of the BS) with further data as conditions warrant. This structure is used in the IDX message of the BS as a new type of submessage.

Format:

```
CommercialVehicle ::= SEQUENCE {

        header          ComVehicleHeader            OPTIONAL,
                        -- various key codes about the gross type and condition
                        -- of the vehicle and cargo and the presence of placard
                        -- or warning data (details in another message)
        registration    SEQUENCE OF ComReg          OPTIONAL,
                        -- data concerning the commercial registration values
        powerUnits      SEQUENCE OF PowerUnits      OPTIONAL,
                        -- data about the truck, train or other power unit
        cargoUnits      SEQUENCE OF CargoUnits      OPTIONAL,
                        -- data about the cargo units (trailers, containers, etc.)
                        -- contents and shipping papers can be found in another message
        refToPlacards   UTF8Strings(SIZE(0..15))    OPTIONAL,
                        -- a unique code to link to any IDX submessage with
                        -- placard or warning data for this vehicle
        other           UTF8Strings(SIZE(0..1000))  OPTIONAL,
                        -- free text information
        towing          UTF8Strings(SIZE(0..1000))  OPTIONAL,
                        -- any further data on tow points or recovery process
        ...
```

```
        }
commercialVehicle IDX-PART-MESSAGE ::= {
        &name           "descriptions of a vehicle used for commercial purposes",
        &id             1000,
        &Type           CommercialVehicle
        …
        }
```

NOTE The various registration numbers, cargoes, trailers and condition of each are noted.

6.1.5 Message: MSG_PlacardsAndLabels

Use: A portion of the IDX message used to denote markings typically found outside a vehicle or container pertaining to contents. This is a rather complex structure allowing a complete description of the marking that may be found on the transport means or on the load itself. The structure also provides flags for occasions when the labelling does not seem to be matched or correct. The data can reflect the hazard class, the material ID values of ERG (including the PSN and trade names), other marking types such NFPA 704 labelling, and can be connected to other messages by way of the unit ID fields for complex situations involving multi-cargo and vehicle events. Note that many of these items are optional to allow a progression of transmitted data to be updated over time (such as goods being added to or removed from a truck at stops along a route).

Format:

```
PlacardsAndLabels ::= SEQUENCE {

        hazardClass         SEQUENCE (SIZE (0..7)) OF HazardClass      OPTIONAL,
                            -- code if known, class and division if known note that zero,
                            -- one, or many hazard class values can be entered here without
                            -- any precedence between them (i.e. no implied order or
                            -- importance)
        dangerCategoryPresent BOOLEAN                                  OPTIONAL,
                            -- true if the DANGER category placard is present anywhere
        doesNotMatch        BOOLEAN,
                            -- set to TRUE if the displayed placards or labels conflict with
                            -- each other or do not match on various sides. This is provided for messages that
                            -- are generated by roadside observers rather than during normal loading of goods.
                            -- Presumably, if this is known to be the case prior to departure the placards will
                            -- be corrected.
        hazardIdentNumber UTF8Strings(SIZE(2..4))                      OPTIONAL,
                            -- used in some intermodal containers and international
                            -- shipments (the upper portion of a two level orange legend)
        materialID          SEQUENCE OF MaterialID                     OPTIONAL,
                            -- material ID number and what format (UN/NA) if known as
                            -- well as psn and trade names
        hazardLevel         SEQUENCE OF HazardLevel                    OPTIONAL,
                            -- any markings found such as NFPA/HMIS, typically this is found on
                            -- buildings and stationary containers rather than mobile shipments
        category            SEQUENCE OF CategoryTypes                  OPTIONAL,
                            -- various labels if present (e.g. fumigation, waste, hot)
        rail                SEQUENCE OF RailMarkings (not defined in this International Standard)      OPTIONAL,
                            -- various labels and marking found on rail cars
                            -- this data element is not used in this International Standard, but is
                            -- kept to maintain compatibility with IEEE 1512.3 encoded fields
        legends             SEQUENCE OF Legends                        OPTIONAL,
                            -- textual warning label and legends
        other               UTF8Strings(SIZE(0..1000))                 OPTIONAL,
                            -- free text information
```

```
    vehicleUnit         SEQUENCE OF PowerUnitID          OPTIONAL,
                         -- designation of any related vehicle description (one or more)
                         -- may contain package item data about actual contents
    cargoUnitIDs        SEQUENCE OF CargoUnitID          OPTIONAL,
                         -- designation of any related cargo descriptions (one or more)
                         -- this value is used to uniquely identify the cargo unit
                         -- so that other messages dealing with type, condition
                         -- and content can refer to it. Note that placards
                         -- and cargo data can link to one or more cargo or powers
                         -- as well, creating whatever many to many link relationships
                         -- are required in more complex incident events may
                         -- contain package item data about actual contents
...
}
placardsAndLabels IDX-PART-MESSAGE ::= {
                        &name "descriptions of visible outside markings",
                        &id 1000,
                        &Type PlacardsAndLabels
                        …
                        }
```

NOTE The container or vehicle on/in which this is found is described by another message.

6.2 Data frames

6.2.1 Data frames introduction

Messages specified in the data messages clause shall be composed of data frames specified in this clause and data elements from the next clause.

6.2.2 Data frame: DF_CargoCondition

Use: This message identifies the condition of the contents of an individual package.

Format:

```
CargoCondition ::= SEQUENCE {

    id                  CargoUnitID
                        -- The reference number for this unit/package
    volume              CargoVolume                  OPTIONAL
    volumeUnits         VolumeUnits                  OPTIONAL
    temp                CargoTemperature             OPTIONAL
    pressure            CargoPressure                OPTIONAL
    pressureUnits       PressureUnits                OPTIONAL
    percentFill         CargoPercentFill             OPTIONAL
    weight              CargoWeight                  OPTIONAL
    weightUnits         WeightUnits                  OPTIONAL
    descriptive         UTF8Strings(SIZE(0..400))    OPTIONAL
                        -- a free text description as needed
    …
    }
```

6.2.3 Data frame: DF_ComVehicleHeader

Use: Various key codes about the gross type and condition of the vehicle and cargo and the presence of placard or warning data.

Format:

```
ComVehicleHeader ::= SEQUENCE {

    hasPlacards        BOOLEAN                          OPTIONAL,
                       -- true if the vehicle has visible placards or labels or material
    hasHazmat          BOOLEAN                          OPTIONAL,
                       -- true if the vehicle has any indication of carrying dangerous goods
    hasWaste           BOOLEAN                          OPTIONAL,
                       -- true if the vehicle has any indication of carrying waste product goods
                       -- Of the three descriptive flags above a dangerous goods waste hauler would
                       -- have at least the two of flags, hasHazmat and hasWaste, set to true
    numOfPowerUnits    INTEGER(0..255),
                       -- how many power units are there.,
                       -- Set to one for passenger cars, and trucks
                       -- Set to number of engines for trains and barge haulers
                       -- Set to 255 if unknown
    numOfCargoUnits    INTEGER(0..255),
                       -- how many cargo carrying units are there.,
                       -- Set to zero for passenger cars, and straight trucks (no trailer)
                       -- Set to 2 for a western double
                       -- Set to one for the typical 18 wheel semi with one trailer
                       -- Set to number of containers for container shipment by boat / barge
                       -- Set to the number of all cars for trains (including non freight cars)
                       -- Set to 254 if the number is greater than 254 units
                       -- Set to 255 if unknown
                       -- further information on power units, cargo units cargo and placards can be found
                       -- in other related messages.
                       ... }
```

Used by: This item is used by the following other data structure in this International Standard:

— Descriptive Name: DF_CommercialVehicle [ASN.1: CommercialVehicle].

In addition, this item may be used by data structures in other ITS standards as well. Implementers are advised to consult the IEEE ITS data registry for the most current information.

NOTE DANGEROUS GOODS warnings/labels and shipping papers can be found in other messages.

6.2.4 Data frame: DF_ConcentrationRange

Use: The concentration range structure is used to provide a more detailed list of the contents that make up a material. This information can be useful to emergency response teams and is at times not sufficiently revealed by the material IDs, the trade names or PSN information found elsewhere. This data structure allows either a range (min and max) or a specific value for percentage concentrations of ingredients. The value of the min and max are listed in units of 0,1 percent. Should an ingredient be between 0,0 and 0,1, the value 0,1 shall be used. Trace ingredients shall be listed as 0,1 when no other information is available. The name of each ingredient shall be the technical name. A sequence of such ingredients can be established with the number of entries as required to describe the material. This information may come from database sources to which the CAD has access in many environments, the shipper, etc. It is recommended that local implementations establish a maximum number of such entries and that the entries be listed in order of precedence from a response perspective (i.e. most to least common in volume unless a component is of greater hazard). The summary of the quantities listed will not necessarily add up to 100 % as approximate ranges are often used. If a specific value is to be transmitted, it will be listed in the min field, followed by zero in the max field. The percentages are denoted by volume (as opposed to, for instance, by weight), unless another format is obvious by the type of material involved. This structure is used by other structures which in turn provide higher level information on the hazard class, PSN, etc.

Format:

```
ConcentrationRange ::= SEQUENCE {

        ingredient SEQUENCE {
                min         INTEGER(1..1000),
                            -- minimum or specific quantity LSB of 0.1 percent
                            -- use 1 for values between 0.1 and zero percent
                max         INTEGER(0..1000)     OPTIONAL,
                            -- maximum quantity
                name        TechnicalName
                            -- the technical name of this ingredient
                }
        …
        }
```

6.2.5 Data frame: DF_Contents

Use: Data about contents (load) of a cargo unit (trailer) or power unit (semi).

Format:

```
Contents ::= SEQUENCE {

        packageType     SEQUENCE OF CargoPackageType OPTIONAL,
                        -- what type of item/structure/package is this, the INTERNAL
                        -- package, not the cargo unit in which it is found
                        -- (i.e. 55 gal drums (found in/on a trailer))
        condition       SEQUENCE OF UnitCondition       OPTIONAL,
                        -- data about the gross condition of this item as
                        -- externally observed
        conditionText   UTF8Strings(SIZE(0..255))       OPTIONAL,
                        -- any free text condition of this item
        description     UTF8Strings(SIZE(0..400))       OPTIONAL,
                        -- a free text description as needed
        item            ShippingEntry                   OPTIONAL,
                        -- a structure with dangerous goods labeling, shipping entries,
                        -- package groups, PSN, quantities and other data
                        -- about the item
        subLocation     UTF8Strings(SIZE(0..400))       OPTIONAL,
                        -- a free text description of where(within the cargo
                        -- or power unit) this item is located (i.e. forward hold)
        source          FoundOn                         OPTIONAL,
                        -- what was the source of the above

        packageUnitID   PackageUnitID                   OPTIONAL,
                        -- a unique string to identify this content description.
        ...
        }
```

NOTE 1 This structure is nested within the cargo or power unit structures to describe internal contents when known. Use it when you need to describe the cargo contents (inside a cargo structure) or when describing object/contents found in the main cabin of a power unit (e.g. inside a car or vehicle without attached cargo unit). For example, a box of dangerous goods found in the back seat of a car would be described as being located on the back seat, the package type would be a box, and the “item” would be filled out with whatever warnings and labels could be determined.

