
**VOLUME 9 NETWORK - TRAFFIC
CONTROL AND
COMMUNICATIONS**

**SECTION 1 STANDARDS OF
PROVISION**

PART 1

TD 46/05

MOTORWAY SIGNALLING

SUMMARY

This issue of TD 46 incorporates Interim Advice Note 27/99 (IAN 27/99) that introduced the Motorway Signals Mk3 (MS3) and Interim Advice Note 43/02 (IAN 43/02) that clarifies but does not increase the standard of provision. Definition of Strategic Junction has been added to the Glossary.

INSTRUCTIONS FOR USE

This Standard is to be incorporated in the Manual.

1. This document supersedes TD 46/94.
2. Remove Contents pages for Volume 9 dated February 2004.
3. Insert new Contents pages for Volume 9 dated November 2005.
4. Remove TD 46/94 from Volume 9, Section 1, Part 1.
5. Insert TD 46/05 into Volume 9, Section 1, Part 1.
6. Archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.



THE HIGHWAYS AGENCY



SCOTTISH EXECUTIVE



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

**WELSH ASSEMBLY GOVERNMENT
LLYWODRAETH CYNULLIAD CYMRU**



**THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND**

Motorway Signalling

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1. Introduction
2. Types of Motorway Signal
3. Signalling Standards
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1. INTRODUCTION

General

1.1 The criteria for mounting either direction signs or motorway signals, or both, on overhead gantries were given in TD 18 (DMRB 9.1).

1.2 This Standard supersedes those sections of TD 18/85 that deal with Matrix Signals on motorways. Specifically paragraphs 1.2 and 10.2 and sections 4, 6 and 9 of TD 18/85 are superseded along with references to “Matrix Traffic Signals” in paragraphs 1.3, 2.1, 10.3 and 11.1.

Scope

1.3 This Standard describes the different types of motorway signals available and gives the criteria to be satisfied for their provision.

Implementation

1.4 This Standard shall be used forthwith for assessing motorway signalling requirements for existing and proposed schemes provided that, in the opinion of the Overseeing Organisation, this will not result in significant additional expense or delay progress. Designers shall confirm its application to particular schemes with the Overseeing Organisation. The relevant Advice Note in the Design Manual for Roads and Bridges gives further interpretation of this standard and guidance for scheme design.

Legislation

1.5 Any reference to ‘the Regulations’ or ‘the Directions’ is a reference to the Traffic Signs Regulations and General Directions 2002 applicable to England, Scotland and Wales. In Northern Ireland the relevant legislation is the Traffic Signs Regulations (Northern Ireland) 1997.

2. TYPES OF MOTORWAY SIGNAL

Overview

2.1 The types of motorway signal currently in use are:

- (a) Motorwarn Signals;
- (b) Post Mounted Matrix Signals (MS1);
- (c) Motorway Signals Mark 2 (MS2);
- (d) Motorway Signals Mark 3 (MS3);
- (e) Gantry Mounted Lane Signals.

2.2 Prior to the introduction in 1991 of the Motorway Signal Mark 2 (MS2) the 'standard' signal on trunk roads and trunk road motorways was the Matrix Signal except in Scotland where the Motorwarn unit was used. This signal, mounted on a post normally located in the central reserve or mounted on a portal gantry for lane signalling, was designated "MS". Since the introduction of the MS2 the designation or abbreviation "MS" has led to confusion; 'message sign' and 'motorway signal' are two examples. To clarify the forerunner of the MS2 and to differentiate between uses the Post Mounted Matrix Signal normally located in the central reserve is now referenced MS1.

2.3 The Motorway Signal Mark 2 (MS2) was superseded in 1999 by the Motorway Signal Mark 3 (MS3).

Motorwarn Signals

2.4 A Motorwarn signal comprises two amber lanterns, one mounted vertically above the other, on a black backboard. The amber lanterns flash alternately. Motorwarn signals are verge mounted and when activated denote a 30mph speed restriction is advised.

Post Mounted Matrix Signals

2.5 A Post Mounted Matrix Signal (MS1) comprises a matrix indicator panel and four amber lanterns mounted on a backing panel and post. The amber lanterns flash in synchronous pairs from top to bottom to draw attention to a restriction set on the sign.

