TECHNICAL SPECIFICATION

ISO/TS 21219-15

First edition
2016-06-01

Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) —

Part 15: Traffic event compact (TPEG2-TEC)

Systèmes intelligents de transport — Informations sur le trafic et le tourisme via le groupe expert du protocole de transport, génération 2 (TPEG2) —

Partie 15: Événement trafic compact (TPEG2-TEC)

Reference number
ISO/TS 21219-15:2016(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO/TS 21219 consists of the following parts, under the general title *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2)*:

— *Part 1: Introduction, numbering and versions (TPEG2-INV) [Technical Specification]*

— *Part 2: UML modelling rules [Technical Specification]*

— *Part 3: UML to binary conversion rules [Technical Specification]*

— *Part 4: UML to XML conversion rules [Technical Specification]*

— *Part 5: Service framework (TPEG2-SFW) [Technical Specification]*

— *Part 6: Message management container (TPEG2-MMC) [Technical Specification]*

— *Part 9: Service and network information (TPEG2-SNI) [Technical Specification]*

— *Part 10: Conditional access information (TPEG2-CAI) [Technical Specification]*

— *Part 14: Parking information application (TPEG2-PKI) [Technical Specification]*

— *Part 15: Traffic event compact [Technical Specification]*

— *Part 18: Traffic flow and prediction application (TPEG2-TFP) [Technical Specification]*

— *Part 19: Weather information (TPEG2-WEA) [Technical Specification]*

The following parts are under preparation:

— *Part 16: Fuel price information and availability application (TPEG2-FPI) [Technical Specification]*

— *Part 23: Road and multi-modal routes application (TPEG2-RMR) [Technical Specification]*

— *Part 24: Light encryption (TPEG2-LTE) [Technical Specification]*

— *Part 25: Electromobility charging infrastructure (TPEG2-EMI) [Technical Specification]*

The following parts are planned:

— *Part 7: Location referencing container [Technical Specification]*

— *Part 11: Universal location reference [Technical Specification]*

— *Part 21: Geographic location referencing [Technical Specification]*

— *Part 22: OpenLR location referencing [Technical Specification]*

Introduction

History

TPEG technology was originally proposed by the European Broadcasting Union (EBU) Broadcast Management Committee, who established the B/TPEG project group in the autumn of 1997 with a brief to develop, as soon as possible, a new protocol for broadcasting traffic and travel-related information in the multimedia environment. TPEG technology, its applications and service features were designed to enable travel-related messages to be coded, decoded, filtered and understood by humans (visually and/or audibly in the user's language) and by agent systems. Originally, a byte-oriented data stream format, which may be carried on almost any digital bearer with an appropriate adaptation layer, was developed. Hierarchically structured TPEG messages from service providers to end-users were designed to transfer information from the service provider database to an end-user's equipment.

One year later, in December 1998, the B/TPEG group produced its first EBU specifications. Two documents were released. Part 2 (TPEG-SSF, which became ISO/TS 18234-2) described the Syntax, Semantics and Framing structure, which was used for all TPEG applications. Meanwhile, Part 4 (TPEG-RTM, which became ISO/TS 18234-4) described the first application for Road Traffic Messages.

Subsequently, in March 1999, CEN/TC 278, in conjunction with ISO/TC 204, established a group comprising members of the former EBU B/TPEG and this working group continued development work. Further parts were developed to make the initial set of four parts enabling the implementation of a consistent service. Part 3 (TPEG-SNI, ISO/TS 18234-3) described the Service and Network Information Application used by all service implementations to ensure appropriate referencing from one service source to another.

Part 1 (TPEG-INV, ISO/TS 18234-1) completed the series by describing the other parts and their relationship; it also contained the application IDs used within the other parts. Additionally, Part 5, the Public Transport Information Application (TPEG-PTI, ISO/TS 18234-5), was developed. The so-called TPEG-LOC location referencing method, which enabled both map-based TPEG-decoders and non-map-based ones to deliver either map-based location referencing or human readable text information, was issued as ISO/TS 18234-6 to be used in association with the other applications parts of the ISO/TS 18234 series to provide location referencing.

The ISO/TS 18234 series has become known as TPEG Generation 1.

TPEG Generation 2

When the Traveller Information Services Association (TISA), derived from former forums, was inaugurated in December 2007, TPEG development was taken over by TISA and continued in the TPEG applications working group.

It was about this time that the (then) new Unified Modelling Language (UML) was seen as having major advantages for the development of new TPEG Applications in communities who would not necessarily have binary physical format skills required to extend the original TPEG TS work. It was also realized that the XML format for TPEG described within the ISO/TS 24530 series (now superseded) had a greater significance than previously foreseen, especially in the content-generation segment and that keeping two physical formats in synchronism, in different standards series, would be rather difficult.

As a result, TISA set about the development of a new TPEG structure that would be UML based. This has subsequently become known as TPEG Generation 2.

TPEG2 is embodied in the ISO/TS 21219 series and it comprises many parts that cover introduction, rules, toolkit and application components. TPEG2 is built around UML modelling and has a core of rules that contain the modelling strategy covered in ISO/TS 21219-2, ISO/TS 21219-3, ISO/TS 21219-4 and the conversion to two current physical formats: binary and XML; others could be added in the future. TISA uses an automated tool to convert from the agreed UML model XMI file directly into an MS Word document file, to minimize drafting errors, that forms the Annex for each physical format.

TPEG2 has a three container conceptual structure: Message Management (ISO/TS 21219-6), Application (many Parts) and Location Referencing (ISO/TS 21219-7). This structure has flexible capability and can accommodate many differing use cases that have been proposed within the TTI sector and wider for hierarchical message content.

TPEG2 also has many location referencing options as required by the service provider community, any of which may be delivered by vectoring data included in the Location Referencing Container.

The following classification provides a helpful grouping of the different TPEG2 parts according to their intended purpose.

— Toolkit parts: TPEG2-INV (ISO/TS 21219-1), TPEG2-UML (ISO/TS 21219-2), TPEG2-UBCR (ISO/TS 21219-3), TPEG2-UXCR (ISO/TS 21219-4), TPEG2-SFW (ISO/TS 21219-5), TPEG2-MMC (ISO/TS 21219-6), TPEG2-LRC (ISO/TS 21219-7), TPEG2-LTE (ISO/TS 21219-24);

— Special applications: TPEG2-SNI (ISO/TS 21219-9), TPEG2-CAI (ISO/TS 21219-10);

— Location referencing: TPEG2-ULR (ISO/TS 21219-11), TPEG2-GLR (ISO/TS 21219-21), TPEG2-OLR (ISO/TS 21219-22);

— Applications: TPEG2-PKI (ISO/TS 21219-14), TPEG2-TEC (ISO/TS 21219-15), TPEG2-FPI (ISO/TS 21219-16), TPEG2-TFP (ISO/TS 21219-18), TPEG2-WEA (ISO/TS 21219-19), TPEG2-RMR (ISO/TS 21219-23), TPEG2-EMI (ISO/TS 21219-25).

TPEG2 has been developed to be broadly (but not totally) backward compatible with TPEG1 to assist in transitions from earlier implementations, while not hindering the TPEG2 innovative approach and being able to support many new features, such as dealing with applications having both long-term, unchanging content and highly dynamic content, such as Parking Information.

This part of ISO/TS 21219 is based on the TISA specification technical/editorial version reference:

SP13001/3.2/002

Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) —

Part 15:
Traffic event compact (TPEG2-TEC)

1 Scope

This part of ISO/TS 21219 specifies the TPEG application: Traffic Event Compact (TEC). The TEC application has been specifically designed to support information about traffic events (e.g. road works, traffic jams). A specific form of traffic events are local hazard warnings which, being safety-related messages, are sent with high priority to warn a driver that may encounter dangerous situations (e.g. black-ice, accident beyond curves, obstacles on road, etc.) unexpectedly.

Generally, the Traffic Event Compact application is designed to allow receivers to

— ensure travel safety for the driver,

— enable the calculation of alternative routes,

— avoid delays (e.g. traffic jams),

— warn the driver of obstructions on route, and

— provide the driver with information on infrastructural problems (e.g. closed petrol stations, non-functioning emergency telephones).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 21219-4, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 4: UML to XML conversion rules*

ISO/TS 21219-6, *Intelligent transport systems — Traffic and travel information via transport protocol experts group, generation 2(TPEG2) — Part 6: Message management container (TPEG2-MMC)*

ISO/TS 21219-7[1)], *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 7: Location referencing container (TPEG2-LOC)*

3 Terms and definitions

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

3.1
local hazard warning
specific form of traffic events which, being safety-related messages, are sent with high priority to assist a driver from encountering dangerous situations

1) Planned.

3.2
location referencing container
concept applied to the grouping of all of the location referencing elements of a TPEG-Message

3.3
location referencing
method to provide information which allows a system to accurately identify a location

Note 1 to entry: The content of a location reference allows the location to be presented in a plain-language manner to the end-user (i.e. text, speech or icons) and also to be used for navigational purposes, for example, for map-based systems.

4 Abbreviated terms

ACID	Application and Content Identifier
ADC	Application Data Container
LRC	Location Reference Container
MMC	Message Management Container
RF	Radio Frequency
SFW	TPEG Service Framework: Modelling and Conversion Rules
TEC	Traffic Event Compact
TISA	Traveller Information Services Association
TPEG	Transport Protocol Expert Group
TTI	Traffic and Traveller Information
UML	Unified Modelling Language

5 Application specific constraints

5.1 Application identification

The word “application” is used in this part of ISO/TS 21219 to describe specific subsets of the TPEG structure. An application defines a limited vocabulary for a certain type of messages, for example, parking information or road traffic information. Each TPEG application is assigned a unique number called the Application IDentification (AID). An AID is defined whenever a new application is developed and these are all listed in the TPEG2-INV specification.

The application identification number is used in the TPEG2-SNI application to indicate how to process TPEG content and facilitates the routing of information to the appropriate application decoder.

5.2 Version number signalling

Version numbering is used to track the separate versions of an application through its development and deployment. The differences between these versions may have an impact on client devices.

The version numbering principle is defined in the TPEG2-INV specification.

Table 1 shows the current version numbers for signalling TEC within the SNI application.

Table 1 — Current version numbers for signalling of TEC

Major version number	3
Minor version number	2

5.3 Ordered components

TPEG-TEC requires a fixed order of TPEG components. The order for the TEC message component is shown in Figure 1. The first component shall be the *Message Management Container.* This shall be the only component if the message is a cancellation message. Otherwise, the MMC component shall be followed by the *one or more Application Data Container component(s) which includes the application-specific information* and this, in turn, is followed by the *Location Referencing Container*.

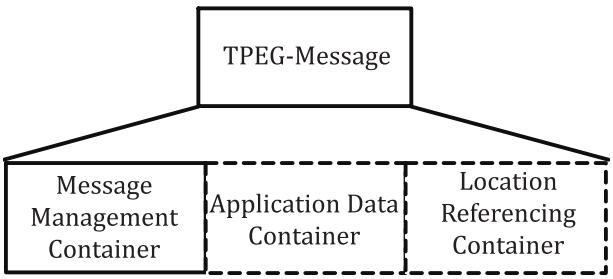

Figure 1 — Composition of TPEG messages

Within the *Event* component, one or more *Cause* components shall come first followed by one or more *Advice* components and so on. Components of the same type shall immediately follow each other.

5.4 Extension

Although there is a requirement to maintain a fixed component order, this does not prevent the extension of a TEC message generally. In case of future extensions, new components may be inserted or existing components may be replaced by new ones without losing backward compatibility. This requires that a TEC decoder shall be able to detect and skip unknown components.

Components of the same type shall be included sequentially without the interleaving of other forms of component.

Example (allowed)

The *Advice* component is replaced by *BetterAdvice* having its own component id. A *WeatherSituation* component is inserted after *Advice* component as shown in Figures 2 and 3.

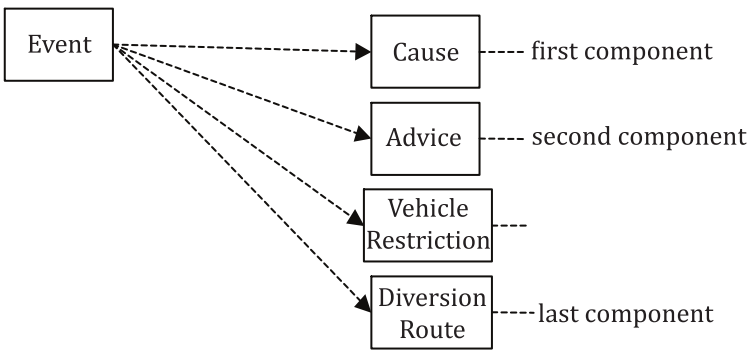

Figure 2 — Example for extension; original component model (before addition of additional components)

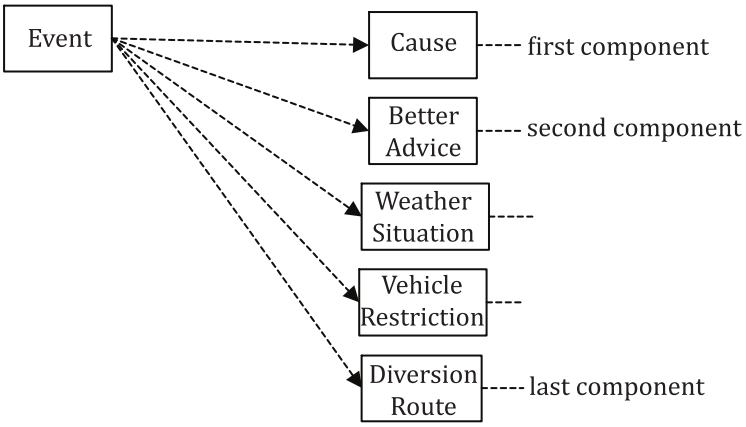

Figure 3 — Example for extension; *Advice* replaced by *BetterAdvice* and *WeatherSituation* added

5.5 TPEG Service Component Frame

TEC makes use of the "Service component frame with dataCRC, groupPriority and messageCount"**.**

6 TEC Structure

The TEC structure is presented in Figure 4.