NOTE 2 This structure is suitable for both items with shipping paperwork and without.

6.2.6 Data frame: DF_HazGoods

Use: Identifies the existence of dangerous goods in the vehicle load in a set of simple true/false declarations.

Format:

```
HazGoods ::= SEQUENCE {

    hasPlacards     BOOLEAN                         OPTIONAL,
                    -- true if the vehicle has visible placards, labels, or material ID numbers (UN,NA,..)
    hasHazmat       BOOLEAN                         OPTIONAL,
                    -- true if the vehicle is carrying dangerous goods
    hasWaste        BOOLEAN                         OPTIONAL
                    -- true if the vehicle is carrying waste product goods

    -- of the three descriptive flags above, a dangerous  waste hauler would
    -- have at least two flags set to true, hasHazmat and hasWaste.
    …
    }
```

6.2.7 Data frame: DF_HazardClass

Use: A classification of material type, code (if known), class and division (if known). Flags for code and placards are also provided.

Format:

```
HazardClass ::= SEQUENCE {

    codePresent     BOOLEAN                         OPTIONAL,
                     -- true if a Dangerous Goods code is present as well
    placardsPresent BOOLEAN                         OPTIONAL,
                     -- true if a placard or label is present
    class           INTEGER (0..9),
    division        INTEGER (0..9),
                     -- use zero if division unknown or not applicable
    color-text      UTF8String(SIZE(0..200))        OPTIONAL
                     -- in cases when only a basic colour or pattern
                     -- applies this field should be used
                     -- note that for fixed list of colours is given as
                     -- field reports of colour and pattern can vary widely
    …
    }
```

6.2.8 Data frame: DF_HazardLevel

Use: This structure is used to hold information relating to the level of hazard of the DG. Such information may or may not be available in different countries based on the local codes. As usual, if the different data elements are not available, it will be left empty.

Format:

```
HazardLevel ::= SEQUENCE {

    damagePresent   BOOLEAN                         OPTIONAL,
                     -- true if label is not visible or damaged (this is usually entered by
                     -- roadside emergency teams responding to an incident)
```

```
    codeSystem          RatingType,
                         -- NFPA-704, HMIS or WHMIS
    fireHazard          INTEGER (0..4),
                         -- in NFPA the top, red, diamond
                         -- in HMIS the 2nd from the top red rectangle
    healthHazard        INTEGER (0..4),
                         -- in NFPA the left, blue, diamond
                         -- in HMIS the top blue rectangle
                         -- note that NFPA and HMIS do NOT use the
                         -- same ratings and meanings for this field
    chronicHazard       BOOLEAN                         OPTIONAL,
                         -- used in HMIS, denoted as an asterisk in
                         -- the health field of the label
    instabilityHazard   INTEGER (0..4),
                         -- also called "reactivity" in some texts
                         -- in NFPA the right, yellow, diamond
                         -- in HMIS the 3rd from the top yellow rectangle
    specialHazard       UTF8Strings(SIZE(0..200)),
                         -- in NFPA the bottom white diamond
                         -- in HMIS the bottom white rectangle
    labels              UTF8Strings(SIZE(0..200)),
                         -- any other label type markings found nearby
    other               UTF8Strings(SIZE(0..200)),
                         -- any other comments relating to the data
     ...
    }
```

NOTE 1 As an example, this Data Frame is named NFPA-HMIS in IEEE 1512.3, where it is used as a data structure to hold information relating to “NFPA 704 Diamonds” found on buildings and containers or to the HMIS label found on various containers.

EXAMPLE The NFPA Diamond uses numbers and colour codes to identify Health Risks (in blue), Flammability (in red), Instability (in yellow), and Special Hazards (in white). The HMIS system is similar. HMIS labels always appear as a rectangle-shaped block of four coloured 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.

NOTE 2 At times, there may be additional space on the label for other information, including product name, supplemental warnings, manufacturer information, or additional information. Both systems rate the severity of the hazard on a scale of 0 to 4, with 4 being the most severe. Textual information can be found in the special hazards section or PPE section, although common acronyms are also often used. While, typically, this information will come from a non-mobile object (such as a building), it is possible that it will be found on cargo while in transport as well. It should be noted that there are a number of defined terms used in white “specialHazard” portion of the sign; however, common usage is that many ad hoc phrases also appear. CAD vendors may wish to provide a combination of established local terms as well as the ability to input free text in the operator's user interface design.

6.2.9 Data frame: DF_MaterialID

Use: This structure describes material and product compounds. It contains the Dangerous Goods ID number and which format (numbering system, i.e. UN/NA), if known. The proper DOT shipping names, as well as the manufacturer’s trade name and the key chemical ingredients, can be described. Some of this information is taken directly from the shipping papers when commercial cargo is involved. In other cases, the manufacturer’s product name can often be used.

Format:

```
MaterialID ::= SEQUENCE {

    value               INTEGER(0..10000)               OPTIONAL,
                         -- the product ID (as per ERG or UN numbers)
```

```
type            MaterialIDReferenceSource       OPTIONAL,
                -- UN or NA numbering used in the above
psn             ProperShippingName              OPTIONAL,
                -- Proper shipping name (PSN) as defined by regulations
techName        SEQUENCE OF TechnicalName       OPTIONAL,
                -- Technical Product Names (key ingredients) one name
                -- per entry, no other formatting such as "contains:" or"," to
                -- be added. Use this format when concentrations are not
                -- known or do not matter and leave contents(below) blank
contents        ConcentrationRange              OPTIONAL,
                -- Technical Product Names along with percentage
                -- concentrations of each use this format when concentrations
                -- are important, and leave techName blank
packGroup       INTEGER(0..10)                  OPTIONAL,
                -- package group, if known
tradeName       TradeName                       OPTIONAL,
                -- The manufacturer product or trade name
where           FoundOn                         OPTIONAL
                -- source of this information
…
}
```

6.2.10 Data frame: DF_PowerUnits

Use: This data structure provides data about the truck, train or other power unit. A power unit in this context is any type of vehicle with an engine (rather than a passive cargo unit). Some power units may have permanent cargo-carrying ability or cargo such as a passenger vehicle or panel van. This is further described in the vehicle type section of the data frame, which includes general classification of vehicles with an emphasis on commercial cargo-carrying types. The vehicle data portion allows for a more legalistic description (ownership, registrations, etc.). The towing free text section allows the description of any unique requirements or plan that is to be followed. Finally, the content area allows for a description of cargo including both free text entries and complex shipping manifests with proper shipping names.

Format:

```
PowerUnits ::= SEQUENCE {

    id   PowerUnitID,
         -- the reference number for this unit / object
         -- (typically assigned by the CAD)
    condition                   SEQUENCE OF UnitCondition    OPTIONAL,
         -- the current condition of this vehicle
         -- place most relevant one first in list
    conditionText               UTF8Strings(SIZE(0..255))    OPTIONAL,
         -- any free text condition of this cargo unit
    axleCount                   AxleCount                    OPTIONAL,
    vehicleType                 PowerUnitType                OPTIONAL,
         -- a list of common power unit types
    vehicleTypeText             UTF8Strings(SIZE(0..100))    OPTIONAL,
         -- free text when above list is not suitable
    towing                      UTF8Strings(SIZE(0..1000))   OPTIONAL,
         -- any further data on tow points or recovery process
    vehicleData                 VehicleData                  OPTIONAL,
         -- various data about the unit such as license number,
         -- VIN etc. most of the actual elements come from
         -- SAE and other industry standards such as NCIC work.
         -- Note that VehicleData may also be sent as its own message
```

```
contains                    SEQUENCE OF Contents        OPTIONAL,
    -- information on any specific packages and cargo
    -- found here includes proper shipping name dangerous goods
    -- labels, and location within unit
towingIssues                UTF8Strings(SIZE(0..255))   OPTIONAL,
    -- any special issues with recovery or towing to be
    -- aware of would be placed here.
    -- see the CommercialVehicle submessage (which this structure is used in)
    -- for additional information about commercial registration values
 ...
}
```

6.2.11 Data frame: DF_ShippingEntry

Use: Representing the key data from each line of a shipping document. This structure replicates the information found on the line-by-line manifest which any commercial carrier should have. Combined with the shipping header structure, and used in the cargo or contents structures, it provides a means to reflect the shipping paperwork of a commercial carrier. Independent of this, it can be used to describe cargo “found” by on-scene responders as well as cargo found without shipping papers.

Format:

```
ShippingEntry ::= SEQUENCE {

    hm              BOOLEAN                     OPTIONAL,
                    -- Set to true for dangerous  goods.
    psn             ProperShippingName          OPTIONAL,
                    -- Proper Shipping Name as per departments of transport
                    -- regulations as found in papers
    tradeName       TradeName                   OPTIONAL,
                    -- Manufacturers product name or common
    nametechName    TechnicalName               OPTIONAL,
                    -- the technical name, if needed
    hazardLevel     SEQUENCE OF HazardLevel     OPTIONAL,
                    -- any NFPA/HMIS markings, typically this
                    -- is found on buildings and stationary containers
                    -- rather than mobile shipments
    hazClass        HazardClass,
                    -- Hazard class and division
    idenNumber      MaterialID,
                    -- identification number and reference system used (ERG or UN)
                    -- when this DF is used the lower data elements should
                    -- be filled out to match, notably the ProperShippingName
                    -- packGroup and the TradeName shall match.
                    -- Technical ingredients can also be added here
    packGroup       INTEGER(0..10)              OPTIONAL,
                    -- package group which this item is a part of
    zone            IsolationZone               OPTIONAL,
                    -- as per ERG, note that this is not the "protect" zone
                    -- and that much more complex zones are handled elsewhere
                    -- Reference IEEE1512.3miscOther   UTF8Strings(SIZE(0..200))   OPTIONAL,
                    -- any other information that would
                    -- be useful to emergency responders
    quantityUnits   UTF8Strings(SIZE(0..20)),
                    -- the quantity AND the units of this item (e.g. 20 lbs.)
                    -- you may wish to render this from a combination of free
                    -- text and units taken from the ITIS codes for units
```

```
emgContact      UTF8Strings(SIZE(0..100))          OPTIONAL,
                -- any line by line emergency contact data
 ...
}
```

6.2.12 Data frame: DF_ShippingHeader

Use: The "header" portion of a shipping paper set. This structure replicates certain information found on manifests. Combined with the shipping entry structure, it is used in the cargo structures to provide a means to reflect the shipping paperwork of a commercial carrier.

