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IEEE Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers

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IEEE Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers

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Abstract: This standard addresses the exchange of vital data about hazardous material and other cargo and contents of vehicles and buildings involved in transportation-related events, through common incident management message sets. That data exchange is specifically to support real-time interagency transportation-related incident management. Message sets specified are consistent with the National Intelligent Transportation Systems Architecture and are described using Abstract Syntax Notation One ("ASN.1") syntax. This standard comprises one companion volume of the family of incident management standards centered around a base standard: IEEE Std 1512™-2000, IEEE Standard for Common Incident Management Message Sets for Use by Emergency Management Centers. Other members of that family that are forthcoming include two other companion volumes, specifying incident management message sets for transportation management and public safety. Collectively, this family of standards shall be referred to as the "IEEE 1512 Family of Standards." The goal of these standards is to support efficient communication for the real-time, interagency management of transportation-related events. Those events include incidents, emergencies, accidents, planned roadway closures, special events, and disasters caused by humans or natural events. These events include any such event that impacts transportation systems, or that causes a report to be received by an emergency management system, whether or not the event actually affects a transportation system, and whether or not a response is required.

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Introduction

(This introduction is not part of IEEE Std 1512.3-2002, IEEE Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers.)

The Incident Management Working Group was formed from a cross section of Intelligent Transportation System (ITS) and incident management practitioners in 1997 to address the problems and concerns of dispatching traffic management centers interacting with each other in the resolution of (primarily) roadway services disruptions (and certain other events on the highway), generically referred to as incidents. Advancing the greater coordination of these centers and their cross servicing over various jurisdictional boundaries is the primary objective of this working group.

This standard is one of several related standards in this area and deals primarily with the communication of vital data about cargo and contents of vehicles and buildings involved in transportation-related events. It is a companion volume to the base standard, IEEE Std 1512-2000, IEEE Standard for Common Incident Management Message Sets for Use by Emergency Management Centers. Other categories of communication, having to do with transportation management, public safety, and asset sharing, will be addressed in subsequent companion volumes generated by this working group. IEEE Std 1512-2000, this volume, and forthcoming companion volumes together comprise what shall be known as the IEEE 1512 Family of Standards.

IEEE Std 1512-2000 includes more general introductory material for the family of standards, including the other companion volumes and the relationship between the family of standards and other ITS standards and the National ITS Architecture. That material will not be repeated here. Rather, the remainder of this section will present a statement of the problem this standard is to address, and its goal.

Problem statement

In the course of a transportation-related events, often the cargo and/or contents carried by involved vehicles, or in involved buildings, can figure importantly in the incident: in the hazardous materials present, in how those hazards should be managed, and how the overall incident should be managed. Yet in the course of an incident, the information about that cargo and/or contents may be complex, disorganized, spatially scattered, and partial (e.g., only a placard, giving only information about the hazard class or divisions of hazardous material carried, and sometimes even less than that).

To restate the problem in decision-support terms: Often there are large gaps between the available information and what the incident commander needs in order to best manage the incident with regard to cargo and/or contents.

Goal of this companion volume

Supporting the incident commander with all available information concerning cargo and content will require collecting on-site data and then accessing perhaps several off-site databases. Managing the operational complexities of collecting the on-site data, then querying multiple databases to gather all relevant information, is a task for the local implementation. The goal for this companion volume is to provide the framework for communication among the site and those databases, to provide a flexible basis for that complex decision support process.

In more detail, the goal of this standard is to support the communication necessary to take the real-world, cargo/content information available to the incident commander, and use off-site databases to make further information available to that commander, to best support him or her in managing the event. That calls for messages that support communication of whatever information is available, often quite partial, to and from off-site databases, and (often) among off-site databases, to accomplish two decision-support functions as follows:

- 1) To retrieve further information about what the cargo and/or contents are, based on what are often quite partial cues available on site. That information is available in off-site databases managed by shippers, carriers and Fleet and Freight Management centers.
- 2) To retrieve information about the characteristics of the cargo and/or contents that is important for incident management, such as toxicity, flammability, danger of explosion, size of a potential toxic plume, environmental damage; recommended set-back distances and evacuation areas.

In order to get the most effective grouping of message sets within each companion volume, the goal of this standard is limited to exchange of information about cargo and contents, and any release and the circumstances of that release, such as spill pool size and weather. Exchange of information directly related to the development and execution of operational plans for managing an incident will be covered in another companion volume that is oriented toward operations.

Companion volumes

This standard provides information on additional messages, data frames, and data elements beyond those appearing in the Base Standard (IEEE Std 1512-2000). In order to make full use of this information the Base Standard and other references to ITS and industry standards may also need to be employed, particularly in the area of message set re-use where the contents of various elements have been taken from well-established practices both within and outside that of the ITS and hazardous response industries.

The standard and use with data registries

This standard was developed in conjunction with entries made into the ITS data registry. The following information may be useful to persons wishing to track the data structures described in this standard with those entries or in other similar registries.

