



IEEE Standard for Common Traffic Incident Management Message Sets for Use by Emergency Management Centers

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IEEE Standard for Common Traffic Incident Management Message Sets for Use by Emergency Management Centers

Sponsor

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of the
IEEE Vehicular Technology Society**

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Abstract: This standard addresses the exchange of vital data about public safety and emergency management issues involved in transportation-related events, through common incident management message sets. The message sets specified are consistent with the National Intelligent Transportation Systems Architecture and are described using Abstract Syntax Notation One ("ASN.1" or "ASN") syntax. This standard comprises the basic volume of the family of incident management standards, a multi-volume set of documents centered around this Base Standard. Other members of that family include three other companion volumes, specifying incident management message sets for transportation-management-related data exchange and hazardous-material- and cargo-related data exchange, etc. Collectively, that family of standards shall be referred to as the "1512 Family of Standards." The goal of that family of 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. Those 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.

Keywords: 911, Abstract Syntax Notation One (ASN.1), ATMS, computer-aided dispatch (CAD), center-to-center, commercial vehicles, dangerous goods, data exchange, emergency management center (EMC), emergency response, emergency services, emergency management service (EMS), fire, hazardous materials, hazmat, incidents, incident response, incident management, incident command, incident management system, intelligent transportation systems, law enforcement, message sets, police, public safety, traffic incidents, traffic incident management, traffic management, traffic management center (TMC), transportation system management

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Introduction

This introduction is not part of IEEE Std 1512.1-2006, IEEE Standard For Common Traffic Incident Management Message Sets for Use by Emergency Management Centers.

The Incident Management Working Group was formed from a cross section of ITS (Intelligent Transportation System) 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 of a public safety and/or emergency management nature involved in transportation-related events. It is a companion volume to a Base Standard: IEEE Std 1512-2006. Other categories of communication, having to do with transportation management, hazardous material, and other cargo are addressed in other companion volumes generated by the Working Group. The Base Standard, this volume, and other companion volumes together comprise what shall be known as the IEEE 1512 Family of Standards.

The Base Standard 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 companion volume is to address and its goal.

Problem statement

This standard provides a framework for exchange of data in message sets for use by centers involved in transportation-related incident management, specific to traffic management communications, in particular, for exchanges of data between a traffic management center (TMC) and other involved agencies.

This standard supplements IEEE Std 1512™-2006, henceforth called the “Base Standard” for the family of incident management message sets. The overview, scope, and purpose of IEEE Std 1512-2006 will not be repeated in this standard.

In the course of managing many transportation-related incidents, there is a need for distributing and managing the often complex and partial information about the traffic flows, infrastructure, and traffic management assets involved in an incident. Often there are large gaps between the available information and what the incident commander and other involved agencies need to know in order to best manage the incident with regard to traffic management and infrastructure. In the intelligent transportation systems (ITS) world, those gaps will often be able to be spanned by exchanges of information of five kinds:

- a) Traffic-related information: collected from those other agencies for collation and analysis to support the second exchange.
- b) Current and predicted traffic conditions: made available to the many agencies that may be involved in the incident—in particular, route information for routing traffic and response vehicles.
- c) The need for cleanup, repair, and replacement of damaged infrastructure: to support responses to carry out that cleanup, repair, and replacement.
- d) Plans for traffic management, evacuation management, and infrastructure cleanup, repair, and replacement.
- e) Asset management information: to coordinate traffic control assets between agencies.

Managing the operational complexities of collecting the data, collating and analyzing it, and then disseminating the results as necessary is a task for the local implementation. The task for this standard is to provide the framework for communication among the TMC and other agencies to provide a flexible basis for the five types of information exchange listed here.

That presents us with the basis for stating the goal.

Goal of this companion volume

The goal of this companion volume is to specify message sets to support the exchange of the five types of information just listed. More precisely, it is to specify the message sets that support that exchange, in combination with the message sets specified in the rest of the IEEE 1512 Family of Standards. As of this writing, that IEEE 1512 Family of Standards includes

- Base Standard: IEEE Std 1512-2006, Standard for Common Incident Management Message Sets for Use by Emergency Management Centers
- Companion Volume: IEEE Std 1512.2™-2005, Standard for Public Safety Incident Management Message Sets for Use by Emergency Management Centers
- Companion Volume: IEEE Std 1512.3™-2006, Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers
- A companion volume dealing with issues of communication and coordination with mobile assets deployed in response to such events is now being developed as well

As part of its support of that exchange, this companion volume will support existing conventions and nomenclature for established practices in public safety incident management, in particular the National Incident Management System (NIMS),^a and existing formats for incident action plans. At the same time, the message sets will not require that the local implementation use NIMS or any particular format for an incident action plan. Although in some local implementations any multi-agency incident is coordinated with a single plan, in other local implementations conventions are oriented around each agency having its own plan without any single, explicitly integrated plan. Both of those cases are supported by this standard. References to ICS and UCS in this volume shall be taken to also refer to the NIMS.

Companion volumes

This document provides information on additional messages, data frames, and data elements beyond those appearing in the Base Standard (IEEE Std 1512-2006) and the companion volumes listed above. In order to make full use of this information the Base Standard, companion volumes and other references to ITS and industry standards may also need to be employed. That is particularly true 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 the public safety industries.

The standard and use with data registries

The standard was developed in conjunction with entries designed to be made into a 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.

^aU.S. Department of Homeland Security, www.dhs.gov, March 1, 2004. As of this writing, exact URL: www.dhs.gov/interweb/asset-library/NIMS-90-web.pdf.

In each of the data structures found in Clause 5 through Clause 9 of this standard, the following meta data fields are used and are equivalent to the named fields in a data 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 that follows after the “:” is the name used). The one or more paragraphs that then follow, headed “Use,” form the DESCRIPTION entry. The final one or more paragraphs, headed “Remarks,” form the REMARKS entry. The section headed “Used by,” contains linkages to other data structures that in turn refer to this one. In a data registry, the fields RELATED DATA CONCEPT and RELATIONSHIP TYPE may be used to convey this information, along with other relationships. The section headed by “ASN.1 Representation,” contains all ASN.1 defining code. In a data 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, whereas in the case of data frames and messages, this information is placed into the BODY field.

