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Directorate General of Traffic, approving the Variable Signage Manual
Submitted by Spain

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I. GENERAL PROVISIONS

INTERIOR MINISTRY

9838

Resolution issued on 1st June 2009, by the Directorate General of Traffic, approving the Variable Signage Manual.

Over the last quarter of a century, road traffic has undergone significant technological developments in terms of vehicles, drivers and the road. As regards this latter aspect, in addition to a major improvement in planning, construction and operating techniques, an unprecedented qualitative leap has also been taken thanks to the possibility of informing drivers in real time and on the road about circumstances that could optimise road safety, mobility, environmental impact and/or comfort levels.

Such improvements are the result of a chain that begins with the process of monitoring traffic, environmental and meteorological parameters, includes mechanisms to interpret these parameters and generate knowledge to make decisions, and finally is specified, among other actions, through the transmission of information. The most visible element for citizens in this chain is the circumstantial signage contained in Variable Message Panels (VMP).

The first generations of VMP appeared in the 1990s and presented serious technical limitations that prevented traffic authorities from developing advanced traffic management strategies. However, as these devices improved in terms of features and capacities, it was clear that the most important aspect is not the technology but rather the usefulness of the information or instructions conveyed. The richness of language means that information can be restricted to avoid alternative interpretations when messages are directed at large groups, and drivers and road users certainly constitute a large group. As soon as this communication difficulty was noted, for reasons of universality and in order to optimise road safety, mobility and comfort levels, the Directorate General of Traffic carried out an in-depth process of study, analysis and summarisation in order to unify and standardise the circumstantial signage criteria used by VMP.

This process took into account the design characteristics incorporated into the regulatory framework of national and international signage, including recent UN incorporations in the specific area of VMP. Furthermore, knowledge has been accumulated based on the experience gained and uses applied in Spain and in the states taking part in the European Study 4 (ES4 VMP Harmonisation), as part of the EC's Easyway programme. It has also taken into account the results of the SOMS–IN–SAFETY project, launched as part of the 6th Framework Programme. Finally, a series of empirical studies were conducted to study the comprehension of signs and alphanumerical elements.

By virtue of article 5 of the Spanish Traffic, Motor Vehicle Circulation and Road Safety Act, passed by Royal Legislative Decree 339/1990, of 2nd March («Boletín Oficial del Estado» issue number 63, of 14th March), as well as article 139.2 of the General Circulation Regulation, approved by Royal Decree 1428/2003, of 21st November («Boletín Oficial del Estado» issue number 306, of 23rd December), the Director General of Traffic hereby resolves as follows:

One. *Criteria governing the usage of Variable Message Panels.*– The use of Variable Message Panels on the road network for which the Central Traffic Authority is responsible will be governed by the criteria established in annex I of this Resolution.

Two. *Compulsory use of circumstantial signage contents on Variable Message Panels.*– In the circumstances established in Annex II of this Resolution, the use of messages expressly contained in this annex will be compulsory and it will be strictly forbidden to use any other pictogram or text.

Three.– Regarding the signage rules for Variable Message Panels issued by the Independent Central Traffic Authority, the Manual for Operators of Traffic Management Centres is hereby approved, published by the Directorate General of Traffic. The core content of this manual is included in annexes I and II of this Resolution.

Sole final provision. *Entry into force.*

This Resolution will enter into force on the day after its publication in the <<Boletín Oficial del Estado>>.

Madrid, 1st June 2009.– The Director General of Traffic, Pere Navarro Olivella.

ANNEX I

Circumstantial signage rules for Variable Message Panels

Following the publication of the Catalogue of Variable Messages in the General Circulation Regulation (RD 1428/2003 of 21st November), at the start of 2005 the Directorate General of Traffic presented the first version of the Manual for Operators of Traffic Management Centres. Four years later, it is now presenting this edition of the Variable Signage Manual, referred to hereinafter simply as the Manual.

The ultimate aim is to ensure that drivers, anywhere on the road network, will see on these panels information that is equally understandable, coherent and appropriate to the traffic context in which they find themselves, avoiding localisms and divergent practices. For this purpose, the most common road situations have been classified, the principles and criteria described below have been applied and, finally, the opportune regulatory signage has been defined, as described in Annex II.

This has been no easy task. The Manual has been compiled in the midst of two almost antagonistic tensions. On the one hand, it must take account of fundamental ergonomic recommendations, relating to the basic capacity to process information, reading time available on fast roads, etc, and promote designs that incorporate them. It must also take account of the current uses and customs in variable signage practices. In relation to this point, there is a negotiation between what is advisable and what is habitual – not always or necessarily contrasted – which must be treated carefully and overcome in each specific message.

Furthermore, the Manual must take account of the international context, the European perspective and multilingual national perspective. This perspective poses a challenge that must be overcome by following certain recommendations, in particular those that emphasise supra-linguistic elements: choose graphic elements (pictograms, abstract alphanumerical information) over natural language (words). In relation to this point, another conflict arises as regards the choice of graphics, their location on the panel and their relationship with alphanumerical elements.