In each of the data structures found in Clauses 5 and 6 of this document, the following meta data fields are used and are equivalent to the named fields in the ITS registry. The mapping between these fields is as follows. The specific clause numbering and name of an entry is also the DESCRIPTIVE NAME of that entry in the registry (the part which follows after the “:” is the name used). The one or more paragraphs that then follow, headed “Use,” forms the DESCRIPTION entry. The final one or more paragraphs, headed “Remarks,” forms the REMARKS entry. The section headed “Used by,” contains linkages to other data structures that in turn refer to this one. In the ITS registry the fields RELATED DATA CONCEPT and RELATIONSHIP TYPE may be used to convey this information along with other relationships. The section headed by “Format,” contains all the ASN.1 defining code. In the ITS registry this information is broken up among the fields: ASN.1 NAME, DATA TYPE, VALID VALUE RULE, and BODY. The ASN.1 NAME contains the formal ASN.1 Type Definition name of the object. The DATA TYPE contains the base type from which it is defined. The VALID VALUE RULE, or the BODY, then contains the various constraints, declared constants, enumerations values, and comments of the rest of the definition. In the case of data element entries this information is found in the VALID VALUE RULE, while in the case of data frames and messages, this information is placed into the BODY field.

Other fields used in the ITS registry (such as UNITS or FORMULA) are typically not provided with content from this standard, or are self evident and constant in nature. The SOURCE field is an example of this, and its value for all entries from this standard is IEEE P1512.1™.

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At the time this Standard was completed, the Incident Management Working Group for Intelligent Transportation Systems had the following membership and officers:

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The IEEE 1512 Family of Standards is dedicated to the memory of those who lost their lives responding to the tragic events of September 11, 2001. The Working Group honors the men and women who continue to maintain vigilance in protecting freedom and security. It is our hope and expectation that these standards will enhance multi-jurisdictional communications.

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IEEE Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers

1. Overview

This standard contains a framework for the exchange of data in messages sets for use by Emergency Management Centers (EMC) for hazardous material incidents.

This standard supplements the IEEE Std 1512™-2000, Standard For Common Incident Management Message Sets for use by Emergency Management Centers, henceforth called the “Base Standard” for the family of incident management message sets. The overview, scope, and purpose of IEEE Std 1512-2000 will not be repeated in this standard.

In the course of managing many transportation-related events, there is a need for sorting out and managing the often complex and partial information about the cargo and contents of involved vehicles and, in some cases, the contents of involved buildings. Often there are large gaps between the available information and what the incident commander needs in order to best manage the incident with regard to cargo and contents. In the ITS world, those gaps will often be spanned by off-site databases. The particular complexities of collecting the on-site data, then querying multiple off-site databases to gather all relevant information, is a task for local implementers. The task for this standard is to provide the framework for communication among the site and those databases, to provide a flexible basis for that complex decision support process.

In supporting that decision process, this standard supports communication concerning vehicle cargo, contents, and building contents. Often a material that must be taken into account in incident management is not an involved vehicle's cargo, but its fuel, as in a fuel spill. Thus, this standard extends to both vehicle cargo and other contents. In addition, the 1512 Family of Standards has within its scope all transportation-related events, which include, for example, building fires and building structural failures as they impact the transportation system. For example, a structural fire can involve significant road closure. Often buildings have contents, in particular hazardous material, that must be taken into account in managing a transportation-related incident. Thus, this standard addresses not only vehicle cargo and contents, but also building contents.

Often information about cargo and/or contents is important for incident management whether or not the cargo and/or contents is labeled as hazardous material or hazardous waste. There are several examples: Many common solvents and cleaning compounds require no shipping papers, labels, or placards when

shipped as new, yet become EPA regulated as hazardous waste, requiring shipping papers, markings, and placards, when they are used and dirty, indicating that they should be considered hazardous when they are spilled. Many combustible liquids in non-bulk packaging are excepted from hazard communication and packaging requirements, but are DOT regulated as hazardous when in bulk packaging. Especially valuable cargo may have to be protected. Perishable cargo may call for special measures to maintain its value. Live animals may call for special measures to prevent escape; to keep them alive; to prevent them from inflicting injury to themselves, other animals, or humans; to handle manure and urine; and to handle carcasses if they perish. Thus, this standard addresses not only hazardous cargo and contents, but also any cargo and contents that could impact the management of a transportation-related incident.

This standard supports communication concerning cargo and contents in transportation-related events, whether those are associated with roadways, railways or waterways.

1.1 Scope

This standard is a companion volume for IEEE Std 1512-2000. This standard specifies messages, data frames and data elements for the exchange of vital data about hazardous material, as defined in 3.1, and other cargo and contents of vehicles and buildings involved in transportation-related events, to support real-time interagency transportation-related incident management.

The Base Standard (IEEE Std 1512-2000) specifies messages, data frames, and data elements for the basic underlying communication involved in real-time interagency transportation-related incident management. Refer to the Base Standard for specification of the scope of the combination of the Base Standard and companion volumes such as this one. Together, the Base Standard and companion volumes shall be referred to as the “1512 Family of Standards.”

Clause 5 and Clause 6 of this standard present the specified messages, data frames, and data elements in ASN.1 format. A mapping of those messages, data frames, and data elements into XML format is presented in Annex A.

1.2 Purpose

This standard provides a framework for the exchange of messages concerning cargo and content of vehicles and content of buildings involved in transportation-related events, to support the management of those events. The clearest examples of the need for these messages are in cases where the cargo and/or content include hazardous material or hazardous waste. However, these messages are also often needed where the cargo and/or content is non-hazardous, as described above under 1.1 Scope.

This standard is part of the 1512 Family of Standards. The purpose of that family of standards as a whole is presented in the Base Standard and will not be repeated here.