Other fields used in a data registry (such as UNITS or FORMULA) are, typically, not provided with content from this standard, or they 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 1512.1-2006.

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^bThis information is given for the convenience of users of this standard and does not constitute an endorsement by the IEEE of these products. Equivalent products may be used if they can be shown to lead to the same results.



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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 multijurisdictional communications.

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Contents

1. Overview	1
1.1 Scope	2
1.2 Purpose	2
2. Normative references.....	2
3. Definitions, acronyms, and abbreviations	3
3.1 Definitions	3
3.2 Acronyms and abbreviations	8
4. Structure of the standard.....	10
4.1 Requirements.....	10
4.2 Request and share information about work zones	12
4.3 Request local traffic control	14
4.4 Describe local traffic control plan	15
4.5 Share information about ingress/egress routes and request route services	17
4.6 Share location/priority/preemption information on a response vehicle	19
4.7 Information on cleanup or infrastructure repair: the need for it and plans	21
4.8 Request information on network conditions or route status	23
4.9 Share information on asset management	24
5. Dialog patterns of the standard	28
6. Message sets.....	28
6.1 Message: MSG_Assigned-Resources [IM]	29
6.2 Message: MSG_ClearOrRepairPlan [IM]	29
6.3 Message: MSG_DSRC-MsgSend [IM]	31
6.4 Message: MSG_InfrastructureReport [IM]	32
6.5 Message: MSG_PhysicalAssetStatus [IM]	34

6.6 Message: MSG_PreemptionUserData [IM].....	37
6.7 Message: MSG_RequestNetworkConditions [IM].....	38
6.8 Message: MSG_RequestPhysicalAsset [IM].....	41
6.9 Message: MSG_RequestPhysicalAssetStatus [IM]	45
6.10 Message: MSG_RequestPreemptionUserData [IM].....	47
6.11 Message: MSG_RequestRouteAdvice [IM]	48
6.12 Message: MSG_RequestTrafficCntlPlan [IM].....	50
6.13 Message: MSG_RequestWorkZoneData [IM]	53
6.14 Message: MSG_RouteAdvice [IM].....	55
6.15 Message: MSG_TrafficCntlPlan [IM].....	57
6.16 Message: MSG_WorkZoneData [IM]	61
6.17 Message: MSG_NetworkConditions [IM].....	63
 7. Data frames.....	 66
7.1 Data frame: DF_AssetDescription [IM]	66
7.2 Data frame: DF_BroadcastCycleTimes [IM]	67
7.3 Data frame: DF_CleanUpPlan [IM]	69
7.4 Data frame: DF_DSRC_UsePlan [IM].....	70
7.5 Data frame: DF_HAR_UsePlan [IM].....	71
7.6 Data frame: DF_LaneDescriptions [IM]	72
7.7 Data frame: DF_LinkDataSet [IM]	74
7.8 Data frame: DF_PositionFix [IM]	77
7.9 Data frame: DF_RepairPlan [IM].....	78
7.10 Data frame: DF_Tail [IM]	79
7.11 Data frame: DF_VehicleSummary [IM].....	80
7.12 Data frame: DF_VMS_UsePlan [IM].....	82
 8. Data elements	 82
8.1 Data frame: DE_Asset_Use [IM]	83
8.2 Data element: DE_CenterAssetPermRef [IM]	83
8.3 Data element: DE_CleanUpItems [IM]	84
8.4 Data element: DE_ConditionTypes [IM]	85
8.5 Data element: DE_FlowType [IM].....	89
8.6 Data element: DE_InfrastructureRestorationList [IM]	90

8.7 Data element: DE_PreemptAuthorization [IM].....	91
8.8 Data element: DE_PreemptGrant [IM].....	92
8.9 Data element: DE_PreemptTech [IM].....	93
8.10 Data element: DE_RepairNeeds [IM].....	94
8.11 Data element: DE_RoadsideAssetLists [IM].....	94
8.12 Data element: DE_RouteStatus [IM].....	95
8.13 Data element: DE_Urgency [IM]	96
8.14 Data element: DE_URL_Link [IM].....	97
8.15 Data element: DE_Vehicle_Asset_Lists [IM]	99
9. External data entries	100
10. Deprecated entries	100
Annex A (informative) Using the messages of this standard	101
Annex B (informative) Bibliography.....	102

IEEE Standard for Common Traffic Incident Management Message Sets for Use by Emergency Management Centers

1. Overview

This standard provides a framework for exchange of data in message sets for use by centers involved in transportation-related incident management, specific to traffic management communications, in particular, for exchanges of data between a traffic management center (TMC) and other involved agencies.

This standard supplements IEEE Std 1512*-2006,¹ henceforth called the “Base Standard” for the family of incident management message sets. The overview, scope, and purpose of IEEE Std 1512-2006 will not be repeated in this standard.

In the course of managing many transportation-related incidents, there is a need for distributing and managing the often complex and partial information about the traffic flows, infrastructure, and traffic management assets involved in an incident. Often there are large gaps between the available information and what the incident commander and other involved agencies need to know in order to best manage the incident with regard to traffic management and infrastructure. In the intelligent transportation systems (ITS) world, those gaps will often be able to be spanned by exchanges of information of five kinds:

- a) Traffic-related information: collected from those other agencies for collation and analysis to support the second exchange.
- b) Current and predicted traffic conditions: made available to the many agencies that may be involved in the incident—in particular, route information for routing traffic and response vehicles.
- c) The need for cleanup, repair, and replacement of damaged infrastructure: to support responses to carry out that cleanup, repair, and replacement.
- d) Plans for traffic management, evacuation management and infrastructure cleanup, repair, and replacement.
- e) Asset management information: to coordinate traffic control assets between agencies.