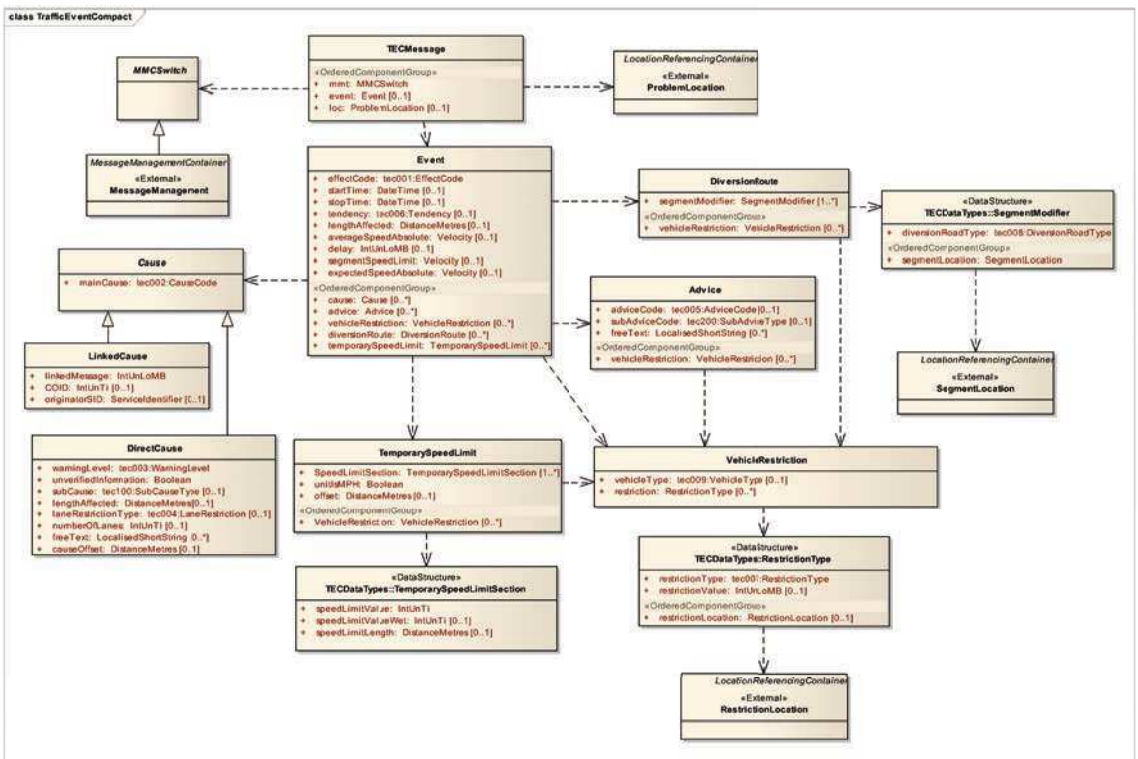

Figure 4 — TEC message structure

7 TEC Message components

7.1 TECMessage

A TECMessage (see Table 2) is either a normal message or a cancellation message. A normal message (i.e. other than cancellation messages) shall include the following:

— one message management container with management information related to the overall message (ID and version, expiry time);

— one event container with one traffic flow effect and, optionally, one or more causes with additional information;

— one location referencing container with the location reference for the overall traffic message.

Cancellation messages (cancelFlag = true) shall not include an event nor a location referencing container, only the message management container.

Table 2 — TECMessage

Name	Type	Multiplicity	Description
Ordered Components			
Mmt	MMCSwitch	1	Message Management Container
Event	Event	0..1	Describes the impact on the traffic flow and the related cause (always included except for cancellation of a message)
Loc	ProblemLocation	0..1	Location Referencing Container (always included except for cancellation of a message)

7.2 MMCSwitch

The MMCSwitch is an abstract container included for formal reasons, to allow future extension of the MMC.

7.3 MessageManagement

The MessageManagement component is a placeholder for the MessageManagementContainer as specified in ISO/TS 21219-6. It assigns the traffic event compact (TEC) application specific local component ID for the MMC container. All component IDs within the MMC container are local to the MMC toolkit. The MMC contains all and only information related to message management.

Message generation systems shall ensure that the information given in the MMC promotes unambiguous interpretation over the whole time a message is valid. It is particularly important to recognize that client devices are likely to suffer from non-continuous reception as typically encountered in broadcast systems suffering intermittent Radio Frequency (RF) performance.

TEC shall only use the monolithic message management as specified in ISO/TS 21219-6. Multipart messages management shall not be used.

7.4 Event

The Event component (see Table 3) supports definition, in general, of the impact on the traffic flow and the related cause.

NOTE For example, Stationary Traffic (due to) Narrow Lanes.

Table 3 — Event component

Name	Type	Multiplicity	Description
effectCode	tec001:EffectCode	1	Describes the impairment of the trafficflow.
startTime	DateTime	0..1	Date and time at which an event began or is scheduled to begin (intended to be used for presentation to the end-user).
stopTime	DateTime	0..1	Date and time at which an event, or status information, ended or is scheduled to end (intended to be used for presentation to the end-user).
tendency	tec006:Tendency	0..1	Tendency is related to the averageSpeedAbsolute indicating if this has been increasing, decreasing or has remained constant. Timescale of this trend should be typically in the range of 30 min or less, but is defined by the service provider. It is not a forecast of a future trend, nor does it relate to the length of the traffic queue.
lengthAffected	DistanceMetres	0..1	Length of the event in metres.
averageSpeedAbsolute	Velocity	0..1	The actual average speed in m/s at the given location. It is recommended to use this value for calculation of the route and estimated arrival time.
delay	IntUnLoMB	0..1	Delay in minutes added to journey due to event at the location. Only applicable to point locations, i.e. at border crossings.
segmentSpeedLimit	Velocity	0..1	Averaged speed limit (in m/s) within the problem location. Within the problem location, multiple speed limits may exist (e.g. multiple reducing speed limits on entering a roadworks zone). Average speed limit is calculated as: the total length (in m) of the problem location divided by the sum of the individual travel times travel times (seconds) when travelling at the defined speed limit. Shall be used as speed limit for re-routing, but not to display or warn the driver.
expectedSpeedAbsolute	Velocity	0..1	The expected (normal) speed in m/s for this time of the day based on, e.g. historical data. This speed may vary as function of the time of day and can be markedly different from the free-flow speed (especially in rush hour conditions).
Ordered Components			
cause	Cause	0..*	Defines the reason for the traffic problem (direct or linked cause).
advice	Advice	0..*	Recommendations or prohibitions for the driver.
vehicleRestriction	VehicleRestriction	0..*	Vehicle types (restrictions) that are relevant for the message.
diversionRoute	DiversionRoute	0..*	Diversion information relating to the event.
temporarySpeedLimit	TemporarySpeedLimit	0..*	This is the temporary speed limit displayed on road signs associated with the Event. This data is intended for display to drivers.

Effect and Cause

For a single event, it should be possible to distinguish between the effect that describes an impairment of the traffic flow (e.g. stationary traffic) and the cause (e.g. roadworks). The latter can be seen as the reason for the traffic flow effect described by the attribute effectCode. A "Cause" can be used to provide further information to inform or warn the driver of a special situation (e.g. oil on the road).

LengthAffected

If LengthAffected is included within the Event component, it describes the length of the overall problem; otherwise, the length is defined by the location given in the Location Reference Container.

LengthAffected shall not be greater than the length defined by the Location Reference Container.

startTime and stopTime

These describe the beginning and end time of a traffic event. The startTime is the time at which an event started or is scheduled to start. The stopTime is the time at which the event is scheduled to end. These times may be presented directly to the user by the receiver for information.

Speed Attributes

Speed related attributes are all defined in metres per second (m/s). Client devices may need to convert to other units.

Average Speed Absolute

The averageSpeedAbsolute is used to signal the real speed of traffic through the problem location.

Delay

Delay associated with a specific location like a border crossing.

Segment Speed limit

The segmentSpeedLimit is used to signal the averaged potential speed (due to applied legal limits along the Problem Location) for re-routing and ETA calculations, but not to display or warn the driver. This attribute is not guaranteed to match signed speed limits on a road.

Expected Speed Absolute

The expectedSpeedAbsolute is used to signal the expected (normal) speed of traffic through the problem location.

Rounding of speed information

Speed information is always given in metres per seconds (m/s) as the TPEG data type "Velocity" is used. For calculations of journey and arrival times, receivers should use this information directly. However, for presentation to the driver, the receiver should convert and round these values as suggested in Table 4.

Table 4 — Rounding of speed information

m/s	km/h (exact)	km/h (rounded, steps of 5)	mph (exact to 2 decimal places)	mph (rounded, steps of 5)
0	0,0	0	0,0	0
1	3,6	5	2,24	0
2	7,2	5	4,49	5
3	10,8	10	6,73	5
4	14,4	15	8,98	10

Table 4 *(continued)*

m/s	km/h (exact)	km/h (rounded, steps of 5)	mph (exact to 2 decimal places)	mph (rounded, steps of 5)
5	18,0	20	11,22	10
6	21,6	20	13,47	15
7	25,2	25	15,71	15
8	28,8	30	17,96	20
9	32,4	30	20,20	20
10	36,0	35	22,44	20
11	39,6	40	24,69	25
12	43,2	45	26,93	25
13	46,8	45	29,18	30
14	50,4	50	31,42	30

The following formulae are used to calculate the values listed in Table 4. Additional higher values than those listed may be used.

For steps of 5 km/h (0, 5, 10, 15, 20, …)

Rounded Speed (km/h) = 5 × [(36 × v + 25)/50]

For steps of 5 mph (0, 5, 10, 15, 20, …)

Rounded Speed (km/h) = 5 × [(360 × v + 401)/802]

Where v is the velocity signalled (in m/s)

In these formulae, the division is an **integer division** which means that the fractional part (remainder) is discarded.

7.5 Cause

The cause component (see Table 5) specifies the additional interface including a mandatory CauseCode for all instances.

Table 5 — Cause

Name	Type	Multiplicity	Description
mainCause	tec002:CauseCode	1	Main categorization of the cause according to table tec002

There are two ways to encode “events” where an effect and one or more causes belong together.

Direct Cause

Direct Cause is where both the effect and the cause are defined together in the same message In this case, both the cause and effect are deemed to occur within the same location as defined by the LRC.

Linked Cause

The other method is called a “LinkedCause” where the effect is defined in one message, but the detailed cause is defined in a separate message.

In this case, the complete description of the traffic situation will be spread over two or more separate messages.

7.6 DirectCause

The DirectCause (see Table 6) is used to describe the reason for traffic problem in general.

The main reason for the separation of causes and the effect is so that the traffic situation can be described in the most meaningful way to the driver.

For example, Road closed (effectCode = 7), (due to) objects on the road (causeCode = 10).

Table 6 — DirectCause

Name	Type	Multiplicity	Description
mainCause	tec002:CauseCode	1	Main categorization of the cause according to table tec002.
warningLevel	tec003:WarningLevel	1	The level “informative” should be used for all traffic events, which may influence the driver’s route in any way requiring normal level of attention from the driver. The “danger levels” 1 to 3 should only be used for dangerous situations. Levels 1 to 3 are used in ascending levels of danger (Level 1 - Danger; Level 3 - Highly Dangerous). Danger levels 1 to 3 in combination with unverifiedInformation = True should be used in case of an unverified danger. For example, a traffic management centre receives a call from a private “jam buster” reporting that there is a “vehicle travelling on the wrong side of the road”, but this has not been confirmed by the police.
unverifiedInformation	Boolean	1	If element is set to 1, the given information has not been verified.
subCause	tec100:SubCauseType	0..1	Carries the value in the sub-cause table defined by the mainCauseCode.
lengthAffected	DistanceMetres	0..1	Length of the cause in metres.
laneRestrictionType	tec004:LaneRestriction	0..1	Specifies whether lanes are closed or open.

Table 6 *(continued)*

Name	Type	Multiplicity	Description
numberOfLanes	IntUnTi	0..1	Specifies how many lanes are closed or open. If this element is not given, but laneRestrictionType indicates there are lane closures, it means an unspecified number of lanes are closed, i.e. “one or more lanes closed”. Or if laneRestrictionType indicates lanes open: “one or more lanes open”.
freeText	LocalizedShortString	0..*	Additional description.
causeOffset	DistanceMetres	0..1	Offset (metres) from the start of the Cause to the end of the Problem Location. When used together with lengthAffected, the cause can be positioned within the event more accurately. Without Cause Offset, but with lengthAffected efined, the cause position is not defined. If neither Affected Length nor Cause Offset are defined, the Cause spans the entire Problem Location.

7.7 Causes and sub-causes

When using a Direct Cause, then this Direct Cause component may optionally include a single subCause attribute of type SubCauseType.

The subCause attribute is used to further elaborate on the type of incident causing the problem.

Applicable SubCauseType values are defined in tables particular to each (mainCause) CauseCode.

Simple receivers shall support at least all Causes.

Receivers with more memory may additionally support subCauses. In this case, subCauses should replace the (main) cause completely. It is not necessary to combine causes and sub-causes in a manner to produce a grammatically correct complete sentence.

7.8 LinkedCause

LinkedCause (see Table 7) specifies a link to a message that provides more details about the cause. A link to another message is uniquely specified by the combination of originatorServiceID, contentID, applicationID and messageID. The linked message can be found in the service component where those attributes are equal to the values given in that component: linkedMessage, contentID (COID), originatorServiceID. In this case, the applicationID points to the TEC Application and is therefore not explicitly given in this component.

Table 7 — LinkedCause

Name	Type	Multiplicity	Description
mainCause	tec002:CauseCode	1	Main categorization of the cause according to table tec002.
linkedMessage	IntUnLoMB	1	Contains a messageID as pointer to a message. If contentID and originatorSID is not given, the linked messages is contained in the actual component stream of the actual service.
COID	IntUnTi	0..1	If COID is not included, the linked message can be found in the component stream that has the same contentID as the linking message.
originatorSID	ServiceIdentifier	0..1	If originatorID is not included, the linked message can be found in the same service as the linking message.

7.8.1 Rules

Effect and cause(s) shall be split into two or more messages (linked cause) if

— they are from different providers, e.g. effect is provided by the police and cause by a private service provider,

— different update rates shall be used,

— the effect does not share the same position with the cause(s); splitting the messages permits a different Problem Location definition for the cause(s) and the effect, and

— the same situation requires two traffic flow-effects, e.g. different speed limits for cars and lorries.

7.8.2 Further constraints

One real cause may be represented either as a linked cause or as a direct cause. It is not allowed to describe one situation using both a direct cause and a linked cause at the same time. But it is allowed to use a direct cause and, in addition, a linked cause if two different causes apply to one situation (see Example 2 below).

7.8.3 Coding Examples

Example 1

In this case (see Figure 5 and Table 8), roadworks are causing a traffic jam, the position of the individual elements cannot be defined in detail, but as an overall event “Roadworks + Queue”, the location is defined by the LRC. If the location of the queue and roadworks need to be explicitly detailed, they shall be split into separate messages.

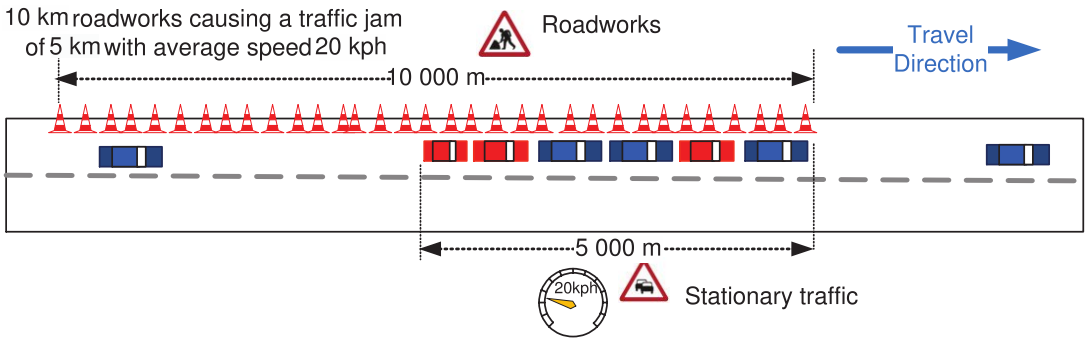

Figure 5 — Example 1 for a traffic situation which can be coded by use of a DirectCause

Table 8 — Example 1

	Attribute	Value	Meaning
trafficflow_effect	effectCode	6	"stationary traffic"
	lengthAffected	5 000	5 000 m
	averageSpeedAbsolute	5 m/s	20 kph
directCause	causeCode	3	"roadworks"
	lengthAffected	10 000	10 000 m

Example 2

In this example (see Figure 6, Table 9 and Table 10), there is an accident causing a traffic queue within a section of roadworks. Since the accident is causing the tailback rather than the roadworks, the accident is the "direct cause" and the stationary traffic is the effect, the later can be reported in a single TEC message, with the Roadworks detailed in a separate message, linked by using the linked cause. For this situation, the two separate messages allow better definition of the location of the various elements of the problem. The first defining the position of the accident and its resulting traffic queue, and a second message reporting the position of the roadworks.