In more detail, the purpose of this standard is to support the communication necessary to take the real-world, available-information situation confronting the incident manager, and use off-site databases to make further information available to that manager, to best support this individual in managing the event. That calls for messages that support communications of whatever information is available, often quite partial, to off-site databases and resources, and (often) then among off-site databases and resources, to accomplish two decision-support functions:

- a) To retrieve further information about what the cargo and/or contents are, based on what are often quite partial cues available on site. That information is available in off-site databases managed by shippers, carriers, and Fleet and Freight Management centers.

- b) To retrieve information about the characteristics of the cargo and/or contents that is important for incident management, such as toxicity, flammability, danger of explosion, size of a potential toxic plume, environmental damage, recommended set-back distances, and evacuation areas.

2. References

The following documents shall be used, when applicable, in the process of populating and developing the message sets of this standard. The specific revision and issued date stated below shall be used for each document. When the following documents are superseded by an approved revision, the revised version shall be reviewed for applicability.

The references cited below shall be included in the references of the other companion volumes of this standard unless specifically excepted.

2000 Emergency Response Guidebook, A Guidebook For First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident.¹

ASN.1:1997, Abstract Syntax Notation One.²

Code of Federal Regulations pertaining to federal hazmat transportation regulations, notably 49 CFR parts 100 to 185.³

IEEE Std 1488TM-2000, IEEE Trial-Use Standard for Message Set Template for Intelligent Transportation Systems.^{4, 5}

IEEE Std 1489TM-1999, IEEE Standard for Data Dictionaries for Intelligent Transportation Systems.

ISO/IEC 8824-1:1998, Information technology-Abstract Syntax Notation One (ASN.1): Specification of basic notation.⁶

ISO/IEC 8824-2:1998, Information technology-Abstract Syntax Notation One (ASN.1): Information object specification.

ISO/IEC 8824-3:1998, Information technology-Abstract Syntax Notation One (ASN.1): Constraint specification.

ISO/IEC 8824-4:1998, Information technology-Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications.

ITE TCIP, Transit Communications Interface Profiles-Standard on Incident Management Objects, NTCIP 1402v01.02, December 2000.

¹2000 Emergency Response Guidebook is available from the U.S. Department of Transportation, Research and Special Programs Administration, Washington, D.C.

²Available from the World Wide Web at the following site: <http://asn1.elibel.tm.fr>.

³Code of Federal Regulations is available from the Federal Government Printing Office. It is also available online from the National Archives and Records Administration at <http://www.access.gpo.gov/nara/CFR/>.

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⁶ISO/IEC publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembe, CH-1211, Genève 20, Switzerland/Suisse (<http://www.iso.ch/>). ISO/IEC publications are also available in the United States from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112, USA (<http://global.ihs.com/>). Electronic copies are available in the United States from the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (<http://www.ansi.org/>).

ITE TMDD, Standards for Functional Level Traffic Management Data Dictionary (TMDD), Standard TM1.03, Amendment 1, March 19, 2001.⁷

NFPA 704 -Standard for the Identification of the Fire Hazards of Materials for Emergency Response, 2001 Edition.⁸

SAE J2313 -On-Board Land Vehicle Mayday Reporting Interface, September 1999.⁹

SAE J2353, Data Dictionary For Advanced Traveler Information Systems (ATIS), October 1999.

SAE J2354 -Message Sets for Advanced Traveler Information System (ATIS), November 1999.

SAE J2369 -Standards for ATIS Message Sets Delivered Over Reduced Bandwidth Media, March 2000.

SAE J2540, Messages for Handling Strings and Look-Up Tables in ATIS Standards, February 2002.

SAE J2540-1, RDS Phrase Lists, July 2002.

SAE J2540-2, ITIS Phrases List, February 2002.

SAE J2540-3, National Names Phrase List, January 2002.

SAE J2630, Draft Converting ATIS Message Standards From ASN.1 To XML, Division ballot draft of July 15, 2002.¹⁰

Other documents defined in IEEE Std 1512-2000 remain as cited and are included herein by reference.

3. Definitions, acronyms, and abbreviations

For the purposes of this 1512 Family of Standards, the following definitions, abbreviations, and acronyms apply. IEEE 100, *The Authoritative Dictionary of IEEE Standards Terms*, Seventh Edition [B1],¹¹ should be referenced for terms not defined in this clause. If the terms do not exist there, consult the latest edition of *Webster's New Collegiate Dictionary*.

The terms, abbreviations, and acronyms cited below shall be a part of the terms of the other companion volumes of this standard unless specifically cited otherwise.

3.1 Definitions

3.1.1 2000 Emergency Response Guidebook: This book (ERG2000) was developed jointly by Transport Canada (TC), the U.S. Department of Transportation (DOT), and the Secretariat of Transport and Communications of Mexico (SCT) for use by fire fighters, police, and other emergency services personnel who may be the first to arrive at the scene of a transportation incident involving dangerous goods. It is

⁷Standards for Functional Level Traffic Management Data Dictionary (TMDD) are available from the Institute of Transportation Engineers, 1099 14th Street, NW, Suite 300 West, Washington, DC 20005-3438, USA (<http://www.ite.org/standards/index.html>).

⁸NFPA publications are published by the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269, USA (<http://www.nfpa.org/>).

⁹SAE publications are available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096, USA (<http://www.sae.org/>).

¹⁰As this standard goes to press, SAE J2630 is not yet published. The draft standard is, however, available from the IEEE. Contact the IEEE Standards Department at 1 (732) 562-3800 for status information.