To resolve the aforementioned difficulties, several empirical studies have been carried out, designed and implemented by the Sub-Directorate General of Traffic and Mobility at the Directorate General of Traffic and the University of Valencia Institute of Research into Traffic and Road Safety, through a cascade procedure, in which the results of one feed into the next. Firstly, a compared estimation test was performed to check comprehension, in accordance with ISO guidelines, and any designs that surpassed the minimum level of 45% went onto the next stage. Then, a comprehension test was carried out, also in accordance with ISO standards, which chiefly consisted of recording the understanding of a sign without giving more information that could contribute to the inference of its meaning. Within the framework of the ES4 study, eight member states contributed data from over 4,000 drivers, of which the Spanish sample represented 25% of the total. In this stage, the recommended alphanumerical features achieved sufficient levels of understanding. Finally, the relevant laboratory studies were performed for some signs, giving comprehension rates of around 90 % in France and 96 % in Italy.

As a result of this work, the Manual incorporates certain changes, although it largely makes the most of the advantages offered by its predecessor. Hence, the Manual is still accessible, direct and easy to use, and maintains certain structural, formal and content characteristics. For example, it maintains the same basic design principles in the messages, such as the structure and location of the different types of informative elements (pictogram, alphanumerical elements); the fundamental order of road and traffic situations (traffic, capacity, adherence, visibility, wind), and the same display format for each situation, in which each page includes the number, name

and verbal description of the situation, a sketch by way of a graphic example, the specific examples of panels proposed to handle this situation in its different alternatives, etc.

Particular mention should be made of the new features introduced, as a result of intense reflection over these past years and the enrichment achieved through the DGT's participation in international groups. Perhaps the most fundamental new feature is the greater specificity and specification of the design criteria and openness towards possible operating principles that could guide variable signage. Hence, new and complementary criteria are incorporated to organise contents in the alphanumerical area; elements are included to give priority to location (over function), to provide more specific messages; new and redesigned traffic signs are contributed; the level of realism is increased... All these aspects constitute the dimensions and criteria of design and usage applied to the Variable Message Panels (VMP) described below. The Manual has mainly developed on the back of its predecessor, although with certain innovations and modifications aimed at a practice structured around five basic criteria, specified through fundamental principles and their consequences for VMP signage, which at times imply obligation and at others prohibition. These are detailed in the road situations described in Annex II.

- Criterion 1 (aspects prior to the use of VMP) refers to issues prior to the use of VMP (the 'on/off' dilemma; traffic and non-traffic messages, etc.).

- Criterion 2 (use of pictograms in VMP) focuses on matters relating to pictograms (selection, use of double pictograms) and on the numerous pictographic innovations in this edition.

- Criterion 3 (use of alphanumerical elements in VMP) also incorporates many innovative aspects: it proposes an organisation of contents based on location (like FIVE), and the order of the elements; it provides greater definition about what is understood by the nature of the event, identifies abbreviations, abstract alphanumerical elements and standard verbal tags, predetermines location, etc.

- Criterion 4 (strategies for locating road events) represents an advance in operational considerations (distance to the event), and their integration with the same VMP design. The near/far distinction in the use of VMP has direct consequences for road safety.

- Criterion 5 (use of regulatory messages) proposes an examination of operating rules and their relationship with the applicability of the regulatory function in VMP.

Criterion 1: Aspects prior to the use of VMP

On/off option: a fundamental issue

VMP provide information about unexpected or changing circumstances in the traffic or on the road. A switched-off VMP gives the driver the impression that, within the range of information usually given by these devices, there is nothing on the horizon of his/her journey that could cause concern. When there are many VMP switched on and displaying information, the driver might experience the start and subsequent reduction of uncertainty without fully tracing the content of the message in question; in other words, mechanically (same congestion as always, same times as always). Having reached this point, in systemic terms, the display of information experiences a certain level of deterioration. If, previously, the driver has overcome this problem without taking especially dramatic measures, we run the risk of not preparing him/her adequately when it is really required.

Principle 1. The VMP must only be switched on if important information must be conveyed to drivers.

Use of traffic and non-traffic messages

In some cases, however, it is thought that VMP should be used to provide extra support for information related with 'generic' road safety campaigns, using them as another means of mass communication.

Principle 2. 'Traffic messages' will be displayed using left-aligned text together with a pictogram; whereas 'non traffic messages' will be displayed using centred text and with no pictogram.

with pictogram, left-aligned

ESSENTIAL TRAFFIC MESSAGE

different from

OPTIONAL NON-TRAFFIC MESSAGE

no pictogram, centred text

Principle 3. «Non-traffic messages» may only be displayed if there is no «traffic message» to show. To put it another way, "traffic messages" take priority over "non-traffic messages".

Principle 4. "Non-traffic messages" may only be displayed during periods of less intense traffic and within a limited frame of time, both in terms of the day (for example two hours) and the period (for example, two weeks).

Principle 5. Non-traffic messages will always be linked to a specific road safety campaign, through which this message takes on meaning and may be conveyed previously and simultaneously in other media (press, radio, television, billboards, etc.). This will achieve maximum recognition of the message with minimal interference.

The number of units of information per message

A VMP may communicate a message efficiently if it is legible, bearing in mind the distance from the driver and the time s/he has to read it. In theory, to achieve this, and assuming that the corresponding regulations have been taken into account by the manufacturers of these panels, the driver must have normal or corrected vision. Compliance with these requirements will respond to two fundamental questions: the reading distance that must be established and the number of units of information that will be read: the more units, the greater the reading time required.