2.6 This type of motorway signal can display temporary maximum speed advised and risk of fog ahead warnings that apply to all carriageway lanes and display lane closures for up to three lanes by the use of "wicket" symbols.

2.7 The MS1 illustrated in Figure 1 is located in the central reserve.

2.8 MS1 are also provided on motorway to motorway interchanges - on the offside of connecting slip roads immediately prior to the point of convergence with the main carriageway.

2.9 Entry slip road signals are provided in pairs at the entry to sections of motorway controlled by MS3 or gantry mounted lane signals. Entry slip road signals comprise an MS1 with red lanterns in addition to amber. The red lanterns flash in synchronous pairs from side to side and are only used when all lanes of the carriageway ahead are closed. The red flashing lanterns must be accompanied by the wicket symbol illustrated in TSRGD diagram 6032.1, i.e. incorporating the symbol prescribed as diagram 6008.1, 6006.2 or 6009.3.

Motorway Signals Mark 3

2.10 Motorway Signal Mark 3 (MS3) is available in two types.

2.11 The first type, MS3 (2 x 12) is a Message Sign only and consists of two lines of twelve text characters. They are mounted on portal gantries as described in 2.17. They are functionally compatible with Motorway Signal Mark 2 (MS2) 2 x 12 signs.

2.12 The second type, normally mounted on a cantilever, combines Message Sign and an Enhanced Matrix Indicator (EMI) and has two variants:

- a) MS3 (2x16) is capable of displaying either 2 x 16 characters in Message Sign only mode or 2 x 12 characters plus EMI in combined mode;
- b) MS3 (3x18) is capable of displaying either 3 x 18 characters in Message Sign only mode or 3 x 12 characters plus EMI in combined mode.

2.13 A combined mode MS3 (3 x 18) displaying a 3 x 12 Message Sign plus EMI is illustrated in Figure 2.

2.14 An Enhanced Matrix Indicator (EMI) is dimensionally larger and has more display cells than the matrix indicator used with post and portal gantry mounted signals. An EMI is mounted on a display board with amber and red lanterns.

2.15 A Message Sign is mounted on a display board with amber lanterns. The amber lanterns flash in synchronous pairs from top to bottom to draw attention to the message set on the sign.

Gantry Mounted Lane Signals

2.16 A lane signal comprises a matrix indicator panel, four amber and four red lanterns mounted on a backing panel. A lane signal is mounted on a portal gantry, over the centre of each traffic lane, where there is a need to display different restrictions over each lane. This is referred to as lane signalling and is illustrated in Figure 3.

2.17 Gantry mounted lane signals can display temporary maximum speed advised, risk of fog ahead warnings, lane divert and lane closure aspects. The amber lanterns flash in synchronous pairs from top to bottom to draw attention to maximum speed advised, fog warnings and lane divert aspects set on the signal. The red lanterns flash in synchronous pairs from side to side to indicate the closure of a lane. The red flashing lanterns must be accompanied by the red 'X' illustrated in TSRGD diagram 6031.1.

Note that in Scotland a combined message/lane indicator sign unit is in use that can indicate either individual lane information or display a single line of 21 characters of text for tactical signing purposes.

2.18 Where lane signals are mounted on gantries an MS3 (2x12) Message Sign shall only be provided in accordance with paragraph 3.26 (e) to (k).

Other Message Sign Configurations

2.19 Verge mounted Message Signs that consist of four lines of fifteen (4x15) characters and portal gantry mounted Message Signs that consist of either three lines of twenty one (3x21) characters or a single line of twenty one (1x21) characters are used in Scotland. The 1 x 21 unit can indicate either individual lane information or display a single line of twenty one characters of text for tactical signing.

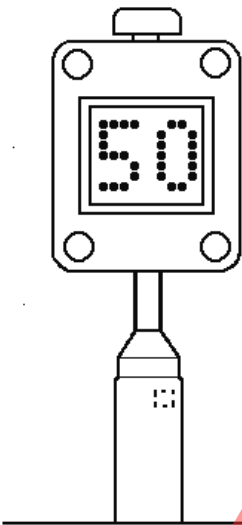


Figure 1 - Post Mounted Matrix Signal (MS1)