The segment_speed is a way to define the overall effect on permitted speed through the roadworks using a single value for routing calculations. The combination of the 80 kph and 60 kph sections combine to give an overall (mean) maximum permitted speed of 64 kph through a 10 km length of the problem.

For details on providing Temporary Speed Limits for display to the driver, see 7.12.

It should be noted that in this example, two messages may have to be transmitted with accident as the cause, one for each direction, as the accident may affect both sides of the road with different "effect".

An accident causing a 5 km traffic jam with average speed 20 kph within a 10 km Roadworks zone with multiple speed limit sections.

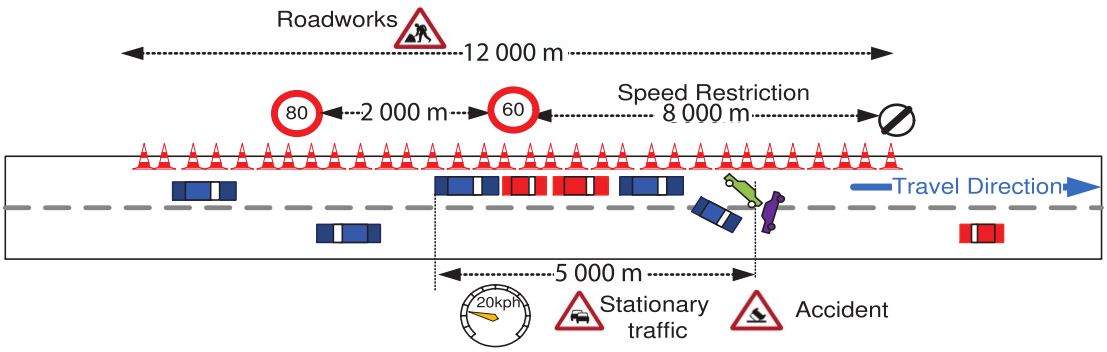

Figure 6 — Example 2 for a traffic situation, where a LinkedCause is necessary

Table 9 — Example 2: First message

	Attribute	Value	Meaning
effect	effectCode	5	"Queuing Traffic"
	lengthAffected	5 000	5 000 m
	averageSpeedAbsolute	5 m/s	20 kph
directCause	causeCode	2	"accident"
linkedCause	causeCode	3	"roadworks"
	linkedMessage	(ID of second message)	

Table 10 — Example 2: Second message

	Attribute	Value	Meaning
effect	effectCode	1	"unknown"
	lengthAffected	10 000	10 km
	segmentSpeedLimit	18 m/s	64 kph
	TemporarySpeedLimit	80 kph (2 km) + 60 kph, offset 10 km	(See 7.12)
directCause	causeCode	3	"roadworks"

Example 3

The causeOffset allows the positioning of DirectCauses within a single event to be defined more precisely.

Figure 7 (see also Table 11) shows an example of an event with 3 Causes: Roadworks and Narrow Lanes and LaneClosed. The Narrow Lanes and LaneClosed causes only cover part of the overall Problem Location.

The causeOffset, for the NarrowLanes and LaneClosed causes in this example, defines the position of the starting point of the cause upstream of the end of the Problem location. When used in addition to the lengthAffected, it allows relative positioning of each Cause within the Problem Location.

If lengthAffected is not defined for a cause, then the cause is deemed to extend fully to the downstream end of the Problem Location.

A message with LengthAffected, but without a causeOffset shall be interpreted as the Cause extending to the downstream end of the Problem Location.

If neither lengthAffected nor causeOffset is defined, then the cause spans the entire Problem Location.

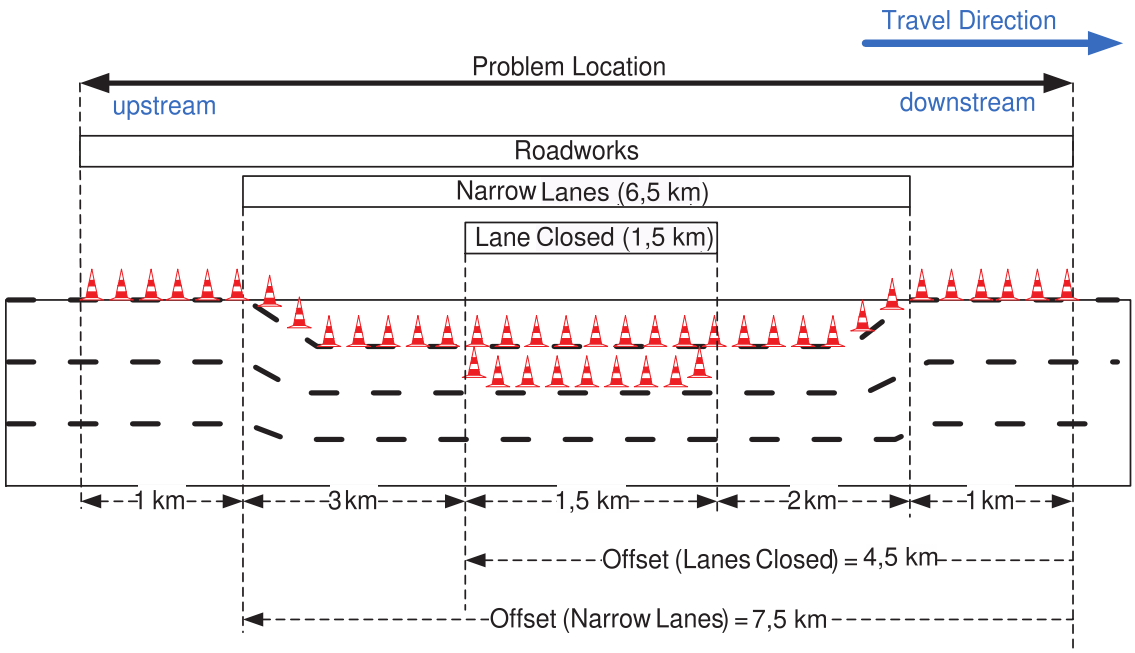

Figure 7 — Cause Offsets

Table 11 — Example 3

effect	effect_code	“unknown”
directCause	causeCode	3-“roadworks”
directCause	causeCode	4-“Narrow Lanes”
	lengthAffected	6 500
	causeOffset	7 500
directCause	causeCode/SubCause	4-“NarrowLanes”/3- ”Right Lane Closed”
	lengthAffected	1 500
	causeOffset	4 500

7.9 Advice

The Advice component (see Table 12) contains information on recommendations or prohibitions for the driver.

Table 12 — Advice

Name	Type	Multiplicity	Description
adviceCode	tec005:AdviceCode	0..1	Main categorization of advice
subAdviceCode	tec200:SubAdviceType	0..1	Detailed advice codes
freeText	LocalizedShortString	0..*	Additional advice or information example: ”please be ready to show passports”
Ordered Components			
vehicleRestriction	VehicleRestriction	0..*	Used where Advice applies to specific vehicle types

7.10 VehicleRestriction

VehicleRestriction (see Table 13) is used when the Event (or Diversion or Advice) is restricted to a specific vehicle type, e.g. only for lorries. If vehicleType is not present, the subsequent RestictionType shall be applied to all types of vehicles.

Table 13 — VehicleRestriction

Name	Type	Multiplicity	Description
vehicleType	tec009:VehicleType	0..1	Type of vehicle
restriction	RestrictionType	0..*	Even when a particular vehicle type has been defined by tec009:VehicleType, VehicleRestriction may be used to specify further attributes to more closely define the vehicles for which the message applies, e.g. vehicle weight, vehicle height, or other attribute, including vehicle destination. For example: “without winter tyres” means the message applies to vehicles without winter tyres. “width greater 300” means that the event or the closure affects only vehicles with a width greater than three metres. “with destination in a given area” means the message is targeted only at vehicles whose destination is as specified in the area as attached to this restriction attribute.

7.11 DiversionRoute

DiversionRoute specifies one or more diversionary routes for use when the intended route passes through the affected area.

7.11.1 Description for Creating and Applying Diversions

Recommendations to avoid the traffic problem area may be added to any event. At the most basic level, this may simply be advice such as “avoid the area“ or “follow signposted diversion“. However, by using the DiversionRoute component, specific diversion routes may be suggested.

TEC creates diversion routes from several road segments. For each segment, a ”segment type” is given describing the suitability of the segment as part of a diversionary route. These range from ”closed road” to ”bypass” (see Table 14). By evaluating the types assigned for each segment, the optimum diversion to route the vehicle from its current position to rejoin the route ”bypassing” the problem area can be calculated.

Differing diversion advice may be appropriate for different classes of vehicle. For example, a diversion route may be suitable for cars, but not for lorries. Different attributes, including vehicle type and further restriction types, as well as diversions specific to destination may be applied. Different diversion recommendations too are often suggested appropriate to the direction of travel.

As well as suggesting diversionary routes, it is also possible to give information to discourage the use of certain segments because of given circumstances. A navigation system knowing that a particular road segment is restricted due to, for example, roadworks, is able to plan a route to avoid the parts of the road network that are unsuitable for a diversion.

In many cases, a provider or road operator may define the diversion information for strategic routes in advance of an actual problems occurring. This is the case in many countries and often predefined signage is in place.

In general, TEC DiversionRoute provides a list of road segments which define the recommended route for the diversion. The diversion segments may also signal roads that are not recommended due to their low capacity.

The segmentType attribute is provided to define the significance of each segment.

Adjustment to the route of a vehicle should only be applied by vehicles directly affected by the traffic problem. If a planned route uses roads near the traffic problem, but not actually part of it, the segment modifiers should not be considered for the routing.

7.11.2 Strategy for Coding a Diversion

The diversions suggested should only be used by the vehicle receiver if both the following apply:

a) the vehicle, if not diverted, would travel on at least one part of the given problem location;

b) the filter criteria apply to the vehicle.

The definition of the TEC Diversion allows signalling which road segments should be considered as preferred in the routing algorithm and which segments should be avoided, if possible.

The definition neither gives explicit routing cost, nor time delay for each segment as the routing function of receivers may be very diverse, but instead describes the relative priority of each segment for use.

The road segment types are detailed below:

— LA = Limited Access: The segment shall be used for local traffic only. If possible, plan a route avoiding this segment.

  → Routing costs for that segment should be raised by a factor much greater than one.

— NR = Not Recommended: The segment should be avoided if an alternative is available. Service provider's intent is to limit traffic using this segment as it already has reduced capacity or will become congested easily.

  → Routing costs for that segment should be raised by a factor greater than one.

— BP = Bypass: This indicates the best segment to use to bypass the obstruction. This shall be used for routing in preference to any other.

  → Routing costs for that segment should be reduced by a factor much smaller than one.

— AR = Access Road: This segment provides the preferred way to get to and from the bypass segments. The use of the AR segment is related to the start position so is not as important as the BP segments in the new route calculation.

  → Routing costs for that segment should be reduced by a factor smaller than one.

— CR = Closed Road: The segment should be avoided for routing, unless there is no other possibility to reach the destination.

  → Routing costs for that segment should be increased by a factor much greater than one and higher than any other possible route reaching the destination.

Example 1

Figure 8 shows a combination of diversion segments each classified as explained above. After evaluating the factors for each possible route between position S (the current position) and the destination, the receiver should propose a diversion route as shown by the dotted route as indicated in the diagram.

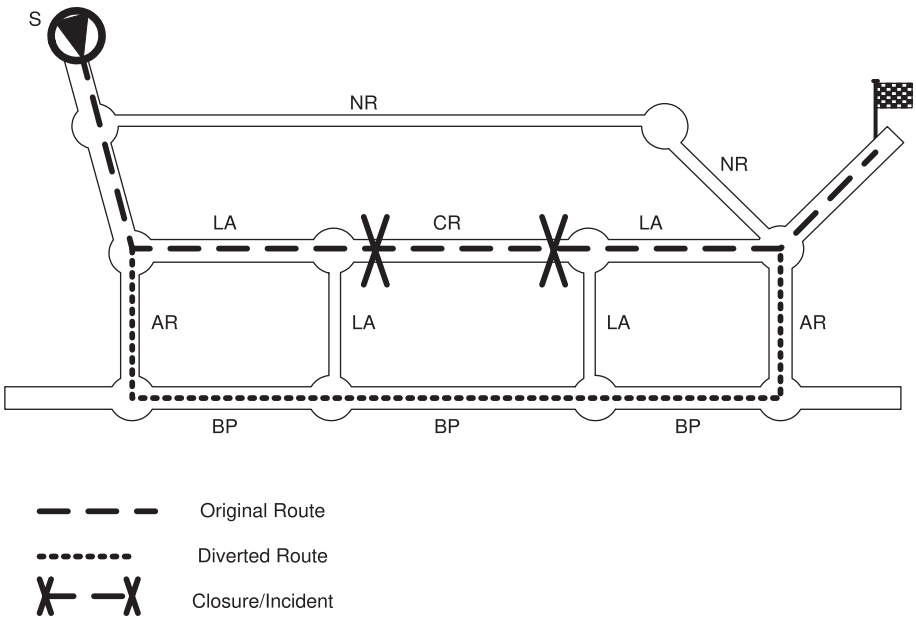

Figure 8 — Example for a simple diversion strategy

As shown in the UML model (Figure 4), an event can carry a list of DiversionRoute elements which need not be connected parts of the road network. Each element can be further defined using filtering information in VehicleRestriction and at least one SegmentModifier. The given DiversionRoute element should only be used by a receiver that is in a vehicle that is not excluded by the filter, fulfilling at least one VehicleRestriction condition.

Example 2

A VehicleRestriction element consisting of a destination filter describing the urban area of a given town should only be taken into account for vehicles having a destination in the urban area of that town (see Figure 9). Though traffic should not use this DiversionRoute, the service provider may have prepared another diversion route for vehicles having a destination outside the urban area.

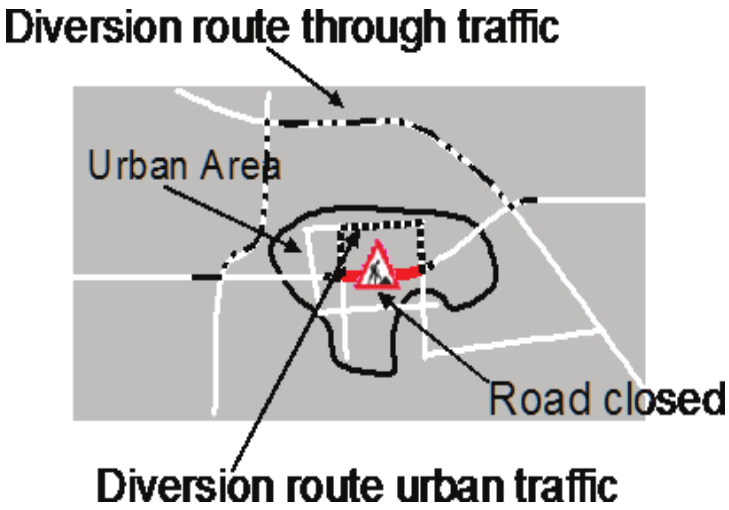

Figure 9 — Example for a diversion strategy with specific destination area

Table 14 — DiversionRoute

Name	Type	Multiplicity	Description
segmentModifier	SegmentModifier	1..*	Data structure used to define diversion
Ordered Components			
vehicleRestriction	VehicleRestriction	0..*	Defines how a diversion is restricted to specific vehicles

7.12 TemporarySpeedLimit

One of the highly visible attributes of many roadworks is the imposed Temporary Speed Limit. This component provides the ability to define temporary speed limit information suitable for display to the driver (see Table 15).