Managing the operational complexities of collecting the data, collating and analyzing it, and then disseminating the results as necessary is a task for the local implementation. The task for this standard is to provide the framework for communication among the TMC and other agencies to provide a flexible basis for the five types of information exchange listed here.

¹ Information on references can be found in Clause 2.

1.1 Scope

This standard is a companion volume for IEEE Std 1512-2006, referred to here as the “Base Standard.” This standard specifies messages, data frames, and data elements for communicating information about traffic and infrastructure management in support of real-time interagency transportation-related incident management. The Base Standard specifies messages, data frames, and data elements to describe an incident and form the message infrastructure for 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 “IEEE 1512 Family of Standards.”

1.2 Purpose

This standard is part of the IEEE 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.

The purpose of this standard is to take the real-world, available-information situation confronting the incident commander and the several involved agencies, and then support the exchange of that information among agencies, to make further information available to the incident commander and involved agencies, to best support them in managing the event. That calls for messages to communicate whatever information is available, often quite partial, among the several involved agencies, to accomplish four decision-support functions, corresponding to the five kinds of information exchange listed earlier in this clause:

- *Function 1:* To disseminate information about current and future traffic flows in the transportation grid, including in particular impacts of an incident and particular route information, to assist in the real-time interagency management of a transportation-related incident or event.
- *Function 2:* To support the management of traffic to assist in the real-time interagency management of a transportation-related incident or event, including establishing reverse links and the use of priority/preemption technologies.
- *Function 3:* To support the management of TMC assets and other assets, as necessary to manage traffic, to assist in the real-time interagency management of a transportation-related incident or event.
- *Function 4:* To support the cleanup, repair, and replacement of damaged infrastructure, treating that operation as part of another incident, or as a separate incident.

2. Normative 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.

IEEE Std 1512[®]-2006, IEEE Standard for Common Incident Management Message Sets for Use by Emergency Management Centers.^{2, 3}

IEEE Std 1512.2[™]-2004, IEEE Standard for Public Safety Incident Management Message Sets for Use by Emergency Management Centers.

IEEE Std 1512.3[™]-2006, IEEE Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers.

ITE TMDD, Standard for Functional Level Traffic Management Data Dictionary (TMDD), Standard TMDD Revision 2.1, December 2004.⁴

3. Definitions, acronyms, and abbreviations

3.1 Definitions

For the purposes of this standard, the following terms and definitions apply. *The Authoritative Dictionary of IEEE Standards* [B5]⁵ should be referenced for terms not defined in this clause.

3.1.1 arrow board: A large board with lights that can be lit in patterns indicating a left arrow, right arrow (arrow panels are also required to be able to display this pattern of 4 dots; for a more complete description, see section 6F-53 of MUTCD), or arrows in both directions. Used to direct traffic.

NOTE—Refer to Figure 1.⁶

² IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA (<http://standards.ieee.org/>).

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⁴ ITE Standards 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>).

⁵ The numbers in brackets correspond to those of the bibliography in Annex B.

⁶ Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.



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Figure 1—Example of an arrow board

3.1.2 automatic incident detection: An algorithm, or set of algorithms, designed to automatically detect and alarm the onset of highway conditions that could indicate the presence of an incident. Algorithms typically use volumes and occupancies as triggering parameters. Algorithms must be carefully tuned to avoid excessive false alarm rates, while maintaining acceptable detection rates.

3.1.3 changeable message sign: A display device, either mobile or fixed, that can display text or graphics in a large format for reading by the driving public. The text or graphics can be changed by programming signals that are either local to the sign or transmitted to the sign from a remote controller. Other such signs include variable message sign (VMS) and dynamic message sign (DMS).

3.1.4 diversion route: A route identified to the driving public with signs, traffic routing devices, and flagger and/or media announcements as a mandatory alternative to a congested or closed route. Distinguished from an alternative route, which is optional.

3.1.5 dynamic message sign: *See: changeable message sign (DMS).*

3.1.6 flagger: Public safety or traffic management personnel assigned to direct traffic with their presence, arm signals, or other devices such as signs or flares.

3.1.7 greenwave: A centrally directed system for granting priority to an emergency vehicle that works by timing signal lights to form a special “pulse” of green lights propagating down a route, such that a vehicle can travel within that pulse and traverse a grid more rapidly than it would without the greenwave. Can be designed to minimize disruption in the rest of the grid. Distinguished from changing signal light patterns to favor a route for all vehicles.

3.1.8 highway advisory radio (HAR): A radio announcement or a series of announcements to the public advising about traffic congestion, recommending alternative routes, and/or describing diversion routes. Typically highway advisory radio (HAR) is implemented as a low-power amplitude-modulated (AM) broadcast originating from equipment mounted near the roadside and consisting of short analog recordings cyclically repeated. It is typically accompanied by a sign board telling the public where to tune. A few locations use frequency-modulated (FM) broadcast technology, and a few use FM data technology [Radio Data System (RDS) modulation] to send digital messages. It is envisioned that once dedicated short-range communications (DSRC) begin to be deployed, that they will offer encoding messages with much broader content, and that such transmission points will be often found in conjunction with HAR and changeable message sign technologies (as well as being mounted on mobile work zone equipment).

3.1.9 infrastructure: Any fixed piece of transportation-related road or roadside equipment or roadway. Examples include light poles, signs, and guard rails.

3.1.10 infrastructure cleanup, repair, replacement plan: A plan to clean up, repair, or replace infrastructure, generated in response to identifying infrastructure in need of clean-up, repair, or replacement.

3.1.11 lane number: Number to identify lane. Numbered in each direction, with 1 at the median or the left-most lane if one way.

NOTE—This definition matches TCIP and TMDD usage, but some states do not follow this numbering.

3.1.12 lane percent blocked: A measure of link impedance defined as 100 minus (current throughput as a percentage of unimpeded throughput); therefore, 100 = completely blocked, 0 = completely unblocked (clear).

NOTE—This definition matches TCIP usage.