Format:

```
ShippingHeader ::= SEQUENCE {

foundIn         CargoUnitID                        OPTIONAL,
                -- Is the cargo unit that this header refers to i.e. which cargo
                -- unit(s) can the shipping entries (which follow)
                -- be located in. Note that there are no data
                -- to connect a group of packages to a location.
                -- this is NOT where the shipping papers are
                -- found, but where the cargo is found
foundIn2        PowerUnitID                        OPTIONAL,
                -- used when the cargo is located in the power unit
                -- this is often the case with passenger vehicles
                -- used for transport of medical samples (bio-hazards)
                -- or with various materials of trade
shipperName     UTF8Strings(SIZE(0..200))          OPTIONAL,
                -- name and contact number of shipper and any general
                -- 24h emergency response number will be placed here
haulerName      UTF8Strings(SIZE(0..200))          OPTIONAL,
                -- name and contact number of hauler
miscOther       UTF8Strings(SIZE(0..1000))         OPTIONAL,
                -- any other information useful to responders
 ...
}
```

6.2.13 Data frame: DF_VehicleData

Use: Common data found in vehicle power units.

For informative purposes, these optional data are similarly defined in SAE J2313.

Format:

```
VehicleData ::= SEQUENCE {

vin             Identity-VIN                       OPTIONAL,
                -- the SAE / ISO std VIN number of the vehicle note that
                -- the make mode etc data is encoding in this serial
                -- number
make            UTF8Strings(SIZE(0..30))           OPTIONAL,
model           UTF8Strings(SIZE(0..30))           OPTIONAL,
Colour          Vehicle-Color                      OPTIONAL,
year            INTEGER(1900..3000)                OPTIONAL,
plate           Identity-plate                     OPTIONAL,
```

```
type                 Identity-plate-type                    OPTIONAL,
                      -- Lic Plate Type
origin               Identity-plate-origin                  OPTIONAL,
                      -- Lic Issuing State/Province/Country
id                   Identity-carrier-id                    OPTIONAL,
                      -- Owner / Operator
fleetnum             Identity-number                        OPTIONAL,
                      -- any id or fleet number of vehicle
text                 UTF8Strings(SIZE(0..4000))             OPTIONAL,
                      -- misc. other information
axleCount            AxleCount,
driverNameFirst      UTF8Strings(SIZE(0..40))               OPTIONAL,
                      -- may change to use ITS/ITE names
driverNameLast       UTF8Strings(SIZE(0..40))               OPTIONAL,
driverLic            UTF8Strings(SIZE(0..30))               OPTIONAL,
driverLicType        UTF8Strings(SIZE(0..30))               OPTIONAL,
                      -- type and endorsements
driverLicIssuingState UTF8Strings(SIZE(2))                  OPTIONAL,
                      -- use ANSI D20 codes
driverContactNumber UTF8Strings(SIZE(0..20))                OPTIONAL,
 ...
}
```

6.3 Data elements

6.3.1 Data elements introduction

Messages specified in the data messages clause shall be composed of data frames from the previous clause and data elements specified in this clause. In some cases, the data element is adopted from, or defined in, another applicable standard; in this case, the referenced standard shall be consulted.

6.3.2 Data element: DE_AxleCount

Use: The number of axles a device has. Typically used in describing cargo or power units.

Format:

```
AxleCount ::=    INTEGER (0..16)          -- use zero for unknown
```

6.3.3 Data element: DE_CargoPackageType

Use: Common types of cargo units and package types (joined in a single list). The most common types of cargo containers and units are classed here. When a type is not found, the method of open text can be used. Other responding CAD systems may filter and respond based on these codes; therefore, data entry of the codes is preferred over free text. The list also contains common types of package units (often found within a cargo unit). In this context, a package unit is a type of container, the inner contents of which may or may not be known. It is the responsibility of the CAD system design to prevent the data entry of “nonsense” ordering of cargo items inside package items.

IEEE 1512.3 provides the dictionary for these data elements and also provides many clarifying illustrations. Implementers are directed to refer to that normative document for the updated and more complete list.

NOTE See important implementation recommendation in 5.5 above.

Format:

CargoPackageType ::= ENUMERATED {

unknown	(0),
freeText	(1), -- text in the using message has a description
none	(2), -- no separate cargo unit involved
aerosolCan	(3), -- one or more
automotiveTransporter	(4), -- use for truck or trailer types
bobtailTank	(5),
bottlerBody	(6), -- beverage carriers
boxCar	(7), -- generic mixed cargo
boxTrailer	(8),
bulkPackage	(9),
cargoTank	(10),
chassisTrailer	(11),
compressedGasCylinder	(12),
compressedLiquefiedGases	(13),
container	(14), -- generic containers (not on wheels)
corrosiveLiquidTank1	(15), -- MC-312 or DOT-412
cryogenicLiquidTank2	(16), -- MC-338
dromedaryTractor	(17),
drum-1a1	(18), -- (55 gal, 250L, others)
drum-1a2	(19), -- (55 gal, 250L, others)
dryBulkCargoTanker	(20),.IEEE 1512.3/D11 [issued: 12-21-01]
earthenwareReceptacle	(21),
fiberboardBox	(22),
fiberboardBoxes	(23),
fiberDrumsNonRemoveableHead	(24),
fiberDrumsRemoveableHead	(25),
fiberPailsNonRemoveableHead	(26),
fiberPailsRemoveableHead	(27),
furnitureVanBody	(28), -- drop style moving vans
glassReceptacle	(29),
hCNtankcar	(30), -- (Hydrogen Cyanide) and DOT105a500
highPressureTank	(31), -- MC330 or MC-331
hopper	(32), -- use also for Dry Bulk
horseVanBody	(33), -- used for valuable saddle horses
intermediateBulkContainer	(34),
intermediateBulkPackage	(35),
interModalFreightContainer	(36),
interModalPortableTank	(37),
jerryCanMetal	(38), -- 15 gal or less
jerryCanPlastic	(39), -- 15 gal or less, use for others as well
largePackages	(40),
livestockTrailer	(41),
logBody	(42), -- also used for pole trailer types
lowPressureChemicalTank	(43), -- MC307 or DOT-407
lowPressureTankCar	(44), -- for various liquids
metalBox	(45),
metalDrumsNonRemoveableHead	(46),
metalDrumsRemoveableHead	(47),
metalPailsNonRemoveableHead	(48),
metalPailsRemoveableHead	(49),
metalReceptacle	(50),
michiganTrailer	(51), -- vehicle with a gross cap of 140,000 pds
mixedCargo	(52),
nonpressureLiquidTank	(53), -- MC306/DOT-406
nursetank	(54),
plasticDrumsNonRemoveableHead	(55),

```
plasticDrumsRemoveableHead          (56),
plasticPailsNonRemoveableHead       (57),
plasticPailsRemoveableHead          (58),
plasticReceptacle                   (59),
poleTrailer                         (60),
portableTank                        (61),
pressurizedTankCar                  (62),
rrBoxCar                            (63),
rrContainerOnFlatCar                (64), -- also known as COFC
rrFlatCar                           (65),
rrTankCar                           (66),
rrTrailerOnFlatCar                  (67), -- also known as TOFC
stakeBodyTrailer                    (68),
stakeBodyTruck                      (69), -- i.e. attached to power unit
tankTrailer                         (70),
tanktruck                           (71), -- for various liquids, type unknown
tubeTrailer                         (72), -- use for types of compressed Gas
unPortableTank                      (73),
woodBox                             (74), -- one or more
woodenBarrel                        (75), -- one or more

-- codes from 100 to 180 may be used for UN packaging markings, above 180 to 255 by local implementations
    …
    }
```

6.3.4 Data element: DE_CargoPercentFill

Use: The amount of cargo contained in the package (container) as a percentage of the total volume. This is usually used for liquid or dry bulk package but can be used whenever such a measure is appropriate.

Format:

```
CargoPercentFill ::= INTEGER (SIZE(0..250))
                -- the amount of cargo as a percentage of the total
                -- volume (not the maximum fill level).
                -- Resolution is 1% per bit.
```

6.3.5 Data element: DE_CargoPressure

Use: The measured pressure of the gas or the liquid-gas mixture confined/contained in the package (container).

Format:

```
CargoPressure ::= INTEGER (SIZE(0..65535))
                -- the pressure in the cargo container measured in the units defined by the
                -- PressureUnits data element. Resolution is 1 unit per bit.
```

6.3.6 Data element: DE_CargoTemperature

Use: The measured temperature of the cargo contained in the package (container).

Format:

```
CargoTemperature ::= INTEGER (SIZE(0..65535))
                -- the temperature of the cargo in degrees Kelvin with a resolution of 1 degree per bit.
```

6.3.7 Data element: DE_CargoUnitID

Use: A string to uniquely refer to a cargo unit (e.g. trailer, container). This DE defines an alphanumeric string used to track and refer to various descriptions created in the use of this message set. It is vital that the agencies using the message set agree to follow common rules in creating and using such IDs. The message set itself does not impose any such limits; however, the concept of nesting to create a "fully qualified path" is supported, as well as simply ensuring that all created strings are unique within the using agencies over the life and any given incident event. There is no limit imposed by the standard regarding the "depth" of any such nesting, but as a practical matter local agencies should establish a practical limit. A limit of eight such path elements would normally be sufficient for all needs. As an example, consider a message ID made up of a sequence of paths, such as: [agency/operator & incident num & sub-message num & vehicle unit & cargo unit & package unit]. Alternatively, establishing rules to create a set of single unique values by every data issuer can often prove simpler to manage across multiple agencies (i.e. Event-100-Veh_12-Cargo_34-Pack_67 would be valid with the definitions below).

Format:

```
CargoUnitID ::=                 UTF8Strings (SIZE(0..50))
```

NOTE Typically assigned by the generating CAD to track each cargo unit involved.

6.3.8 Data element: DE_CargoVolume

Use: The volume of cargo.

Format:

```
CargoVolume ::= INTEGER (SIZE(0..65535))
        -- the volume of the cargo in volume units with a resolution of 1 bit per measured unit.
        -- Reference DE_VolumeUnits for the specific units used.
```

6.3.9 Data element: DE_CargoWeight

Use: Refers to the net weight of the content of the package, not, for example, the package.

Format:

```
CargoWeight ::= INTEGER (SIZE(0..65535))
        -- the weight of the cargo with a resolution of 1 weight unit per bit.
        -- Units are defined in the data element DE_CargoUnits
```

6.3.10 Data element: DE_CategoryTypes

Use: Various labels commonly found in package markings that are used to aid in determining a suitable response in the event of an emergency. List source: IEEE 1512.3/D11 (issued: 01-12-21). See important implementation recommendation in 5.5.