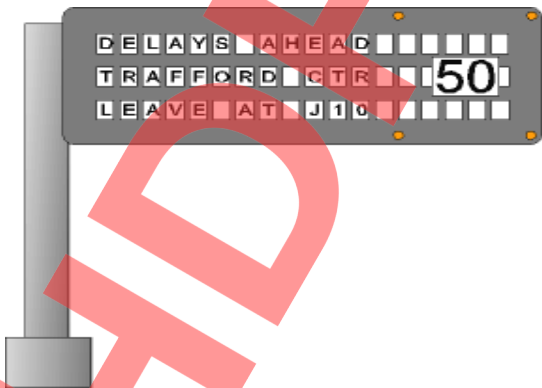


Figure 2 - Motorway Signal Mark 3 (MS3)

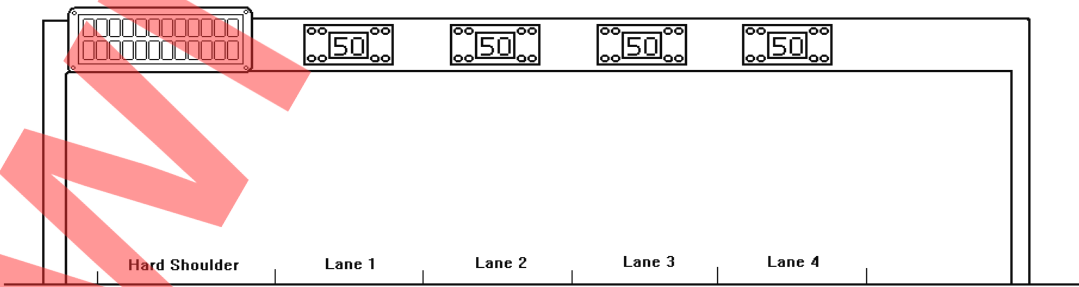


Figure 3 - Gantry Mounted Lane Signals with a 2x12 Message Sign

3. SIGNALLING STANDARDS

General

3.1 The signalling arrangements that may be considered for motorways are:

- (a) Motorwarn (in Scotland only);
- (b) Post Mounted Matrix Signals (MS1) (England, Wales and Northern Ireland only);
- (c) Motorway Signals Mark 3 (MS3);
- (d) Gantry Mounted Lane Signals.

3.2 The type of signal which may be justified depends on a number of criteria, including the standard of carriageway, traffic flow, the need to control traffic in individual lanes, and proposals for traffic diversion strategies.

Motorwarn (in Scotland only)

3.3 Motorways in Scotland shall be provided with Motorwarn signals.

2-Lane Motorways

3.4 MS1 sited in the central reserve shall be installed on two lane motorways unless there is a justifiable case to use MS3 or the provision of gantry mounted lane signals can be justified in accordance with the criteria in 3.14 to 3.20.

3-Lane Motorways

3.5 Three lane motorways may be provided with MS1 or MS3 depending on the criteria in 3.6 to 3.10. Gantry mounted lane signals shall be provided where they can be justified in accordance with the criteria in 3.14 to 3.20.

Low Flow

3.6 Where the two-way Average Annual Daily Traffic flow (AADT) is less than 60,000 vehicles per day and the provision of gantry mounted lane signalling is not justified MS1 sited in the central reserve shall be provided.

High Flow

3.7 MS3 shall be provided where the AADT is equal to, or greater than, 60,000 vehicles per day and the provision of gantry mounted lane signalling is not justified.

3.8 On existing motorways, in addition to the traffic flow criteria, MS3 may only be considered when the existing signalling is near the end of its design life or where an opportunity for replacement is provided by major highway improvement or major maintenance works.

3.9 For new motorways forecast flows shall be the AADT high growth estimate 15 years after opening.

3.10 MS3 may not be considered for provision on an individual basis but only in a sequence forming part of a signalling scheme.

4 or More Lane Motorways

3.11 Motorways having four or more lanes shall be provided with gantry mounted lane signals; the gantries shall also be equipped with an MS3 (2x12) Message Sign in accordance with paragraph 3.26.

3.12 On existing motorways an MS3 (2x12) Message Sign may be provided together with lane signalling on existing gantries in accordance with paragraph 3.26.

3.13 Gantries for motorway signals may not be considered for provision on an individual basis but only in a sequence forming part of a signalling scheme.