3.1.13 level of service: A standardized system of letters A through F defining the degree to which traffic flow matches unimpeded flow. A is completely unimpeded, and F is completely impeded, “stop and go.”

3.1.14 management support team (MST): Provides field command and control in a disaster for deployed Federal medical assets. The MST can provide and coordinate communications, transportation, a medical cache, and other logistical support to DMATs and Specialty Teams. This terminology is used by the medical response community, particularly those using the National Disaster Medical System.

3.1.15 national disaster medical system (NDMS): A federally coordinated system that augments the nation’s emergency medical response capability. The overall purpose of the NDMS is to establish a single integrated national medical response capability for assisting state and local authorities in dealing with the medical and health effects of major peacetime disasters. It also is used to provide support to the military and the Department of Veterans’ Affairs medical systems in caring for casualties evacuated back to the United States from overseas conflicts.

3.1.16 occupancy: The number of vehicles in a lane divided by the ability of that lane to carry vehicles.

3.1.17 preemption, preemption technology: A technology that forces a signal light to go green or stay green specifically in the direction of an emergency vehicle approaching an intersection. Distinguished from

priority technology that changes the timing of lights in favor of a vehicle or set of vehicles, but only by increasing the priority for the direction and route of that vehicle or set of vehicles.

3.1.18 priority: A condition where the approaching vehicle is given a priority in the signal timing algorithms of the transportation signal ahead, adjusting the normal cycles of the controller. Typically, this results in holding the green cycle longer so that the priority vehicle may pass, or a cycle preemption if an emergency vehicle is involved.

3.1.19 priority technology: A technology that changes the timing of signal lights in favor of a vehicle or set of vehicles, by increasing the priority for the direction and route of that vehicle or set of vehicles. Distinguished from preemption technology that forces a signal light to go green or stay green specifically in the direction of an emergency vehicle approaching an intersection.

3.1.20 ramp meter system (RMS): A traffic control device that meters traffic on a freeway on-ramp according to a Time-of-Day or Traffic Responsive algorithm. An RMS can be locally or centrally controlled. An RMS can be used to limit traffic upstream of an incident site as part of an incident response plan.

3.1.21 remote surveillance asset: Any asset that collects data remotely that can be used to observe an incident or traffic. Examples include CCTV cameras and loop sensors.

3.1.22 reverse flow, reverse flow link: The operation of reversing the traffic flow on a traffic link, for either of two purposes: To provide ingress or egress to an incident site; in which case, the reverse access is only granted to emergency vehicles; or to provide an alternative or diversion route; in which case, the reverse access is granted to all vehicles including private vehicles.

3.1.23 sensor: A device for sensing traffic, weather, or other road-related data.

3.1.24 sensor data, sensor data asset: The data generated by a sensor. *See also:* **sensor**.

3.1.25 service patrol vehicle: Primarily exists to assist motorists, constantly patrolling a given roadway network, but typically, it also has some incident clearance capability, such as a push bumper and basic traffic control device, such as an arrow board and a cone—it constantly patrols, looking for motorists who have problems. These vehicles and their associated programs go by numerous names in different regions. *Syn:* **incident response vehicle**.

NOTE—Refer to Figure 2.



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Figure 2—Example of a service patrol vehicle

3.1.26 traffic channelization devices: Devices, such as cones, barriers, barrels, and arrow trucks, and changeable message signs to force or guide traffic into particular temporary channels or routes.

3.1.27 traffic control plan: A plan for traffic control and routing as part of incident management. From Section 6B.01 of the Manual on Uniform Traffic Control Devices (MUTCD), the control of road users through a temporary traffic control zone shall be an essential part of highway construction, utility work, maintenance operations, and incident management.

NOTE—See MUTCD 2000 [B14]].

3.1.28 traffic incident: An incident where the primary impacts are on road traffic. A traffic incident may have a traffic-related cause, or it may not. For example, a building fire that causes significant road traffic congestion is a traffic incident.

3.1.29 traffic incident management: The process of real-time command and control of a traffic incident response, including asset management, the assignment of tasks to those assets, and the monitoring and communication of situation status.

3.1.30 traffic management: The process of real-time control of traffic flows by means of traffic monitoring devices and traffic control devices such as traffic signals, metering lights, variable message signs, arrow trucks, barriers, cones, flares, and traffic direction personnel. Traffic management can include the management of routine traffic as well as traffic related to an event, i.e., an incident, a planned road closure, or a special event. It can include traffic in the vicinity of an event as well as traffic at some distance from an event. It can include detours and evacuations.

3.1.31 traffic management center (TMC): A state or local government operations center responsible for the monitoring and controlling of field sensors, motorist information devices, and the processing of real-time sensor and incident data; the execution of timely and accurate incident response actions; the archiving of historical traffic data; and the dissemination of incident-related information to coordinating agencies and to the general public. In some communities, a TMC is called a transportation management center or, otherwise, is known as a traffic operations center (TOC) or a traffic control center (TCC).

3.1.32 traffic management plan: *See:* **traffic control plan.**

3.1.33 traffic routing devices: *See:* **traffic channelization devices.**

3.1.34 transportation grid: A common alternative term for the transportation network.

3.1.35 transportation system management: The management of the transportation system, as opposed to traffic itself. It primarily involves the planning, deployment, monitoring, and maintenance of traffic infrastructure, including traffic control infrastructure.

3.1.36 variable message sign: *See:* **changeable message sign (CMS).**

3.1.37 vehicle detection system: A sensor, or set of sensors, that detect the flow of vehicles past a fixed point, either along freeway mainlines, freeway connectors, or arterial highways.