Clearly, this matter is directly linked to the speed at which the driver is travelling. A driver travelling at 120 km/h covers 33 metres a second. With standard vision, this individual is capable of reading a VMP at a distance of around 200 metres. The last few metres before the panel must be subtracted from this distance because we should not assume that the driver will raise his/her eyes to a degree of over 10-15 degrees to read. In short, there is a 'reading window' of around 165 metres, equivalent to 4.5 to 5 seconds to read the VMP at least twice. The idea is to link this timeframe with the number of information elements. This relationship is normally expressed using the following simplified formula:

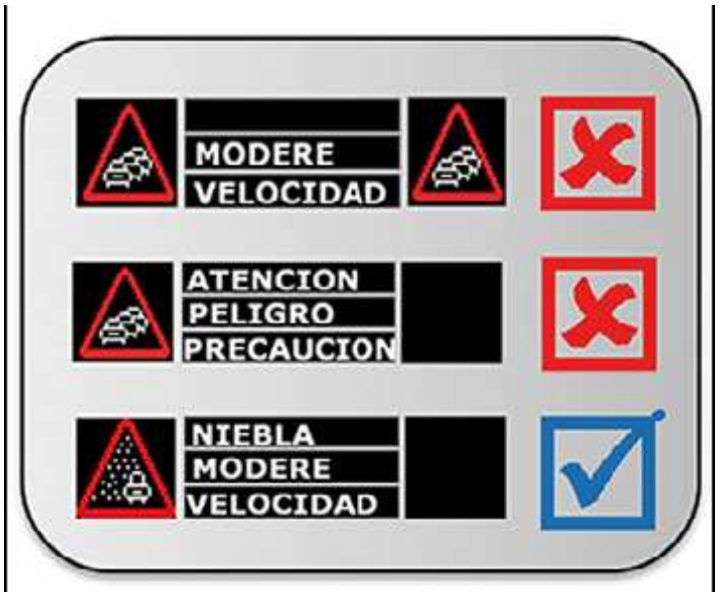
$$t = \frac{2 + n}{3}$$

Where *t* is the time in seconds and *n* is the number of information elements that must be read. To read three information elements will take around 3 seconds (reading twice). With a reading window of 5 seconds at 120 km/h, the message must necessarily be brief and easy. It is hardly surprising that drivers slow down as they approach variable message panels, especially when they carry more text. A message with six information units requires, in theory, at least 4 seconds according to the formula described above. Slowing down to 100 km/h gives drivers an extra second, which allows them to read the message more comfortably. This type of response – drivers slow down to read longer messages – usually occurs in real traffic situations and therefore must be borne in mind. An important question is the concept of a «unit of information». One could say that these units of information comprise informative elements such as pictograms, place names, numbers, abbreviations, descriptors, etc. So, a unit of information is defined as the response we get to a significant question for the driver. A unit of information might be, for example «maintain safety distance», «tailbacks», or «recommended diversion», etc.

Principle 6. In a range of between 4 and 7 words together with a pictogram, travelling at speeds of 120 km/h, between 2 and 4 units of information are completed per message. These parameters must not be exceeded except in exceptional cases, for example, alternating messages when travelling at speeds of 60 km/h owing to congestion or forecast snow.

The need to avoid redundancy

Drivers have a limited time to understand the message, and therefore unnecessary and particularly redundant terms must be avoided. Hence, practices such as repeating the same pictogram twice (on panels with double pictograms), or repeating all or part of the meaning already transmitted through the pictogram with the text are not acceptable (for example, using words such as warning, danger or precaution next to a pictogram that already warns of danger). If the driver should have the opportunity to read the message at least twice, this task must be facilitated. The only exception to this rule is the use of additional text to support certain pictograms whose meaning is not entirely clear or which have been incorporated recently – semantic orthopaedics.



SLOW
DOWN

WARNING
DANGER
PRECAUTION

FOG
SLOW
DOWN

Principle 7. Unless the Director of the Traffic Management Centre issues a direct order to the contrary, the following conditions must be obeyed:
- Do not display alternating messages
- Not exceed 7 words per aspect
- Do not repeat in the text, totally or partially, what the pictogram already transmits (redundancy)

Principle 8. In regions of Spain that have more than one official language, two alternating messages shall be sent to the VMP: one incorporated in Annex II, and the other in the joint official language. The translation into the joint official language shall be determined by the Director of the Management Centre.

Principle 9. In cases in which it is decided that an alternate message shall be sent in an official language of the European Union, two alternating messages shall be sent to the VMP: one incorporated in Annex II, the other in an official language of the European Union. The translation into the other official EU language shall be determined by Central Services at the Directorate General of Traffic.

Criterion 2: Use of pictograms in VMP

Choice of the main pictogram

The pictogram is the main element that transmits information since it summarises complex road or traffic situations, can generally be read at double the distance of text and potentially transmits a universal language. Priority must be given to pictograms that specifically reflect the situation as opposed to more generic ones, because a specific pictogram transmits more information and requires less additional text to communicate something.

Principle 10. Priority must be given to pictograms showing consequences as opposed to those that inform about causes, since the former convey more important information in the time order of actions that must be carried out by the driver and are usually more specific.

specific	generic
better than	
consequences	causes

Rules for the positioning of information on VMP with a double pictogram

Principle 11. If there is a regulatory sign on the left, on the right there should either be a regulatory sign, warning of danger, or an informative one. The sign on the left – obligation or prohibition – should not be the same as the sign on the right (principle of redundancy), although it could be a sign with the same function but with different content.

Principle 12. If, on the left, there is a sign warning of danger, on the right there could be a sign either warning of danger or providing information. The sign on the left – danger warning – should not be the same as the sign on the right (principle of non-redundancy) although it could be a sign with the same function but with different content.