Format:

```
CategoryTypes ::= ENUMERATED {

    unknown                 (0),
    noneArePresent          (1),
    danger                  (2), -- When used in message the
                                 -- related Boolean must also be set
    dangerousWastes         (3),
    elevatedTemperature     (4),
    empty                   (5),
```

```
environmentallyHazardous        (6), -- (found in US and Canada)
environmentalWaste              (7),
forAircraft                     (8),
fumigation                      (9),
hazardousSubstance              (10),
hazardousWaste                  (11),
hot                             (12),
inhalationHazard                (13),
innerPackagesComply             (14),
irritant                        (15),
marinePollutant                 (16),
molten                          (17),
oRMD                            (18), -- Other Regulated Materials
packageOrientation              (19),
subsidiaryRiskLabel             (20),
 ...
 }.
```

6.3.11 Data element: DE_ComReg

Use: Commercial registration values found on commercial vehicles from the registration authority with which the vehicle is registered.

Format:

```
ComReg ::= UTF8Strings (SIZE(0..200))
            -- the textual format of the commercial registration string
            -- e.g. "US DOT 123456" "ICC 123456" "CA 12345" "ON-1234"
            -- numbers without letter designations should be avoided
            -- there is a great variety in the designation found here, it is the
            -- responsibility of the CAD system to sort them all out and further
            -- classify the input into whatever structures may be needed
```

NOTE License plates and vehicle types can be found in power units.

6.3.12 Data element: DE_FoundOn

Use: Where a material number may be visually found and/or verified. In the absence of a trained first-responder, any on-scene information can provide a level of validation and presumed quality for information relayed back to the CAD and exchanged with others. The unknown value shall be used if, as a standard operating procedure, your CAD implementation does not prompt for or obtain this data element. List source: IEEE 1512.3/D11 (issued: 01-12-21). See important implementation recommendation in 5.5.

Format:

```
FoundOn ::= ENUMERATED {

    unknown         (0),
    orangePanel     (1),    -- number appears in a std orange background panel,
                            -- indicating that this is a UN ID number
    insidePlacard   (2),    -- number appears inside a class/division placard or label
    printedNum      (3),    -- number appears printed in plain text
                            -- (perhaps with a UN or NA present as well)
    printedText     (4),    -- text appears printed (perhaps a product or trade name)
    shippingPapers  (5),    -- information taken from shipping or manifest papers
    shipperFirm     (6),    -- information provided by the firm creating the shipment
                            -- (typically provided by a corporate office)
```

```
haulerFirm          (7),   -- information provided by the firm hauling the shipment
                           -- (typically provided by a corporate office)
verbalReport        (8),   -- information obtained from driver or other verbal source
identByPlumes       (9),   -- ident made by smoke/flame color, by smell or
                           -- by other observable characteristics
other               (10),  -- number/data found elsewhere
                           -- (and may be suspected that it is not a material number)
…
}
```

6.3.13 Data element: DE_Legends

Use: Labels and statements regarding the hazard or contents.

Format:

```
Legends ::= UTF8Strings (SIZE(0..200))
```

6.3.14 Data element: DE_ITIScodes

Use: The ITIS codes are a widely adopted set of phrases encoded by common number across the entire ITS industry and its message sets. These codes are uniformly used to allow both cross communication between different message sets and to allow a more automated sorting and filtering of what would otherwise be free text description of events. The more than 1 200 codes have evolved over a number of years from industry practice. They are used (typically in various subsets by way of a constraint clause in the ASN) by this International Standard to express descriptions and categories of events. Often, codes can be best used with mixtures of free text to provide a complete description that is still entirely sortable for automated process. The complete rules for using these codes in mixed text (of which ITIS is but one of several ITS code lists) can be found in the SAE J2540 standard (see Clause 2). Among these rules are methods for extending the list locally and exchanging such local lists which shall be used in conjunction with this International Standard when local lists are created. See IEEE 1512.3/D11 (issued: 01-12-21).

Format:

```
ITIScodes ::= INTEGER (0..65535)  -- a placeholder for the "SAE STD J2540.ITIS" code values
                                  -- this is the large set of common codes and phrases used in ITS
```

6.3.15 Data element: DE_PackageUnitID

Use: A string to uniquely refer to a package unit (a single unit of cargo). This DE defines an alpha string used to track and refer to various descriptions created in the use of this message set. It is vital that the agencies using the message set agree to follow common rules in creating and using such IDs. The message set itself does not impose any such limits, but the concept of nesting to create a “fully qualified path” is supported as well as simply ensuring that all created strings are unique within the using agencies over the life and any given incident event. There is no limit imposed by the standard regarding the “depth” of any such nesting, but as a practical matter local agencies should establish some practical limit to this. A limit of eight such path elements would normally be sufficient for all needs. As an example, consider a message ID made up of a sequence of paths such as: [agency/operator & incident num & sub-message num & vehicle unit & cargo unit & package unit]. Alternatively, establishing rules to create a set of single unique values by every data issuer can often prove simpler to manage across multiple agencies (e.g. Event-100-Veh_12-Cargo_34-Pack_67 would be valid with the definitions below).

Format:

```
PackageUnitID ::= UTF8Strings (SIZE(0..50))
```

NOTE These are typically assigned by the generating CAD to track each package unit involved. Source: IEEE 1512.3/D11 (issued: 01-12-21). See important implementation recommendation in 5.5.

6.3.16 Data element: DE_PowerUnitID

Use: A string to uniquely refer to a power unit (vehicle, car, semi, train, barge). This DE defines an alpha string used to track and refer to various descriptions created in the use of this message set. It is vital that the agencies using the message set agree to follow common rules in creating and using such IDs. The message set itself does not impose any such limits, but the concept of nesting to create a "fully qualified path" is supported and ensures that all created strings are unique within the using agencies over the life and any given incident event. There is no limit imposed by this International Standard regarding the "depth" of any such nesting but, as a practical matter, local agencies should establish some practical limit to this. A limit of eight such path elements would normally be sufficient for all needs. As an example, consider a message ID made up of a sequence of paths such as: [agency/operator & incident num & sub-message num & vehicle unit & cargo unit & package unit]. Alternatively, establishing rules to create a set of single unique values by every data issuer can often prove simpler to manage across multiple agencies (e.g. Event-100-Veh_12-Cargo_34-Pack_67 would be valid with the definitions below).

Format:

```
PowerUnitID ::= UTF8Strings (SIZE(0..50))
```

NOTE These are typically assigned by the generating CAD to track each cargo unit involved.

6.3.17 Data element: DE_PowerUnitType

Use: Common types of power unit classifications. This collection of listed types is used to describe the type of vehicle involved. This can affect the type of response with which others will reply to an event (size of wrecker or tow, number of dispatched response vehicles, etc.) This list is targeted to the needs of responders to understand the involved vehicles. Other reporting systems (for example a highway fatality reporting database type of application) will need to develop mappings to other lists as part of the internal CAD design when needed. The value "none" should be used when this element does not apply. The value "unknown" should be used when the element applies but the precise value is not (yet) known. The value "freeText" should only be used when text contains a suitable entry present in the accompanying message. This would typically occur during an event when the correct vehicle type was not part of the list. List source: IEEE 1512.3/D11 (issued: 01-12-21). See important implementation recommendation in 5.5.

Format:

```
PowerUnitType ::= ENUMERATED {

    unknown                 (0), -- data is not available -- or not (yet) known
      none                  (1), -- no power unit involved, used when a cargo unit is
                                 -- found free standing
    freeText                (2), -- text in the using message has a description
    dumpTruck               (3),
    endDumpTrailer          (4),
    farmTractor             (5),
    farmTractorAndTrailer   (6),
    hazMatCargoTankTrailer  (7),
    hazMatTankTruck         (8),
    passengerCarAndTrailer  (9),
    semiTractor             (10),
    straightTruck           (11),
    straightTruckAndFullTrailer (12),
    tractorAndDoubleTrailers (13),
    tractorAndTripleTrailers (14),
    tractorTrailerCombination (15),
```

```
    bellyDumpTrailer            (16
    bicycle                     (17),
    busSchool                   (18),
    busTransit                  (19),
    busArticulated              (20),
    fixedCargoTruck             (21),
    helicopter                  (22),
    limo                        (23),
    moped                       (24),
    motorCoach                  (25),
    motorcycle                  (26),
    passengerCar                (27),
    passengerVan                (28),
    pickupTruck                 (29),
    pickupTruckAndTrailer       (30),
    private-plane               (31), -- used for all “small” planes, single or multi prop, less than 10
                                      -- total occupants
    commercial-plane            (32), -- used for all “larger” planes able to hold >10 total occupants
    rrTrain                     (33), -- an Engine
    sideDumpTrailer 1           (34),
    smallTruck                  (35),
    agitatorBody                (36), -- a cement mixer truck
    bobTailTruckFxd             (37), -- when a fixed (attached) cargo is found [note that this is
                                      -- also a cargo term],
    vanTruck                    (38),
    wrecker                     (39), -- all types and sizes values from 128 to 255 may be used for
                                    local
                                      -- items
     ...
    }
```

6.3.18 Data element: DE_PressureUnits

Use: The units used by the CargoPressure data element. Since there is an extreme range of pressures possible, it is preferable to have multiple units rather than a single unit with the necessary range and resolution required for all possible scenarios.

Format:

```
PressureUnits ::= ENUMERATED {
        pascals                 (0),
        kilopascals             (1),
        bar                     (2)
        mmHg                    (3)
        …
        }
```

6.3.19 Data element: DE_ProperShippingName

Use: The proper shipping name (PSN) for the material in question as defined by an authoritative source (typically the United Nations). Many products have commercial or trade names promoted by the manufacture. Typically, these are translated to a common PSN as a requirement for preparing commercial shipping documents. Such names are also used by the responder community.

Format:

```
ProperShippingName ::= UTF8Strings (SIZE(0..255))       -- Proper shipping name (PSN)
```

6.3.20 Data element: DE_RatingType

Use: The type of label rating system being used. Typically, this is either the “diamonds” of the NFPA 704 system or the “rectangles” of the WHMIS system. It is important to know which rating system is being used as the health category ratings are NOT the same. The rating criteria for label categories of flammability and reactivity used by HMIS and NFPA are both based on NFPA 704.

Format:

```
RatingType ::= ENUMERATED {

    unknown          (0), -- use when rating systems are not known
    NFPA             (1), -- use when NFPA-704 "diamond ratings" are the source
    whmis            (2), -- use when NFPA-704 "rectangle ratings" are the source
    ghs              (3), -- use when Global Harmonization System is implemented in 2008
     ...
     }
     -- values above 127 may be used by local implementations
```

6.3.21 Data element: DE_MaterialIDReferenceSource

Use: Material ID format (UN/NA), if known.