Temporary Speed limit information associated with the event is defined in either kph or mph. Multiple sections with a different speed value may be provided with a length. The offset from the end of the Location Reference to the start of the first speed limit restriction allows the speed limit zone to be positioned independently of the cause.

Vehicle Restriction can be added if needed.

Table 15 — TemporarySpeedLimit

Name	Type	Multiplicity	Description
SpeedLimitSection	TemporarySpeedLimitSection	1..*	Individual Section for the speed limit.
unitIsMPH	Boolean	1	Units definition for this Temporary Speed Limit. If speed limit should be displayed as mph, then this is set to true.
offset	DistanceMetres	0..1	Offset defines the distance from the start of the Temporary speed limit to the end of the Location reference. If not defined, then first SpeedLimitSection starts at the beginning of the Location Reference.
Ordered Components			
VehicleRestriction	VehicleRestriction	0..*	One or more vehicle restrictions can be associated to each Temporary Speed Limit. This allows different speed limits to be signalled to different vehicles. (Lorries, Towing Vehicles) without the use of "VehicleRestriction" indicates that all vehicles are relevant.

Examples of TemporarySpeedLimit coding:

Example 1 (Figure 10 and Table 16)

This example shows a single speed limit covering the whole event location with optional "wet" driving Speed Limit.

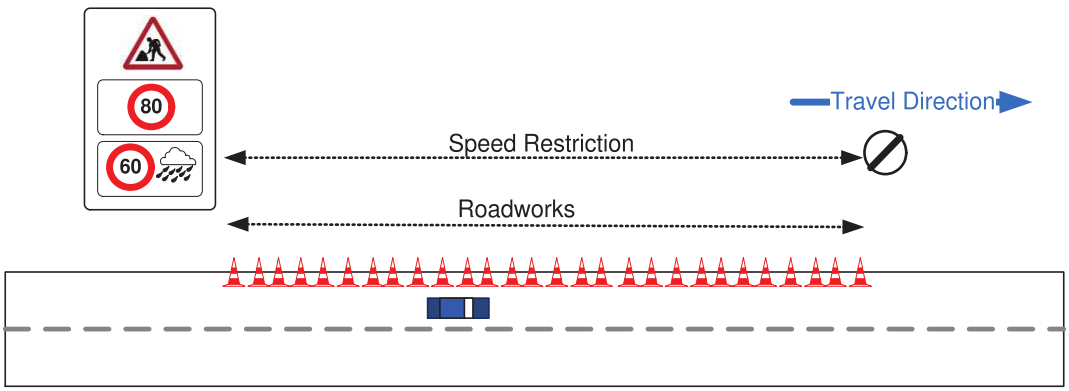

Figure 10 — Example 1 Single Section Speed Limit (Simple Case)

Table 16 — Example 1

Section details		Comment
TemporarySpeedLimitSection #1	**Value = 80**	**Only 1 section defined**
	ValueWet = 60	**Optional Wet weather speed limit sent**
	(Length not defined)	Section extends from Start to End of Problem Location
unitsIsMPH = false		**Unit are in kph**
(offset not defined)		Section starts at beginning of Problem Location
(Vehicle Restrictions not defined)		Affects All Vehicles

Example 2 (Figure 11)

In this case, the speed at the beginning of the Roadworks is limited to 80 kph, within the section where there are narrow lanes the limit is lower at 40 kph, followed by the remaining stretch to the end of the Problem Location, where the speed limit is again 80 kph.

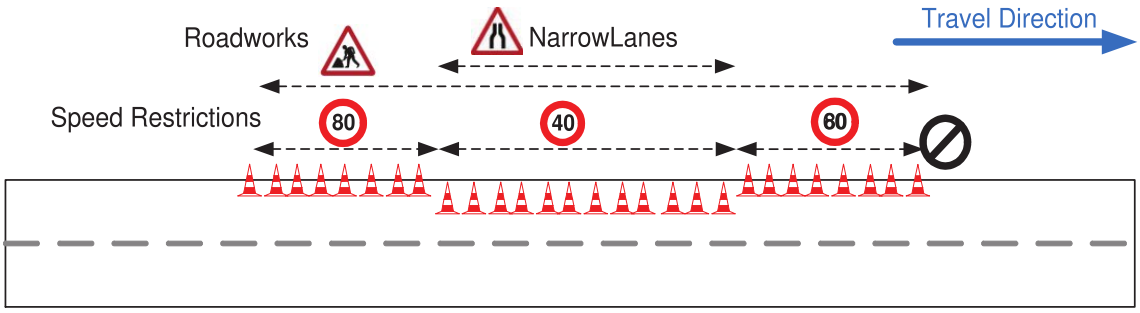

Figure 11 — Example 2 Multiple Section Speed Limit

Table 17 — Example 2

Section details		Comment
TemporarySpeedLimitSection #1	**Value = 80**	**First Section**
	(ValueWet not defined)	
	Length = 200m	
TemporarySpeedLimitSection #2	**Value = 40**	**Second Section**
	(ValueWet not defined)	
	Length = 4 000 m	
TemporarySpeedLimitSection #3	**Value = 60**	**Last section**
	(ValueWet not defined)	
	(Length not defined)	**Section extends to End of Problem Location**
unitsinMPH = false		**Unit are in kph**
(offset not defined)		**Sections start at beginning of Problem Location**
(Vehicle Restrictions not defined)		Affects All Vehicles

Example 3 (Figure 12, Table 18 and Table 19)

In this example, the temporary speed limits are placed in advance of the roadworks, as a “slowdown” zone and the final section of 100 kph speed limit also extends past the end of the roadworks.

Within TPEG, there is a general principle that the location of the whole of the message content is defined within the Location Reference of that message. To retain compatibility and consistency with devices/services that do not support this temporarySpeedLimit component, where the speed limits extend outside the normal problem location associated with the roadworks, the speed limit is signalled in a separate message and uses a Linked Cause to the Roadworks. This allows a difference in overall position to be signalled.

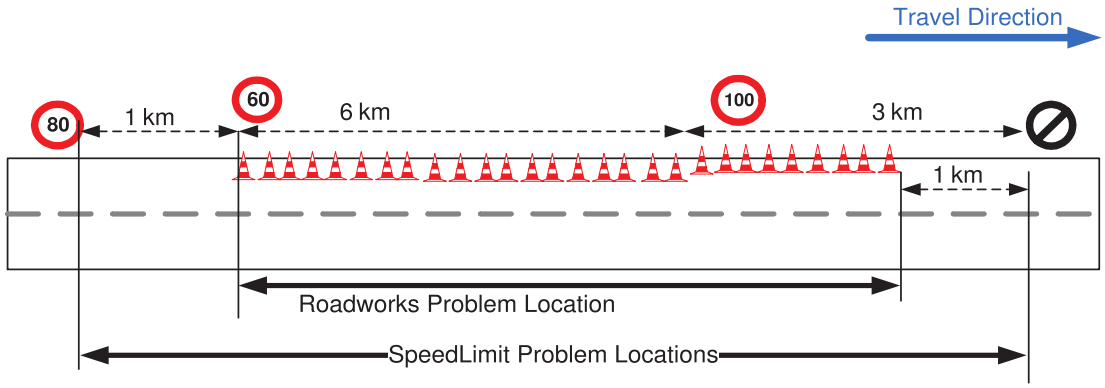

Figure 12 — Multiple Section Speed Limit with slow down Zone

In this case, since the Problem Location of the roadworks and the Speed Limit do not share the same location. The Effect (SpeedLimit) and the Cause (Roadworks) are split between two messages with different locations and a linkedCause is used.

Table 18 — Example 3 message 1

Message #1			Comment
Event			Problem Location #1 (10 km long)
Effect Code	"unknown"		
Cause	Linked Cause	mainCause "Roadworks"	
		linkedMessage ID Message #2	Linked to message #2
Temporary Speed Limit	**temporarySpeed LimitSection #1**	**Value = 80**	**First Section**
		(ValueWet not defined)	
		Length = 1 000 m	
	temporarySpeed LimitSection #2	**Value = 60**	**Second Section**
		(ValueWet not defined)	
		Length = 6 000 m	
	temporarySpeed LimitSection #3	**Value = 100**	**Last section**
		(ValueWet not defined)	
		(Length not defined)	Section extends to the End of #1 Problem Location for Speed limit
	unitsinMPH = false		**Unit are in kph**
	(Offset not defined)		Sections starts at beginning of #1 Problem Location
	(Vehicle Restrictions not defined)		Affects All Vehicles

Table 19 — Example 3 message 2

Message #2			Comment
Event			Problem Location #2 (8 km long)
	“unknown”		
Cause	Direct Cause	mainCause “Roadworks”	

7.13 ProblemLocation

The ProblemLocation component is a placeholder for the LRC container as specified in ISO/TS 21219-7. It assigns the traffic event compact (TEC) application specific local component ID for the LRC container. All component IDs within the LRC container are local to the LRC toolkit.

7.14 RestrictionLocation

The RestrictionLocation component is a placeholder for the LRC container as specified in ISO/TS 21219-7. It assigns the traffic event compact (TEC) application specific local component ID for the LRC container. All component IDs within the LRC container are local to the LRC toolkit.

7.15 SegmentLocation

The SegmentLocation component is a placeholder for the LRC container as specified in ISO/TS 21219-7. It assigns the traffic event compact (TEC) application specific local component ID for the LRC container. All component IDs within the LRC container are local to the LRC toolkit.

8 TEC Datatypes

8.1 RestrictionType

Table 20 — RestrictionType

Name	Type	Multiplicity	Description
restrictionType	tec007:RestrictionType	1	Defines the sort of restriction
restrictionValue	IntUnLoMB	0..1	Defines values associated to the restrictions where applicable
Ordered Components			
restrictionLocation	RestrictionLocation	0..1	Restriction filter for specific destination

8.2 SegmentModifier

Table 21 — SegmentModifier

Name	Type	Multiplicity	Description
diversionRoadType	tec008:DiversionRoadType	1	Type of road used as a diversion
Ordered Components			
segmentLocation	SegmentLocation	1	Position of the segment

8.3 TemporarySpeedLimitSection

Each section of the speed Limit is defined by a speed value and length.

A speed value for use in Wet conditions is also optionally available.

Table 22 — TemporarySpeedLimitSection

Name	Type	Multiplicity	Description
speedLimitValue	IntUnTi	1	Speed Limit numerical value in kph or mph.
speedLimitValueWet	IntUnTi	0..1	Speed Limit numerical value to be used in wet conditions, in kph or mph.
speedLimitLength	DistanceMetres	0..1	Length of the SpeedLimitSection. If this is not defined, then section finishes at end of the Problem Location.

9 TEC Tables

9.1 tec001:EffectCode

EffectCode (see Table 23) describes the effect on the traffic flow.

Table 23 — EffectCode

Code	TISA English "Word"	Comment	Example
1	traffic flow unknown	Shall be used if traffic flow is unknown. NOTE: This is often the case for local hazard warnings.	
2	free traffic flow	Traffic flow is not restricted.	
3	heavy traffic	Traffic flow is restricted due to a large number of vehicles.	
4	slow traffic	Traffic flow is slower than normal.	
5	queuing traffic	Traffic is in queues, but still slowly moving.	
6	stationary traffic	Traffic is stationary or barely moving	
7	no traffic flow	Traffic is completely stopped or there is no flow due to road being closed /blocked; the cause-component may give more information about the reason for "no traffic flow".	The road has been closed by police as a "regulatory measure: the road is blocked by a temporary incident".

9.2 tec002:CauseCode

CauseCode (see Table 24) defines various reasons why this message was sent.

Table 24 — CauseCode

Code	TISA English "Word"	Comment	Example
1	traffic congestion	The event is signalled due to the amount of traffic on the road causing, queues delays, or increase travel time.	
2	Accident	An accident is affecting normal traffic movement.	An accident has taken place, causing an obstruction; sightseers are slowing as they pass the site.
3	Roadworks	Roadworks are affecting normal traffic movement.	
4	narrow lanes	The width of a road lane is smaller than usual.	

Table 24 *(continued)*

Code	TISA English "Word"	Comment	Example
5	impassability	The road is affected by an obstacle that may make it impassable. (actual impassable road should be signalled with TrafficFlowEffect = no_traffic_ flow).	Closed by police or road authority, or blocked or partially blocked unintentionally, for example, fallen tree, flood, landslip, overturned vehicle.
6	slippery road	Traction between the types and the road is adversely affected.	Spillage of oil or diesel fuel on the road, ice, or loose chippings.
7	Aquaplaning	Substantial areas of water are on the road surface, and a danger of aquaplaning exists.	
8	Fire	Used when a fire/smoke is affecting driving conditions.	Fire and/or smoke from a vehicle on the roadway: from a burning building: "stubble burning" adjacent to the roadway.
9	hazardous driving conditions	Driving conditions are hazardous and driver should proceed with caution.	Road subsidence.
10	objects on the road	Objects are on the road, that may require the driver to deviate to avoid; objects are not large enough to block the road.	Objects have fallen from a moving vehicle, or onto the roadway from the roadside (e.g. landslip).
11	animals on roadway	Animals are on the road.	Typically cattle may have broken through a fence and be wandering on the road.
12	people on roadway	People are on the road.	
13	broken down vehicles	A broken down vehicle is on the road causing a potential obstruction.	
14	vehicle on wrong carriageway	A motorist is driving his/her vehicle on the wrong side of the carriageway (also known as ghost-driver).	
15	rescue and recovery work in progress	Emergency services are on site to deal with an earlier accident.	
16	regulatory measure	Traffic authorities have imposed some change to the regulations or road situation changing the usual traffic situation (usually this will affect traffic flow, resulting in an "effect" e.g. "slow traffic").	One or more lanes have been closed.
17	extreme weather conditions	Extreme weather conditions exist.	
18	visibility reduced	Visibility is reduced, requiring reduced speeds and additional care.	Typically weather related, especially fog, driving rain, but also swarms of insects, low sun glare.
19	precipitation	Precipitation is affecting driving conditions, usually requiring reduced speeds and consequentially resulting in longer journey times.	
20	reckless persons	The reckless acts of a person require a driver to take action.	A person is throwing objects from a bridge over the roadway; people are rioting.

Table 24 *(continued)*

Code	TISA English "Word"	Comment	Example
21	overheight warning system triggered	An overheight vehicle has triggered a warning system, causing a delay.	A vehicle that is too high to pass through a tunnel has been halted by the system just before entering, and now has to back-up and turn-around.
22	traffic regulations changed	A higher than usual risk of accident exists due to a change in traffic regulation (risk exists until drivers become familiar with the revised regulations).	Traffic light phasing changed; speed limits revised, priorities changed at road junctions.
23	major event	A major event causes traffic disruption. Details may be given as "free-text"	A soccer match causes a considerable extra number of vehicles, and also hundreds of people walking to the stadium alongside the roadway.
24	service not operating	A transport service is not operating, causing disruptions for would-be users and others.	Rail service is disrupted because rail workers are on strike – usual users choose to drive instead.
25	service not useable	A service although operating, is not usable, or usable with restrictions.	Service is overcrowded; technical difficulties are preventing "normal" operation, delays are occurring.
26	slow moving vehicles	Slow moving vehicles are causing congestion or is a hazard.	A lorry transporting an oversize load is moving slowly along the roadway.
27	dangerous end of queue	There is a particular danger to vehicles suddenly encountering the end of a queue of traffic.	
28	risk of fire	A risk of fire exists (see code 8). Open fire, Naked flames or glow should be extinguished.	A gas main has fractured, gas is escaping.
29	time delay	A delay exists.	Extra security measures are in place at a border crossing, causing longer than usual crossing times.
30	police checkpoint	A police checkpoint is causing delay or congestion.	
31	malfunctioning roadside equipment	Roadside equipment is not working, or working incorrectly.	Traffic lights are "stuck on red".
100	test message	This is a test message used for testing only. Any additional content of this message shall be marked as being a test only.	
255	undecodable cause		

9.3 tec003:WarningLevel

WarningLevel (see Table 25) defines different levels of danger associated with the event.