3.2 Acronyms and abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AHO	available for hand off
AID	automatic incident detection
AM	amplitude modulation
ASN.1	abstract syntax notation one
ATIS	advanced traveler information systems
AVL	automatic vehicle location
BS	Base Standard, in this case, IEEE Std 1512-2006
CAD	computer-aided dispatch
CCP	change center properties
CCTV	closed-circuit television
CIE	close incident event
CMS	changeable message sign
CORBA	common object request broker architecture
DCO	disable center on-line
DE	data element
DF	data frame
DHS	Department of Homeland Security
DMS	dynamic message sign
DOJ	Department of Justice

IEEE Standard for Common Traffic Incident Management Message Sets
for Use by Emergency Management Centers

DOT	Department of Transportation
DSRC	dedicated short-range communications
E911	enhanced 911
ECO	establish center on-line
ECP	establish center properties
EMS	emergency medical service
EOC	emergency operations center
ERM	event reporting message
FBI	Federal Bureau of Investigation
FM	frequency modulation
FOSC	federal on-scene coordinators
GAC	global advisory committee
GHO	grant hand off
GJIN	global justice information network
GPS	global positioning system
HAR	highway advisory radio
hazmat	hazardous materials (slang)
IAP	incident action plan
ICS	incident command system, or incident command structure
ID	identification
IDX	incident description
IM	incident management
IMS	incident management system
ISO	International Standards Organization
ISP	information service provider
ITE	Institute of Transportation Engineers
ITIS	international traveler information system
ITS	intelligent transportation system
JUST	department of justice, also known as DOJ
LOS	level of service
LRMS	location reference message set
MIE	merge incident event
MUTCD	manual on uniform traffic control devices
NIE	new incident event
NTCIP	National Transportation Communications for ITS Protocol

PHO	poll for hand off
PID	public incident description
PIO	public information officer
PSAP	public safety answering point
RDS	Radio Data Systems
RF	radio frequency
RHO	request hand off
RIN	request information
RMS	ramp meter system
RUI	request unverified incidents
RVI	request verified incidents
SAE	Society of Automotive Engineers
SDO	standards development organization
SIE	split incident event
TCC	traffic control center
TCIP	transit communications interface profiles
TCP/IP	transmission control protocol / internet protocol
TMC	traffic management center
TMDD	transportation management data dictionary
TOC	traffic operations center
VDS	vehicle detection system (or station)
VIN	vehicle identification number
VMS	variable message sign
XML	eXtensible markup language

4. Structure of the standard

4.1 Requirements

4.1.1 Scope of requirements

The scope of these requirements, and so of IEEE Std 1512.1-2003, shall extend to the exchange of information supporting real-time interagency transportation-related incident management, between transportation agencies, and between any of those agencies and any other agencies or centers included in incident-management communications. This standard is intended for interagency aspects of that exchange, though that does not prevent its use in information exchange within any one agency.

The term transportation-related incident, for purposes of defining the scope of these requirements, includes, and only includes, the following two types of events:

- a) A non-recurring event, such as a motor vehicle accident, other unplanned road closure, planned road closure, or planned special event (such as a parade, sporting event or demonstration), or any other event that affects transportation services. For example, a structural fire could be a transportation-related incident, since the response to that fire could affect the traffic grid.
- b) Any transportation-related event reported to a public safety access point (PSAP) (where 911 and other incident-reporting calls are received), whether or not a response is required, and whether or not the event actually affects transportation services.

For convenience, the term transportation-related incident will be shortened to incident in this standard.

4.1.2 Conformance with this standard

All communications systems using this standard shall be in conformance with this standard. The conformance statement can be found in 4.2 of the Base Standard.

4.1.3 Structure of the remainder of this requirements clause

In 4.2 through 4.9 of this standard, the specific requirements are presented in the form of explanatory text and tables. The requirements and tables are arranged so that each table corresponds to a message, and each row in a table corresponds to a data element or data frame within that message.

Subclauses 4.2 through 4.9 are summarized in Table 1. Table 1 introduces acronyms for each of the following tables. Those acronyms provide a summary way to refer to each table and any corresponding message.

Table 1—Subclauses and tables specifying requirements

Subclause	Table	Acronym	Requirement
4.2			Request and share information about work zones
4.2.1	2	RZD	Request work zone description
4.2.2	3	WZD	Work zone description
4.3	4	RTC	Request local traffic control
4.4	5	DTC	Describe local traffic control plan
4.5			Share information about ingress/egress routes, and request route services
4.5.1	6	RRA	Request route advice/services
4.5.2	7	ORA	Offer route advice/services
4.6			Share location/priority/preemption information on a response vehicle
4.6.1	8	RLP	Request location/priority/preemption information on a response vehicle
4.6.2	9	SLP	Share location/priority/preemption information on a response vehicle
4.7			Information on cleanup or infrastructure repair: the need for it and plans
4.7.1	10	NCI	Need for cleanup/infrastructure repair
4.7.2	11	CRP	Cleanup/infrastructure repair plan
4.8	12	RNC	Request information on network conditions or route status
4.9			Share information on asset management
4.9.1	13	AFA	Ask for assets
4.9.2	14	RPA	Respond to poll for assets
4.9.3	15	RAS	Request asset status
4.9.4	16	AST	Asset status

4.2 Request and share information about work zones

Work zones can be an important consideration in the management of incidents nearby. Work zones close to another incident can impact local traffic and may be taken into account in managing the incident because of their impacts on local traffic, and implications for routes associated with the incident: ingress, egress, detour, alternative, and evacuation routes. Requesting and sharing information about work zones facilitates improved coordination of incident management activities and helps prevent conflicts. To better define the requirements for the information to be requested and shared, 4.2.1 and 4.2.2 describe the operational activities of requesting, and then sharing, information about work zones.

4.2.1 Request information about work zones

Any agency involved in managing an incident shall be able to ask if there are any work zones that might affect the management of the incident, and if so, that they be described (**Error! Reference source not found.**). The requester shall be able to specify the area of interest: circle, polygon, or route. The requester shall be able to broadcast the request, or direct it to one or more specific agencies.

The information that is shared when requesting information about work zones shall include the following:

Message name, acronym: Request work zone description, RZD

Table 2—Information for requesting information about work zones

Data items	Description
Header	Header information specified in the Base Standard, including the ID of the incident concerned.
Area of interest	Area within which the requester is interested in hearing about work zones. Can be a circle around the incident, a polygon, or a route, using Location Reference Message Set (LRMS) profiles.