Format:

```
MaterialIDReferenceSource ::= ENUMERATED {

    unknown          (0),
    na               (1), -- "NA" number system, e.g. North American
    un               (2), -- "UN" number system
    lc               (3), -- "LC" local code numbers
     ...
    }
```

6.3.22 Data element: DE_ refToPlacards

Use: A unique code to link to any IDX submessage with placard or warning data for this vehicle.

Format:

```
refToPlacards ::=UTF8Strings(SIZE(0..15))
```

NOTE These are typically assigned by the generating CAD to link each cargo to its placard information.

6.3.23 Data element: DE_TechnicalName

Use: The name of the material as provided by the manufactures or shipper. This may be the same as the PSN, in which case it need not be repeated (it is optional when used in messages). More typically, it is reflective of major ingredients used. Use of trade names here should be avoided. See also: DE_TradeName.

Format:

```
    TechnicalName ::= UTF8Strings (SIZE(0..250))       -- Technical Product Name
```

6.3.24 Data element: DE_TradeName

Use: The product name or common trade name of a material. Often such a name can be used in conjunction with external databases by responders to determine the product content, and therefore the suitable response. Registered or copyright marks shall not be used when entering this name (© or ®). This is different from the key ingredients (typically made up of chemical names) or the proper shipping name (a regulated set of terms to describe the hazard aspects of the material). See also DE_ProperShippingName and DE_TechnicalName.

Format:

```
TradeName ::= UTF8Strings (SIZE(0..250))          -- The Manufacturer's product or trade name
```

6.3.25 Data element: DE_UniqueConsignmentReference

Use: Unique consignment reference is the World Customs Organization unique identifier for interrelating subdomains of the supply chain.

Format:

```
UniqueConsignmentReference ::= UTF8String (SIZE(0..35))  OPTIONAL,
```

6.3.26 Data element: DE_UnitCondition

Use: Gross condition of a power unit, cargo unit or cargo in general. This element is used to reflect the overall condition of the unit and is not normally entered into the on-board data. The primary use of this data element is when roadside observers, such as police or emergency response teams, arrive at the site and are sending the data to a central control centre. More than one code may apply. The “unknown” value should be used when the condition is not ascertainable. The “intact” value should be used when conditions appear to be normal.

Format:

```
UnitCondition ::= ENUMERATED {

 -- General.IEEE 1512.3/D11 [issued: 12-21-01]

      unknown                   (0),
      seeText                   (1), -- free text in the using message contains further information
                                     -- beyond these items
      abandoned                 (2), -- used for power unit and cargo found without apparent owner
                                     -- and giving an indication of long term location in one position
                                     -- (rather than simply disabled by the roadside)
      blownTire                 (3), -- one or more, including tires damaged by impact and fire
      contaminated              (4),
      damaged                   (5), -- any form of damage to unit, catch all for damage code not
                                     -- specified here
      derailed                  (6), -- use for trains and for any load requiring equipment to
                                     -- replace/return into proper position for towing
      disabled                  (7), -- unable to move under own power, not tow-able if cargo
      evidence                  (8), -- used for any sort of crime scene where disturbing the unit is
                                   not
                                     -- allowed
      intact                    (9), -- no apparent damage and presumed to be operating correctly
                                     -- use this value if no damage is believed to have occurred
      knownOperational          (10), -- when the unit is confirmed by a competent source as
                                      -- functional (i.e. no damage) and may be used/moved
                                      -- This may require an inspection process
```

```
-- Leaks

        leakingFluidsFromUnit       (11), -- leaking of either power unit or cargo unit
                                          -- and NOT from cargo itself
        leakingFluidsFromCargo      (12), -- leaking from cargo contents
        multipleLeaksFromUnit       (13), -- leaking from multiple points of either power unit or cargo
                                          unit
                                          -- and NOT from cargo itself
        multipleLeaksFromCargo      (14), -- leaking from multiple points of cargo contents
        leakingCorrosives           (15), -- leaking corrosive fluids (such as an acid)

-- Temperature & Environmental

        mustNotAllowToFreeze        (16),
        lossOfRefrigerationGeneral  (17), -- used for refrigeration units in general and food transport
                                          units
        lossOfRefrigerationChemical (18), -- used for "temperature control" chemicals
        magneticMaterials           (19), -- used with strong magnetic fields or when a
                                          -- "magnetized material" label is present

-- Other

        onFire                      (20), -- used for fire and post fire
        hasGasTank                  (21), -- unit (typically a cargo refer) has its own Gas/Fuel supply
                                          source
                                          -- integral to it, do not use for power units (which are
                                          presumed to
                                          -- have one)
        overturnedOnSide            (22), -- any condition other than upright or overturned on top
        overturnedOnTop             (23),
        requiresCrane               (24), -- any sort of damage where a crane or other equipment will
                                          be
                                          -- needed to remove (rather than simply overturn)
        requiresUnloading           (25), -- content must be unloaded
        unloadBeforeMove            (26), -- content must be unloaded before any movement
        shedLoad                    (27), -- cargo unit (such as a container trailer) has lost load or the
                                          load
                                          -- has become unstable for movement
        sinking                     (28), -- unit is in water (and is not a boat) or taking on water actively
        submerged                   (29), -- unit has settled into water (no longer sinking, there is no
                                          longer
                                          -- any possibility of preventing further sinking)
        ...
        }
```

6.3.27 Data element: DE_VolumeUnits

Use: The units used by the CargoVolume data element.

Format:

```
VolumeUnits ::= ENUMERATED {
        litres                  (0),
        cubic meters            (1),
        gallons                 (2),
        cubic feet              (3)
        …
        }
```

6.3.28 Data element: DE_WeightUnits

Use: The units used by the CargoWeight data element.

Format:

```
WeightUnits ::= ENUMERATED {
        kilograms                       (0),
        pounds                          (1)
        …
        }
```

Annex A
(informative)

Use of messages

A.1 General

In order to maintain 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 not 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.

The load may be defined as any combination of transport goods, packages, pallets and/or containers. Each of these may be nested in any combination, as shown in Figure A1. There can be any number of sub-elements in the higher order loads of packages, pallets and containers.

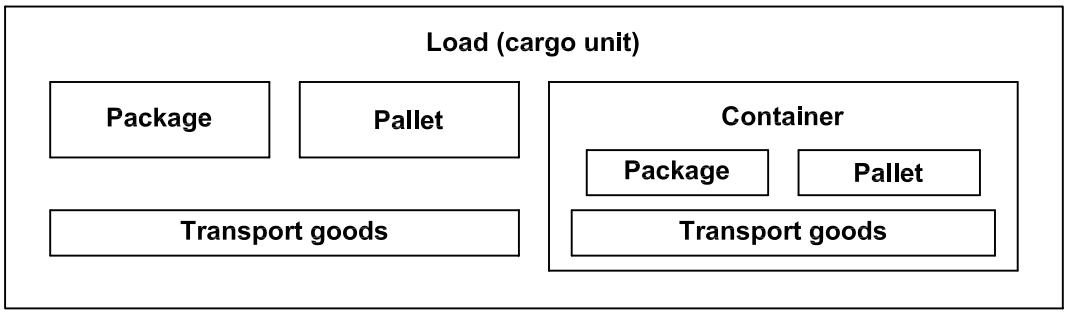


Figure A.1 — Transport goods, packages, pallets and/or containers

Three examples of using the messages and data elements contained within this International Standard are provided. The first is for simple electronic placarding information. The second defines the entire transport unit (commercial truck) and its contents, though there is not the breakdown into the multiple sequences that would normally occur when multiple cargo units are included in the load. The third example illustrates how to use the sequencing of messages and elements to define a load that consists of multiple elements.

A.2 Placard data only

Figure A.2 shows how to use the message and data elements to define information relative to dangerous goods placards and labels. This message provides only the placard/label information and does not include anything about the package or condition of the goods. This should be repeated for each equivalent placard that may exist. If multiple trailers exist, there should be one placard for each trailer.

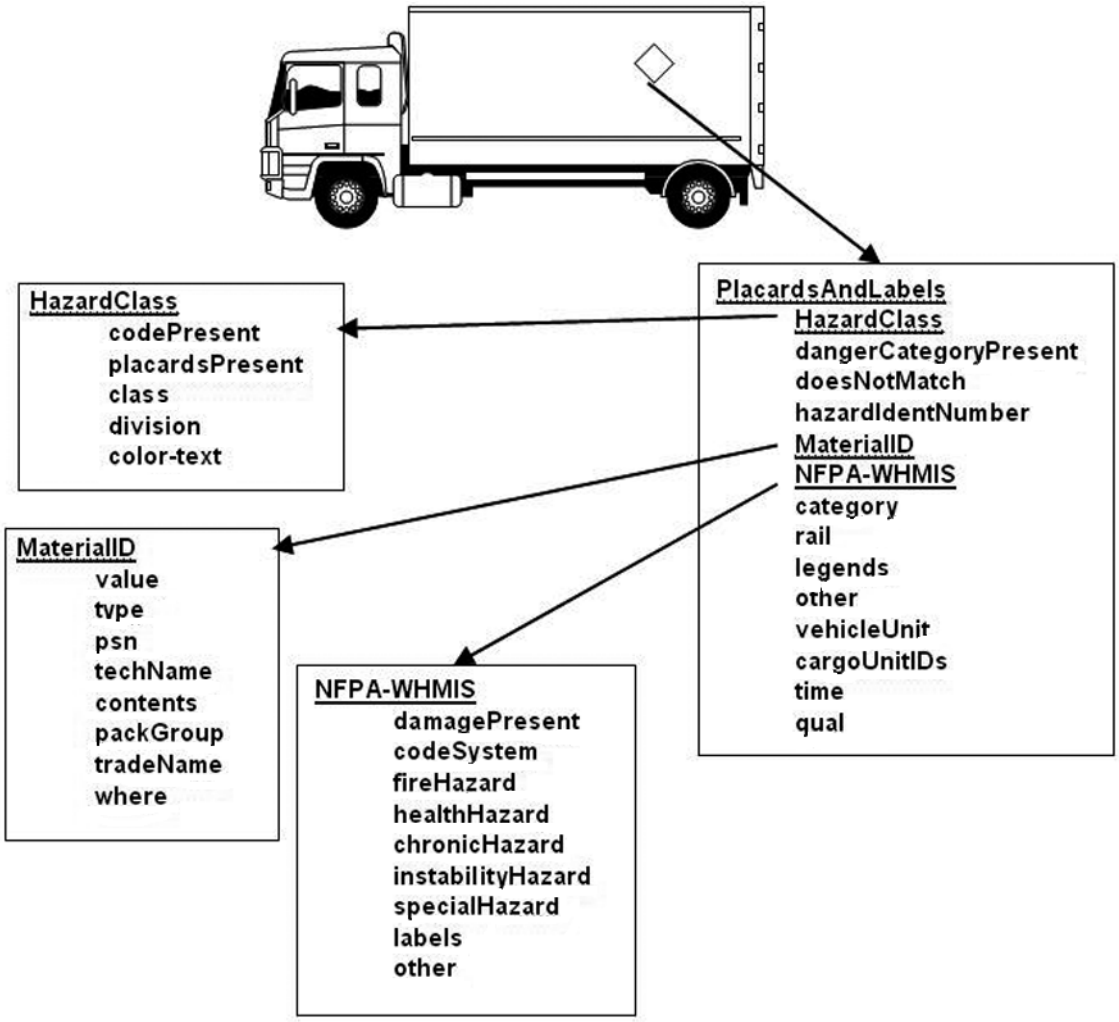


Figure A.2 — Nesting of messages and data elements to define DG data

The following is the total contents of a PlacardsAndLabels message. This does not reflect the actual encoded fields that are inserted as part of the ASN.1 encoding.