¹¹The numbers in brackets correspond to those of the bibliography in Annex B.

primarily a guide to aid first responders in quickly identifying the specific or generic hazards of the material(s) involved in the incident, and protecting themselves and the general public during the initial response phase of the incident. For the purposes of this guidebook, the “initial response phase” is that period following arrival at the scene of an incident during which the presence and/or identification of dangerous goods is confirmed, protective actions and area securement are initiated, and assistance of qualified personnel is requested. It is not intended to provide information on the physical or chemical properties of dangerous goods.

3.1.2 adjustable bogie: Trailer axles that are adjustable in a longitudinal (fore/aft) manner to transfer greater or lesser trailer weight on the towing vehicle axles.

3.1.3 agitator body: A truck body designed and equipped to mix concrete in transit. (Refer to Figure 1.)



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Figure 1—Example of an agitator body type

3.1.4 automobile transporter body: Truck or trailer body designed for the transportation of vehicles. (Refer to Figure 2.)



Figure 2—Example of an automobile transporter

3.1.5 balloon freight: Light, bulky cargo.

3.1.6 bobtail: A truck tractor moving without a trailer or a straight tank truck carrying a propane cargo tank. (Refer to Figure 3.)



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Figure 3—Example of a Bobtail

3.1.7 bottlers body: Truck body designed for hauling cased, bottled beverages.

3.1.8 bottom dump: Trailer body designed to dump its cargo through gates in bottom or floor of the trailer. (Refer to Figure 4.)



Figure 4—Example of a bottom dump

3.1.9 B-trains: A combination consisting of a tractor and two semitrailers, the second trailer coupled to the first trailer by use of a fifth wheel, which is mounted directly behind cargo body on the lead semitrailer.

3.1.10 bulk packaging: Bulk packaging means a packaging, other than a vessel or a barge, including a transport vehicle or freight container, in which hazardous materials are loaded with no intermediate form of containment and that has (1) a maximum capacity greater than 450 L¹² as a receptacle for a liquid; (2) a maximum net mass greater than 400 kg¹³ and a maximum capacity greater than 450 L¹⁴ as a receptacle for a solid; or (3) a water capacity greater than 454 kg¹⁵ as a receptacle for a gas as defined in 49CFR Sec. 173.115. (Refer to Figure 5.).



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Figure 5—Examples of bulk packaging

¹²450 L is equal to 119 gallons.

¹³400 kg is equal to 882 lbs.

¹⁴450 L is equal to 119 gallons.

¹⁵454 kg is equal to 1000 lbs.

3.1.11 cab, conventional: A tractor on which the cab is behind the engine. *See: snub-nose.*

3.1.12 cab-over-engine (COE): A tractor on which the cab is located over the engine.

3.1.13 cargo tank: A bulk packaging designed to transport liquid or gaseous cargo. The tank may be mounted on a truck, trailer, or semitrailer. (Refer to Figure 6.)



Figure 6—Example of a cargo tank

3.1.14 carrier: A person engaged in the transportation of passengers or property by land or water, or by civil aircraft.

3.1.15 clean bore tank: A single tank without compartments inside.

3.1.16 combination vehicle: A truck or truck-tractor coupled to one or more trailers, also referred to as a “rig.” *See: rig.*

3.1.17 container (van body type): A truck or trailer body provided with means for ready removal from and attachment to a vehicle.

3.1.18 converter gear or dolly: The coupling device composed of one or two axles and a fifth wheel by which a semitrailer can be coupled to the rear of a tractor-trailer combination, forming a double-bottom rig.

3.1.19 convertible: A truck or trailer that can be used either as a flat-bed or open top by means of removable side panels.

3.1.20 dangerous goods: *See: hazardous materials.*

3.1.21 data frame: Formerly called data structure in the Base Standard, it is any construct [including data elements (DEs)] used to represent the contents of a Data Dictionary. From a computer science perspective, data structures are viewed as logical groupings of DEs, used in this document to describe “messages” or parts of messages. The data structures comprise the data elements defined in this standard.

3.1.22 diamond ratings: *See: NFPA 704.*

3.1.23 double bottom or triple bottom: Two or three semitrailers attached as unit and towed by a truck tractor.

3.1.24 double bottoms: *See: doubles.*

3.1.25 doubles: A combination vehicle consisting of a tractor, a semitrailer, and a full trailer, coupled together. *Syn.:* **twins, twin trailers**, and most often **double bottoms**.

3.1.26 dromedary tractor: A tractor with a cargo body placed between the fifth wheel and the cab.

3.1.27 drop frame: A “U” shaped trailer frame. The objective is to either lower the overall height of large/bulky loads, or maximize the available volume for low density cargo.

3.1.28 dry bulk tank: Large cargo tank-like unit designed to move solid or dry materials like cement or flour. Some carry hazardous materials.

3.1.29 EPA hazardous waste marking: Package marking required by 40CFR Sec 262.32, to be displayed on non-bulk packagings of hazardous waste, that includes the DOT Proper Shipping Name, United Nations (UN) Identification number, and other information as required by the Environmental Protection Agency (EPA). (Refer to Figure 7.)

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Figure 7—Example of an EPA hazardous waste marking

3.1.30 fuel tank: The tanks that provide fuel to engine of the truck or truck tractor.