Principle 13. If on the left there is an informative sign, on the right there may only be an informative sign. The sign present on the left – informative – must not be the same as the sign on the right (principle of non-redundancy), although it could be a sign with the same function but with different content.

As with all things, there are some exceptions and the most significant one is probably the sign obliging drivers to respect certain safety distances. This pictogram is often located on the right, not on the left, accompanied by the danger pictogram on the left (tailbacks, slippery road surface). In some cases, it even seems advisable to do it like this (it seems that «there is a 4 km tailback – respect safety distances», is more easily understood than «respect safety distances for 4 km – due to tailbacks». In actual fact, what this situation indicates is that this sign must be used as a danger warning, or a recommendation, with an informative use. Furthermore, it is difficult to specify the recommended safety distance (see Criterion 5), and drivers find it difficult to know whether they are keeping a distance of 60, 80 or 100 metres from the vehicle in front, although they might understand that they have to exercise caution in this respect. In any case, these conditions must be taken into account and implemented only on the instructions of the Director of the Traffic Management Centre

Incorporation of new and redesigned pictographic elements

One of the problems encountered in the management of VMP is the lack of pictograms for all the situations required. This problem is closely linked with the short period of implementation and relatively recent introduction of variable signs, limited to the last 20 years, in comparison with the majority of «static» traffic signs, standardised between 1909 and 1968. VMP offer management and operational possibilities that had not been considered previously (for example, redirecting traffic for 6 hours), and these possibilities require new pictograms. When the need for a new traffic sign is observed, two options present themselves: total innovation and a kind of graphic syncretism (condensation). This latter option was taken at the Vienna Convention on Road Signs and Signals in 1968 (and therefore is implemented in the General Circulation Regulation) and has materialised through techniques of addition and transfer.

addition *transfer*

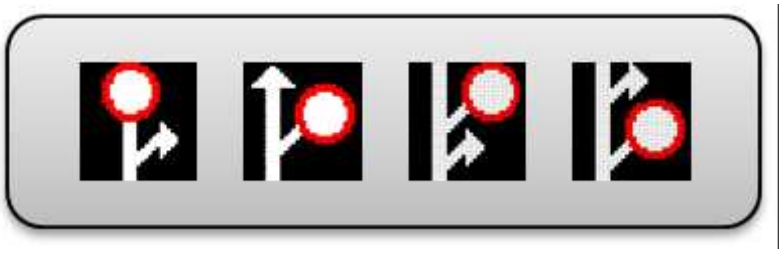
Principle 14. New signs are incorporated (obtained through the transfer of danger signage) for the variable signposting of equivalent circumstances but not dangerous in the short term.

	Tailbacks	Road Works	Slippery surface	Ice or snow	Poor visibility	Wind	Accident
Danger (close)							
Information (far)							

Principle 15. **Driveable hard shoulder**. New signs are incorporated by means of addition, relating to the viability of the hard shoulder, broken down into three graphic elements: a) hard shoulder driveable or available, b) driveable hard shoulder that will soon become unavailable, c) hard shoulder unavailable or non-driveable.

Driveable hard shoulder	Leave the hard shoulder	Non-driveable hard shoulder

Principle 16. Road closed. A series of signs are incorporated to indicate a closed road (no exit, with exit or in the exit) through the derivation of basic lane signs and the no entry sign.



Principle 17. Tailbacks. Option «a» is established to indicate «tailbacks on the main road, alternative exit», or to indicate «tailbacks on exit, alternative main road». Option «b» develops the same concepts, but for the case in which the tailback is far from the VMP.

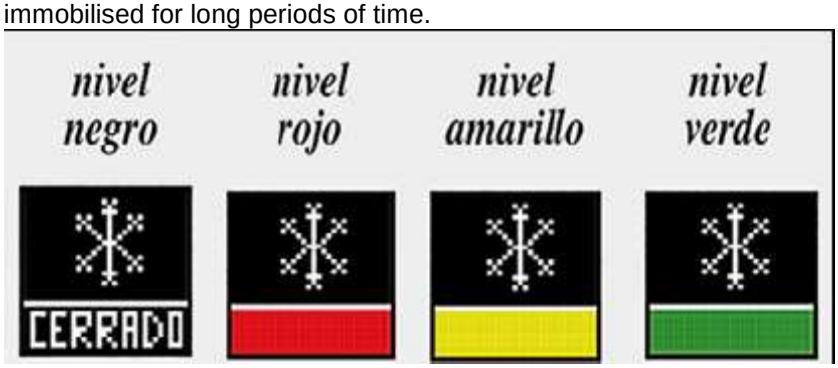
Principle 18. Snow indication colours. Four levels of driving/traffic are established associated with the condition of the road surface due to the presence of snow.

- Green. Means caution. It is just starting to snow. Although traffic will not be affected, caution should be exercised. Drivers are advised not to exceed 100 km/h on motorways and dual carriageways, and 80 km/h on other roads. Trucks and lorries should drive in the far right-hand lane and may not overtake.

- Yellow. Means precaution. The road surface is starting to be covered with snow. At this level, articulated lorries and vehicles are not permitted on the road. Cars and buses should not exceed 60 km/h.