PlacardsAndLabels ..... message defining placard and label information

Sequence of, (meaning DF_hazardClass may be repeated multiple times before the "dangerCategoryPresent" data element):
HazardClass ..... imbedded message repeated for each class present
codePresent ..... true/false: is there a dangerous goods code?
placardsPresent ..... true/false: is there a placard present? This is a legacy item from off-board systems that are relying upon human observation of the vehicle, in which they need to visually determine if there are displayed placards.
class ..... integer
division ..... integer
color-text ..... ASCII text string

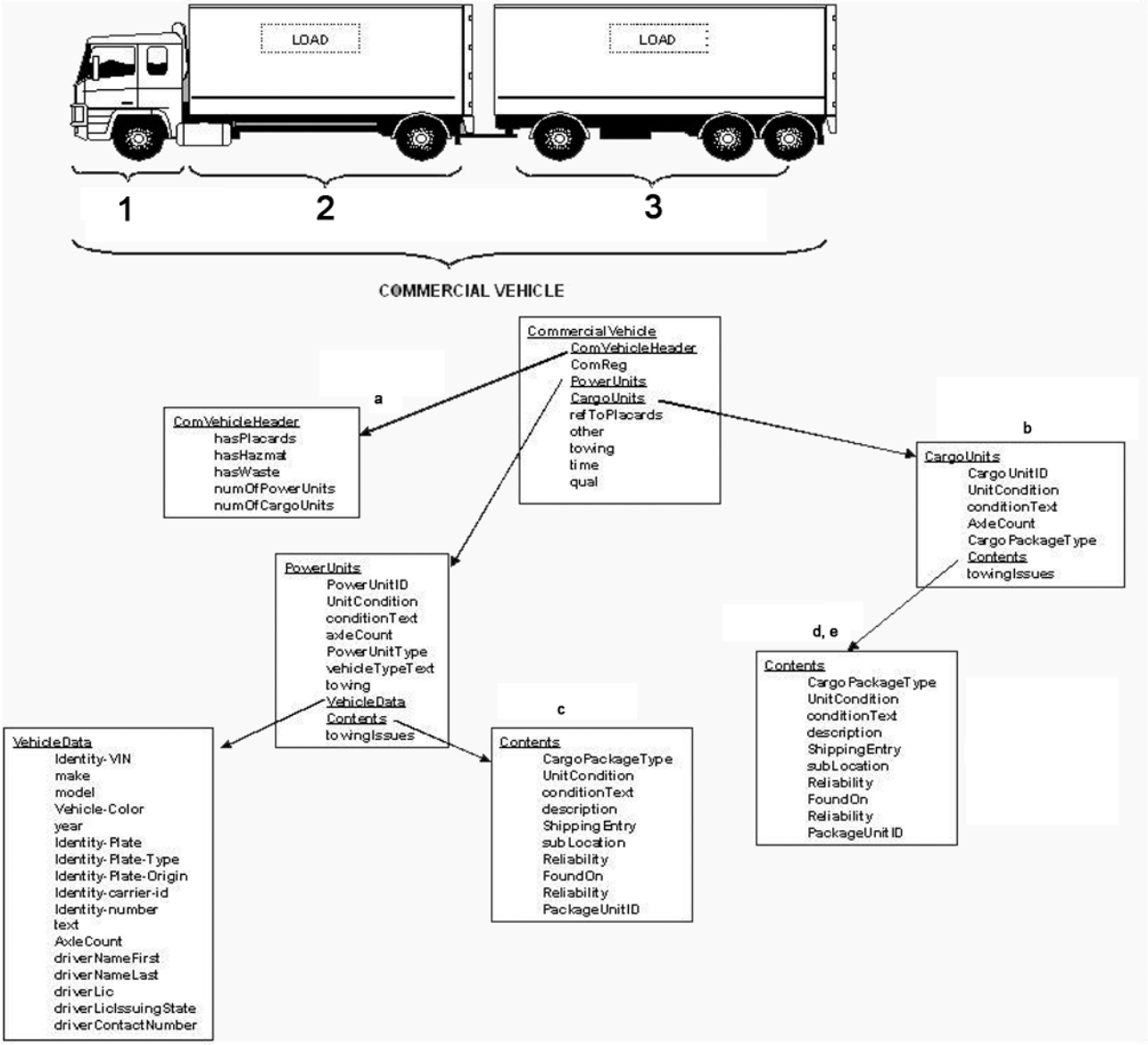
dangerCategoryPresent .....
DoesNotMatch .....
HazardIdentNumber .....
Sequence of, (meaning DF_MaterialID may be repeated multiple times before "hazardLevel"):
MaterialID
- value ..... integer - the product ID (as per ERG or UN numbers)
- ReferenceSource ..... UN or NA numbering used in the above
- ProperShippingName ..... proper shipping name (PSN) as defined by regulations
- Sequence of DE_TechnicalName (more than one name may apply to this MaterialID)
- TechnicalName ..... Technical names (key ingredients) one name per entry, no other formatting such as "contains:" or "," to be added. Use this format when concentrations are not known or do not matter and leave contents (below) blank
- (ConcentrationRange ..... not used when TechnicalName is used. When used, this may also be a sequence of names/concentrations)
- packGroup ..... integer, used if known
- TradeName ..... ASCII string
- (FoundOn ..... not used in this application as it applies only to messages generated by a roadside observer)

Sequence of, (meaning DF_ HazardLevel may be repeated multiple times before "category"). Note that this is optional and not used if not applicable:
HazardLevel .....
- damagePresent ..... Boolean set to false since this can be set to true only by visual inspection from roadside emergency teams responding to an accident.
- RatingType ..... enumerated value
- fireHazard ..... integer
- healthHazard ..... integer
- chronicHazard ..... boolean
- instabilityHazard ..... integer
- specialHazard ..... ASCII string
- labels ..... ASCII string
- other ..... ASCII string

Sequence of, (meaning DE_ CategoryTypes may be repeated multiple times before "rail"). Note that this is optional and not used if not applicable:
CategoryTypes ..... enumerated value
Rail ..... not used but retained in definition to maintain ASN.1 encoding compatibility with standards that do use it.
Sequence of, (meaning DE_ Legends may be repeated multiple times before "PowerUnitID"). Note that this is optional and not used if not applicable:
Legends ASCII string giving labels and statements regarding the hazard or contents
other ..... ASCII string for free text information
Sequence of, (meaning DE_ PowerUnitID may be repeated multiple times before "CargoUnitID"). Note that this is optional and not used if not applicable:
PowerUnitID ..... ASCII string
Sequence of, (meaning DE_ CargoUnitID may be repeated multiple times before "time"). Note that this is optional and not used if not applicable:
CargoUnitID ..... ASCII string
time ..... the system fills in the time/version
qual ..... level of reliability and presumed quality of the information

A.3 Vehicle identification and load data

This message can contain the full set of data about the vehicle, all trailers that it may be towing, and a description of the load. To identify the vehicle itself and not the contents (load), the DF_Contents option is not exercised.



Key

1 power unit

2 cargo unit = power unit + load

3 cargo unit = trailer + load

a This header is for the entire transport unit.

b There may be any number of cargo units, using a sequence of DF_CargoUnits to describe each.

c This describes the power unit load.

d This describes the cargo unit load.

e By using the various options available with the “Sequence” capability, it is possible to define a hierarchical set of packages and pallets within a single cargo unit.

Figure A.3 — Identifying the vehicle which may include multiple load units

The following commercial vehicle message may occur as a single instance or as a sequence, allowing a series of transport units to be described in a single message.

CommercialVehicle description of a vehicle and/or trailer used for commercial uses.

- ComVehicleHeader — description of the gross type and number of transport units
  - hasPlacards — boolean, set to true if a placard is present
  - hasHazmat — boolean, set to true if dangerous goods are present
  - hasWaste — boolean, set to true if waste products are present
  - numOfPowerUnits — integer identifying the number of power units, for powered vehicles this will almost always be one.
  - numOfCargoUnits — integer identifying the number of cargo units. This will usually be the number of trailers or containers. For a cargo and power unit combined (straight truck), this will be one.

Sequence of, (meaning ComReg may be repeated multiple times before "PowerUnits"):

