



Management of displays on the MMIs of road operator OBUs

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- **R** corresponds to the release number : it is upgraded each time SC Studies validates the diffusion of a new release,
- **X** is the major version number: it is upgraded each time SC Studies validates the deliverable,
- **Y** is the minor version number: it is upgraded each time a contributor changes anything.

Once the deliverable is approved, its version number is upgraded from vR.XY to vR.(X+1)0

Once the deliverable is release, its version number is upgraded from vR.XY to v(R+1).00

As illustration :

- 0.03 > Work in progress version
- 0.10 > Del. Approved by SC Studies but not released
- 2.00 > Del. approved & released (in release 2)
- 2.05 > Del. Updated - in progress version

Table of Contents

1.	Introduction	4
1.1	Purpose of the deliverable	4
1.2	Preliminary comment on the impact of displays	4
1.3	Presentation of the regulations	5
2.	General elements	6
2.1	Glossary	6
3.	General display principles	7
3.1	Preliminary reminders about the main specifications	7
3.2	Major ergonomic display principles	8
3.3	Content of messages	11
3.4	Display time and distances	12
3.5	Prioritisation of displays	14
3.6	Inputting of events	15
4.	Pictogram per use case	16
4.1	Road temporarily slippery	16
4.2	Stopped vehicle	18
4.3	Vehicle breakdown	18
4.4	Accident	19
4.5	Own visibility	20
4.6	Alert emergency braking	21
4.7	Alert end of queue	22
4.8	Exceptional weather conditions	23
4.9	Animal on the road	25
4.10	Person on the road	26
4.11	Obstacle on the road (road where circulation remains possible)	26
4.12	Unmanaged obstruction on the road (road with blocked traffic)	27
4.13	Scheduled stationary and mobile roadwork	29
4.14	Alert work on road	30
4.15	Winter Road Maintenance vehicles	31
5.	Synthesis	32

1. Introduction

1.1 Purpose of the deliverable

The objective of this document, developed as part of the joint deliberations of the road operators network, is to present the major management principles for displays on the MMIs of road operators' OBUs, as well as their practical details.

This document also proposes for each use case the most appropriate pictogram among the current road signs.

For use cases that have no equivalent in the current legislation, this document proposes the creation of specific pictograms.

Its purpose is to help, when drawing up MMI specifications, to choose the pictograms most suited to the message to the driver.

1.2 Preliminary comment on the impact of displays

The deliberations of the road operators network are based at this stage on the major principles and the current regulations, especially the inter-ministerial directions on Road Signs.

The ex-ante impact studies do not presently make provision to simulate the impacts of Scoop messages on the road operator driver: is the displayed message understood, and beyond this, does the road operator driver adopt the expected behaviour after receiving this message? The project schedule does not provide a sufficient period of availability to conduct these studies before the MMI's development phases.

At this stage the following key dual assumptions are made:

- a very large majority of the road operator OBUs will be used to provide information during an intervention rather than to receive it during a liaison period;
- road operator drivers in user mode are trained how to behave next to major events and do not require advisory messages in addition to the display of the use cases as described below.

On the occasion of the project's impact studies, the behavioural impacts of the different messages on the road operator driver will be measured so they can be optimised (Cerema study on the evaluation of the road operator MMI).

Furthermore, in a second phase, the production of recommendation messages (e.g., slow down next to roadwork) may be envisaged based on the initial results of the impact studies and system evaluations.

1.3 Presentation of the regulations

First of all, article R412-6-2 of the highway code indicates: "It is prohibited to place in the field of vision of a driver of a moving vehicle an operating device equipped with a screen that does not constitute a driving or navigation aid."

There are no other regulations concerning the items that can be displayed to the user in his vehicle.

Consequently, this document is based on the currently known road sign documents. The amended decree of 24 November 1967 concerning road signs and motorways provides all the usable signs and their meaning. It is an exhaustive list of all the existing road panels. There is also an inter-ministerial directive (decree of 7 June 1997 concerning road signs and motorways), which shows a road operator how to use road signs.

This directive includes 9 parts:

1. General Remarks
2. Danger signs
3. Intersections and priority regulations
4. Regulatory signs
5. Information, service and location signs
6. Permanent traffic lights
7. Pavement markings
8. Temporary signs
9. Dynamic signs

There is also a catalogue of road signs.

(*) To be exact, the 9th part concerns "dynamic signs related to road operation and security, [...] intended to deliver messages that will be modified frequently or will have to be activated on very short notice."

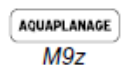
2. General elements

This document is positioned from the point of view of a vehicle that receives a message. It does not concern SCOOP use cases that do not display information to the user.

You will find below a few extracts in general terms of the inter-ministerial directive.

4th Part – Article 44

"The different types of panels and their exact meaning are indicated [...], and they cannot be given any other meaning."



2nd Part – Article 41. Other dangers

The early warning of dangers other than those for which a specific symbol exists is done using an A14 panel. This symbol should not be used when a specific symbol exists. The A14 panel must, as much as possible, be completed by an M9 tab sign with diverse information indicating the nature of the danger.

[...] The use of the A14 panel does not indicate in any way that the signalled danger is of low importance, but only that at the time it was installed there was no regulatory symbol for this danger.



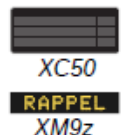
8th part – Article 130. Temporary dangers and stationary roadwork

[This article specifies the use cases for the AK14 panel]

9th part – Article 152: XA14 signs

To signal a proven danger other than those where a specific symbol exists, we use the AX14 sign. On variable message panels, the message must be associated with a literal

information (XC50 signal-text or XM9z tab sign) specifying the nature of the danger.