Table 25 — WarningLevel

Code	TISA English "Word"	Comment	Example
1	informative	This level is of an informative nature.	Congestion, delay.
2	danger level 1	This level is used for situations requiring additional attention by the driver.	Visibility reduced due to thick fog.
3	danger level 2	This level is used when local hazard situations present danger to the driver.	Danger due to deer wandering on road.
4	danger level 3	This level is used when local hazard situations present highly dangerous situations to the driver.	High level of danger due to vehicle being driven on the wrong side of the road.

9.4 tec004:LaneRestriction

LaneRestriction (see Table 26) defines lanes being restricted with this message.

Table 26 — LaneRestriction

Code	TISA English "Word"	Comment	Example
1	lane(s) closed	One or more lanes are defined as being closed.	
2	lane(s) open	One or more lanes are defined as being open.	
3	right lane(s) closed	"Right-hand-lane" always refers to the driving lane(s) on the right-hand side, in the direction of travel, as seen from the driver's perspective. It excludes "special" lanes such as "crawler lane", or "hard-shoulder".	In countries that drive on the left, "right-hand-lane" would be the "overtaking lane"; in countries that drive on the right, "right-hand-lane" would be the "normal" driving (slow) lane.
4	left lane(s) closed	"Left-hand-lane" always refers to the driving lane(s) on the left-hand side, in the direction of travel, as seen from the driver's perspective. It excludes "special" lanes such as "crawler lane", or "hard-shoulder".	In countries that drive on the left, "left-hand-lane" would be the "normal driving (slow) lane"; in countries that drive on the right, "left-hand-lane" would be the "overtaking lane".

9.5 tec005:AdviceCode

AdviceCode (see Table 27) describes recommendations or instructions for the driver to do something.

Table 27 — AdviceCode

Code	TISA English "Word"	Comment	Example
1	drive to next available parking place	Drivers should find a safe place to park.	There are delays at a border crossing; drivers are asked to park until the back-log is cleared.
2	overtaking not allowed	Vehicles should remain in line and not overtake.	
3	driving not allowed	Situations determine that driving is not allowed. Drivers should stop at the first place it is safe to do so.	
4	use hard shoulder as lane	The hard shoulder may be used as an additional driving lane.	A normal driving lane is closed; the hard shoulder is allowed to be used to maintain the capacity of the road.

Table 27 *(continued)*

Code	TISA English "Word"	Comment	Example
5	wait for police patrol	Vehicles are required to await a police patrol before continuing their journey.	
6	wait for improved weather	Current weather conditions are unsafe for driving, and drivers are requested to wait until conditions improve before continuing their journey.	
7	make way for vehicles coming from behind to pass	Drivers are requested to move aside to allow vehicles approaching from behind to pass.	An emergency vehicle needs to pass.
8	follow diversion	Instructions to a driver to follow a specific diversion route.	
9	no diversion to recommend	Drivers are advised that a diversion is needed, however there is no specific diversion offered.	
10	do not divert	Used to advise a driver that although there is a problem on the road, no suitable better alternative exists, and the driver should keep on the current route.	All adjacent and possible alternative routes are also congested.
11	follow police instructions	Police are directing traffic; drivers should follow their instructions.	
12	avoid the area	Used to advise that a particular areas should be avoided.	Heavy congestion exists; area is unsafe.
13	drive carefully	Drivers should take extra care, because there are increased road hazard.	
14	do not leave your vehicle	Drivers should remain with their vehicles.	
15	switch on radio	Used to advise drivers that further detailed information is available on the radio.	
16	use toll lanes	Used to advise drivers that toll lanes may be used.	
17	wait for convoy	The driver should await a convoy service before proceeding.	There are high winds, and drivers of high-sided vehicles are required to cross with a "safety vehicle".
255	undecodable advice		

9.6 tec006:Tendency

Tendency (see Table 28) is related to the traffic flow speed indicating if this has been increasing, decreasing or has remained constant. It is not a forecast of a future trend, nor does it relate to the length of the traffic queue.

Table 28 — Tendency

Code	TISA English "Word"	Comment	Example
1	slightly increasing		
2	increasing		
3	strongly increasing		
4	slightly decreasing		

Table 28 *(continued)*

Code	TISA English "Word"	Comment	Example
1	slightly increasing		
5	decreasing		
6	strongly decreasing		
7	constant		

9.7 tec007:RestrictionType

RestrictionType (see Table 29) defines different types of attributes for filtering the addressed vehicles for this message.

Table 29 — RestrictionType

Code	TISA English "Word"	Comment	Example
1	width less than	Units: cm	
2	width greater than	Units: cm	
3	height less than	Units: cm	
4	height greater than	Units: cm	
5	weight less than	Units: kg	
6	weight greater than	Units: kg	
7	without winter tyres		
8	without snow chains		
9	with trailer		
10	with caravan		
11	persons in vehicle less than	Units: number	
12	persons in vehicle more than	Units: number	
13	even number plate		
14	odd number plate		
15	length less than	Units: cm	
16	length greater than	Units: cm	
17	axle load less than	Units: kg	
18	axle load greater than	Units: kg	
19	vehicle fulfils emission standard EURO3	"EURO3" is a specific vehicle emission class according to European Council Directives.	
20	vehicle fulfils emission standard EURO3D4	"EURO3D4" is a specific vehicle emission class according to European Council Directives.	
21	vehicle fulfils emission standard EURO4	"EURO4" is a specific vehicle emission class according to European Council Directives.	
22	vehicle fulfils emission standard EURO5	"EURO5" is a specific vehicle emission class according to European Council Directives.	
23	with petrol engine		
24	with diesel engine		
25	with LPG engine		

Table 29 *(continued)*

Code	TISA English "Word"	Comment	Example
26	through traffic		
27	residents traffic		
28	with destination in given area		
255	undecodable restriction		

9.8 tec008:DiversionRoadType

DiversionRoadType (see Table 30) defines different levels of usability for parts of the diversion.

Table 30 — DiversionRoadType

Code	TISA English "Word"	Comment	Example
1	bypass	A road or section of a road that passes around the restricted or congested area.	
2	access road	The part of the diversion that gives access to the bypass.	
3	limited access road	Part of the network which is not usable for through traffic.	
4	not recommended route	Part of the network which should be avoided.	
5	closed road	Part of the network which is closed.	

9.9 tec009:VehicleType

VehicleType (see Table 31) defines different types of cars for filtering the addressed vehicles for this message.

Table 31 — VehicleType

Code	TISA English "Word"	Comment	Example
1	car		
2	lorry		
3	bus		
4	taxi		
5	train		
6	motor cycle		
7	vehicle with trailer		
8	motor vehicle		
9	vehicle transporting hazardous goods		
10	vehicle transporting an abnormal size load		
11	heavy goods vehicle		
255	undecodable vehicle type		

9.10 tec100:SubCauseType

The SubCauseType defines the generic type applying different tables according to the different mainCauses.

Valid entries for attributes of this type are listed in the tables.

tec101:TrafficCongestion

tec102:Accident

tec103:Roadworks

tec104:NarrowLanes

tec105:Impassability

tec106:SlipperyRoad

tec108:Fire

tec109:HazardousDrivingConditions

tec110:ObjectsOnTheRoad

tec111:AnimalsOnRoadway

tec112:PeopleOnRoadway

tec113:BrokenDownVehicles

tec115:RescueAndRecoveryWorkInProgress

tec116:RegulatoryMeasure

tec117:ExtremeWeatherConditions

tec118:VisibilityReduced

tec119:Precipitation

tec120:RecklessPersons

tec123:MajorEvent

tec124:ServiceNotOperating

tec125:ServiceNotUseable

tec126:SlowMovingVehicles

tec127:DangerousEndOfQueue

tec128:RiskOfFire

tec129:TimeDelay

tec130:PoliceCheckpoint

tec131:MalfunctioningRoadsideEquipment.

NOTE In the case a client device is unable to decode a subcause code, the original mainCause is to be used.

9.11 tec101:TrafficCongestion

TrafficCongestion (see Table 32) is used when the volume of traffic is excessive for the roadway.

Table 32 — TrafficCongestion

Code	TISA English "Word"	Comment	Example
1	increased volume of traffic	Traffic problem is caused by the volume of traffic being excessive for the roadway.	

9.12 tec102:Accident

Accident (see Table 33) is used in the case of an accident.

Table 33 — Accident

Code	TISA English "Word"	Comment	Example
1	multi-vehicle accident	Multiple vehicles have been involved in an accident.	
2	major accident	Used when rescue and recovery work will take an especially long time to clear after the accident and for normal flow to be re-established.	
3	accident involving lorry	The accident involves a lorry.	
4	accident involving bus	The accident involves a bus.	
5	accident involving hazardous materials	The accident involves a vehicle carrying hazardous materials, posing additional dangers.	
6	accident in opposite lane	An accident occurred affecting traffic in the opposite direction, but drivers are slowing to look, causing a "secondary" effect on the traffic flow.	Traffic is slowing to observe an accident that occurred in the opposite carriageway.
7	unsecured accident	An accident has occurred, and at the time of broadcast, the accident is not being attended to by the emergency services.	

9.13 tec103:Roadworks

Roadworks (see Table 34) is used when road works are the reason.

Table 34 — Roadworks

Code	TISA English "Word"	Comment	Example
1	major roadworks	Major roadworks are causing disruption.	
2	road marking work	Road marking work is causing disruption.	
3	Slow moving road maintenance	Slow-moving road maintenance vehicles are causing disruption.	Trimming of the grass on the soft shoulder.

9.14 tec104:NarrowLanes

NarrowLane (see Table 35) is used when the width of lanes is less than usual or other lane restriction exists.

Table 35 — NarrowLane

Code	TISA English 'Word'	Comment	Example
1	contraflow	One side of the roadway is closed, resulting in traffic in both directions sharing the remaining open side: consequently the number of lanes in both directions is reduced.	
2	hard shoulder closed	The hard shoulder is closed.	
3	slip lane closed	An entry or exit slip lane is closed.	
4	crawler lane closed	The crawler lane is closed; slow traffic may be using a 'normal' driving lane.	

9.15 tec105:Impassability

Impassability (see Table 36) is used in cases where the road may be generally impassable or partially blocked, or is hazardous due to driving conditions. If truly blocked, then TrafficFlowEffect is expected to be "no_traffic_flow" (use of the Impassability cause does not by itself indicate a closure).

Table 36 — Impassability

Code	TISA English "Word"	Comment	Example
1	flooding	The road is affected by flooding.	
2	danger of avalanches	The road is at risk of being affected by avalanches.	
3	blasting of avalanches	There is active blasting of avalanches on or near the road and so may be impassable for short periods of time.	
4	landslips	The road has been affected by landslips.	
5	chemical spillage	The road is affected by a chemical spillage.	
6	winter closure	The road is impassable due to a winter closure.	

9.16 tec106:SlipperyRoad

SlipperyRoad (see Table 37) is used when the road surface is slippery.

Table 37 — SlipperyRoad

Code	TISA English "Word"	Comment	Example
1	heavy frost on road	Heavy frost is making the road surface slippery.	
2	fuel on road	A fuel spillage is making the road surface slippery.	
3	mud on road	Mud is making the road surface slippery.	
4	snow on road	Snow is making the road surface slippery.	
5	ice on road	Ice is making the road surface slippery.	
6	black ice on road	Black ice is making the road surface slippery.	
7	oil on road	Oil on the road is making the road surface slippery.	

Table 37 *(continued)*

Code	TISA English "Word"	Comment	Example
8	loose chippings	Loose chippings are making the road surface slippery.	
9	instant black ice	Black ice, which is forming instantly when freezing rain hits the road is making the road surface slippery.	
10	roads salted	Although roads have been salted, the surface may still be slippery.	

9.17 tec108:Fire

Fire (see Table 38) is used when a fire is affecting traffic flow.

Table 38 — Fire

Code	TISA English "Word"	Comment	Example
1	major fire	A major fire is causing a problem for traffic.	
2	forest fire	A forest fire is causing a problem for traffic.	

9.18 tec109:HazardousDrivingConditions

HazardousDrivingConditions (see Table 39) is used when environmental conditions are causing problems and require additional caution by the driver.

Table 39 — HazardousDrivingConditions

Code	TISA English "Word"	Comment	Example
1	rock falls	Falling rocks are causing a danger to traffic.	
2	earthquake damage	There is a danger to traffic resulting from earthquake damage.	
3	sewer collapse	A sewer has collapsed.	
4	subsidence	Subsidence has affected the road condition.	
5	snow drifts	Snow drifts are causing a hazard to drivers.	
6	storm damage	Damage caused by a storm is causing hazardous conditions for drivers.	
7	burst pipe	Traffic is affected by a burst pipe.	
8	volcano eruption	A danger to traffic exists resulting from a volcano eruption.	
9	falling ice	There is danger to traffic resulting from falling ice.	

9.19 tec110:ObjectsOnTheRoad

ObjectsOnTheRoad (see Table 40) is used when objects on the road are impeding traffic or may be a hazard to traffic.

Table 40 — ObjectsOnTheRoad

Code	TISA English "Word"	Comment	Example
1	shed load	Part of a load being carried has fallen into the roadway.	
2	parts of vehicles	Part of a vehicle has become detached and fallen into the roadway.	Exhaust system
3	parts of tyres	A vehicle has shed parts of its tyres, which are on the roadway.	
4	large objects	Objects in the roadway are of a large size that a vehicle cannot drive over and will need to drive around them.	
5	fallen trees	Fallen trees or branches have fallen onto the roadway.	
6	hub caps	Hub caps are lying on the roadway.	
7	stationary vehicle	There is an abandoned or stationary vehicle on the roadway.	

9.20 tec111:AnimalsOnRoadway

AnimalsOnRoadway (see Table 41) is used when there is a danger to the driver from animals on the roadway.

Table 41 — AnimalsOnRoadway

Code	TISA English "Word"	Comment	Example
1	wild animals	There is a danger from wild animals on the roadway ("wild" animals are not "controlled" by humans).	Deer
2	herd of animals	A herd of animals is on the roadway. It is to be expected that the herd is being "controlled" by a human, who will expect the driver to stop until the herd has been moved on.	Sheep, cows
3	small animals	Small animals are on the roadway.	Frogs, foxes, badgers
4	large animals	Large animals are on the roadway which are a danger to drivers and may cause considerable damage. Drivers should slow down and proceed with caution.	Horses

9.21 tec112:PeopleOnRoadway

PeopleOnRoadway (see Table 42) is used when people or people with unauthorized vehicles are on the roadway.

Table 42 — PeopleOnRoadway

Code	TISA English "Word"	Comment	Example
1	children on roadway	Children are on the road.	
2	cyclists on roadway	A cyclists on a road where cycling is prohibited.	On a Motorway
3	moped rider on roadway	A moped rider is driving on a road where mopeds are prohibited.	

9.22 tec113:BrokenDownVehicles

BrokenDownVehicles (see Table 43) is used when a broken down vehicle is on the roadway, causing a danger or obstruction hazard.

Table 43 — BrokenDownVehicles

Code	TISA English "Word"	Comment	Example
1	broken down vehicle on fire	A broken down vehicle is also on fire.	
2	broken down unlit vehicle	An unlit vehicle is causing a hazard	

9.23 tec115:RescueAndRecoveryWorkInProgress

RescueAndRecoveryWorkInProgress (see Table 44) is used when accident rescue and recovery work is in progress, drivers should take extra care and slow down.