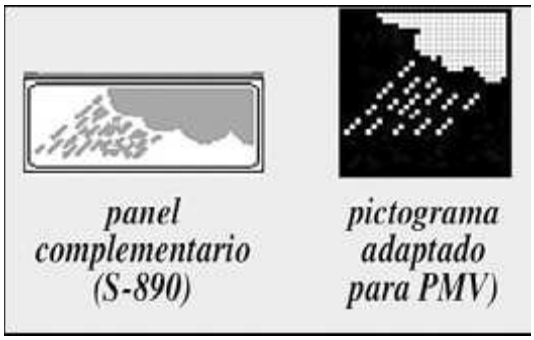
- Red. Means driving conditions are very difficult. The road is completely covered in snow. In this situation, vehicles are only permitted on the roads if they use chains or other authorised devices. Maximum recommended driving speed is 30 km/h. Buses, lorries and articulated vehicles are not permitted on the roads.

- Black. Means that the road is impassable to any kind of vehicle and there is a clear risk of being immobilised for long periods of time.



Black level CLOSED	Red level	Yellow level	Green level

Principle 19. Rain. The complementary panel S-890 is transferred to indicate the presence of rain on VMP.



Complementary panel (S-890)	Pictogram adapted for VMP

Criterion 3: Use of alphanumerical elements on VMP

Principle 20. The organisation of contents in the alphanumerical zone

As a premise, the fundamental principle that each type of information should occupy its own line should be observed: first line for additional information about the nature of the event; second line for information about the distance and/or extension; and third line for causes or additional advice. When organising content in the alphanumerical zone, the following considerations shall be taken into account:

1. Inevitably, the criteria regarding the positioning of information must be flexible depending on the type of information, although within a fixed order. Information shall be positioned depending on its type in the following order: nature of the event – location – advice – cause. The final assignation of spaces will depend on the needs and possibilities offered by the type of VMP.

2. A distinction should be made between simultaneous or consubstantial causes to the main event (almost always meteorological events or causes that directly affect visibility and road adherence), and consecutive causes to the main event (at a different location from that of the preceding event). Simultaneous causes (snow, rain, ice, smoke, etc.), are understood to be the nature of the event and are displayed on the first line of the VMP, followed by the pictogram that provides further details. Consecutive causes (accident, works, road closed, etc.), are shown on the third line of the VMP, or in the second pictogram in VMP with two pictograms.

3. It is advisable to classify the extension of the event, particularly in quantitative terms, as information relating to the nature of the event and not separate from it (such as distance). Preferably, it should be positioned on the first line of the VMP.

Principle 21. Abbreviations, abstract alphanumerical elements and verbal tags. Internationally standardised abbreviations or those indicated by the Spanish Royal Academy shall only be incorporated into VMP in the following cases:

Concept	Abbreviation
Kilometres	km
Metres	m
Minutes	min
Tonnes	t
Kilograms	Kg
Bridge	PTE.
Exit	S.
Direction	DIR.
Council	AYTO.
Main road	CTRA.
Avenue	AVDA.
Road/Street	C.
City	CDAD.
Right	DCHO. / DCHA.
Left	IZDO. / IZDA.
North, South, East, West	N, S, E, O

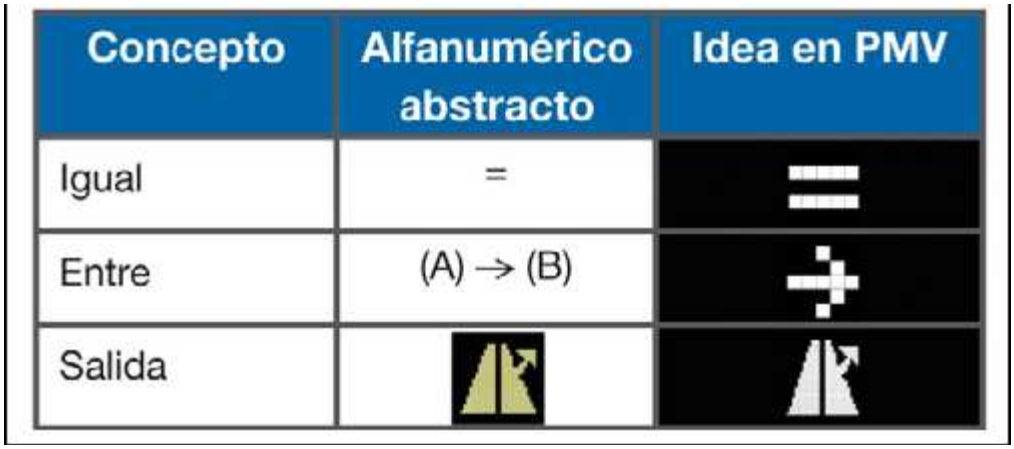
Principle 22. Quantitative extension of an event. To give a quantitative indication of the extension of the event indicated in the pictogram, the sign «=» shall be used on the first line of the alphanumerical section together with the corresponding number of kilometres.

Principle 23. Qualitative extension of an event. To give a qualitative indication of the extension of the event indicated in the pictogram, the two geographical locations shall be indicated: On the second line of the alphanumerical section, the geographical location where the event starts; on the third line of the alphanumerical section, the geographical location where the event finishes.

Principle 24. General indication of the extension of an event. To communicate the extension of the event indicated in the pictogram quantitatively, the sign «→» shall be used, which will separate the origin from the end of the same expressed in kilometres on the road.

Principle 25. The sign indicating an exit on a road expressed using alphanumerical elements.

Whenever VMP technology allows, the symbol S-341; S-342 should be gradually introduced to indicate “Exit””.