2.1 Glossary

- MMI: Man-Machine Interface
- OBU(o): On-Board Unit (operator)
- UV: User Vehicle
- OV: Operator Vehicle
- PF: SCOOP Platform

3. General display principles

The issues examined revolve around the following themes:

- the major ergonomic principles;
- the content of messages;
- the display time and distances;
- the prioritisation of displays;
- the inputting of events

3.1 Preliminary reminders about the main specifications

3.1.1 Equipment specifications

The following equipment specifications were retained as part of the 2.4.2.2 document:

- Resolution 1024 x 600
- Size: 5 inches < T < 8 inches
- Type of screen: No preference
- Multipoint: Optional
-

The major display principles should be compatible with the size and resolution of the screen for optimal legibility of the information.

Note: for the needs of some local road operators, the development of a 4-inch size screen is planned.

3.1.2 Functional specifications

The national specifications of the 2.4.2.2 and 2.4.2.2 bis documents are completed by the contractual specifications for the development of the Scoop application.

Three major functionalities of the Scoop application were retained:

- the display of an event alert received from the OBUs, ITSS-Rs and the platform (via the mobile ITSS-R function),
- the ability to manually declare an event corresponding to A3 use cases, and
- the ability to upload a distress signal (software emergency button)

The major functional display specifications retain:

- the mapping that the events from the neighbouring vehicles and the SCOOP platform will be encrusted on via icons; special colouring on the circuit itinerary will be planned so the agent can navigate along the itinerary;
- the icons of sub-activities used to emit "sector-specific" messages as defined in the paragraph by pressing on the corresponding buttons;
- the event declaration icons used to emit "user" messages by pressing on the corresponding buttons;
- a menu comprised of tabs or buttons that can be used to change the activity or mode, quit the application, update, access the navigation, make an emergency call, if the "emergency" button is not physical, and switch to the sector-specific application.

Note that when the Scoop application is used outside of the event display screen, if an event occurs, the display should automatically switch to the map and the associated pop-up, where necessary, to signal it. It should be easy to return to the previous screen without losing pre-entered elements, if applicable.

3.2 Major ergonomic display principles

3.2.1 Introduction

The Scoop project is a major technological innovation project that will significantly modify the professional environment of road operators. Its purpose is to improve the security of service personnel and users through the exchange of information and alerts about traffic conditions.

Consequently, the appropriation and acceptance issue of the technological system is significant. In order to achieve an optimal handover of the tool, and especially the Scoop application itself, considerable discussion and reflection must be carried out about the ergonomics of the system.

Ergonomics are defined as the "scientific study of the relation between man and his means, methods and work environment" and the application of this knowledge to the design of systems "that can be used with the maximum comfort, security and efficiency by the most people."

Therefore, maximum refinement must be sought to avoid overloading the displays, which should not mix text and mapping.

3.2.2 Mapping

The mapping used will be an OpenStreetMap type 2D map. This map should dynamically integrate the vehicle's trajectory on the screen with the direction taken by the driver at the top of the screen. This solution is preferred to a fixed map representing the north at the top of the screen to facilitate system users' orientation.

The alerts and geo-referenced information received will be displayed directly on the map in the form of icons (see hereafter the selection of icons) and the user should be able to navigate on the map to identify potential events and alerts on the network beyond the current position and its level of zoom.

The ergonomist may propose recommendations on how to enter the itinerary, accessible in principle from the main menu.

In addition, in order not to uselessly overload the map, the following display principles on the map were retained:

- in the case where the user has entered an itinerary, **only the events on this itinerary are displayed**;
- otherwise, all events in the scope of the map are displayed.

An informative part on the itinerary (next point of choice or change of route) may be offered in the maps distinct banner.

In the same guiding principle of fluidity, **the display shall clearly display the map part, the "buttons" part and the information part.**

3.2.3 Information about events

Regarding the information part, given the position of the equipment and the natural and intuitive tendencies to look right, a potential **information banner listing the events should be envisaged on the right of the screen** in order to ensure the best possible visibility. Its size should be considered in light of the character heights and the contents of messages and the potential option of information about the itinerary (next point of choice or change of route mentioned above in the mapping part).

In order to provide a perspective of the traffic conditions on the user's itinerary, **the display conditions in the sidebar should make it possible to describe from zero to two elements**, which will not necessarily be related to the zoom level on the map. This way, the events that are not on the user's itinerary will not be displayed in the sidebar.

The information about events, presented in the banner, should only concern the events that the user is likely to encounter. Consequently, for the events on roads with separate lanes declared in the opposite direction of traffic from the EGO vehicle, only the following AllTrafficDirection events will be displayed on the EGO vehicle's MMI: D2, A3-D3, A3-D5, D6, E6.

Additional events may be created in the short- or medium-term. A configurable parameter should exist to assign each of these events to a display strategy.

Finally, the display of an event should be deactivated on the sidebar when the EGO vehicle has passed it.

To implement the preceding provisions, the developers will rely on using the traces entered in the DENMs.

3.2.4 Access to applications

The components of the application part should be grouped into the same area of the screen with a minimisation of the number of buttons, in principle 3:

- **The emergency button should be big to facilitate its use:** an initial touch of a few seconds should activate the emergency button. A second touch of a few seconds should deactivate the call.
- **The ability to enter an event should be accessible immediately.**
- **The application's other functionalities will be accessible from a "menu" providing access to a list of these functionalities.**

3.2.5 Enhancing information

In case of an immediate major special danger type of event, an enhanced pop-up type display will be envisaged. The purpose of this type of display is to attract the driver's attention and, therefore, it is not to be retained as a common form of information to avoid reducing its effectiveness. The eligible use cases for this type of display are presented in the following paragraphs.

The concept retained for the pop-up is a full screen display, with the ability to delete its display after viewing (red cross to close the window in the upper right corner) and maintain access to the other functionalities (emergency button and events entry button in particular). The purpose of the pop-up display is not necessarily to be thought of with the map and sidebar being maintained by overlay / transparency in particular.