4.2.2 Describe work zones

An agency that has information about one or more work zones that may be significant for managing an incident shall be able to describe those work zones to other agencies involved in managing that incident (Table 3). The agency may describe a work zone in response to a request such as the one specified in 4.2.1, or it may choose to broadcast or send the description on its own initiative, either in response to an incident or simply according to a schedule.

The information that is shared when describing a work zone shall include the following:

Message name, acronym: Work zone description, WZD

Table 3—Shared information describing a work zone

Data items	Description
Header	Header information specified in the Base Standard, including the ID of the incident concerned.
ID of work zone	Unique identifier of the work zone, which could be a previously assigned identifier for the zone as a planned road closure.
Work zone description	Physical description of the zone in terms of a local traffic plan: lane-by-lane closures/restrictions (including ramps and side streets), length of each closure/restriction, detour route. Beginning and ending times for each closure/restriction/detour. This could simply be the local traffic plan information described in 4.4, which would also cover all the information in the remaining rows of this table. This could also simply be a previously broadcast description of the zone as a planned road closure.
Restrictions	Vertical, horizontal, and/or weight restrictions to passage of vehicles through the work zone.
Descriptive text	Free text description of the work zone, to cover cases not adequately described by other data items, and to provide an alternative means to describe the work zone.
Descriptive graphic	Link to a graphic, perhaps generated during the incident, to illustrate the work zone. For example, computer-aided dispatch (CAD) plots, layout plots, although take care that layout plot is as-built-that-day, as opposed to simply as-planned.
Descriptive image	Link to a digital image of the work zone or parts of the work zone.

4.3 Request local traffic control

An agency involved in managing an incident shall be able to request local traffic control services of another agency, such as a TMC or local law enforcement (Table 4). That request shall include both a request for local traffic control services and a description of the traffic control plan the traffic control agency intends to execute.

The information that is shared when requesting local traffic control, and a description of a local traffic control plan, shall include the following:

Message name, acronym: Request local traffic control, RTC

Table 4—Information for requesting local traffic control

Data items	Description
Header	Header information specified in the Base Standard, including the ID of the incident concerned.
Special instructions	Free text description of special instructions: can range from “I’m closing the right lane on link EBxyz” to “Close the right lane on link EBxyz” to “Stop all traffic on link BothWaysxyz” to “Close ramp z” to “Reverse link EBxyz.” If this entry is blank, it means “Do whatever is called for based on the incident as described in the incident description (IDX) message specified in the Base Standard.”
Constraints	Free text description of constraints. Examples: “Leave Route 85 open,” “Leave at least one lane open,” and “avoid routes past the school at xxx.”
Pre-planned plan	Pre-planned incident management plan name(s).
Descriptive graphic	Link to a graphic to illustrate the incident and/or local traffic situation.
Descriptive image	Link to a digital image of the incident and/or local traffic situation.

4.4 Describe local traffic control plan

An agency involved in providing local traffic control services for an incident shall be able to describe the local traffic control plan that it intends to execute (Table 5). That description may be sent or broadcast in response to a request for local traffic control as presented in 4.3, or it may be sent or broadcast on the agency’s own initiative.

The information that is shared when describing a local traffic control plan shall include the following:

Message name, acronym: Describe local traffic control plan, DTC

Table 5—Shared information describing a local traffic control plan

Data items	Description
Header	Header information specified in the Base Standard, including the ID of the incident concerned.
Lane-by-lane description	Lane-by-lane (and shoulders and ramps) description of whether or not closed, where closed, distance closed, when closed, for how long closed, and/or criteria by which will be reopened, how closed (taper, merge, cones, flares, barrels, arrowboard, staffed/unstaffed, if staffed, by whom, etc.); same list of parameters for section of alternating traffic; same list of parameters for section of reversed traffic (plus reason for reversal—ingress/egress vs. diversion/detour); same list of parameters for section where lane is restricted, plus parameters of restriction (vertical clearance, horizontal clearance, weight, speed, vehicle type, e.g., truck); and point of contact (POC)—who is in charge.
Detour routes	When routine route is blocked or restricted, so traffic must take the detour route. For each route: route; estimated time to establish the route; estimated duration route will be in place; units assigned to establish it; and POC—who is in charge.
Alternate routes	When routine route is not blocked or restricted, but use of the alternate route is advised. For each route: route; estimated time to establish the route; estimated duration route will be in place; units assigned to establish it; and POC—who is in charge.
Evacuation routes	A managed route to facilitate evacuation. For each route: route; estimated time to establish the route; estimated duration route will be in place; units assigned to establish it; upon whose authority the evacuation would be initiated; and POC—who is in charge.
Variable message sign (VMS) information	For each VMS: location; message; when message placed; duration of message, or on what criterion it is to be taken down; what unit assigned; what organization is in charge. Note that VMSs are managed as assets with asset management messages specified later in this clause, and they are controlled by Traffic Management Data Dictionary (TMDD) messages. This data item specifies how VMSs are to be used as part of the description of the traffic control plan.
Highway advisory radio (HAR) information	For each HAR: broadcast range; message; when message placed; duration of message, or on what criterion it is to be taken down; what organization is in charge. As with VMSs, this data item is part of the description of the traffic control plan.
Special tasks	Free text to specify special tasks.
Pre-planned IM plan ID	Pre-planned incident management plan name and/or ID number.
IM plan text	Free text plan description instead of or to supplement pre-planned IM plan.
Pre-planned traffic management plan ID	Pre-planned local traffic management plan name and/or ID number.
Traffic management plan text	Free text plan description instead of, or to supplement, pre-planned local traffic management plan.
Descriptive graphic	Link to a graphic to illustrate the incident, the local traffic situation, and/or the traffic control plan.
Descriptive image	Link to a digital image of the incident and local traffic situation.
Video of incident	Link to a video of the incident site.
Pre-planned IM plan	The actual incident management plan, as opposed to simply its name and/or ID number.
Pre-planned traffic control plan	The actual local traffic management plan, as opposed to simply its name and/or ID number.