3.1.31 full trailer: Vehicle designed to be drawn by another vehicle and constructed so no part of its weight rests on the towing vehicle. Usually towed by a truck.

3.1.32 furniture van body: Truck body designed for the transportation of household goods; usually a van of drop-frame construction. (Refer to Figure 8.)



Figure 8—Example of a furniture van

3.1.33 hazard classes and divisions: Many hazardous materials are required to be identified in transportation by the hazard class or division definitions they meet. Some hazard classes are divided into divisions. Some materials exhibit multiple hazards. The resulting categories are organized into number sets with known meanings. A listing of these sets can be found on page 13 of the 2000 Emergency Response Guidebook, which is derived from 49CFR Sec. 172.101. A set can be assigned for each class or division. (The classes and divisions are enumerated in Clause 6 on Data Elements.)

3.1.34 hazard identification codes: A hazardous materials marking required by European and South American regulations consisting of an orange panel with two sections. The top section displays two to four figures indicating hazard characteristics or warnings, and the lower section displays the United Nations (UN) identification number of the material.

3.1.35 hazard identification numbers: See: **hazard identification codes.**

3.1.36 hazard marking: Marking is the display of United Nations (UN) Identification numbers and/or the DOT shipping name of the hazmat on packaging used to transport hazardous materials. Marking may also include additional hazard warnings (Inhalation Hazard, HOT, and others) and package specifications. In most crash situations, the markings on non-bulk packages (drums and boxes) will not be visible because the cargo is inside a closed vehicle. Marking of UN Numbers and shipping names on commercial vehicles or bulk tanks is most relevant to this standard. Non-hazmat first responders will often only notice the placards with ID numbers and report “it has got a 1203 placard.” The report of even just the ID number to the dispatcher still is of great value if it can be sent to the responders.

3.1.37 hazardous materials: As defined by the United States Department Of Transportation, “Hazardous material means a substance or material, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. The term includes hazardous substances, hazardous wastes, marine pollutants, and elevated temperature materials as defined in 49CFR Sec. 171.8, materials designated as hazardous under provisions of 49CFR Sec. 172.101, and materials meeting the defining criteria for hazard classes and divisions in 49CFR Part 173.”

3.1.38 heavy trailer: A trailer, typically of a drop frame construction, designed to carry heavy loads. (Refer to Figure 9.)

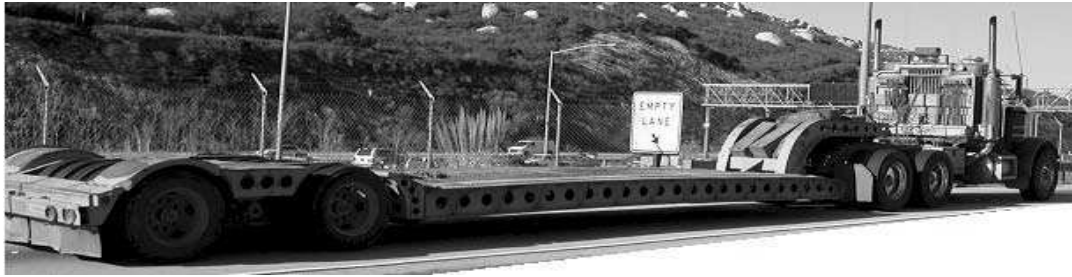


Figure 9—Example of a heavy trailer

3.1.39 HM packaging types: Abandoned packages (illegal dumping) of hazmat are a large problem nationwide, and dumping becomes a hazmat transportation response when it occurs on highway right of way. Further, van trucks and trailers often transport non-bulk hazmat packaging. Rollovers of van units containing large numbers of non-bulk packages can take longer to clear than bulk units like cargo tanks, because of the labor needed to move hundreds of smaller containers. In this standard, a non-bulk packaging type is a packaging with a capacity of 450 L or less for liquids.¹⁶ The other definitions exist for non-bulk packages for solids and gases. Packages with capacities greater than 450 L are bulk packaging. Non-bulk packaging include drums, cylinders, pails, boxes, and bags. (Refer to Figure 10.)



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Figure 10—Typical examples of non-bulk packaging (above) and bulk packaging (below)

¹⁶The United States Department Of Transportation divides all hazmat packaging into two categories: non-bulk and bulk. A non-bulk packaging is a packaging with a capacity of 450 L (119 gallons) or less for liquids.

3.1.40 HMIS: Hazardous Materials Identification System, a product labeling system developed by the National Paint and Coatings Association (NPCA) and similar in many respects to the NFPA 704 system. HMIS labels always appear as a rectangle-shaped block of four colored bars with a blue “health” bar on top, a red “flammability” 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” [B2]. 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 in the label. In older labels (which are expected to be prevalent for many years), the mark is combined with the numerical rating value. (Refer to Figure 11.)



Figure 11—Typical (blank) HMIS label

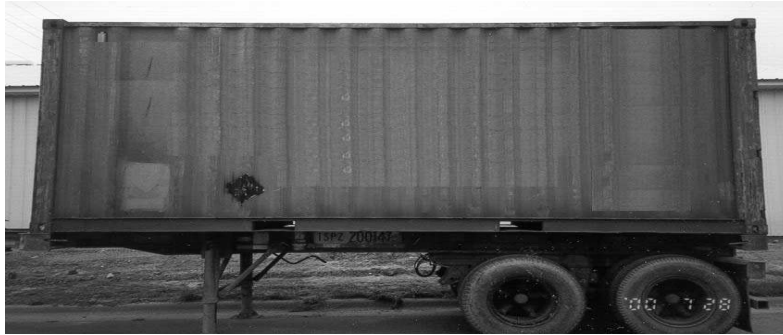
3.1.41 hopper body: Truck or trailer body capable of discharging its load through a bottom opening without tilting.