Accompanying a pop-up message with a sound system presents disadvantages in case of repetitions, which could lead the user to cut the system. If this option is retained, it should be configured just for emergency cases and in a typology, that does not generate a surprise effect for the driver.

3.2.6 Display adjustment

The system should be able to configure the display options in terms of luminosity. From the main menu, it should be possible to adjust the screen's luminosity.

The developer shall seek the ability to create a "night" display mode that is accessible from the menu.

3.2.7 Operational state of equipment

The user shall be able to view the operational state of the different equipment connected to the application. The following priority is retained:

- network connection (cellular, G5);
- GPS connection;
- battery state;
- connection state to the different equipment.

3.3 Content of messages

A sidebar, recommended to be on the right side of the screen, must be able to describe the events that will be encountered on the user's itinerary. Several pieces of information must be able to describe this event so the user can adapt his driving:

- **the nature of the event:** the event is described by a police sign type pictogram from the inter-ministerial directive for Road Security. This pictogram is accompanied by a text clarifying the information (e.g., animal). For each use case, this document recommends in the following chapters the choice of pictogram and the related text. In principle there should be two lines of display and the height of the associated characters should make the information easily legible.
- **the quality of the information:** the DENMs received include the quality of the information based on the sender in particular. This quality of information will be translated in the display in the form of stars: 1 star for a "Risk of" type event, 2 stars for a "Possibility of" type event and 3 stars for a confirmed event.
- **the distance to the event:** this distance will be dynamic in proportionate steps (e.g., every 500 m at a distance of a few kilometres, then every 200 m less than one km, etc.).

The event updates received will include the same information fields, which will then supersede the previous information.

When the events are positioned or repositioned manually, the corresponding messages emitted will not include any traces. In case an event is repositioned, the initial event is updated.

3.4 Display time and distances

3.4.1 Display distance to the event

The major principles previously described propose to correlate the display of pictograms on the map and the descriptive information on the sidebar. All pictograms must be displayed and visible on the map by moving on the map. However, the events are displayed in the sidebar as soon as they fulfil the display distance criteria hereafter. The display strategy of the next events in a sidebar results in not having a problem of repeating a message.

Therefore, the proposed display distances only concern the description of the events in the sidebar and are primarily taken from the specifications of deliverables 2.4.1.1 and 2.4.1.2:

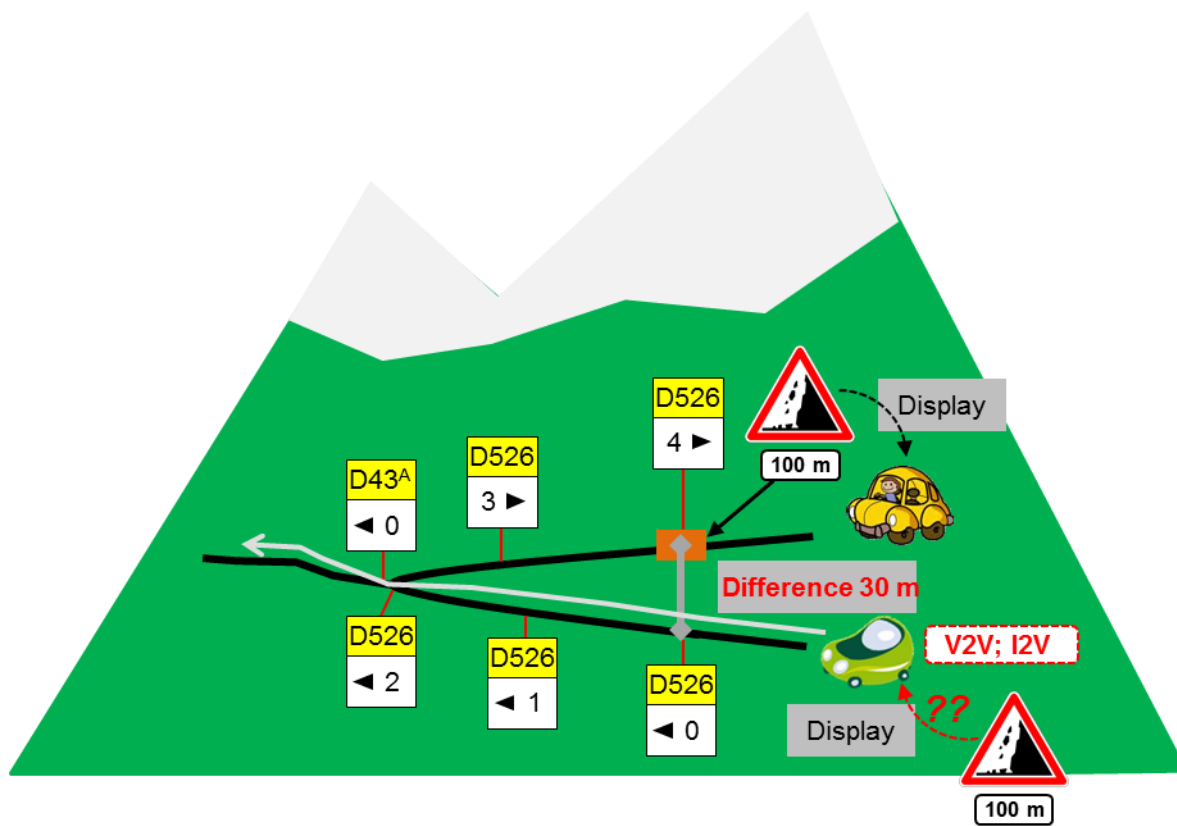
- for B use cases: the display distance corresponds to the distance travelled in 30" before the event;
- for D use cases: the display distance corresponds to the distance travelled in 30" before the event;
- for D8 use cases: the display distance retained corresponds to the distance travelled in 10' at the travelled speed, so the driver can potentially adapt his itinerary;
- for D10 use cases: the display distance corresponds to the distance travelled in 10" before the event;
- for D11 use cases: the display distance corresponds to the distance travelled in 15" before the event.