Table 44 — RescueAndRecoveryWorkInProgress

Code	TISA English "Word"	Comment	Example
1	emergency vehicles	Emergency vehicles are at the scene of an accident.	
2	rescue helicopter landing	A rescue helicopter is landing at or near the scene of the accident.	
3	police activity ongoing	There is ongoing police activity.	
4	medical emergency ongoing	Emergency medical crews are at the scene.	
5	child abduction in progress	A child abduction has occurred at the scene (Amber Alert).	Child abduction alert bulletins used in several countries around the world have different names. In parts of the US, it is called an "Amber Alert".

9.24 tec116:RegulatoryMeasure

RegulatoryMeasure (see Table 45) is used when additional restrictions or regulations are imposed. If a road is closed, then the traffic flow effect shall be set to "no_traffic_flow".

Table 45 — RegulatoryMeasure

Code	TISA English "Word"	Comment	Example
1	security alert	A security alert has been declared, possibly resulting in restrictions on traffic movement and delays.	An area is closed due to hostage situation.
2	contagious disease	A contagious disease is affecting the location potentially resulting in a movement restriction being applied.	A disease of animals such as foot and mouth or blue tongue.
3	environmental	An environmental incident has occurred, potentially resulting in a movement restriction being applied.	An area is closed due to pollution.

Table 45 *(continued)*

Code	TISA English "Word"	Comment	Example
4	smog alert	A smog alert has been declared due to pollution levels in the air.	
5	batch service in progress	Traffic may flow in only one direction at a time. Commonly known as "Single Alternate Line Traffic".	One side of a single carriageway road is closed; traffic in one direction uses the remaining open side for two minutes, then traffic in the other direction uses it for two minutes, alternately.
6	road closed by the regulatory authorities	The regulatory authorities have closed the road for whatever reason.	

9.25 tec117:ExtremeWeatherConditions

ExtremeWeatherConditions (see Table 46) is used when extreme weather conditions are causing a hazard to drivers.

Table 46 — ExtremeWeatherConditions

Code	TISA English "Word"	Comment	Example
1	strong winds	Strong winds, especially cross winds, are causing a driving hazard.	
2	damaging hail	Hail is falling that could potentially damage cars.	
3	hurricane	Storm with winds exceeding 118 km/h.	
4	thunderstorm	Thunderstorm may affect driving conditions.	
5	tornado	Destructive winds likely to make driving dangerous.	
6	blizzard	Strong winds combined with snow reducing visibility to less than a few hundred metres.	

9.26 tec118:VisibilityReduced

VisibilityReduced (see Table 47) is used to warn drivers of reduced visibility, which may require a speed reduction and other measures.

Table 47 — VisibilityReduced

Code	TISA English "Word"	Comment	Example
1	visibility reduced due to fog	Fog is reducing visibility.	
2	visibility reduced due to smoke	Smoke is reducing visibility.	
3	visibility reduced due to heavy snowfall	Heavy snowfall is reducing visibility.	
4	visibility reduced due to heavy rain	Heavy rain is reducing visibility.	
5	visibility reduced due to heavy hail	Heavy hail is reducing visibility.	

Table 47 *(continued)*

Code	TISA English "Word"	Comment	Example
6	visibility reduced due to low sun glare	Glare from low sun is reducing visibility (usually applies to a particular direction of travel).	
7	visibility reduced due to sandstorms	A sandstorm is reducing visibility.	
8	visibility reduced due to swarms of insects	A swarm of insects is reducing visibility.	

9.27 tec119:Precipitation

Precipitation (see Table 48) is used when precipitation is causing a hazard to drivers.

Table 48 — Precipitation

Code	TISA English "Word"	Comment	Example
1	heavy rain	Heavy rain is causing a hazard to drivers.	
2	heavy snowfall	Heavy snowfall is causing a hazard to drivers.	
3	soft hail	Soft Hail (or snow pellets) is causing a hazard to drivers.	

9.28 tec120:RecklessPersons

RecklessPersons (see Table 49) is used when persons acting irresponsibly are causing a danger to motorists.

Table 49 — RecklessPersons

Code	TISA English "Word"	Comment	Example
1	reckless driver	A motorist driving in a reckless manner. Drivers may need to take evasive action.	A motorist is weaving from side to side on the road; a motorist is constantly slowing down and speeding up.
2	gunfire on road	Someone is discharging a weapon on or near the roadway.	
3	persons throwing objects	Drivers are potentially in danger due to objects being thrown at or in the path of vehicles.	People are dropping objects onto vehicles from a bridge.

9.29 tec123:MajorEvent

MajorEvent (see Table 50) is used when an organized event is affecting normal driving progress.

Table 50 — MajorEvent

Code	TISA English "Word"	Comment	Example
1	sports event	A sports event is affecting traffic.	
2	demonstration	A demonstration is affecting traffic.	Political demonstration
3	demonstration with vehicles	A demonstration, with the added presence of vehicles, is affecting traffic.	

Table 50 *(continued)*

Code	TISA English "Word"	Comment	Example
4	concert	Traffic is affected by a concert, due to people arriving or leaving the venue.	
5	fair	A fair is affecting traffic.	
6	military training	Military training is affecting traffic.	
7	emergency training	Emergency Services training is affecting traffic.	
8	festival	A festival is affecting traffic.	
9	procession	A procession is affecting traffic.	

9.30 tec124:ServiceNotOperating

ServiceNotOperating (see Table 51) is used when a transport service is not operating.

Table 51 — ServiceNotOperating

Code	TISA English "Word"	Comment	Example
1	ferry service not operating	A ferry service is not operating.	Due to bad weather
2	air service not operating	An air service is not operating.	Airport closed due to fog
3	train service not operating	A train service is not operating.	
4	bus service not operating	A bus service is not operating.	

9.31 tec125:ServiceNotUseable

ServiceNotUseable (see Table 52) is used when a service is operational, but is temporarily not usable.

Table 52 — ServiceNotUseable

Code	TISA English "Word"	Comment	Example
1	fuel station closed	A fuel station is temporarily closed.	A fuel station is closed while a tanker is delivering new supplies.
2	service area closed	A service area is temporarily closed.	The service area is overcrowded, and there are no more parking spaces are available.
3	service area busy	A service area is busy; there may be long waiting times.	The service area is overcrowded, and long delays will result.
4	parking full	A parking area/car park is full.	
5	car park closed	A parking area or car park is closed.	

9.32 tec126:SlowMovingVehicles

SlowMovingVehicles (see Table 53) is used when slow moving vehicles are impeding normal progress.

Table 53 — SlowMovingVehicles

Code	TISA English "Word"	Comment	Example
1	slow moving maintenance vehicle	Slow moving maintenance vehicles are affecting traffic or may be causing a hazard.	
2	vehicles slowing to look at accident	Drivers are slowing to look at an accident or incident that has occurred in the opposite carriageway, or by the side of the road, thus, causing a hazard.	
3	abnormal load	A vehicle carrying an abnormal load is affecting traffic or causing a hazard.	
4	abnormal wide load	A vehicle carrying a wide load is affecting traffic or causing a hazard, possibly restricting the ability to pass the vehicle.	
5	convoy	A convoy on the road is affecting traffic.	
6	snowplough	A snowplough is on the road.	
7	de-icing	A de-icing vehicle is on the road.	
8	salting vehicles	A vehicle is salting/gritting the road	

9.33 tec127:DangerousEndOfQueue

DangerousEndOfQueue (see Table 54) is used when the end of queue of vehicles could cause an accident.

Table 54 — DangerousEndOfQueue

Code	TISA English "Word"	Comment	Example
1	sudden end of queue	Used when the end of a queue is in a dangerous situation or unexpected location causing an added hazard to approaching drivers.	
2	queue over hill	Used when a queue has formed over a hill and may not be visible to approaching drivers.	
3	queue around bend	Used when a queue has formed around a bend in the road and may not be visible to approaching drivers.	
4	queue in tunnel	Used when a queue has formed in a tunnel and may not be visible to approaching drivers.	

9.34 tec128:RiskOfFire

RiskOfFire (see Table 55) is used to warn that a risk of fire exists.

Table 55 — RiskOfFire

Code	TISA English "Word"	Comment	Example
1	leakage of fuel	A risk of fire exists because of a fuel leak.	
2	leakage of gas	A risk of fire exists because of a gas leakage.	A broken gas-main

9.35 tec129:TimeDelay

TimeDelay (see Table 56) is used to advise of longer than usual delays.

Table 56 — TimeDelay

Code	TISA English "Word"	Comment	Example
1	time delay at frontier	There is a delay at a frontier or border point.	Increased security checks
2	time delay at ferry port	There is a delay at a ferry port.	One ferry is out of service
3	time delay at vehicle-on-rail terminal	There is a delay at a car-train terminal.	

9.36 tec130:PoliceCheckpoint

PoliceCheckpoint (see Table 57) is used to advise of time delays due to police checks.

Table 57 — PoliceCheckpoint

Code	TISA English "Word"	Comment	Example
1	permanent police checkpoint	A delay is occurring at a regular police checkpoint.	
2	temporary police checkpoint	A delay is occurring at a temporary police checkpoint.	Police check-point setup after a crime.

9.37 tec131:MalfunctioningRoadsideEquipment

MalfunctioningRoadsideEquipment (see Table 58) is used when roadside equipment is malfunctioning.

Table 58 — MalfunctioningRoadsideEquipment

Code	TISA English "Word"	Comment	Example
1	road-rail crossing failure	A level crossing (rail road crossing in USA) is malfunctioning.	Barriers stuck in "down" position.
2	tunnel ventilation not working	Tunnel ventilation is malfunctioning.	The number of vehicles allowed to use the tunnel is restricted.
3	traffic control signals working incorrectly	Traffic control signals are malfunctioning.	Signals stuck on "red"; signals failed completely.
4	emergency telephones not working	Emergency telephones are malfunctioning.	
5	automatic payment lanes not working	Automatic payment lanes are not working.	Barriers broken; all vehicles have to use the manual pay lanes.

9.38 tec200:SubAdviceType

The SubAdviceType defines the generic type applying different tables appropriate to the different mainAdviceCodes.

Valid entries for attributes of this type are listed in the tables.

tec202:OvertakingNotAllowed

tec203:DrivingNotAllowed

tec207:GiveWayToVehiclesFromBehind

tec208:FollowDiversion

tec213:DriveCarefully

tec214:DoNotLeaveYourVehicle

tec216:UseTollLanes

NOTE In the case a client device is unable to decode a subadvice code, the original advice is to be used.

9.39 tec202:OvertakingNotAllowed

OvertakingNotAllowed (see Table 59) is used to advise that different forms of restriction on overtaking are in place.

Table 59 — OvertakingNotAllowed

Code	TISA English "Word"	Comment	Example
1	do not use overtaking lanes	Overtaking lanes are those closest to the central reservation (median) on highways. On single carriageway roads, the "overtaking lane" may be a central lane used by traffic in both directions.	May be used to direct vehicles out of the overtaking lane: a vehicle is being driven on the wrong side of the road in this lane.
2	overtaking not allowed, drive on crawler lane	The overtaking lane is not to be used, but the crawler lane is available for use.	
3	overtaking not allowed, drive on left most lane	The overtaking lane is not to be used; drivers should use the left most lane only.	
4	overtaking not allowed, drive on right most lane	The overtaking lane is not to be used; drivers should use the right most lane only.	

9.40 tec203:DrivingNotAllowed

DrivingNotAllowed (see Table 60) is used to advise drivers that they should find a safe place to pull over and stop.

Table 60 — DrivingNotAllowed

Code	TISA English "Word"	Comment	Example
1	driving not allowed, find a safe place to pull over and stop the vehicle	Driving is prohibited for some reason; drivers should pull over at next safe place..	An earthquake will happen; violent weather is approaching.

9.41 tec207:GiveWayToVehiclesFromBehind

GiveWayToVehiclesFromBehind (see Table 61) is used to advise drivers to make way for vehicles approaching from behind and allow them to pass.

Table 61 — GiveWayToVehiclesFromBehind

Code	TISA English "Word"	Comment	Example
1	make way for rescue vehicles to pass	Drivers are asked to pull aside and make way for rescue vehicles approaching from behind, which need to pass.	
2	make way for service vehicles to pass	Drivers are asked to pull aside and make way for service vehicles approaching from behind, which need to pass.	

9.42 tec208:FollowDiversion

FollowDiversion is (see Table 62) used to advise that drivers should follow a diversion.

Table 62 — FollowDiversion

Code	TISA English "Word"	Comment	Example
1	follow diversion signs	Drivers should follow a signed diversion.	Follow routing displayed on VMS r fixed plate road signs.

9.43 tec213:DriveCarefully

DriveCarefully is (see Table 63) used to advise drivers that extra care should be taken.

Table 63 — DriveCarefully

Code	TISA English "Word"	Comment	Example
1	drive carefully, dangerous situation on entry slip road	A dangerous situation exits on an entry slip road.	
2	drive carefully, dangerous situation on exit slip road	A dangerous situation exists on an exit slip road.	The exit slip is partially blocked, traffic is backing up on the slip road.
3	drive carefully, ice buildup on cable structure	Ice is building up on a cable structure over, or close to the road, and there is a danger of cables breaking, or ice falling.	

9.44 tec214:DoNotLeaveYourVehicle

DoNotLeaveYourVehicle (see Table 64) is used to advise drivers not to leave their vehicles.

Table 64 — DoNotLeaveYourVehicle

Code	TISA English "Word"	Comment	Example
1	do not leave your vehicle		Due to security reasons.
2	do not leave your vehicle, close windows		Toxic gas coming from a fire could flow into the vehicle.

9.45 tec216:UseTollLanes

UseTollLanes (see Table 65) is used to advise about usage of toll lanes.

Table 65 — UseTollLanes

Code	TISA English "Word"	Comment	Example
1	use manual payment toll lanes	Manual payment toll lanes should be used.	Automatic lanes are not working.
2	use automatic payment toll lanes	Automatic payment toll lanes should be used.	Manual toll lane booths are not staffed.

Annex A
(normative)

TPEG TEC, TPEG-Binary Representation

A.1 General

This Annex provides the TPEG binary representation derived via application of the UML to binary conversion rules specified in TPEG2-UBCR.