Concept	Abstract alphanumerical element	Idea in VMP
Equals	=	
Between	(A) → (B)	
Exit		

Criterion 4: Strategies for the positioning of road events

One of the aspects that cause great concern to traffic managers and variable messaging operators is the proximity of the VMP to certain dangerous traffic events. Drivers have a limited margin to react and adapt to the situation, especially on high speed roads. In contrast to the omnipresence of static signs on the road network, in a figure-background relationship in the context of the traffic, VMP are more illustrative and salient than static signs, they are more attention grabbing, which strengthens their influential capacity. But the problem is not the identification of important information, but rather the space-time dimension: when an event is reached, how much time information is retained for, how long a current alert is maintained. Furthermore, VMP are more flexible instruments than static traffic signs, but they are also more problematic. In contrast to the highly structured world of static signs, we never know which exact danger we are going to have to announce on a VMP. In contrast to the relatively narrow range in distance between a static sign and the event (150-250 m to warn of danger; 500-1000m for directional warnings, etc.), the distance between the panel and the dangerous event is never determined beforehand in VMP. This issue has never been seen as a problem; rather its advantageous effect has been noted, «we can announce danger due to tailbacks 15 km away». However, travelling 15 km at 120 km/h takes around 8 minutes, which will quadruple the standard assimilated by the driver of the imminent and immediate, built on the basis of previous experience with static signs.

minutos	1	2	3	4	5	6	7	8
metros	2.000	4.000	6.000	8.000	10.000	12.000	14.000	16.000

minutes	1	2	3	4	5	6	7	8
metres	2,000	4,000	6,000	8,000	10,000	12,000	14,000	16,000

In practice, the solution to this issue involves assuming that danger warnings must be relatively close to VMP and, consequently, adopting various rules for the use of VMP that warn of danger. Messages that warn of danger use the red triangle, because they provide 'hot' information. Their objective is road safety, triggering preventive action. As the danger is close enough to hold the driver's attention until it is encountered, it is not necessary to indicate the distance. The recommendation to «slow down» reinforces the idea of the imminent and immediate. Messages that inform of danger do not incorporate the red triangle because they provide 'cold' information. Their objective encompasses the following parameters: comfort, efficiency, mobility (possible re-routings) and road safety. For this reason, it is important to indicate a distance that gives the driver sufficient margin for the possible actions required. A greater distance between the panel and the event (10 km, 20 km…), permits a broader margin of action.

Hence, it is a good idea to distinguish between a warning of danger and information about danger, both in terms of form, treatment and function. The purpose of making this distinction is to give the driver keys to decipher which messages require special, direct and unavoidable attention, and which messages require simply being aware of a situation that might or might not apply. Hence, the driver understands, in the first case, that s/he must tackle this event in the medium term or that perhaps should do something to avoid it. To distinguish between the two types of events, the driver must be provided with categorisation elements, characteristics that permit him/her to determine whether the information displayed belongs to one or the other set. The Manual proposes two characteristics to resolve this problem: the first, through the pictorial representation of danger (with or without red triangle); the second, thanks to the indication of the distance from the event (absent or present).

Principle 26. Limit the margin of anticipation

The danger warning sign (red triangle) will only be used on VMP when the dangerous event is near. In operational terms, with traffic flowing at 120 km/h, the term 'near' is equivalent to between 0 and 4 km, or between 0 and 2 minutes.

Principle 27. Do not specify the distance on the panel before near events

The driver should not be given the chance to consider whether 500m or 2 km is near or far. We have to get them used to taking action as soon as they see the danger warning pictogram (to slow down, to increase or maintain their attention, to be more alert), because they understand that they will soon encounter danger, albeit non-specific in nature.

Principle 28. Extend the margin of anticipation

The strategy of informing – instead of warning – about a danger on a VMP will only be used when the dangerous event is relatively far away. This range is, with a traffic flow of 120 km/h, at least 5 km or 3 minutes away. Naturally, there is a certain margin of assignation between near and far in terms of time and distance, determined at the discretion of the Directors of Traffic Management Centres.

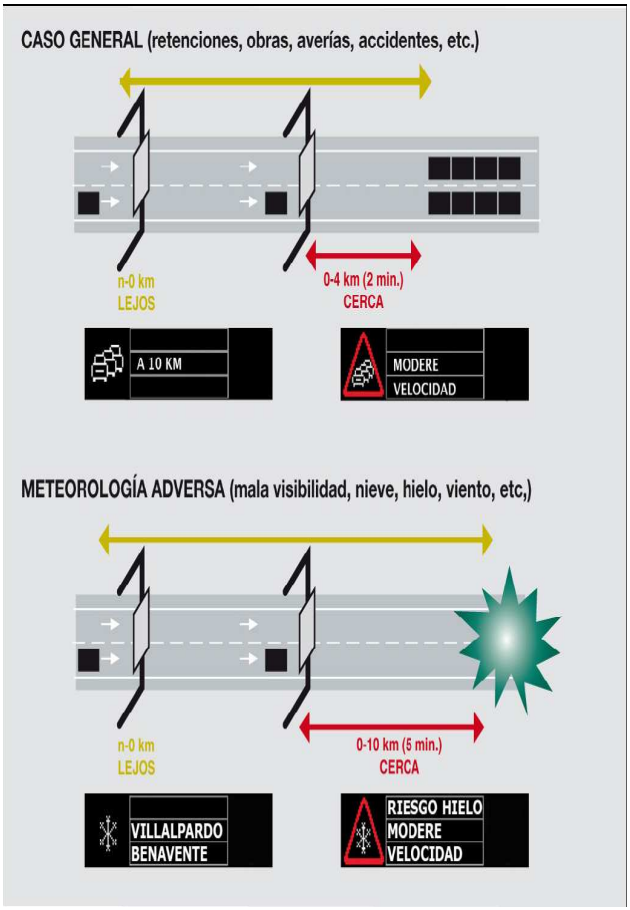
Principle 29. Indicate the distance on the panel before far-off events

The distance to far-off events will be indicated on the VMP, in whichever format is possible (numerical, qualitative distance).