On the other hand, for an event occurring at a distance very close to the user (in view of the read time + reaction time), the system must not distract the user from the necessary responsiveness and his primary task of driving. Consequently, provision must be made for a distance to the event below which the event will not be displayed (this involves a notion of not displaying the new event; it does not involve deleting the display of an event). In principle, it concerns the D10 and D11 use cases. It is fixed at 3" by default for these two use cases and at 0 for the other use cases.

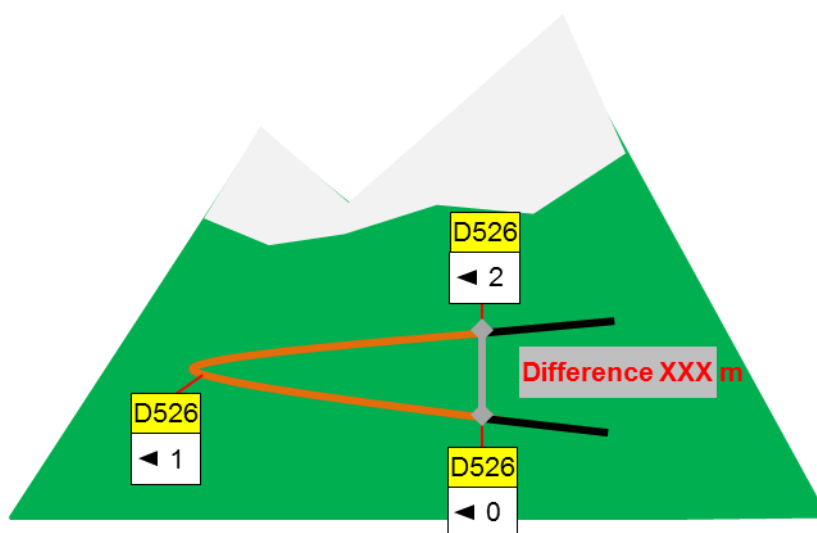
Nevertheless, each of these distances shall remain configurable for potential updates based on feedback.

Finally, in the vicinity of linear events, the distance to the event is replaced by the distance to the end of the event (e.g., B1 case), by using the DENM's EventHistory in particular.

Note: the configuration of display distances should reason using the abscissa vis-a-vis the road repository and not the geographic coordinates (3 dimensions) for the special problem of mountain roads, illustrated by the schema below.



Case of a distance to an event



Case of a length to an event

3.4.2 Event display time

In light of the major display principles recommending the continuous display of an event in the sidebar until it is encountered and during its occurrence, the issue of managing the display time is not meaningful for the current cases. Only cases of displays enhanced by pop-ups are concerned.

The display of an pop-up type enhanced message is proposed at 5 seconds.

The use cases concerned are the B2, D5, D10 and D11 type use cases.

For the D10 and D11 use cases, the display remains active for 5" (i.e., a few hundred metres) and therefore results in a display over a distance of approximately 150 metres at 110 km/h, 125 metres at 90 km/h and 100 metres at 70 km/h. The need to repeat the message does not seem appropriate in this precise case, since the message will be displayed in the sidebar.

For the B2 and D5 use cases, since the display distance before the event is 30", it seems pertinent to repeat the message. The message will be repeated at 10s from the event (e.g., 250 m at 90 km/h).

3.5 Prioritisation of displays

The preceding recommendations concerning displays (display of all items on the map and description of two events in a sidebar) limit potential conflicts of managing events. Nevertheless, there is the possibility that two events (or more) can occur with intercepting areas of influence (e.g., accident on a slippery road).

The following principle is retained:

- the closest event, with respect to its distance from the display, is displayed in the sidebar first;
- If display areas are covered by several events, which make it impossible to display all of them in the sidebar, they must be prioritised;
- the prioritisations are valid irrespective of the operating procedure of the OBU (operator or user);
- the quality of an event is the last prioritisation criterion: for two identical use cases at an equivalent display distance, the quality index is then used to define the prioritisation.

The priorities between the different use cases are managed according to the following hierarchy, independently of the quality of the event

1.A2-D10 ;	12.B3b ;	23.B1a ;
2.A3-D11 ;	13.B3c ;	24.B3a ;
3.A2-D11 ;	14.D4b ;	25.B2a ;
4.D5 ;	15.A2-D4b ;	26.B2c ;
5.A2-D5 ;	16.A2-D4a ;	27.D8 ;
6.A3-D5 ;	17.D4a ;	28.A3-D8 ;
7.B2b ;	18.D1 ;	29.D6 ;
8.D3 ;	19.A2-D1 ;	30.A2-D6 ;
9.D2b ;	20.D2a ;	31.E6 ;
10.A3-D3 ;	21.A3-D2a ;	32.A2-E6
11.A3-D2b ;	22.B1b ;	

3.6 Inputting of events

One of the MMI's functions is the user's input of events encountered on the network. Given the priority of driving tasks, this input must be as intuitive as possible to limit the driver's distraction. This results in minimising the number of actions and maximising the icons' legibility.

Events' input functions are accessed via a button located on the main screen. The following concept is proposed:

- the button opens an event input menu;
- have a function to select the geographic: the principle is the ability to save a position and recover it later or to create a position;
- have a function to select the direction of the event with, by default, the direction of traffic;
- have a function to select the event: events are represented by the pictograms retained in chapter 4.
-

Inputting basic information about an event should not take more than 2 clicks in traffic.