3.1.42 horse van body: Truck designed for the transportation of valuable saddle horses.

3.1.43 identification number: The four digit number assigned by the U.S. DOT hazardous material regulations, or the United Nations (UN) dangerous goods regulations, to a hazardous material. Numbers may be prefixed by either NA or UN and are found in the 2000 Emergency Response Guidebook (ERG), and the U.S. DOT and UN regulations. In the ERG, this value is called the “material number.” Many materials (each with a proper shipping name of its own) can share the same material number. For example, all types of common gasoline are numbered 1203. The term identification number is preferred over material number or slang such as “UN number” in this document.

3.1.44 interline freight: Tonnage passing over the lines of two or more carriers. The interchange is termed an interline movement. Freight moving from the point of origin to its destination over the lines of two or more transportation lines. Also known as interlining. For example, many carriers are regional. A carrier that accepts a load for delivery outside of its normal working area will bring the material to a freight terminal and interline the freight to a carrier that services the location of the consignee.

3.1.45 intermodal containers, IM containers, freight containers: Freight boxes designed to be moved from one mode of transportation to another; IM containers may be stacked on ship, removed, and placed on a chassis trailer, or railroad car. (Refer to Figure 12.)



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Figure 12—Example of a freight container

3.1.46 intermodal portable tank: A type of container tank designed to be moved from one mode of transportation to another. *See also:* **United Nations (UN) portable tank** and **large packaging**. (Refer to Figure 13.).



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Figure 13—Example of an intermodal portable tank

3.1.47 International Traveler Information System (ITIS): The term commonly associated with the standard for incident phrases developed by the SAE ATIS Committee in conjunction with ITE TMDD and other standards. 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.

3.1.48 labels: Graphic communications devices that communicate the hazard class or division of a hazardous material by use of color and design, as specified in 49CFR Part 172, Subpart E.

3.1.49 large packaging: An outer packaging that contains articles or inner packaging. It is designed for mechanical handling, exceeds 400 kg net mass or 450 L capacity, but has a volume not more than 3 cubic meters.

3.1.50 legends: A term of art used in this standard to refer to various markings found on the outside of vehicles (power units), trailers (cargo units), packages, and products that may be helpful to document in the message set for use in the response to the incident.

3.1.51 log body: Truck or trailer body designed for the transportation of long items. *See also:* **pole trailer.**

3.1.52 marking: A descriptive name, identification number, instructions, cautions, weight, specification, United Nations (UN) marks, or combinations thereof, required by the United States Department Of Transportation hazardous materials transportation regulations.

3.1.53 material number: A number used to identify the type and properties of a material in the ERG, and properly called an “Identification Number” in various regulations. Many materials (each with a proper shipping name of its own) can share the same material number. For example, all types of common gasoline are numbered 1203.

3.1.54 Material Safety Data Sheet (MSDS): A collection of information concerning the properties and safety handling of a material. Commonly used with any chemical substance and typically available from the manufacturer, the seller, or the agent, often by way of web sites or provided in printed form with the product. The format of these can vary quite widely. Information contained on MSDS can be quite useful to responders. The specific legal requirements for MSDS can be found at 29CFR Sec. 1910.1200.

3.1.55 NFPA 704: As used in this standard, referring to the four diamond legend found on buildings and objects that reflects the hazard degree of the contents. Properly called an NFPA diamond, and based on the 704 standard developed by NFPA, these symbols are used to alert responders to the contents of the building, tank, etc. and provide a gross indication of flammability, instability, and other data. They are similar in intent to the class-divisions numbering found on hazmat 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 instability rating. The lower triangle (white) is used to reflect any specific hazard indication. (Refer to Figure 14.)

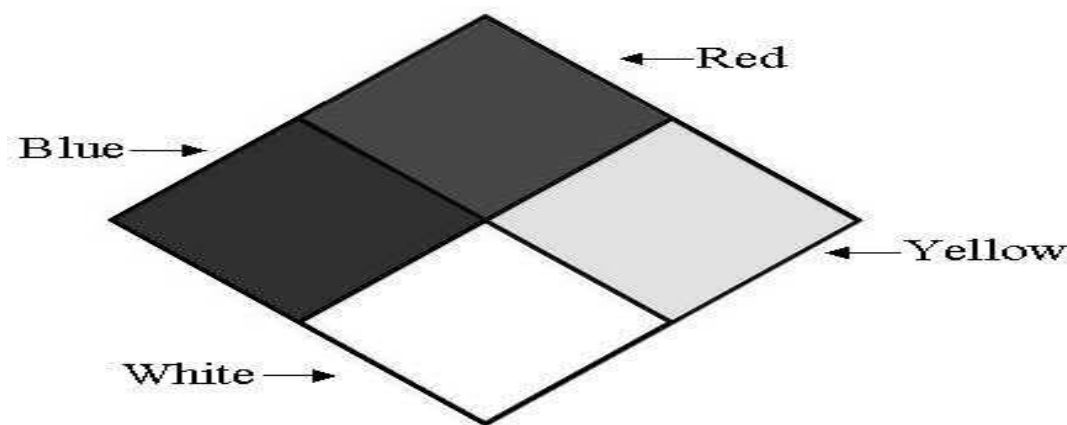


Figure 14—Typical NFPA 704 diamond sign (no rating data added)

3.1.56 NFPA Diamond: *See: NFPA 704.*

3.1.57 nurse tank: A tank mounted on a farm wagon, often used for transport of anhydrous ammonia to farm locations; however, other uses also exist. These tanks are occasionally converted to transport propane or other flammable gases. If a tank contains NH_3 , it is a nurse tank; if it contains LPG, it is a nonspecification cargo tank built and (presumably) marked to ASME Code. (Refer to Figure 15.)