Principle 30. Present a far-off danger without a red triangle.
Information about a danger that is still a fair way away shall be presented without the red triangle.

Principle 31. Nearness or farness of meteorological events: an exception to bear in mind

For cases of adverse weather, the distance of nearby danger will double (10 km) and far-off events will be classed as those located over 10 km away.



GENERAL CASE (tailbacks, road works, broken-down vehicles, accidents, etc)

n-0km	0-4 km (2 min)
FAR	NEAR
10 KM	SLOW DOWN

ADVERSE WEATHER (bad visibility, snow, ice, wind, etc)

n-0km	0-4 km (2 min)
FAR	NEAR
	RISK ICE
VILLALPARDO	SLOW
BENAVENTE	DOWN

Criterion 5: Use of regulatory messages

The regulatory function, obliging and prohibiting, is normally unpopular with drivers. This function announces restrictions and changes plans and expectations that individuals had assumed during their journey (speed of travel, manoeuvres, directions, etc.), although they should understand its necessity. Therefore, when directors consider this option, they must know what they are dealing with and make sure they comply with a series of conditions and know a series of parameters. In this respect, the rules of functional adaptation, quantification, vigilance and sanction shall be taken into account.

Principle 32. Functional adaptation of the regulatory function

Before using the regulatory function on VMP, we must make sure that the specific prohibition or obligation is in fact the solution to the road or traffic situation.

Principle 33. Quantification of the regulatory function

If the first rule is applied, the second step will be to make sure the terms of the prohibition or limitation can be established clearly, in their specific magnitudes (time, place, distance, extension, etc). Ultimately, if functional adaptation determines that prohibition is opportune, quantification will determine whether specific levels of this prohibition can be established. These are two rules of coherence.

Principle 34. Vigilance and sanctioning support

The reasonable possibility of controlling and sanctioning illegal behaviour derived from non-compliance with circumstantial signage must be determined. The operational effectiveness of sanctioning determines the capacity to manage an obligation or limitation efficiently and credibly. If the three rules – adaptation, quantification, vigilance – are obeyed, it will undoubtedly be appropriate for circumstantial signage to display regulatory messages. Otherwise, a danger warning should be issued, so that drivers regulate their own conduct (if they deem the warning to be justified and understand the danger, they will regulate their driving), or the option will be made simply to recommend a course of action so that the driver can decide whether to accept and follow the advice.

ANNEX II

Manual for Operators of Traffic Control Centres

1. TRAFFIC

Variable Message Panels. Road Situations and Management Actions

1.1.1 TRAFFIC, TACTICAL, BLACK

The aim is to warn drivers that a road is totally closed. No lane is open; therefore we have black levels of traffic (complete gridlock).

FAR	NEAR	ALREADY REACHED EVENT

ALTERNATIVE
DISTANCE/EXTENSION
FORMULAS FOR
THE TEXT

1.1.2 TRAFFIC, TACTICAL, RED/YELLOW

The aim is to signal a tailback on a road. We have red and yellow traffic levels.

FAR	NEAR	ALREADY REACHED EVENT

ALTERNATIVE
DISTANCE/EXTENSION
FORMULAS FOR
THE TEXT

1.2.1.1 TRAFFIC, STRATEGIC, BLACK, *SAME ROAD*

The aim is to get traffic off the main road which is total closed (black level traffic)

FAR – NEAR

ALTERNATIVE
DISTANCE/EXTENSION

FORMULAS FOR
THE TEXT

1.2.1.2 TRAFFIC, STRATEGIC, BLACK, *DIFFERENT ROAD*
The aim is to prevent the traffic from heading towards a destination via a certain road because it is totally closed (black level traffic)

NEAR – FAR No alternative route Follow a consecutive order over time (e.g. 1 for six months, 2 after this time) With alternative (before closed road) With alternative (after closed road) Follow a consecutive order over time (e.g. periods of four/six months for 1, 2 and 3)	EXIT 21 EXIT 19 Location of black level traffic EXIT 17 NEAR FAR (GENERAL CASE)

1.2.2.1 TRAFFIC, STRATEGIC, RED/YELLOW, *SAME ROAD*

The aim is to get part of the traffic to take a diversion, either through an explicit recommendation (management messages) or of their own accord, thanks to the information displayed (information messages)

FAR NEAR ALREADY REACHED EVENT

ALTERNATIVE
DISTANCE/EXTENSION
FORMULAS FOR
THE TEXT

Management	Management
Info-management	Info-management
Information	Information
FAR	ALREADY REACHED EVENT

1.2.2.2 TRAFFIC, STRATEGIC, RED/YELLOW, *DIFFERENT ROAD*

The aim is make part of the traffic accessing a link with a road aware of the state of traffic on that road or section (and encourage at least some drivers not to take that road but rather find an alternative route)

FAR-NEAR Management Alternating Alternating Follow a consecutive order over time (e.g. 1 for six months, 2 afterwards) ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT Information	 Location of incident NEAR FAR