4. Pictogram per use case

4.1 Road temporarily slippery

4.1.1 EXTRACT OF THE MINISTERIAL DIRECTIV

There are three panels to describe a "slippery road":

- A4, permanent, road "especially slippery"



2nd Part - Article 30: "The A4 panel is used to provide early warning of especially slippery sections of roadways plus potentially an M9 tab sign with various indications [...]"

- AK4, temporary, road "potentially slippery"



8th part - Article 130 A/1.a) Slippery roads: The potentially slippery road is signalled via an AK4 panel

- XA4, dynamic, road "currently slippery"



9th part – Article 152 –D/Signal XA4

Poor road grip (due to ice, freezing rain, etc.) is signalled dynamically with an XA4 panel, potentially completed by an XM9z tab sign with the word "ICE". Sometimes this panel can be completed by an extended XM2 tab sign.



There is no panel that signifies "a single vehicle has slipped."



A2-D1: ROAD TEMPORARILY SLIPPERY

Sender: Uv – automatic

DENM: 6/0: Adverse weather conditions – adhesion / Unavailable

We recommend using the AK4 panel with the only related text, "SLIPPERY ROAD". Indeed, the vehicle that slipped does not know why.

Comment: precautions should be taken when displaying this use case. A vehicle may have slipped for its own reasons that won't reoccur (abrupt start, oil on the road, etc.). Consequently, we recommend using other information to ensure the reliability of the information (several vehicles have slipped, etc.).

4.1.3 D1: ROAD TEMPORARILY SLIPPERY

Sender: PF

DENM: 6/x Adverse weather conditions – adhesion / 0: Unavailable - 1: ice, - etc.

We recommend using the related AK4 pictogram for the cases known by the road operator, with the shortest possible explanatory text.

DENM	Propose text
6/0 unavailable	SLIPPERY ROAD
6/1 heavy frost on road	ICE
6/2 fuel on road	DIESEL
6/3 mud on road	MUD
6/4 snow on road	SNOW
6/5 ice	ICE
6/6 black ice	ICE
6/7 oil on road	OIL
6/8 LooseChippings	GRAVEL
6/9 instantBlackIce	ICE
6/10 roads Salted	ICE (*)

Comment: The work "Ice" is recommended for several use cases. Indeed, today road operators use the term ICE for any type of ice on the road. Consequently, we recommend this term that drivers are used to in France (instead of more precise terms like FROST). It should be noted that in another country, where the inhabitants are used to different types of ice, some use cases could be subject to different words. Therefore, we recommend that the road operator use the 6/6 case, which corresponds to "traditional" ICE.

(*) NOTE: the road is salted, but it is in the road operators' interest to signal that the road risks being slippery in spite of the salting.

4.2 Stopped vehicle

4.2.1 Extract of the ministerial directive

There is no panel signifying "stationary vehicle"

4.2.2 A2-D4A and D4A: Stationary vehicle

Sender Uv – automatic and PF

DENM 94/0: Stationary vehicle / Unavailable

Consequently, for these two use cases, we recommend using a specific pictogram associated with text signifying "stationary vehicle."



4.3 Vehicle breakdown

4.3.1 Extract of the ministerial directive

There is no panel signifying "vehicle breakdown." It only refers to the warning triangle preceding a vehicle breakdown.

8th part – Article 122. - A - 1-: "the warning triangle of a vehicle breakdown"

4.3.2 A2-D4B and D4B: Vehicle breakdown (Causecode 94/2)

Sender: Uv – automatic and Platform

DENM 94/2 Stationary vehicle / vehicle breakdown

Therefore, we recommend using a specific pictogram associated with text signifying "vehicle breakdown."



4.3.3 A2-D4B: Vehicle breakdown (Causecode 91/X)

Sender: Uv – automatic

DENM 91/x: Vehicle breakdown / x: 0 Unavailable 1 Lack of fuel, etc.

We recommend using a specific pictogram associated with text signifying "vehicle breakdown."



Comment: There is no point in making a distinction between the different cases for the display in a vehicle. This distinction will be useful for the road operator and road assistance.

4.4 Accident

4.4.1 Extract of the ministerial directive

There is:

- AK31, a temporary "accident " panel.



AK31 (temporaire)



XAK31

8th part – Article 130 c). Accident

When it can be implemented, the signage leading up to an accident must be made first with the AK312 panel. Exceptionally, it can be replaced by the AK14 panel plus the KM9 tab sign bearing the word "ACCIDENT." The AK312 panel must not be used to signal a risk of an accident, even if it is completed by a tab sign.

- XAK31, a dynamic "accident " panel.

The 9th part does not specify the conditions for using this panel. There is a general use paragraph for pictograms on XA or XAK type VMS: Article 148 to 152 of the 9th part:

"XA type dynamic danger signs (inverted background) are used to signal established dangers"

4.4.2 A2-D5: Vehicle in an accident

Sender: Uv – automatic

DENM 94/3: Stationary vehicle / Postcrash

We recommend using the AK31 symbol. This high quality information is eligible for enhanced display.

4.4.3 A3-D5: Unprotected accident

Sender: Uv – manual

DENM 2/0: Accident / unknown

We recommend using the AK31 symbol.

4.4.4 D5: Accident Area

Sender: PF

DENM 2/x: Accident /

- 0: unknown
- 1: multiple vehicles
- 2: major rescue means
- 3: heavy goods vehicle
- 7: not secured

We recommend using the AK31 symbol. This information, if it has a high quality index, is eligible for enhanced display.

4.5 Ow visibility

4.5.1 Extract of the ministerial directive



For signalling in an area with frequent low visibility, there are no specific panels. It is recommended to use an A14 "Danger" panel and a tab sign specifying the danger.

