

INTERIM ADVICE NOTE 109/08

Advice Regarding the Motorway Signal Mark 4 (MS4)

Summary

This document provides advice on usage of MS4 signal and when they can be used to replace MS3 signals.

Instructions for Use

This IAN should be forwarded to all contractors and agents that perform work on behalf of the Highways Agency.

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1. Introduction and Implementation

1.1 The design and reliability of electrical/electronic components has progressed since the introduction of the Motorway Signal Mark 2 (MS2) in the early 1990s and the MS3 in the late '90s. Advances have been made in Light Emitting Diode (LED) technology that enables a wider viewing angle and a higher resolution display with two colours. These developments have been incorporated into a new generation of motorway signal, known as the Motorway Signal Mark 4 (MS4) as shown in Figure 1.



Figure 1. Motorway Signal Mark 4 (MS4)

1.2 The cantilever mounted MS4 is now a standard Motorway Signal and may be used as an alternative to the cantilever mounted two line MS3, for use on D2M and D3M motorways, shown in Figure 2.



**Figure 2. Two Line Motorway Signal Mark 3 (MS3)
- the MS4 is an alternative to this MS3**

The two line MS3 is capable of displaying either 2 rows of 16 characters (of 400mm nominal character height) in Enhanced Message Sign only mode, or 2 rows of 12 characters, plus an

Enhanced Matrix Indicator (EMI) in combined mode (as shown in Figure 2.). The MS4 display panel and cantilever structure are Bulk Purchase supplied equipment.

1.3 The cantilever mounted MS4 is not an alternative or a replacement for the 3 line strategic MS3. The three line MS3, which displays 3 rows of 18 characters of 400mm nominal character height, as shown in Figure 3, will remain the standard motorway signal for strategic use.



**Figure 3. 3 x 18 Motorway Signal Mark 3 (MS3)
- the MS4 is not an alternative to this MS3.**

The MS4 is also not a replacement for the reduced character height (nominal 320mm) tactical VMS, displaying 3 rows of 12 characters, used to support lane signals on portal gantries (see section 5 for details).

1.4 It is the project sponsor's and scheme designer's option to use either the cantilever mounted MS4 or the cantilever mounted two line MS3, having taken into consideration the guidance given in section 2 below and the views of the relevant Regional Control Centre Manager and Traffic Operations Regional Director.

1.5 Departmental Standard TD46: Motorway Signalling, stipulates when MS3s should be provided and should be used to determine the level of provision of MS4s. Both MS3s and MS4s are commonly installed as replacements for central reserve MS1 (also known as motorway matrix) signals as part of a "Triple Package" (signals, MIDAS and communications system) or MIDAS and signals "Automatic Queue Protection" upgrade.

1.6 This Interim Advice Note does not affect the location and spacing of the signals, which remain in accordance with the Standard. However, the increased visibility of the MS4 may result in two or more signals being visible to drivers at the same time, particularly on motorways having a largely straight alignment. As the principal benefit of the MS4 is its reduced size, and hence visual and environmental impact, sympathetic consideration will be given to departures from the standard spacing where it can be shown that an acceptable level of driver information and safety is provided by the alternative spacing. Similarly departures seeking variations from the standard spacing to allow the positioning of the MS4 in less obtrusive locations (e.g. immediately in front of a structure), will also be considered sympathetically. Additional work is in progress to assess the extent to which guidance on the

spacing and location standards can be relaxed when this Interim Advice Note is incorporated into a Standard or Advice Note.

2. Guidance on the use of cantilever mounted motorway signals

2.1 The MS4 provides a display panel of between 3.64m and 3.84m wide by 2.50m and 2.56m high, formed from an array of 20mm light emitting “pixels”, capable of displaying a wide range of red and “off white/yellow” bitmap images. However it is only allowed to display legends and aspects prescribed in the Traffic Signs Regulations and General Directions 2002 or those specifically authorised in writing on behalf of the Secretary of State. The top two thirds of the MS4 display panel is populated with two colour LEDs for displaying EMI aspects and pictograms, and single colour LEDs in the bottom third for displaying text.

2.2 Currently the MS4 can only be used to display EMI aspects (advisory speeds, lane diverts and “wicket” lane closure pictograms) and messages in 400mm high upper case characters. This limits the MS4 to tactical applications only and to a sub-set of the full MS3 message set. Further work is underway to assess the safety implications of the use of a wider range of pictograms and mixed case text, as trialled in the M4 MS4 pilot. The pilot indicated that some pictograms were less well understood than the equivalent text message, so mitigating actions may be required to maintain safety levels. The pilot also indicated that mixed case messages (in a simulated “Transport” font), which allow the longer tactical diversion messages to be displayed on the MS4 panel, were acceptable to drivers. However, the European Standard for VMS (Variable Message Signs), EN 12966, specifies the use of (minimum) 400mm high characters in “VMS” font to ensure that the messages can be safely read in all weather conditions. Again, additional work will determine what mitigating actions are required to maintain safety with the use of mixed case messages, in Transport font and with character heights of less than 400mm.

2.3 Currently, the MS4 is available in a housing 4.44m wide by 3.16m high with display panel dimensions as in section 2.1. This size was determined in anticipation of the adoption of pictograms with supporting upper case or mixed case text below the pictogram.

2.5 Both the two line MS3 and the MS4 can display, at the same time, an EMI aspect and supporting text. Of the two, the EMI aspect has the higher priority, i.e. it is more important that a driver sees the EMI than the supporting text message.