4.5 Share information about ingress/egress routes and request route services

Ingress and egress routes are important considerations in incident management. Different agencies involved in incident management may seek advice from other agencies as to the best ingress and egress routes, whereas other agencies, primarily TMCs, provide that advice. Other route information involves asking for a reverse-direction link for ingress, egress, or other uses, sharing the fact that such a link has been set up, asking for priority or preemption for particular vehicles and routes, and sharing the fact that such priority or preemption has been set up. Some agencies, in particular, law enforcement, do not wish to seek advice on routes or use routes selected by another agency, and in fact, they want to keep route information about their vehicles from being disseminated. Nothing in this standard forces those agencies to seek advice or disclose route information. To better define the requirements for the information to be requested and shared, and route services to be requested, 4.5.1 and 4.5.2 describe the operational activities of requesting information and services concerning ingress and egress routes and then sharing information about those routes.

4.5.1 Request advice and services concerning ingress and egress routes

Any agency involved in managing an incident shall be able to (Table 6)

- a) Request advice as to the best ingress and egress routes to use with an incident.
- b) Request that a reverse-direction link be set up for ingress, egress, or other uses.
- c) Request priority or preemption for one or more vehicles for any route or a particular route.

Requesting the information and services just listed shall include the following:

Message name, acronym: Request route advice/services, RRA

Table 6—Information and services concerning ingress and egress routes

Data items	Description
Header	Header information specified in the Base Standard, including the ID of the incident concerned.
Vehicle for which request is made	Specifies the vehicle(s) for which the request is made. That can be a single response vehicle, a list of response vehicles requesting the same route/services (e.g., several vehicles from one fire station), or all public vehicles, for which an agency is requesting the best detour route, and/or signal-light priority for any recommended detour route. For either of the two explicitly identified response vehicle cases, each response vehicle is specified with four attribute types: ID character string, vehicle type and subtype, vehicle limitations on turning radius, height, width, weight, and speed, and reason for requesting the route for that vehicle (approaching site, removing injured to hospital, etc.), including free text.
Origin	Unit's base, incident site, staging area, etc.
Destination	Unit's base, incident site, staging area, care facility, etc.
Time needed	When the route is needed.
Duration needed	Estimation of how long the route will be needed.
Request reverse flow	Request to establish a reverse flow link, including the reason, a description of that link, and beginning and ending times. Reasons can include ingress, resolving gridlock.
Request priority	Request for priority treatment/preemption, including the reason/justification. Either the TMC may ration use without physically controlling priority/preemption, or it may enable/disable vehicle-roadside systems or, for the detour case, reset signal timing to favor the detour route.
Priority route desired	Description of route for which priority treatment/preemption is being requested. If no route specified, assume the request is for a recommended route, whether or not priority/preemption is requested.
Plan names	Related pre-planned IM plan or local traffic management plan names.
Descriptive graphic	Link to a graphic to illustrate the route situation.

4.5.2 Offer ingress/egress route advice and/or notify that route services have been set up

An agency that has information about the best ingress or egress routes shall be able to describe those routes to agencies requesting route advice, or to broadcast those routes to all involved agencies (Table 7). An agency that can set up priority or preemption for a route, or a route/vehicle combination, shall be able to notify the agency requesting that priority or preemption that service has been set up, and for what time period, or that the request was denied. An agency that can set up a reverse-flow link shall be able to notify all involved agencies that the reverse-flow link has been set up, and for what time period, or to notify the requesting agency that the request was denied. It shall also be able to notify other agencies that the reverse-flow link has been set up (and for what time period).

The information that is shared when offering ingress/egress route advice and/or notifying that ingress/egress route services have been set up shall include the following:

Message name, acronym: Offer route advice/services, ORA

Table 7 —Information for ingress/egress route advice, and/or notifying about route services

Data items	Description
Header	Header information specified in the Base Standard, including the ID of the incident concerned.
Requesting message	ID of requesting message this message is in response to (known to the communication system, so no need for an explicit data element). Note that vehicle ID information is contained in the requesting message.
Route	ID, description of route that is the advised route.
Start time	Start time when route service is to be active, or when route advice applies.
Duration	Duration of time when route service is to be active, or when route advice applies.
Reverse-flow link grant/deny	Flag designating that request for reverse-flow link has been granted or denied.
Priority/preempt grant/deny	Flag designating that request for priority/preemption has been granted or denied.
Priority/preempt route	Route for which priority/preemption granted, if different from the requested route.
Priority/preempt technology	Priority/preemption technology being used, along with any codes necessary to use that technology.
Plan names	Related pre-planned IM plan or local traffic management plan names.
Current IM plan	IM plan being generated in real time in the course of managing the current incident.
Descriptive graphic	Link to a graphic to illustrate the route situation.

4.6 Share location/priority/preemption information on a response vehicle

In incident management, it can be important to keep track of what vehicles are using what priority/preemption technologies, where, and on what routes. Although the current Base Standard supports the communication of which vehicles are dispatched to which incidents on what routes, that information is sourced from the dispatching agency. The additional requirements specified here are to support the requesting and sharing of location/priority/preemption information, with the capability of that information being sourced from a TMC, based on information from its network of sensors, including in particular its capability to detect where a vehicle is and what priority/preemption technology it is using by monitoring signals received by roadside devices. In addition, requirements specified in this subclause include the sharing of AVL information from response vehicles en route to and from an incident. To restate a point made previously, some agencies may not want location information on their vehicles to be disseminated. Nothing in this standard forces those agencies to have that information disseminated—local implementations can decide to not disseminate that information.

Four functions are supported by the requirements specified here:

- a) Interagency exchange of detected location information for response vehicles en route.
- b) Interagency exchange of detected location information for response vehicles not associated with an incident.
- c) Interagency tracking of use of priority/preemption technologies.
- d) Interagency tracking of unauthorized use of priority/preemption technologies.