For temporary signalling, there are temporary and dynamic "fog patches or thick smoke" panels: AK32 and XAK32:



2nd Part – Article 41-1. Frequent fog

[...] In addition, one can place A14 panels with M9 tab signs with diverse indications "FREQUENT FOG." [...]



8th part – Article 130. A/ 1/ Dangers not obstructing the roadway - c). Smoke emissions

In the exceptional case of thick smoke emissions (e.g., during a fire), or in the presence of persistent fog patches, the AK32 panel or the XAK32 signal on a dynamic system can be used to alert users of the restricted visibility caused by these phenomena.

9th part – Article 152 –D/Signal XAK32

This signal can only be displayed when fog patches or smoke reducing users' visibility are relatively close.

4.5.2 A2-D6: Low visibility

Sender: Uv – automatic

DENM 18/0: Adverse weather conditions – Visibility / Unavailable

We recommend using the AK32 pictogram.

4.5.3 D6: Low visibility

Sender: PF

DENM 18/x: Adverse weather conditions – Visibility / x

We recommend:

DENM	Pictogram	text
18/0 Unavailable	AK32	LOW VISIBILITY
18/1 Fog	AK32	FOG
18/2 Smoke	AK32	SMOKE
18/3 Heavy snowfall	AK32	SNOW
18/4 Rain	AK32	RAIN
18/5 Hail	AK32	HAIL

4.6 Alert emergency braking

4.6.1 Extract of the ministerial directive

There is no "braked vehicle" panel.

4.6.2 A2-D10: Alert emergency braking

Sender: Uv – automatic

DENM 99/1: Dangerous situation / Emergency electronic brake lights

We recommend using the AK14 pictogram associated with text signifying "emergency braking." We also propose that this display be enhanced, given the importance of this use case.



4.7 Alert end of queue

4.7.1 Extract of the ministerial directive



There are several panels to signal a "traffic jam."

- AK30, temporary

8th Part – article 130 – A / 2/ Dangers obstructing the roadway b). Traffic jam

When it can be implemented, the signage leading up to a traffic jam must be made first with the AK30 panel. Exceptionally, it can be replaced by the AK14 panel plus the KM9 tab sign bearing the words "TRAFFIC JAM."

The AK30 panel must not be used to signal a risk of a traffic jam, even if it is completed by a tab sign. [...]

- XAK30, dynamic

9th Part – Article. 173.-1. Signalling end of queues

When we have to use a fixed system to signal the danger represented by an end of queue, we use the AK30 or XAK30 sign (see art. 130, paragraph A020b of the 8th part).

When the variable message panel cannot display a pictogram, the literal message "DANGER TRAFFIC JAM" can be displayed. A variable message panel displaying an AK30 or XAK30 signal must be installed at a distance from the end of queue in compliance with article 150.

The message must be reinforced when the end of queue is less than 2 km.

9th Part – Article 150. Installation distance

The installation distances of signals displayed on variable message panels are the same as those of signals displayed with permanent displays. Exceptions include signals (A, AK, XAK, X1, X2, etc.) used to deliver immediate danger messages of event messages (see article 148):

- immediate danger messages: they are delivered near the signalled danger; the installation distance must not exceed if possible 500 m on bi-directional roads and 2km on separated carriageways;
- [...]

4.7.2 A2-D11 and D11: Alert end of queue

Sender Uv – automatic and PF

DENM 27 / 0: Dangerous end of queue / Unavailable

We recommend using the AK30 pictogram. We also recommend reinforcing this display on the approach to the end of queue given the importance of the use case.

4.8 Exceptional weather conditions

4.8.1 Extract of the ministerial directive



XA25

There is no panel that signals "strong precipitation" or strong rain, whether the case is frequent or just temporary.

There is a "snow" panel (XA25) to announce snowfall underway.

9th Part – Article 152 – B/ XA 25 Signal

This signal can only be displayed when the snow phenomenon is not yet clearly visible: start of snowfall, melted snow or freezing rain. It can also be used to announce snowfalls underway rather close by, less than about 10 kilometres, on another itinerary.

- The A24 panel signals a frequent wind area.

2nd part - Article 41-3. Side wind

The early warning of the wind danger is made using the A24 panel.

In addition, it is recommended to implement a J7 marker at a location exposed to the wind and quite visible from the road, in the day and at night.

- The XA24 panel signals the actual presence of a violent wind.

9th Part – Article 152 – B/ XA24 signal

As dynamic signalling, the XA24 panel can only be displayed in case of violent wind with a strong impact on driving. Its display in a tunnel, immediately before the exit, is recommended when the J7 marker that normally accompanies the permanent signal is not visible from inside the tunnel.



A24 (fréquent)



XA24



Balise J7

4.8.2 A2-E6: Exceptional weather conditions (Strong precipitation)

Sender: Uv – automatic

DENM 19 / 0: Adverse weather precipitation – Extreme weather condition / Unavailable

Since the emitter vehicle does not distinguish between strong rain or snow, we recommend using a specific pictogram associated with the text "STRONG RAIN." A supplement for cases of snowfalls could be envisaged later.



4.8.3 E6: Alert - exceptional weather conditions (Thunderstorm)

Sender: Platform

DENM 17 / 4: Adverse weather condition – Extreme weather condition / Thunderstorm

We recommend using a specific pictogram associated with text signifying "THUNDERSTORM."



4.8.4 E6: Alert - Exceptional weather conditions (strong winds)

Sender: Platform

DENM 17 / 1: Adverse weather condition – Extreme weather condition / Strong winds

We recommend using a specific pictogram, taken from the A24 panel, associated with text signifying "WIND."



4.9 Animal on the road

4.9.1 Extract of the ministerial directive



There is an "animal on the road" panel: XA15b

9th part – Article 152: Signal XA15b

As dynamic signalling, the XA15b signal is only displayed when an animal is actually detected on the roadway, which could constitute an obstacle jeopardising the safety of motorists.