2.6 The MS4 display panel is generally located further to the left of the carriageway than the MS3. Therefore an EMI aspect on an MS4 will be further left of the same aspect displayed on an MS3. This requires careful siting of MS4s, particularly on left hand curves to achieve sight lines that are not obscured by verge mounted lighting columns or vegetation. This may require a strict pruning regime. There are potential safety issues if the vertical parts of a wicket aspect displayed on the EMI are partially obscured by verge mounted lighting columns. Cantilever mounted MS4s should be located as far laterally to the right as is practical to maintain sight lines.

2.7 Both the off road and on road trials of the MS4 indicated that an MS4 becomes conspicuous earlier than an MS3. However neither trial indicated a significant change in legibility limits. For both MS3s and MS4s, EMIs are designed to be legible from 350m and the 400mm high, upper case characters of the MS3 are designed to be legible from 250m.

2.8 The longitudinal spacing of inter junction MS4s is the same as MS3s [ref TD46], but as stated above (section 1.6), sympathetic consideration will be given to applications for departures seeking alternative spacing, where environmental benefits can be shown.

2.9 Designers should minimise changing signal types along a route. Thus where MS3 are already provided on a motorway, but in non-contiguous sections, any gaps should be filled with further MS3s.

2.10 The maintenance lay-bys provided at the trial sites on the M4 are not a standard provision.

3. Flashing Lanterns

3.1 It is a requirement of the Traffic Signs Regulations and General Directions 2002 that certain EMI aspects are supported by flashing lanterns [Regulations: 37, 46 (6)]

3.2 The flashing lanterns on MS1, MS2 and MS3 motorway signals are separate units to the display panel. The flashing lanterns requirement is met by the MS4 providing this facility as part of the display panel.

4. Costs

4.1 The installed, whole life cost of an MS4 display panel and cantilever, plus site costs, is comparable with that of an MS3 installed in a similar location. For the MS4 a higher proportion of the cost is attributable to the display panel. As with most electronic technology the cost of the MS4 display is likely to reduce in real terms over time, and with further value engineering the MS4 is likely to remain a cost effective alternative to the MS3.

4.2 Both the MS3 and MS4 require a hardshoulder and lane 1 closure for maintenance, although existing MS3 with walkway access may continue to be maintained without a lane 1 closure (IAN 86/07 provides further information).

4.3 The MS4 requires less maintenance than an MS3 as it has more reliable components. In addition, where possible, electronic devices have been moved from the display panel housing to cabinets installed on the verge to facilitate maintenance.

4.4 The MS4 cantilever is supplied as standard with a CCTV mounting bracket, and the facility to install power and data cabling. This facility may be used when CCTV cameras for traffic management purposes are being provided as part of a scheme.

4.5 Traffic Technology Division's Bulk Purchase Team can supply current costs of Motorway Signal items and Message Signs.

5. Portal Gantry mounted MS4 technology display panels

5.1 As part of the M42 ATM pilot, 4.44m wide by 3.16m high MS4 technology display panels are mounted on portal gantries as shown in Figure 4. These panels have a scheme description of "Advanced Message Sign" (AMS) and are being used as part of the pilot to display pictograms, upper case and mixed case text. **This is not a standard provision.**



Figure 4. MS4 display panel mounted on a portal gantry as part of the ATM Pilot being used as a Message Sign. Panel size 4.44m by 3.16m

5.2 The standard display panel for motorways provided with lane signalling is the 2 x 12 Enhanced Message Sign with a 4.656m wide by 1.695m high panel size mounted at the same height as the lane signals, as shown in Figure 5 [ref TD46 Motorway Signalling]. This remains the standard pending detailed results and analysis of the M42 ATM pilot.



Figure 5. Portal gantry mounted 2 x 12 Message Sign.

6. Future developments using MS4 technology

6.1 As stated above (section 2.2), work is already underway to permit the authorisation of a wider range of pictograms and messages in mixed case "Transport" font and using smaller character heights than specified in EN 12966. When this authorisation is in place, any MS4 already installed can be upgraded to support the latest message set through simple software upgrades, without any requirement to change the physical installation.

6.2 The modular, higher resolution technology as used for the MS4 4.44m wide by 3.16m high display panel can be used for other panel sizes. Consideration is being given to developing panel sizes suitable for the post mounted matrix signals (MS1) used as entry slip road signals and central reserve signals on D2M motorways where cantilever signals cannot be justified under TD46 provision criteria.

6.3 Consideration is also being given to the development of a modular display panel, say 0.40m high by 3.60m wide, with one module mounted over each lane on portal gantries provided with lane signals or indicators. An application of this panel is the provision of a Message Sign facility on D4M and above motorways, particularly those with a hard shoulder running provision, where the left hand side 2 x 12 Message Sign gantry position is unsuitable or unavailable.

6.4 All such proposed applications on specific schemes will require early consultation with both SSR, ID and TO to assess their availability and feasibility. If agreed in principle such applications will be subject to a formal Departure from Standard submission.

7. Contacts

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8. References

8.1 Highways Agency Bulk Purchase Procurement Specifications:-

MCE 2214 Motorway Signal Mark 4 (MS4) Requirements for Signal Equipment (Display and Communications Equipment)

MCE 2215 Motorway Signal Mark 4 (MS4) Requirement for enclosures, mounting brackets and cantilever structures

8.2 Installation Drawings:-

MCX 0169 NMCS2 Motorway Signal Mark 4 (MS4)

8.3 Infrastructure Design Guide:-

MCH 1927 Motorway Signal Mark 4 (MS4) Infrastructure Design Guide

The above "MC" prefixed documents are available from www.tssplansregistry.org as PDF downloadable files.