A.2 Message components

A.2.1 List of Generic Component Ids

Table A.1 — Generic Component Ids

Name	Id
TECMessage	0
MessageManagement	1
ProblemLocation	2
Event	3
DirectCause	4
LinkedCause	5
Advice	6
VehicleRestriction	7
DiversionRoute	8
RestrictionLocation	9
SegmentLocation	10
TemporarySpeedLimit	11

A.2.2 TECMessage

<TECMessage(0)>:=	
<IntUnTi>(0),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
ordered {	
<MMCSwitch>(mmt),	: Message Management Container
n * <Event>(event)[0..1],	: Describes the impact on the Traffic Flow and the related cause.
n * <ProblemLocation>(loc)[0..1]	: Location Reference Container (always included except for cancellation of a message)
};	

A.2.3 MMCSwitch

<MMCSwitch(x)>:=	
<IntUnTi>(x),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr);	: number of bytes in attributes

A.2.4 MessageManagement

<MessageManagement(1)<MMCSwitch()>>:=	
External<MessageManagementContainer(1)>;	: see MessageManagementContainer specification

A.2.5 Event

<Event(3)>:=	
<IntUnTi>(3),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<tec001:EffectCode>(effectCode),	: Describes the impairment of the traffic flow.
BitArray(selector),	
if (bit 0 of selector is set)	
<DateTime>(startTime),	: Date and time at which an event began or is scheduled to begin (used for presentation to the end-user).
if (bit 1 of selector is set)	
<DateTime>(stopTime),	: Date and time at which an event, or status information, ended or is scheduled to end (used for presentation to the end-user).
if (bit 2 of selector is set)	
<tec006:Tendency>(tendency),	: Tendency is related to the traffic flow speed indicating if this has been increasing, decreasing, or has remained constant. It is not a forecast of a future trend, nor does it relate to the length of the traffic queue.
if (bit 3 of selector is set)	
<DistanceMetres>(lengthAffected),	: Length of the event in metres.
if (bit 4 of selector is set)	
<Velocity>(averageSpeedAbsolute),	: The actual average speed in m/s at the given location. It is recommended to use this value for calculation of the route and estimated arrival time.
if (bit 5 of selector is set)	

<IntUnLoMB>(delay),	: Delay in minutes. Only applicable to point locations, i.e. at border crossings.
if (bit 6 of selector is set)	
<Velocity>(segmentSpeedLimit),	: Averaged speed limit (in m/s) within the problem location. Within the problem location multiple speed limits may exist (e.g. multiple reducing speed limits on entering a roadworks zone). Shall be used as speed limit for re-routing, but not to display or warn the driver.
if (bit 7 of selector is set)	
<Velocity>(expectedSpeedAbsolute),	: The expected (normal) speed in m/s for this time of the day, based on e.g. historical data. This speed may vary as function of the time of day, and can be markedly different from the free-flow speed (especially in rush hour conditions).
ordered {	
n * <Cause>(cause),	: Defines the reason for the traffic problem (direct or linked cause)
n * <Advice>(advice),	: Recommendations or prohibitions for the driver.
n * <VehicleRestriction>(vehicleRestriction),	: Vehicle types(restrictions) that are relevant for the message.
n * <DiversionRoute>(diversionRoute),	: Diversion information relating to the event.
n * <TemporarySpeedLimit>(temporarySpeed-Limit)	: This is the temporary speed limit displayed on road signs associated with the Event. This data is for display to drivers.
};	

A.2.6 ProblemLocation

<ProblemLocation(2)>:=	
External <LocationReferencingContainer(2)>;	: see LocationReferencingContainer specification

A.2.7 RestrictionLocation

<RestrictionLocation(9)>:=	
External <LocationReferencingContainer(9)>;	: see LocationReferencingContainer specification

A.2.8 SegmentLocation

<SegmentLocation(10)>:=	
External <LocationReferencingContainer(10)>;	: see LocationReferencingContainer specification

A.2.9 Cause

<Cause(x)>:=	
<IntUnTi>(x),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<tec002:CauseCode>(mainCause);	: Main categorization of the cause according to table tec002

A.2.10 DirectCause

<DirectCause(4)<Cause(4)>>:=	
<IntUnTi>(4),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<tec002:CauseCode>(mainCause);	: Main categorization of the cause according to table tec002
<tec003:WarningLevel>(warningLevel),	: The level "informative" should be used for all traffic events, which may influence the driver's route in any way requiring normal level of attention from the driver. The "danger levels" 1 to 3 should only be used for dangerous situations. Levels 1 to 3 are used in ascending levels of danger. (Level 1 - Danger; Level 3 - Highly Dangerous) Danger levels 1 to 3 in combination with unverifiedInformation = True should be used in case of an unverified danger. NOTE For example, a traffic management centre receives a call from a private "jam buster" reporting that there is a "vehicle travelling on the wrong side of the road", but this has not been confirmed by the police.
BitArray(selector),	
if (bit 0 of selector is set)	
<Boolean>(unverifiedInformation),	: If element is set to 1, the given information has not been verified.
if (bit 1 of selector is set)	
<tec100:SubCauseType>(subCause),	: Carries the value in the sub-cause table defined by the mainCauseCode.
if (bit 2 of selector is set)	
<DistanceMetres>(lengthAffected),	: Length of the cause in metres.
if (bit 3 of selector is set)	
<tec004:LaneRestriction>(laneRestrictionType),	: Specifies whether lanes are closed or open.
if (bit 4 of selector is set)	
<IntUnTi>(numberOfLanes),	: Specifies how many lanes are closed or open. If this element is not given, but laneRestrictionType indicates there are lane closures it means an unspecified number of lanes are closed, i.e. "one or more lanes closed".

if (bit 5 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalizedShortString>(freeText),	: Additional description
}	
if (bit 6 of selector is set)	
<DistanceMetres>(causeOffset);	: Offset (metres) from the start of the Cause to the end of the Problem Location. When used together with lengthAffected, the cause can be positioned within the event more accurately. Without Cause Offset, but with lengthAffected defined, the cause position is not defined. If neither lengthAffected nor Cause Offset are defined, the Cause spans the entire Problem Location.

A.2.11 LinkedCause

<LinkedCause(5)<Cause(5)>>:=	
<IntUnTi>(5),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<tec002:CauseCode>(mainCause);	: Main categorization of the cause according to table tec002
<IntUnLoMB>(linkedMessage),	: Contains a messageID as pointer to a message. If contentID and originatorSID is not given, the linked messages is contained in the actual component stream of the actual service.
BitArray(selector),	
if (bit 0 of selector is set)	
<IntUnTi>(COID),	: ifCOID is not signalled, the linked message can be found in the component stream that has the same contentID as the linking message.
if (bit 1 of selector is set)	
<ServiceIdentifier>(originator-SID);	: If originatorSID is not signalled, the linked message can be found in the same service as the linking message.

A.2.12 Advice

<Advice(6)>:=	
<IntUnTi>(6),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<tec005:AdviceCode>(adviceCode),	: Main Categorization of advice
if (bit 1 of selector is set)	
<tec200:SubAdviceType>(subAdviceCode),	: Detailed advice code
if (bit 2 of selector is set)	

{	
<IntUnLoMB>(n),	
n * <LocalizedShortString>(freeText),	: Additional advice
}	
ordered {	
n * <VehicleRestriction>(vehicleRestriction)	: Used when advice applies to specific vehicle types
};	

A.2.13 VehicleRestriction

<VehicleRestriction(7)>:=	
<IntUnTi>(7),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<tec009:VehicleType>(vehicleType),	: Type of vehicle
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <RestrictionType>(restriction)	: Even when a particular vehicle type has been defined by tec009:VehicleType, RestrictionType may be used to specify further attributes to more closely define the vehicles for which the message applies, e.g. vehicle weight, vehicle height or other attribute, including vehicle destination. For example: “no winter tyres” means the message applies to vehicles without winter tyres. “width greater 300” means that the event or the closure affects only vehicles with a width greater than 3 m. “with destination in a given area” means the message is targeted only at those vehicles whose destination is as specified in the area as attached to this restriction attribute.
};	

A.2.14 DiversionRoute

<DiversionRoute(8)>:=	
<IntUnTi>(8),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(n),	
n * <SegmentModifier>(segmentModifier),	: Data structure to define diversion

ordered {	
n * <VehicleRestriction>(vehicleRestriction)	: Defines how diversion information is restricted to specific vehicles
};	

A.2.15 TemporarySpeedLimit

<TemporarySpeedLimit(11)>:=	
<IntUnTi>(11),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(n),	
n * <TemporarySpeedLimitSection>(SpeedLimit-Section),	: Individual section for the speed limit information.
BitArray(selector),	
if (bit 0 of selector is set)	
<Boolean>(unitIsMPH),	: Units definition for this Temporary Speed Limit.
if (bit 1 of selector is set)	
<DistanceMetres>(offset),	: Offset defines the distance from the start of the Temporary speed limit to the end of the Location reference. If not defined, then first SpeedLimitSection starts at the beginning of the Location Reference.
ordered {	
n * <VehicleRestriction>(VehicleRestriction)	: One or more vehicle restrictions can be associated to each Temporary Speed Limit. This allows different speed limits to be signalled to different vehicles (e.g. Lorries, Towing Vehicles). Absence of the "VehicleRestriction" attribute indicates all vehicles are affected.
};	

A.3 TEC Datatypes

A.3.1 RestrictionType

<RestrictionType>:=	
<tec007:RestrictionType>(restrictionType),	: Defines the form of restriction
BitArray(selector),	
if (bit 0 of selector is set)	
<IntUnLoMB>(restrictionValue),	: Defines value associated to the restrictions where applicable
if (bit 1 of selector is set)	
<RestrictionLocation>(restrictionLocation);	: Restriction filter for specific destination

A.3.2 SegmentModifier

<SegmentModifier>:=	
<tec008:DiversionRoadType>(diversionRoadType),	: Nature of diversion route element
<SegmentLocation>(segmentLocation);	: Position of segment

A.3.3 TemporarySpeedLimitSection

<TemporarySpeedLimitSection>:=	
<IntUnTi>(speedLimitValue),	: Speed limit numerical value in kph or mph.
BitArray(selector),	
if (bit 0 of selector is set)	
<IntUnTi>(speedLimitValueWet),	: Speed limit numerical value to be used in wet conditions; in kph or mph.
if (bit 1 of selector is set)	
<DistanceMetres>(speedLimitLength);	: Length of the SpeedLimitSection, If this is not defined, then for sections starting upstream of the end of the Problem Location, the section finishes at end of Problem Location. In other cases, it should be defined explicitly or a default length of 500 m is assumed.

Annex B
(normative)

TPEG application, TPEG-ML Representation

NOTE In the course of ISO processing, XML-compliant quotation marks are replaced with non-compliant quotation marks. When taking over material from these sections, be advised to substitute any double quote to the XML-compliant equivalent quotation mark (Unicode U +0022).

B.1 General

This Annex contains the tpegML physical format representation of the TEC application. See ISO/TS 21219-4.

B.2 Message Components

B.2.1 TECMessage

```
<xs:element name="TECMessage" type="TECMessage"/>
<xs:complexType name="TECMessage">
 <xs:complexContent>
 <xs:extension base="tsf:ApplicationRootMessageML">
 <xs:sequence>
 <xs:element name="mmt" type="MMCSwitch"/>
 <xs:element name="event" type="Event" minOccurs="0"/>
 <xs:element name="loc" type="lrc:LocationReferencingContainer" minOccurs="0"/>
 </xs:sequence>
 </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

B.2.2 MMCSwitch

```
<xs:complexType name="MMCSwitch">
 <xs:sequence>
 <xs:choice minOccurs="1" maxOccurs="1">
 <xs:element name="optionMessageManagement" type="mmc:MessageManagementContainer"
minOccurs="1" maxOccurs="1"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.3 Event

```
<xs:complexType name="Event">
 <xs:sequence>
 <xs:element name="effectCode" type="tec001_EffectCode"/>
 <xs:element name="startTime" type="tdt:DateTime" minOccurs="0"/>
 <xs:element name="stopTime" type="tdt:DateTime" minOccurs="0"/>
 <xs:element name="tendency" type="tec006_Tendency" minOccurs="0"/>
 <xs:element name="lengthAffected" type="tdt:DistanceMetres" minOccurs="0"/>
 <xs:element name="averageSpeedAbsolute" type="tdt:Velocity" minOccurs="0"/>
 <xs:element name="delay" type="tdt:IntUnLoMB" minOccurs="0"/>
 <xs:element name="segmentSpeedLimit" type="tdt:Velocity" minOccurs="0"/>
 <xs:element name="expectedSpeedAbsolute" type="tdt:Velocity" minOccurs="0"/>
 <xs:element name="cause" type="Cause" minOccurs="0" maxOccurs="unbounded"/>
 <xs:element name="advice" type="Advice" minOccurs="0" maxOccurs="unbounded"/>
 <xs:element name="vehicleRestriction" type="VehicleRestriction" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="diversionRoute" type="DiversionRoute" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="temporarySpeedLimit" type="TemporarySpeedLimit" minOccurs="0"
```

```
maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

B.2.4 Cause

```
<xs:complexType name="Cause">
 <xs:sequence>
 <xs:choice minOccurs="1" maxOccurs="1">
 <xs:element name="optionDirectCause" type="DirectCause" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionLinkedCause" type="LinkedCause" minOccurs="1" maxOccurs="1"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.5 DirectCause

```
<xs:complexType name="DirectCause">
 <xs:sequence>
 <xs:element name="mainCause" type="tec002_CauseCode"/>
 <xs:element name="warningLevel" type="tec003_WarningLevel"/>
 <xs:element name="unverifiedInformation" type="tdt:Boolean"/>
 <xs:element name="subCause" type="tec100_SubCauseType" minOccurs="0"/>
 <xs:element name="lengthAffected" type="tdt:DistanceMetres" minOccurs="0"/>
 <xs:element name="laneRestrictionType" type="tec004_LaneRestriction" minOccurs="0"/>
 <xs:element name="numberOfLanes" type="tdt:IntUnTi" minOccurs="0"/>
 <xs:element name="freeText" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="causeOffset" type="tdt:DistanceMetres" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.6 LinkedCause

```
<xs:complexType name="LinkedCause">
 <xs:sequence>
 <xs:element name="mainCause" type="tec002_CauseCode"/>
 <xs:element name="linkedMessage" type="tdt:IntUnLoMB"/>
 <xs:element name="COID" type="tdt:IntUnTi" minOccurs="0"/>
 <xs:element name="originatorSID" type="tdt:ServiceIdentifier" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.7 Advice

```
<xs:complexType name="Advice">
 <xs:sequence>
 <xs:element name="adviceCode" type="tec005_AdviceCode" minOccurs="0"/>
 <xs:element name="subAdviceCode" type="tec200_SubAdviceType" minOccurs="0"/>
 <xs:element name="freeText" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="vehicleRestriction" type="VehicleRestriction" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

B.2.8 VehicleRestriction

```
<xs:complexType name="VehicleRestriction">
 <xs:sequence>
 <xs:element name="vehicleType" type="tec009_VehicleType" minOccurs="0"/>
 <xs:element name="restriction" type="RestrictionType" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

B.2.9 DiversionRoute

```
<xs:complexType name="DiversionRoute">
 <xs:sequence>
 <xs:element name="segmentModifier" type="SegmentModifier" maxOccurs="unbounded"/>
 <xs:element name="vehicleRestriction" type="VehicleRestriction" minOccurs="0"
maxOccurs="unbounded"/>
```

```
 </xs:sequence>
</xs:complexType>
```

B.2.10 TemporarySpeedLimit

```
<xs:complexType name="TemporarySpeedLimit">
 <xs:sequence>
 <xs:element name="SpeedLimitSection" type="TemporarySpeedLimitSection"
maxOccurs="unbounded"/>
 <xs:element name="unitIsMPH" type="tdt:Boolean"/>
 <xs:element name="offset" type="tdt:DistanceMetres" minOccurs="0"/>
 <xs:element name="VehicleRestriction" type="VehicleRestriction" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

B.3 Datatypes

B.3.1 RestrictionType

```
<xs:complexType name="RestrictionType">
 <xs:sequence>
 <xs:element name="restrictionType" type="tec007_RestrictionType"/>
 <xs:element name="restrictionValue" type="tdt:IntUnLoMB" minOccurs="0"/>
 <xs:element name="restrictionLocation" type="lrc:LocationReferencingContainer"
minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.3.2 SegmentModifier

```
<xs:complexType name="SegmentModifier">
 <xs:sequence>
 <xs:element name="diversionRoadType" type="tec008_DiversionRoadType"/>
 <xs:element name="segmentLocation" type="lrc:LocationReferencingContainer"/>
 </xs:sequence>
</xs:complexType>
```