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Figure 15—Example of a nurse tank

3.1.58 oversized vehicle: Any vehicle whose weight and/or dimensions exceeds state regulations.

3.1.59 package unit: The package unit is a term of art used in this standard to refer to a portion of cargo (which may be found in a cargo carrying device such as a trailer or in a power unit such as the trunk of a vehicle or the cargo area of a flat bed). Corrugated cardboard boxes, or 210 L drums,¹⁷ are examples. The package unit is a part of the “contents” data structure that describes the type and condition of various cargo.

¹⁷210 L is equal to 55 gallons.

3.1.60 placards: Graphic warning devices designed to give the hazard class or division of the hazardous materials carried in a vehicle or railroad car. There are different placards for each class or division except 6.2. Placards are color coded and must be at least 273 mm on a side and must be displayed on all four sides of the vehicle.¹⁸ Placards display the hazard class number in the bottom corner. Some vehicles are required to display more than one placard, and some will display three or more. (Refer to Figure 16.)



Figure 16—Examples of some common placards

3.1.61 pole trailer: A trailer designed to move long or irregular loads like poles, pipes, or beams, where the cargo acts as a support member of the unit.

3.1.62 power unit: The power unit is a term of art used in this standard to refer to the tractor portion of a trailer tractor or any other powered vehicle (as opposed to a hauled unit such as a trailer). Semi-tractors, train engines, and passenger vehicles are examples. Each power unit described by instances of the message set contains unique numbering and data values related to its contents, registration, overall type, and current status.

3.1.63 private motor carrier: A carrier that transports its own property or materials in vehicles it owns, leases, or controls.

3.1.64 pup: A slang term for a short four-wheel trailer that is pulled behind a semitrailer or a straight truck.

3.1.65 rig: A slang term for a truck, tractor-semitrailer, truck and full trailer, or other combination vehicle.

¹⁸The United States Department Of Transportation defines hazmart placards, both the shapes and color codes to be used, and the size (273 mm or 10.8 in). Consult 49CFRPart 172, Subpart F for these definitions.

3.1.66 saddle tank: Barrel type fuel tanks that hang from the sides of the trailer's frame. These large fuel tanks can vary considerably in capacity and are also found some trailers. (Refer to Figure 17.)



Figure 17—Example of a Saddle Tank

3.1.67 semitrailer: A vehicle designed to be pulled by another vehicle and constructed so some of its weight rests on the self-propelled towing motor vehicle. May be a tank, van-box, flatbed, end dump, or belly dump or other. Usually pulled by a truck tractor.

3.1.68 shipper: A person or entity that offers hazardous material for transportation.

3.1.69 single axle: A slang term that refers to either a tractor with one front axle and one rear axle or a semi-trailer with only one axle.

3.1.70 sleeper: Truck with a sleeping compartment in the cab.

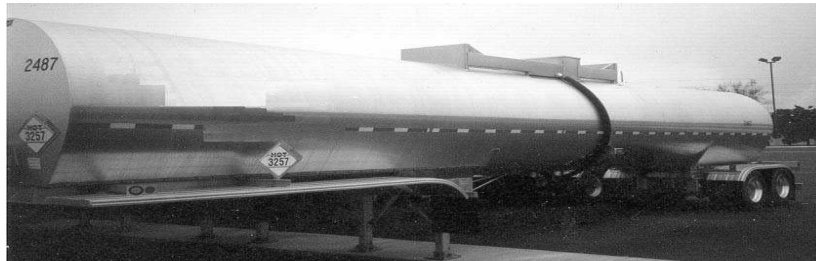
3.1.71 sliding tandem: An adjusted bogie beneath the trailer that can be moved forward or backward to distribute the weight between tractor and trailer axles.

3.1.72 straight truck: A truck with the body and engine mounted on the same chassis (as contrasted to a combination unit such as tractor-trailer).

3.1.73 tag axle: The rearmost axle of a tandem-axle tractor if that axle serves only to support additional gross weight. A tag axle does not transmit power to the roadway.

3.1.74 tandem axle: An assembly of two axles, either, none, or both of which may be powered.

3.1.75 tank trailer: A cargo tank mounted on a semitrailer or full trailer. *See:* **tanker.** (Refer to Figure 18.)



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Figure 18—Example of a tank trailer

3.1.76 tank truck: A truck with a cargo tank permanently attached to it. (Refer to Figure 19.)



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Figure 19—Example of a tank truck

3.1.77 tanker: *See:* **tank trailer.**

3.1.78 trailer: Includes several types designed to be pulled by trucks or truck tractors.

3.1.79 trash hauler: A type of straight truck with a mounted apparatus for the collection and containment of trash. (Refer to Figure 20.)