4.9.2 A3-D2a - Animal on the road

Sender:Uv – manual

DENM 11/0: Hazardous location – Animal on the road / Unavailable

We recommend using a specific pictogram, taken from the A15b panel, for common cases.



4.9.3 D2a: Animal on the road

Sender: PF

DENM 11/x: Hazardous location – Animal on the road / x

We recommend using a specific pictogram, taken from the A15b panel, for the 11/x cases, except for the 11/2 case, associated with a short explanatory text.



For the specific case of 11/2, we recommend using a specific pictogram taken from the A15a1 panel, associated with a short explanatory text.



DENM	Text
11/0	Animal
11/1	Animal
11/2	Herd
11/3	Animal
11/4	Animal

4.10 Person on the road

4.10.1 Extract of the ministerial directive



There is a "person on the road" panel as a dynamic sign: XA26

9th part – Article 152: Signal XA26

This signal can only be displayed when the nearby presence of one or more pedestrians is detected on the lanes or emergency lane less than approximately 2 km.

4.10.2 A3-D2b and D2b: Person on the road

Sender: Uv – manual

DENM 12 / 0: Human presence on the road / Unavailable

We recommend using a specific pictogram, taken from the XA26 panel, with a short associated explanatory text.



4.11 Obstacle on the road (road where circulation remains possible)

4.11.1 Extract of the ministerial directive

There is no "obstacle on the road" panel.

There is the A19 panel signalling the "potential presence of stones" on the road.

2nd Part – Article 40-5. Risk of falling rocks

The purpose of the A19 panel is to warn the user of an approaching area where there is a danger of falling rocks and the potential presence of rocks on the road. This panel can be completed by an extended M2 tab sign. It is recommended to provoke a decree, from the competent authority, prohibiting stopping in the dangerous area and implementing the corresponding B6d panels.

4.11.2 A3-D3 and D3: Obstacle on the road

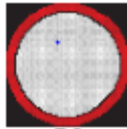
Sender: Uv – manual

DENM 10 / 0: Hazardous location – Obstacle on the road / Unavailable

We recommend using the AK14 pictogram associated with text signifying "obstacle."

4.12 Unmanaged obstruction on the road (road with blocked traffic)

4.12.1 Extract of the ministerial directive



B0



B1

There is no panel to signal an unmanaged obstruction on the road.

The "unmanaged" aspect of an obstruction on the road is not provided for in the regulations. From the time when the signalling warns of an obstruction, it is considered as managed.

There are several signals to warn of a closed or blocked road. But the main information for the driver is that it is no longer possible to drive on the road in question.

4th Part: Article 50. Circulation prohibited: The B0 panel indicates that, on the road it applies to, all circulation of vehicles is prohibited in both directions. The B0 signal may also be used as part of dynamic measures to cut roads with separated lanes (see art. 161, 171 and 176 of the 9th part).

4th Part: Article 50-1. One way: The B1 panel indicates at the beginning of one-way roads that vehicles can only circulate in the opposite direction. [...] The B1 signal may also be used as part of dynamic measures to cut roads with separated lanes (see art. 161, 171 and 176 of the 9th part).

9th Part: Article 152

[...] B0 and B1 signals:

The dynamic prohibition to circulate in both directions or the one way direction can only be signalled by the B0 and B1 signs (normal background). [...]

4.12.2 1.23.2. A3-D8 unmanaged obstruction on the road

Sender: Uv

DENM: 9/0: hazardous location – surface condition / unavailable

We recommend using a B0 pictogram, associated with text signifying "road blocked" or "risk of road blocked." Since this information is declared manually, precautions should be taken when posting the display.

4.12.3 D8: Unmanaged obstruction on the road

Sender: Platform

DENM 9/x: Hazardous location – Surface condition

We recommend using the B0 pictogram associated with text based on the cause code:

0 Unavailable	Road blocked
1: Rockfalls	Rockfalls
4: Subsidence (weakening)	Weakening
5: Snow drifts (avalanche)	Avalanche
7: Burst pipe (leaking pipe)	Burst pipe

4.13 Scheduled stationary and mobile roadwork

4.13.1 Extract of the ministerial directive



The road signage concerning stationary roadwork is rather complex, with in particular the implementation of Arrow board trailers, panels, markers and cones at well defined locations. To have the details, refer to part 8 (article 124 to 131, and particularly 130 B Stationary roadwork on road).

There is no specific panel signalling the presence of mobile roadwork. (see 8th Part - article 131 mobile roadwork C. - mobile equipment)

4.13.2 B1: Scheduled stationary roadwork

Sender: Ov and Platform

DENM 3 / 0: Roadwork / Unavailable

We recommend using the AK5 pictogram with the addition, if the information is available in the DENM:

- of the speed limit, in the form of a B14 pictogram, displayed when the regulation applies and not before
- of information concerning the side to move to (a KR43, KD10a, XA3a, XA3b, B21a1 or B21a2 directional arrow)



4.13.3 B1: Scheduled mobile roadwork

Sender: Ov and Platform

DENM 3 / 3: Roadwork / SlowMovingRoadMaintenance

We recommend using the AK5 pictogram with the addition of text signifying "mobile roadwork", if the information is available in the DENM:

- of the recommended speed limit, in the form of a C4 pictogram, displayed when the regulation applies and not before



- of information concerning the side to move to (a KR43, KD10a, XA3a, XA3b, B21a1 or B21a2 directional arrow).

4.14 Alert work on road

4.14.1 Extract of the ministerial directive

There are no panels signalling the presence of stopped patrol vehicles, protection vehicles, slow vehicles or priority vehicles on the road.