- ComReg ASCII string containing the textual form of the registration

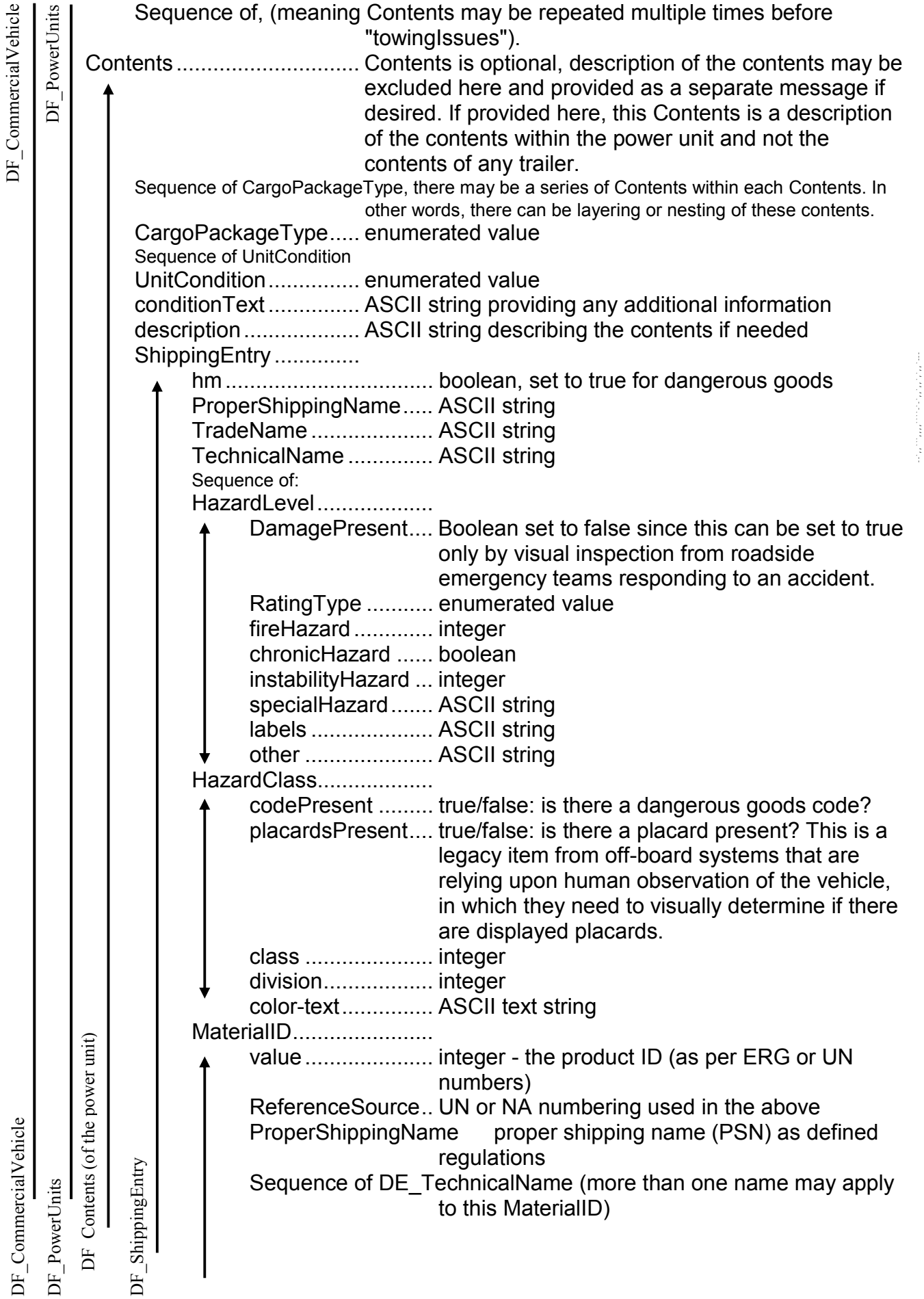
Sequence of, (meaning PowerUnits may be repeated multiple times before "cargoUnits", this is primarily for other uses of this message which included rail wherein multiple engines/power units often occur):

- PowerUnits — data about the Vehicle power unit
  - PowerUnitID — ASCII string

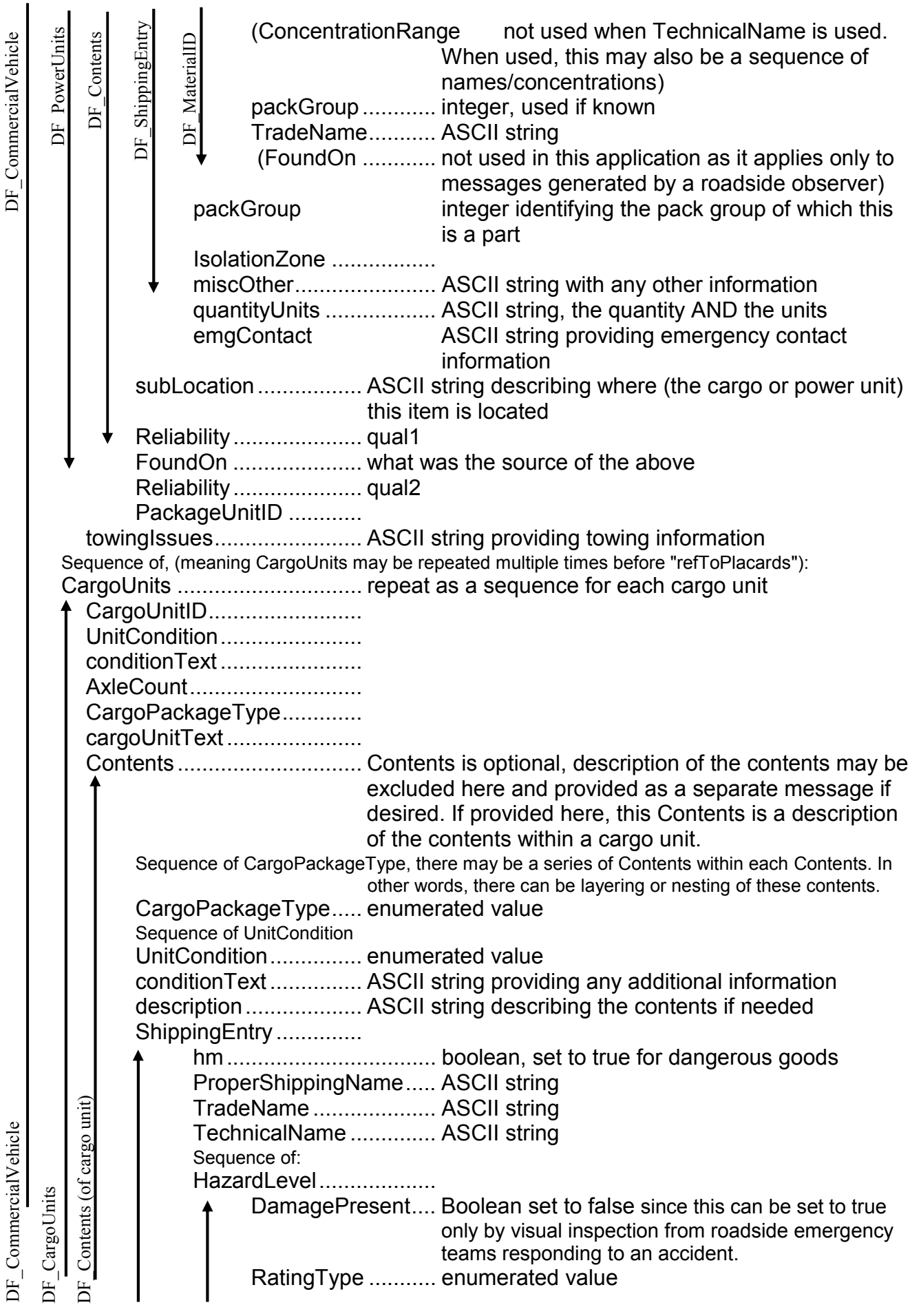
  Sequence of UnitCondition (if than one applies, put most relevant first)
  - UnitCondition — enumerated value, generally will be = 0 for unknown, other values may be used if monitoring systems are in place that can determine the condition.
  - conditionText — ASCII string describing the condition, generally not used within the scope of this International Standard
  - AxleCount — integer, use zero if unknown
  - PowerUnitType — enumerated integer value
  - vehicleTypeText — ASCII string to describe vehicle type if the type in the enumeration list is not suitable.
  - towing — ASCII string to provide data on tow points or recovery process
  - VehicleData — provides common data regarding the vehicle
    - Identity-VIN — VIN number of the vehicle (from SAE J2313)
    - make — ASCII string (from SAE J2313)
    - model — ASCII string (from SAE J2313)
    - Vehicle-Color — (from SAE J2313)
    - year — integer (from SAE J2313)
    - Identity-plate — type of identity plate (from SAE J2313)
    - Identity-plate-origin — issuing country/state/province (from SAE J2313)
    - Identity-carrier-id — owner/operator (from SAE J2313)
    - Identity-number — any id or fleet number of vehicle
    - text — ASCII string providing any additional information
    - AxleCount — integer
    - driverNameFirst — ASCII string
    - driverNameLast — ASCII string
    - driverLic — ASCII string
    - driverLicType — ASCII string
    - driverLicIssuingState — ASCII string (use ANSI D20 codes)
    - driverContactNumber — ASCII string

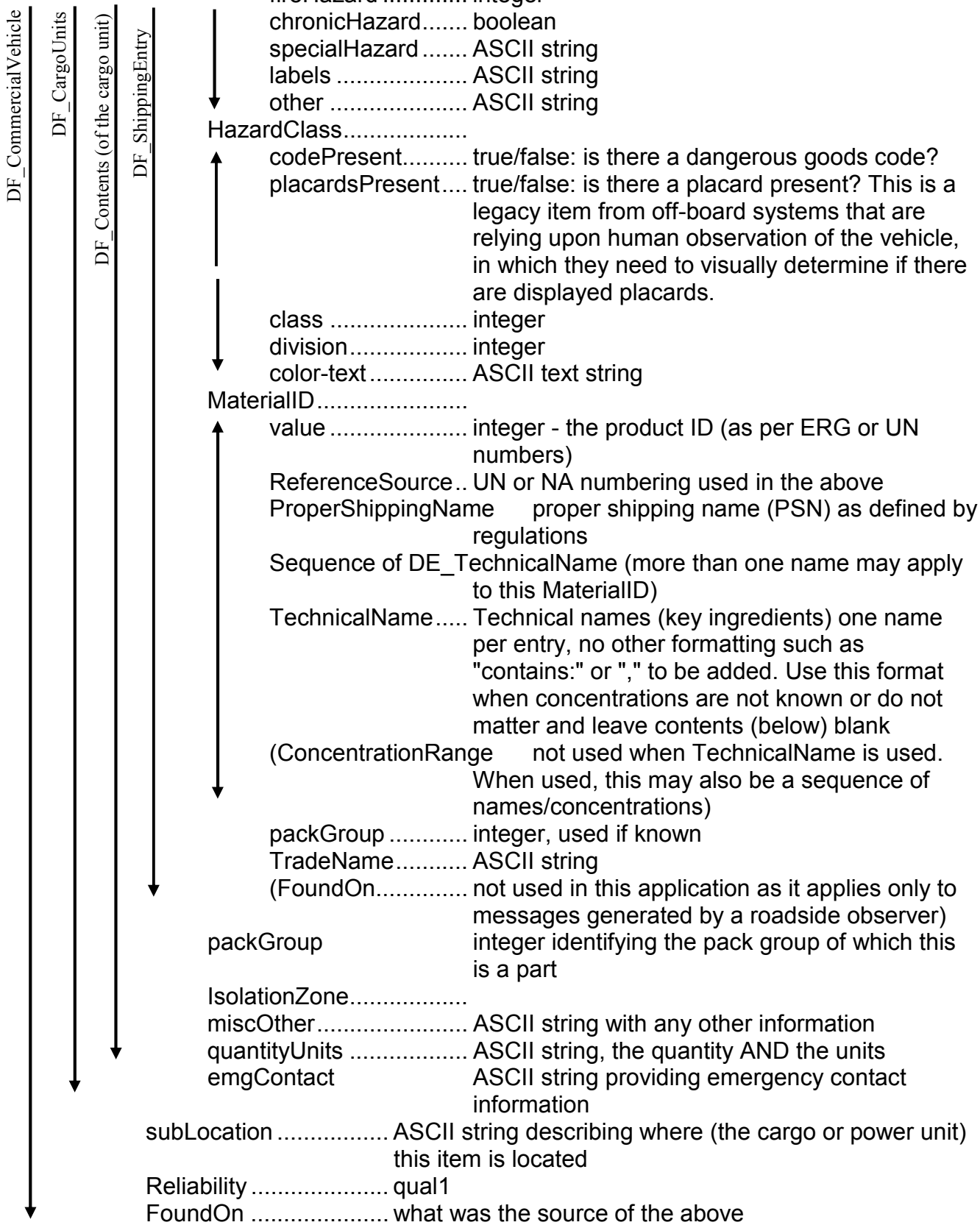
DF_CommercialVehicle

DF_PowerUnits



TechnicalName Technical names (key ingredients) one name per entry, no other formatting such as "contains:" or "," to be added. Use this format when concentrations are not known or do not matter and leave contents (below) blank