Figure 20—Example of a trash hauler

3.1.80 truck tractor or semi-tractor: Self-propelled motor vehicle designed for and primarily used for pulling other vehicles.

3.1.81 truck, or straight truck: Any self-propelled commercial motor vehicle, except for a truck tractor.

3.1.82 tube trailer: A compressed gas trailer consisting of several long tubes or compressed gas cylinders. (Refer to Figure 21.)



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Figure 21—Example of a tube trailer

3.1.83 twin trailers: See: **doubles**.

3.1.84 twins: See: **doubles**.

3.1.85 United Nations (UN) portable tank: A UN portable tank is a tank with a capacity greater than 450 L. It is built to meet UN standards, similar to intermediate bulk containers; its capacity and size is large enough to require mechanical handling.

3.1.86 van or box trailer: A trailer with a permanently installed cargo box or van, designed to haul general freight.

3.1.87 van truck: A truck with a van box permanently attached.

3.1.88 Workplace Hazardous Materials Information System (WHMIS): Workplace Hazardous Materials Information System is the Canadian government regulation equivalent to the OSHA standard Hazard Communication Standard (HCS) in the United States. In many ways, the WHMIS system of labeling 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.

3.1.89 wrecker: Truck designed for hoisting and towing disabled vehicles.

3.1.90 XML: A common method of exchanging messages made up of tags and values organized in a data structure and typically transported over common Internet formats such as HTTP. XML has a growing number of supporters due to its ability to be implemented in the types of heterogeneous systems often found in public safety. It is possible to express and exchange IEEE Std 1512-2000 message sets using this method. (Commentary on the implementing of this standard using XML is provided in Annex A of this standard.)

3.1.91 yard mule: A slang term for a tractor used to move semitrailers around the terminal yard.

3.2 Abbreviations and acronyms

ATIS	advanced traveler information system
BNICE	biological, nuclear, incendiary, chemical, explosives; also defined by medical users
	address resolution protocol as: bombs, nuclear, irritants, chemical, etiological
BS	base standard, in this case IEEE Std 1512-2000
CAD	computer-aided dispatch
CFR	Code of Federal Regulations
COFC	container on flat car
DE	data element
DF	data frame
DOT	Department of Transportation
DTD	document type definition
ERG	2000 Emergency Response Guidebook
HazMat	hazardous materials (slang)
HM	hazardous material or “hazmat” (slang)
HMIS	hazardous materials identification system
ICAO	International Civil Aviation Organization
IDX	incident description
IEEE	Institute of Electrical and Electronics Engineers
IM	incident management or intermodal
IMDG	international maritime dangerous goods (Code)
IMO	International Maritime Organization
ISO	International Standards Organization
ITE	Institute of Transportation Engineers
ITIS	international traveler information system
MSDS	material safety data sheet
NA	North America
NFPA	National Fire Protection Association
NPCA	National Paint and Coating Association
ORM-D	other regulated materials (consumer commodity)
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
SAE	Society of Automotive Engineers
SDO	standards developing organization
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

4. Structure of the standard

This clause lays out a logical progression, from a statement of the problem and the key functions the communication system is to perform (4.1), to the resulting requirements at a general level (4.2), to the resulting requirements at a more specific level (4.3), and finally, to the resulting requirements worded as bases for message sets and data frames (4.4).

4.1 The problem and functions

The problem:

In the course of a transportation-related incident, often the cargo and/or contents carried by involved vehicles, or in involved buildings, can figure importantly in the incident: in the hazards present, in how those hazards should be managed, and how the overall incident should be managed. Yet in the course of an incident, the information about that cargo and/or contents may be only partial (e.g., only a placard, giving only information about the hazard class or divisions of hazardous material carried, and sometimes even less than that). So incident management should be supported by communicating with off-site parties to determine what the cargo and/or contents are and how to manage the incident given the characteristics of that cargo and/or contents.

That problem leads us to the basic mission for the messages, data frames, and data elements specified in this volume:

To support the communication of information about cargo and/or contents, including but not limited to hazardous material and hazardous waste, to assist in the real-time interagency management of a transportation-related incident or event.

Two functions that must be performed to satisfy that mission:

- F1: Retrieve further information about what the cargo and/or contents is, based on what are often quite partial cues available on site. That information is available in off-site databases managed by shippers, carriers, and Fleet and Freight Management centers.
- F2: Retrieve information about the characteristics of the cargo and/or contents that is important for incident management, such as toxicity, flammability, danger of explosion, size of a potential toxic plume, environmental damage, recommended set-back distances, and evacuation areas.

4.2 The resulting requirements, at a general level

The functions just specified naturally lead to the following list of requirements the system of messages, data frames, and data elements specified in this volume shall fulfill, in concert with the Base Standard. These requirements are based on a combination of the experience of members of the IEEE 1512 Working Group and results of several table top exercises. These requirements fall into three categories:

- a) Messages or sets of messages that describe on-site cues about the cargo and/or contents to a remote cargo/contents database, to retrieve more complete data on that cargo and/or contents. Examples of on-site cues range from statements by the driver to placards to labels on packages to the shipping papers. That database can be very general, such as providing a mapping from package labels to contents types, or very specific, such as might be available from the shipper.
- b) Messages or sets of messages that describe the cargo and/or contents to a remote hazard-management database, to retrieve data on how to manage any cargo/content-related hazards in the course of the management of the incident. The cargo/contents information can range from quite cursory, such