B.3.3 TemporarySpeedLimitSection

```
<xs:complexType name="TemporarySpeedLimitSection">
 <xs:sequence>
 <xs:element name="speedLimitValue" type="tdt:IntUnTi"/>
 <xs:element name="speedLimitValueWet" type="tdt:IntUnTi" minOccurs="0"/>
 <xs:element name="speedLimitLength" type="tdt:DistanceMetres" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.3.4 Full TEC Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- This XML schema is generated with tpegUMLconverter V2.3 -->
<xs:schema xmlns="http://www.tisa.org/TPEG/TEC_3_2"
   targetNamespace="http://www.tisa.org/TPEG/TEC_3_2"
   xmlns:xs="http://www.w3.org/2001/XMLSchema"
   xmlns:tsf="http://www.tisa.org/TPEG/SFW_1_1"
   xmlns:tdt="http://www.tisa.org/TPEG/TPEGDataTypes_2_0"
   xmlns:mmc="http://www.tisa.org/TPEG/MMC_1_1"
   xmlns:lrc="http://www.tisa.org/TPEG/LRC_2_1"
   elementFormDefault="qualified"
   attributeFormDefault="qualified">
   <xs:import namespace="http://www.tisa.org/TPEG/SFW_1_1" schemaLocation="SFW_1_1.xsd"/>
   <xs:import namespace="http://www.tisa.org/TPEG/TPEGDataTypes_2_0"
schemaLocation="TDT_2_0.xsd"/>
   <xs:import namespace="http://www.tisa.org/TPEG/MMC_1_1" schemaLocation="MMC_1_1.xsd"/>
   <xs:import namespace="http://www.tisa.org/TPEG/LRC_2_1" schemaLocation="LRC_2_1.xsd"/>
   <xs:element name="TECMessage" type="TECMessage"/>
   <xs:complexType name="TECMessage">
      <xs:complexContent>
         <xs:extension base="tsf:ApplicationRootMessageML">
            <xs:sequence>
               <xs:element name="mmt" type="MMCSwitch"/>
```

```
               <xs:element name="event" type="Event" minOccurs="0"/>
               <xs:element name="loc" type="lrc:LocationReferencingContainer"
minOccurs="0"/>
            </xs:sequence>
         </xs:extension>
      </xs:complexContent>
   </xs:complexType>
   <xs:complexType name="MMCSwitch">
      <xs:sequence>
         <xs:choice minOccurs="1" maxOccurs="1">
            <xs:element name="optionMessageManagement"
type="mmc:MessageManagementContainer" minOccurs="1" maxOccurs="1"/>
         </xs:choice>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="Event">
      <xs:sequence>
         <xs:element name="effectCode" type="tec001_EffectCode"/>
         <xs:element name="startTime" type="tdt:DateTime" minOccurs="0"/>
         <xs:element name="stopTime" type="tdt:DateTime" minOccurs="0"/>
         <xs:element name="tendency" type="tec006_Tendency" minOccurs="0"/>
         <xs:element name="lengthAffected" type="tdt:DistanceMetres" minOccurs="0"/>
         <xs:element name="averageSpeedAbsolute" type="tdt:Velocity" minOccurs="0"/>
         <xs:element name="delay" type="tdt:IntUnLoMB" minOccurs="0"/>
         <xs:element name="segmentSpeedLimit" type="tdt:Velocity" minOccurs="0"/>
         <xs:element name="expectedSpeedAbsolute" type="tdt:Velocity" minOccurs="0"/>
         <xs:element name="cause" type="Cause" minOccurs="0" maxOccurs="unbounded"/>
         <xs:element name="advice" type="Advice" minOccurs="0" maxOccurs="unbounded"/>
         <xs:element name="vehicleRestriction" type="VehicleRestriction" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="diversionRoute" type="DiversionRoute" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="temporarySpeedLimit" type="TemporarySpeedLimit" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="Cause">
      <xs:sequence>
         <xs:choice minOccurs="1" maxOccurs="1">
            <xs:element name="optionDirectCause" type="DirectCause" minOccurs="1"
maxOccurs="1"/>
            <xs:element name="optionLinkedCause" type="LinkedCause" minOccurs="1"
maxOccurs="1"/>
         </xs:choice>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="DirectCause">
      <xs:sequence>
         <xs:element name="mainCause" type="tec002_CauseCode"/>
         <xs:element name="warningLevel" type="tec003_WarningLevel"/>
         <xs:element name="unverifiedInformation" type="tdt:Boolean"/>
         <xs:element name="subCause" type="tec100_SubCauseType" minOccurs="0"/>
         <xs:element name="lengthAffected" type="tdt:DistanceMetres" minOccurs="0"/>
         <xs:element name="laneRestrictionType" type="tec004_LaneRestriction"
minOccurs="0"/>
         <xs:element name="numberOfLanes" type="tdt:IntUnTi" minOccurs="0"/>
         <xs:element name="freeText" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="causeOffset" type="tdt:DistanceMetres" minOccurs="0"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="LinkedCause">
      <xs:sequence>
         <xs:element name="mainCause" type="tec002_CauseCode"/>
         <xs:element name="linkedMessage" type="tdt:IntUnLoMB"/>
         <xs:element name="COID" type="tdt:IntUnTi" minOccurs="0"/>
         <xs:element name="originatorSID" type="tdt:ServiceIdentifier" minOccurs="0"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="Advice">
      <xs:sequence>
```

```
         <xs:element name="adviceCode" type="tec005_AdviceCode" minOccurs="0"/>
         <xs:element name="subAdviceCode" type="tec200_SubAdviceType" minOccurs="0"/>
         <xs:element name="freeText" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
         <xs:element name="vehicleRestriction" type="VehicleRestriction" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="VehicleRestriction">
      <xs:sequence>
         <xs:element name="vehicleType" type="tec009_VehicleType" minOccurs="0"/>
         <xs:element name="restriction" type="RestrictionType" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="DiversionRoute">
      <xs:sequence>
         <xs:element name="segmentModifier" type="SegmentModifier" maxOccurs="unbounded"/>
         <xs:element name="vehicleRestriction" type="VehicleRestriction" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="TemporarySpeedLimit">
      <xs:sequence>
         <xs:element name="SpeedLimitSection" type="TemporarySpeedLimitSection"
maxOccurs="unbounded"/>
         <xs:element name="unitIsMPH" type="tdt:Boolean"/>
         <xs:element name="offset" type="tdt:DistanceMetres" minOccurs="0"/>
         <xs:element name="VehicleRestriction" type="VehicleRestriction" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="RestrictionType">
      <xs:sequence>
         <xs:element name="restrictionType" type="tec007_RestrictionType"/>
         <xs:element name="restrictionValue" type="tdt:IntUnLoMB" minOccurs="0"/>
         <xs:element name="restrictionLocation" type="lrc:LocationReferencingContainer"
minOccurs="0"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="SegmentModifier">
      <xs:sequence>
         <xs:element name="diversionRoadType" type="tec008_DiversionRoadType"/>
         <xs:element name="segmentLocation" type="lrc:LocationReferencingContainer"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="TemporarySpeedLimitSection">
      <xs:sequence>
         <xs:element name="speedLimitValue" type="tdt:IntUnTi"/>
         <xs:element name="speedLimitValueWet" type="tdt:IntUnTi" minOccurs="0"/>
         <xs:element name="speedLimitLength" type="tdt:DistanceMetres" minOccurs="0"/>
      </xs:sequence>
   </xs:complexType>
   <xs:complexType name="tec001_EffectCode">
      <xs:attribute name="table" type="xs:string" fixed="tec001_EffectCode"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="7"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec002_CauseCode">
      <xs:attribute name="table" type="xs:string" fixed="tec002_CauseCode" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
```

```
               <xs:maxInclusive value="255"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec003_WarningLevel">
      <xs:attribute name="table" type="xs:string" fixed="tec003_WarningLevel"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="4"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec004_LaneRestriction">
      <xs:attribute name="table" type="xs:string" fixed="tec004_LaneRestriction"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="4"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec005_AdviceCode">
      <xs:attribute name="table" type="xs:string" fixed="tec005_AdviceCode"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="255"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec006_Tendency">
      <xs:attribute name="table" type="xs:string" fixed="tec006_Tendency" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="7"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec007_RestrictionType">
      <xs:attribute name="table" type="xs:string" fixed="tec007_RestrictionType"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="255"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec008_DiversionRoadType">
      <xs:attribute name="table" type="xs:string" fixed="tec008_DiversionRoadType"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
```

```
               <xs:maxInclusive value="5"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec009_VehicleType">
      <xs:attribute name="table" type="xs:string" fixed="tec009_VehicleType"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="255"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec100_SubCauseType">
      <xs:attribute name="table" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:string">
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
      <xs:attribute name="code" type="xs:unsignedByte" use="required"/>
   </xs:complexType>
   <xs:complexType name="tec101_TrafficCongestion">
      <xs:attribute name="table" type="xs:string" fixed="tec101_TrafficCongestion"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="1"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec102_Accident">
      <xs:attribute name="table" type="xs:string" fixed="tec102_Accident" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="7"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec103_Roadworks">
      <xs:attribute name="table" type="xs:string" fixed="tec103_Roadworks" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="3"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec104_NarrowLanes">
      <xs:attribute name="table" type="xs:string" fixed="tec104_NarrowLanes"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="4"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
```

```
   </xs:complexType>
   <xs:complexType name="tec105_Impassability">
      <xs:attribute name="table" type="xs:string" fixed="tec105_Impassability"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="6"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec106_SlipperyRoad">
      <xs:attribute name="table" type="xs:string" fixed="tec106_SlipperyRoad"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="10"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec108_Fire">
      <xs:attribute name="table" type="xs:string" fixed="tec108_Fire" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="2"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec109_HazardousDrivingConditions">
      <xs:attribute name="table" type="xs:string" fixed="tec109_HazardousDrivingConditions"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="9"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec110_ObjectsOnTheRoad">
      <xs:attribute name="table" type="xs:string" fixed="tec110_ObjectsOnTheRoad"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="7"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec111_AnimalsOnRoadway">
      <xs:attribute name="table" type="xs:string" fixed="tec111_AnimalsOnRoadway"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="4"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
```

```
   </xs:complexType>
   <xs:complexType name="tec112_PeopleOnRoadway">
      <xs:attribute name="table" type="xs:string" fixed="tec112_PeopleOnRoadway"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="3"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec113_BrokenDownVehicles">
      <xs:attribute name="table" type="xs:string" fixed="tec113_BrokenDownVehicles"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="2"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec115_RescueAndRecoveryWorkInProgress">
      <xs:attribute name="table" type="xs:string" fixed="tec115_
RescueAndRecoveryWorkInProgress" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="5"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec116_RegulatoryMeasure">
      <xs:attribute name="table" type="xs:string" fixed="tec116_RegulatoryMeasure"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="6"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec117_ExtremeWeatherConditions">
      <xs:attribute name="table" type="xs:string" fixed="tec117_ExtremeWeatherConditions"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="6"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec118_VisibilityReduced">
      <xs:attribute name="table" type="xs:string" fixed="tec118_VisibilityReduced"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="8"/>
            </xs:restriction>
         </xs:simpleType>
```

```
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec119_Precipitation">
      <xs:attribute name="table" type="xs:string" fixed="tec119_Precipitation"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="3"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec120_RecklessPersons">
      <xs:attribute name="table" type="xs:string" fixed="tec120_RecklessPersons"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="3"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec123_MajorEvent">
      <xs:attribute name="table" type="xs:string" fixed="tec123_MajorEvent"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="9"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec124_ServiceNotOperating">
      <xs:attribute name="table" type="xs:string" fixed="tec124_ServiceNotOperating"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="4"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec125_ServiceNotUseable">
      <xs:attribute name="table" type="xs:string" fixed="tec125_ServiceNotUseable"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="5"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec126_SlowMovingVehicles">
      <xs:attribute name="table" type="xs:string" fixed="tec126_SlowMovingVehicles"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="8"/>
            </xs:restriction>
```

```
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec127_DangerousEndOfQueue">
      <xs:attribute name="table" type="xs:string" fixed="tec127_DangerousEndOfQueue"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="4"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec128_RiskOfFire">
      <xs:attribute name="table" type="xs:string" fixed="tec128_RiskOfFire"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="2"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec129_TimeDelay">
      <xs:attribute name="table" type="xs:string" fixed="tec129_TimeDelay" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="3"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec130_PoliceCheckpoint">
      <xs:attribute name="table" type="xs:string" fixed="tec130_PoliceCheckpoint"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="2"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec131_MalfunctioningRoadsideEquipment">
      <xs:attribute name="table" type="xs:string" fixed="tec131_
MalfunctioningRoadsideEquipment" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="5"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec200_SubAdviceType">
      <xs:attribute name="table" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:string">
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
      <xs:attribute name="code" type="xs:unsignedByte" use="required"/>
   </xs:complexType>
```

```
   <xs:complexType name="tec202_OvertakingNotAllowed">
      <xs:attribute name="table" type="xs:string" fixed="tec202_OvertakingNotAllowed"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="4"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec203_DrivingNotAllowed">
      <xs:attribute name="table" type="xs:string" fixed="tec203_DrivingNotAllowed"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="1"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec207_GiveWayToVehiclesFromBehind">
      <xs:attribute name="table" type="xs:string" fixed="tec207_
GiveWayToVehiclesFromBehind" use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="2"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec208_FollowDiversion">
      <xs:attribute name="table" type="xs:string" fixed="tec208_FollowDiversion"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="1"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec213_DriveCarefully">
      <xs:attribute name="table" type="xs:string" fixed="tec213_DriveCarefully"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="3"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
   <xs:complexType name="tec214_DoNotLeaveYourVehicle">
      <xs:attribute name="table" type="xs:string" fixed="tec214_DoNotLeaveYourVehicle"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="2"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
```

```
   </xs:complexType>
   <xs:complexType name="tec216_UseTollLanes">
      <xs:attribute name="table" type="xs:string" fixed="tec216_UseTollLanes"
use="required"/>
      <xs:attribute name="code" use="required">
         <xs:simpleType>
            <xs:restriction base="xs:unsignedByte">
               <xs:minInclusive value="1"/>
               <xs:maxInclusive value="2"/>
            </xs:restriction>
         </xs:simpleType>
      </xs:attribute>
   </xs:complexType>
</xs:schema>
```

Bibliography

[1] ISO/TS 18234-9:2013, *Intelligent transport systems — Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format — Part 9: Traffic event compact (TPEG1-TEC)*

[2] ISO 14819-1:2013, *Intelligent transport systems — Traffic and travel information messages via traffic message coding — Part 1: Coding protocol for Radio Data System — Traffic Message Channel (RDS-TMC) using ALERT-C*

[3] ISO 14819-2:2013, *Intelligent transport systems — Traffic and travel information messages via traffic message coding — Part 2: Event and information codes for Radio Data System — Traffic Message Channel (RDS-TMC) using ALERT-C*

[4] ISO 14819-3:2013, *Intelligent transport systems — Traffic and travel information messages via traffic message coding — Part 3: Location referencing for Radio Data System — Traffic Message Channel (RDS-TMC) using ALERT-C*

[5] ISO/TS 21219-1, *Intelligent transport systems — Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) — Part 1: Introduction, numbering and versions (TPEG2-INV)*

[6] ISO/TS 21219-2, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 2: UML modelling rules*

[7] ISO/TS 21219-3, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 3: UML to binary conversion rules*

[8] ISO/TS 21219-5, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 5: Service framework (TPEG2-SFW)*

[9] ISO/TS 21219-9, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 9: Service and network information (TPEG2-SNI)*

[10] SCHEMA DEFINITION X.M.L. http://www.w3.org/XML/Schema]

ICS 03.220.01; 35.240.60

Price based on 63 pages