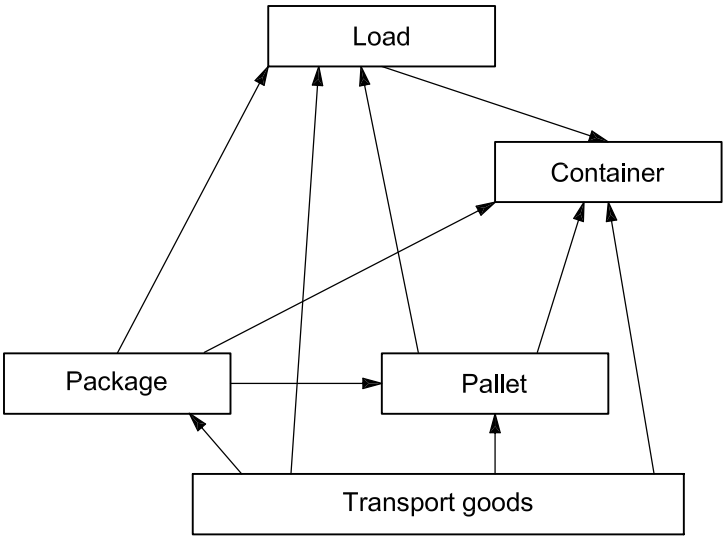




other ..... ASCII string of free text information
towing ..... ASCII string providing towing information
time ..... time/version stamp
Reliability ..... qual

A.4 Load contents/identification

The load may be defined as any combination of transport goods, packages, pallets and/or containers. Each of these may be nested in any combination as shown in Figure A.4. There can be any number of subelements in the higher order loads of packages, pallets and containers.



NOTE 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.

Figure A.4 — Load contents/identification

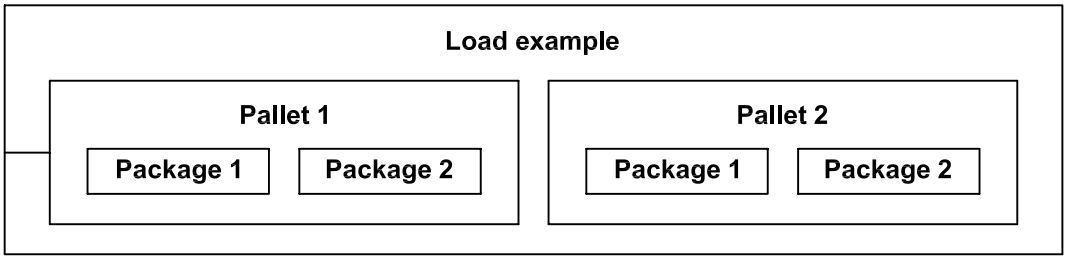


Figure A.5 — Transport goods example includes multiple sub-elements

For the following example, emphasis is being placed on how to identify a more complex load such as the one given in the example. Thus, only information showing this will be given; those data elements that do not support this example will not be detailed. In addition, to make the example simpler, it is assumed that no dangerous goods are present.

Contents ..... Contents of the total load shown in Figure A.5.

The total trailer

CargoPackageType..... 8 (box trailer)
●
●
●
ShippingEntry .....
●
HazardLevel .....
●
●
●
HazardClass.....
●
●
●
MaterialID.....
●
●
●
packGroup 1 (package group 1 is being used to denote the entire trailer 1)
●
●
subLocation ..... Trailer #1
●
●
PackageUnitID..... T1 (for trailer #1, could be any value as long as it is unique to this transport means/load)

Contents ..... Contents of Pallet #1 shown in Figure A.5.

Pallet #1

CargoPackageType..... 9 (bulk package)
●
ShippingEntry .....
●
HazardLevel .....
●
HazardClass.....
●
MaterialID.....
●
packGroup T1 (package group T1 is the entire trailer in which this is located)
●
●
PackageUnitID..... 12345 (the identifying number for this pallet)

Contents ..... Contents of Package #1 in Pallet #1 shown in Figure A.5.

Package #1 in Pallet #1

- CargoPackageType..... 22 (fiberboard box)
- ShippingEntry .....
  - HazardLevel.....
  - HazardClass.....
  - MaterialID.....
  - packGroup ..... 12345 (this box is part of pallet #12345)
- PackageUnitID ..... BAXYZ (the identifier for this box)

Contents ..... Contents of Package #2 in Pallet #1 shown in Figure A.5.

Package #2 in Pallet #1

- CargoPackageType..... 22 (fiberboard box)
- ShippingEntry .....
  - HazardLevel.....
  - HazardClass.....
  - MaterialID.....
  - packGroup ..... 12345 (this box is part of pallet #12345)
- PackageUnitID ..... BA1234 (the identifier for this box)

Contents ..... Contents of Pallet #2 shown in Figure A.5.

Pallet #2

- CargoPackageType..... 9 (bulk package)
- ShippingEntry .....
  - HazardLevel.....
  - HazardClass.....
  - MaterialID.....
  - packGroup ..... T1 (package group T1 is the entire trailer in which this is located)
- PackageUnitID ..... 56789 (the identifying number for this pallet)

Contents ..... Contents of Package #1 in Pallet #2 shown in Figure A.5.

Package #1 in Pallet #2

CargoPackageType..... 22 (fiberboard box)

●

ShippingEntry .....

●

HazardLevel .....

●

HazardClass.....

●

MaterialID.....

●

packGroup..... 56789 (this box is part of pallet #56789)

●

●PackageUnitID ..... BCDEF (the identifier for this box)

Contents ..... Contents of Package #2 in Pallet #2 shown in Figure A.5.

Package #2 in Pallet #2

CargoPackageType..... 22 (fiberboard box)

●

ShippingEntry .....

●

HazardLevel .....

●

HazardClass.....

●

MaterialID.....

●

packGroup..... 56789 (this box is part of pallet #56789)

●

●PackageU

Annex B
(informative)

Typical system architecture

The transportation of dangerous goods from origin to destination can be intermodal or remain within a single mode. Figure B.1 illustrates the system configuration for road-based DG transportation under normal as well as emergency conditions.

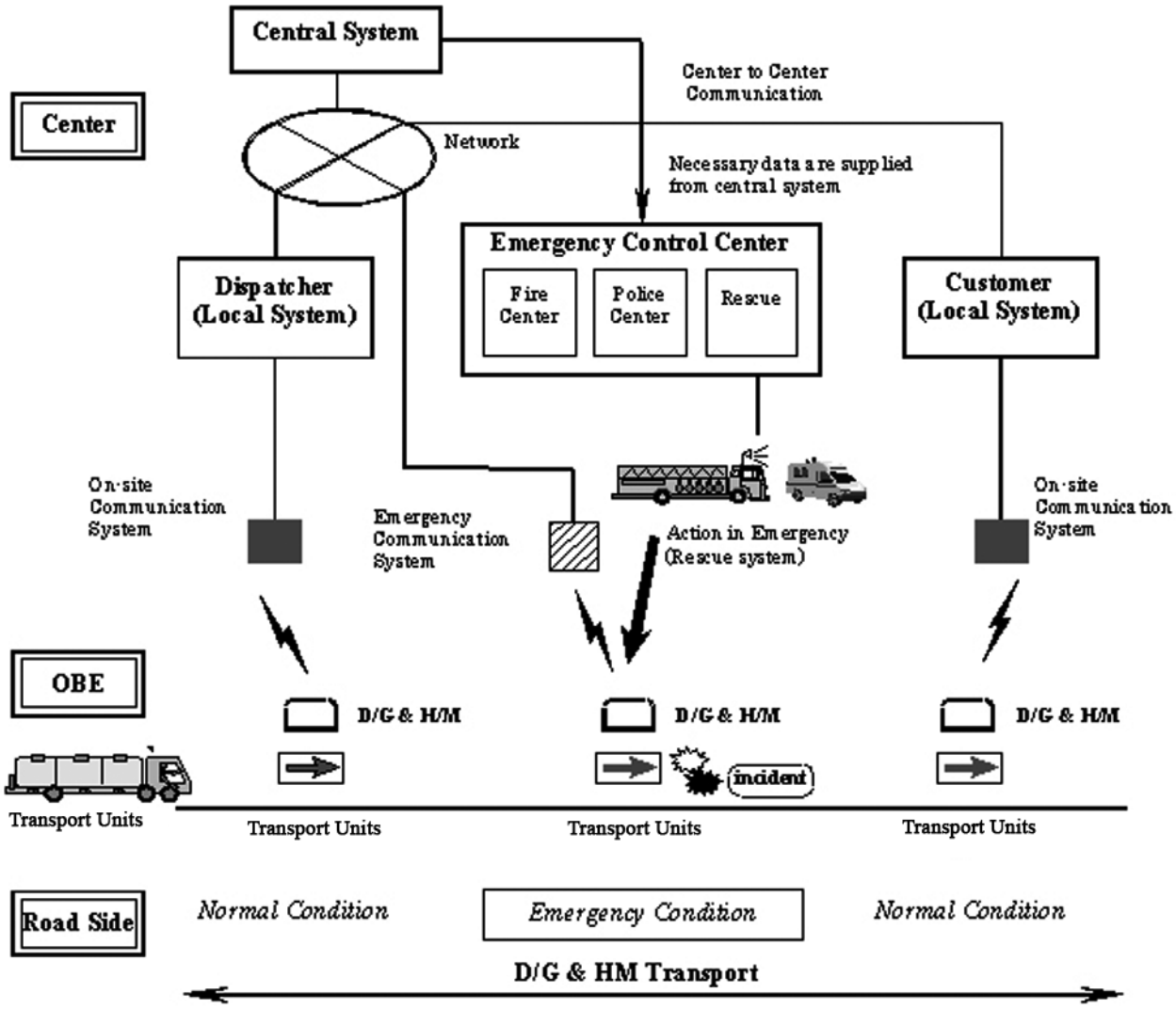


Figure B.1 — System configuration for road-based DG transportation under normal as well as emergency conditions

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