1.2.2.3 TRAFFIC, STRATEGIC, RED/YELLOW, *ON ACCESS TO ANOTHER ROAD*

The aim is to inform part of the traffic accessing a link road of the state of traffic on that road or section (so they are encouraged not to take that link road)

FAR NEAR Follow a consecutive order over time (e.g. 1 for six months, 2 afterwards)	NEAR FAR

2.1.1.1 LANE ALTERATION CAPACITY, CLOSED, *RIGHT*

The aim is to warn the traffic that one or more lanes on the right-hand side of the road are closed (due to road works, accidents, etc)

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	NEAR	ALREADY REACHED EVENT

2.1.1.2 CAPACITY, LANE ALTERATION, CLOSED, *LEFT*

The aim is to warn the traffic that one or more lanes on the left-hand side of the road are closed (due to road works, accidents, etc)

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	NEAR	ALREADY REACHED EVENT With no traffic on closed lane With traffic on closed lane (additional lane in opposite direction)

2.1.2.1 CAPACITY, LANE ALTERATION, ADDITION, *TOWARDS DESTINATION*

The aim is to get part of the traffic to divert off the main trunk of the road using the direct lane (additional, reversible). It also aims to guarantee that the traffic returns to the main road correctly

Start of the transfer

Start of the incorporation section

FAR NEAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT Up to 500 m Management (Flashing arrow) Management (Fixed arrow)	FAR NEAR Up to 750 m

2.2.1.1 CAPACITY, HARD SHOULDER ALTERATION, TRAFFIC PERMITTED, *MAIN SECTION*

The aim is to warn the traffic that it may use the hard shoulder

BEFORE ENTERING ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	ALREADY REACHED EVENT During Exit warning Closure warning

2.2.1.2 CAPACITY, HARD SHOULDER ALTERATION, TRAFFIC PERMITTED, *ACCESS (RAMP METERING)*

The aim is to warn traffic on the main road of the length of access on the hard shoulder to facilitate incorporation from the link section to the main section of the road.

NORMAL ACCESS PROLONGED ACCESS ON HARD SHOULDER

NEAR – ALREADY REACHED EVENT

With traffic

Without traffic

With traffic

2.2.2 CAPACITY, HARD SHOULDER ALTERATION, HARD SHOULDER CLOSED/BLOCKED

The aim is to warn traffic of the presence of obstacles on the hard shoulder (due to accidents, road works, etc.)

FAR-NEAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	ALREADY REACHED EVENT

3. ADHERENCE

Variable Message Panels: Road Situations and Management Actions

3.1.1 ADHERENCE, GENERAL, MODERATE RAIN

The aim is to warn traffic of the existence of an area on the road with a risk of skidding due to excess water or puddles caused by moderate rain (intensity < 5 mm/h)

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	NEAR Follow a consecutive order over time (e.g. 1 for 6 months, 2 from then on)	ALREADY REACHED EVENT

3.1.2 ADHERENCE, GENERAL, INTENSE RAIN

The aim is to advise traffic of the existence of an area of the road with a risk of skidding due to excess water or puddles caused by intense rain (intensity > 5 mm/h)

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	NEAR Follow a consecutive order over time (e.g. 1 for 6 months, 2 from then on)	ALREADY REACHED EVENT

3.2.1 ADHERENCE, SNOW OR ICE, BLACK LEVEL

The aim is to warn traffic of the existence of a road that is closed due to snow. Strategic messages are used to prevent traffic from entering roads that have been restricted due to snow.

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	NEAR Distance 1-5 km Tunnels < 1 km General: compulsory	ALREADY REACHED EVENT

General: strategic Level of service: black Lorries: strategic diversion Lorries: road open times	Lorries: compulsory diversion	

3.2.2 ADHERENCE, SNOW OR ICE, RED LEVEL

The aim is to warn of red-level traffic due to snow and the consequences of this situation

FAR	NEAR	ALREADY REACHED EVENT
ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT Rerouting Alternating	Alternating Alternating Rerouting	Cars

3.2.3 ADHERENCE, SNOW OR ICE, YELLOW LEVEL

The aim is to warn of yellow-level traffic due to snow and the consequences of this situation

FAR	NEAR	ALREADY REACHED EVENT
ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT Alternating Rerouting Alternating	Alternating Rerouting Alternating	Alternating

3.2.4 ADHERENCE, ICE OR SNOW, GREEN LEVEL

The aim is to warn of green-level traffic due to snow and the consequences of this situation

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT NOTE: a mountain pass is accepted as a locator in snow	NEAR	ALREADY REACHED EVENT

4. VISIBILITY

Variable Message Panels: Road Situations and Management Actions

4.1.1 VISIBILITY, FOG, MODERATE

The aim is to warn of reduced visibility on the road owing to the presence of moderate fog (visibility > 250 m)

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	NEAR	ALREADY REACHED EVENT

4.1.2 VISIBILITY, FOG, DENSE

The aim is to warn of reduced visibility on the road owing to the presence of dense fog (visibility < 250 m)

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	NEAR	ALREADY REACHED EVENT Speed flow > 60 km/h Speed flow < 60 km / h

5. WIND

Variable Message Panels: Road Situations and Management Actions

5.1 WIND

The aim is to warn of the presence of high winds on the road

FAR ALTERNATIVE DISTANCE/EXTENSION FORMULAS FOR THE TEXT	NEAR	ALREADY REACHED EVENT