4.14.2 B2: Alert work on road (Slow vehicle on patrol)

Sender: Ov

DENM 26 / 1: Slow vehicle / Slow moving maintenance vehicle

We recommend using a specific pictogram associated with text signifying "VEHICLE ON PATROL."



4.14.3 B2: Alert work on road ("facilitate the passage" of approaching vehicle)

Sender: Ov

DENM 95 / 0: Emergency vehicle approaching / Unavailable

We recommend using a specific pictogram associated with text signifying "facilitate the passage of a service vehicle."



4.14.4 B2: work on road (Protection vehicle)

Sender: Ov

DENM 15 / 0: Rescue and recovery work in progress / Unavailable

We recommend using a specific pictogram associated with text signifying "PERSONNEL ON ROAD."



4.15 Winter Road Maintenance vehicles

4.15.1 Extract of the ministerial directive

There are no panels signalling the presence of this type of vehicle on the road.

But the highway code indicates:

- In this case the vehicle can be equipped with an operating flashing orange light and a visible AK5 or AK14 panel.
- If it is operating (snow removal or salting), the flashing blue lights are on and it is forbidden to pass them.

4.15.2 B3 - Alert priority winter road maintenance vehicles - winter road maintenance vehicle on road

Sender: Ov

DENM 3 / 6: Roadwork / Winter service

We recommend using a specific pictogram associated with text signifying "WINTER ROAD MAINTENANCE" or "WRM MACHINE."



4.15.3 B3 - Alert priority winter road maintenance vehicles - winter road maintenance vehicle clearing snow

Sender: Ov

DENM 26 / 6: Slow vehicle / snowplough

We recommend using a specific pictogram associated with text signifying "SNOW REMOVAL UNDERWAY" or "SNOW REMOVAL."



4.15.4 B3 - Alert priority winter road maintenance vehicles - winter road maintenance vehicle is salting












Sender: Ov















DENM 26 / 8: Slow vehicle / salting vehicles














We recommend using a specific pictogram associated with text signifying "SALTING UNDERWAY" or "SALTING."



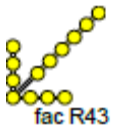









5. Synthesis

SCOOP name of use case	Code	Pictogram	Proposed text	Pop-up
A2-D1 and D1: Road temporarily slippery	6/0	 AK4	SLIPPERY ROAD	
D1: Road temporarily slippery	6/1	 AK4	ICE	
	6/2	 AK4	DIESEL	
	6/3	 AK4	MUD	
	6/4	 AK4	SNOW	
	6/5	 AK4	ICE	
	6/6	 AK4	ICE	
	6/7	 AK4	OIL	
	6/8	 AK4	GRAVEL	
	6/9	 AK4	ICE	
	6/10	 AK4	ICE	

SCOOP name of use case	Code	Pictogram	Proposed text	Pop-up
A2-D4a and D4a: stationary vehicle	94/0		STATIONARY VEHICLE	
A2-D4b and D4b: vehicle breakdown	94/2		VEHICLE BREAKDOWN	
A2-D5: Alert - accident area	94/3	 AK31	ACCIDENT	YES
A3-D5: Accident area not secured	2/0	 AK31	ACCIDENT	
D5: Accident area	2/x	 AK31	ACCIDENT	YES
A2-D6 and D6: Low visibility	18/0	 AK32	LOW VISIBILITY	
D6: Low visibility	18/1	 AK32	FOG	
	18/2	 AK32	SMOKE	
	18/3	 AK32	SNOW	
	18/4	 AK32	RAIN	
	18/5	 AK32	HAIL	
A2-D10: Alert emergency braking	99/1	 AK14	EMERGENCY BRAKING	YES
A2-D11 and D11: Alert end of queue	27/0	 AK30	TRAFFIC JAM	YES
A2-E6: Exceptional weather conditions (Strong precipitation)	19/0		STRONG RAIN	

SCOOP name of use case	Code	Pictogram	Proposed text	Pop-up
E6: Alert - exceptional weather conditions (thunderstorm)	17/4		THUNDERSTORM	
E6: Alert - exceptional weather conditions (wind)	17/1		WIND	
A3-D2a and D2a: Animal on the road	11/0		ANIMAL	
D2a: Animal on the road	11/x (except 2)		ANIMAL	
D2a: Animal on the road	11/2		HERD	
A3-D2b and D2b: Person on the road	12/0		PEDESTRIAN	
A3-D3 and D3: Obstacle on the road	10/0	 AK14	OBSTACLE	
A3-D8: Unmanaged obstruction on the road	9/0	 B0	RISK OF BLOCKED ROAD	
D8: Unmanaged obstruction on the road	9/0	 B0	ROAD BLOCKED	
B1: Scheduled stationary roadwork	3/0	 AK5  fac B14  fac R43  fac KD10		

SCOOP name of use case	Code	Pictogram	Proposed text	Pop-up
B1: Scheduled mobile roadwork	3/3	 AK5  fac C4  fac R43  fac KD10	MOBILE ROADWORK	
B2: Alert work on road (Slow vehicle on patrol)	26/1		VEHICLE ON PATROL	
B2: Alert work on road ("facilitate the passage" of approaching vehicle)	95/0		FACILITATE THE PASSAGE	YES
b2: work on road (Protection vehicle)	15/0		PERSONNEL ON ROAD	
B3 - Alert priority winter road maintenance vehicles - winter road maintenance vehicle on road	3/6		WINTER ROAD MAINTENANCE or WRM MACHINE	
B3 - Alert priority winter road maintenance vehicles - winter road maintenance vehicle clearing snow	26/6		SNOW REMOVAL UNDERWAY (otherwise, if MMI too short: SNOW REMOVAL	
B3 - Alert priority winter road maintenance vehicles - winter road maintenance vehicle is salting	26/8		SALTING UNDERWAY (otherwise, if MMI too short: SALTING	