The last two of those functions are of use to TMCs for flow management and so are part of real-time incident management.

4.6.1 Request location/priority/preemption information on a response vehicle

Requests for location/priority/preemption information on a response vehicle can originate from the owner of the vehicle, the IC, or any other agency (Table 8).

The information that is shared when requesting the information and services just listed shall include the following:

Message name, acronym: Request location/priority/preemption information, RLP

Table 8—Information for requesting response vehicle location/priority/preemption

Data items	Description
Header	Header information specified in the base standard, including the ID of the incident concerned.
Password	Local implementations could restrict the dissemination of location/priority/preemption information to agencies having a password, which could be reset for each incident.
Vehicle ID	ID of the vehicle that is the subject of the request.
Assigned-resource submessage	The base standard defines an assigned-resource submessage that can be included in this request. That submessage specifies the currently-known information about the vehicle dispatch, including dispatch details, response unit ID and type, status, location, ETA, estimated time of departure from scene, route, and response plan information. This data item is not necessary if the receiver has already received the current version of that submessage.

4.6.2 Share location/priority/preemption information on a response vehicle

Location/priority/preemption information can originate from the TMC, based on location information it has detected, or it could originate from the vehicle's agency, based on AVL or any other source (Table 9).

Location/priority/preemption information shall include the following:

Message name, acronym: Share location/priority/preemption information, SLP

Table 9—Shared location/priority/preemption information

Data items	Description
Header	Header information specified in the Base Standard, including the ID of the incident concerned.
Requesting message	ID of requesting message this information is in response to (known to the communication system, so no need for an explicit data element). Note that vehicle ID information is contained in the requesting message.
Vehicle ID	ID of the vehicle that is the subject of this information. Not necessary if the requesting message is specified
Assigned-resource submessage	The Base Standard defines an assigned-resource submessage that can be included here. That submessage specifies the currently known information about the vehicle dispatch, including dispatch details, response unit ID and type, status, location, ETA, estimated time of departure from scene, route, and response plan information. This data item is not necessary if the receiver has already received the current version of that submessage.
Vehicle location	Vehicle location, including confidence area (the area within which the vehicle could be expected to actually be with a specified probability, e.g., circle with radius 300m at 80%), and technology used to ascertain that location.
Technology	What priority/preemption technology is being used for that vehicle, if any.
Associated incident	Denotes that this vehicle is not associated with any currently active incident, or if it is associated with an incident, that incident number. This is as known to the center creating this information. So if that center has no records matching that vehicle ID to an incident, this data item specifies that fact.
Authorization	A flag denoting that this vehicle is not authorized to be using the priority/preemption technology it is using. This flag would be set if the center creating this information has access to who has been “granted” use of the priority/preemption technology detected on the route detected, and finds that vehicle ID has not been granted use of that technology. A center equipped to set this flag may be a different center than the originator of most of this information. In that case the authorization-checking center could simply be included in the exchanges of location/priority/preemption information, and remain silent until an unauthorized use is detected.

4.7 Information on cleanup or infrastructure repair: the need for it and plans

Cleanup and infrastructure repair is an important part of incident management. Cleanup or infrastructure repair caused by an incident is part of that incident. An instance of need for cleanup or infrastructure repair is itself an incident, whether or not it is associated with a traffic incident. TMCs often try to repair infrastructure while lanes are still closed for an incident, to minimize total time of closure, so there is a tendency to start that repair as soon as possible, while the incident is still active. This subclause concerns sharing that information between agencies, for example: a non-TMC agency reporting in to a TMC on the need for infrastructure repair, then that TMC reporting its corresponding infrastructure repair plans out to other agencies. Although the goal of this standard is to support that information sharing between agencies, there is nothing to prevent its use supporting that information sharing within agencies as well. Examples of infrastructure that might be involved: signals, signs, guard rails, bridge abutments, illumination, and malfunctioning equipment.

4.7.1 Report on the need for cleanup or infrastructure repair

This information would be reported to a TMC by an agency on an incident scene, or by an agency discovering a need for cleanup or infrastructure damage or failure (Table 10). This information is focused on describing the need for cleanup and/or infrastructure repair. If there is a need to also request traffic control associated with that cleanup/infrastructure repair, it shall be handled by a separate message as specified in 4.3.

The information that is shared when reporting the need for cleanup and/or infrastructure repair shall include the following:

Message name, acronym: Need for cleanup/infrastructure repair, NCI

Table 10—Information for reporting on the need for cleanup or infrastructure repair

Data items	Description
Header	Header information specified in the Base Standard, including the ID of the incident concerned.
Cleanup needs	A list: a location (location data items for a point or an area, with free text supplement) and for each location: the cleanup operation needed (enumerated list with free text supplement), current status (impeding traffic, etc.), and the estimated time duration of that cleanup.
Infrastructure repair needs	A list: a location (location data items with free text supplement) and for each location: the infrastructure unit needing repair/replacement (enumerated list with free text supplement), its current status (operational or not, etc.), and the desired time for that repair/replacement to be completed.
Time observed	The time the problem was observed, as that can differ from the timestamp of a communication.
POC	Point-of-contact information on the person reporting this information.
Urgency	Free text description of the effects of the cleanup or infrastructure situation, indicating the urgency that should be applied in resolving it.

4.7.2 Share information on a cleanup plan and/or an infrastructure repair plan

This information shall originate from a TMC (Table 11). It may be in response to one or more reports on the need for cleanup or infrastructure repair, or it may be initiated by the TMC. This information is focused on describing a cleanup and/or infrastructure repair response. If there is a need to describe a traffic control operation associated with that cleanup and infrastructure repair response, it shall be handled by a separate message as specified in 4.4.

The information that is shared in specifying a cleanup plan or infrastructure repair plan shall include the following:

Message name, acronym: Cleanup/infrastructure repair plan, CRP