Gantry Mounted Lane Signalling on 2 or 3-Lane Motorways

3.14 Gantry mounted lane signalling shall be provided on two or three lane motorways in the following situations:

- (a) on the approaches to motorway to motorway interchanges, where there is an extended parallel deceleration lane, with or without loss of lane at the bifurcation;
- (b) on the approaches to motorway to motorway interchanges, where a traffic diversion strategy is planned;

- (c) in conjunction with (a) or (b) above at the divergence points of a link road within the interchange;
- (d) on the approach to motorway tunnels;
- (e) on motorway tidal flow schemes;
- (f) on elevated urban motorways.

3.15 Where the provision of gantries is justified for direction signs, in accordance with the current signing standards, the gantries shall also be used for lane signalling.

3.16 Sections of motorway which would normally be provided with either MS1 or MS3 and occur between adjacent sections where gantry mounted lane signals are justified by paragraphs 3.14 and 3.15 shall also be provided with gantry mounted lane signals where a signalling sequence cannot be provided by MS1 or MS3.

3.17 Gantries for motorway signals may not be considered for provision on an individual basis but only in a sequence forming part of a signalling scheme.

3.18 Gantries used for lane signalling shall also be equipped with an MS3 (2x12) Message Sign as stated in paragraph 3.25.

3.19 Where an all purpose road feeds directly into a motorway gantry mounted lane signals shall be provided where the road:

- (a) merges with the motorway as a slip road the gantry is provided prior to the point where the two carriageways merge;
- (b) ends and becomes the motorway the gantry is provided immediately after the start of the motorway.

3.20 An additional gantry will be required in advance of the start of motorway except where the speed limit of the approach road is less than 40mph. This gantry will also be used for mounting direction signs and its location will be dictated by signing requirements. Special site approval will be required before signals may be sited on such a gantry. Where the approach road is a high speed road more than one additional gantry may be required.

Signal Spacing

Motorway (in Scotland only)

3.21 Where motorway signals are provided, they shall be provided at nominal 1,500 metres intervals and normally sited adjacent to Emergency Roadside Telephones.

Post Mounted Matrix Signals (MS1)

3.22 Where MS1 are provided they shall be provided at 3,000m (+0%, -20%) intervals in the central reserve, with additional signals at junctions and interchanges.

Motorway Signal Mark 3

3.23 Where the provision of MS3 is justified, signals shall be provided on cantilevers as follows:

- (a) 300m (+/- 100m) downstream from junction and Motorway Service Area entry slip road merges;
- (b) on the approaches to motorway junctions and interchanges 300m (+/- 100m) in advance of the one mile and half mile Advance Direction Signs;
- (c) between junctions at 1,500m (+0%, -20%) spacings;
- (d) 100m (+0%, - 20%) from the back of the diverge nose;
- (e) intra junction if the distance between the diverge MS3 [re (d)] and the first MS3 following the junction merge [re (a)] is greater than 1800m. The MS3 shall be located at the mid point.

Note: In Scotland the above criteria has not been adopted and the provision of MS3 signals is carried out on a strategic basis and the signals are installed singly in advance of major junctions: using siting criteria similar to that listed above.

3.24 MS3 provision is shown on Drawing 6.

3.25 EMI aspects are not required on MS3 (3x18) that are mounted on portal gantries and where there are other gantry mounted lane signals.

Gantry Mounted Lane Signals

3.26 Where the provision of gantry mounted lane signalling is justified, signals shall be provided over each running lane as follows:

- (a) 300m (+/- 100m) downstream from junction and Motorway Service Area entry slip road merges;
- (b) on the approaches to motorway interchanges and junctions on one mile, half mile, final, supplementary and confirmatory gantries. A supplementary gantry is required at the mid point of a two or more lane parallel diverge or parallel lane drop where the parallel length exceeds 800m;
- (c) between junctions at 1,000m (+0%, -20%) spacings;
- (d) intra junction if the distance between the confirmatory gantry [re (b)] and the first gantry following the junction merge [re (a)] is greater than 1200m. The lane signalling gantry shall be located at the mid point.

3.27 In addition, the following gantries shall be provided with a 2x12 Message Sign:

- (e) the first gantry following a junction or Motorway Service Area entry slip road merge [re (a)];
- (f) gantries between junctions [re (b)], excluding supplementary gantries;
- (g) intra junction gantries [re (d)];
- (h) gantries over the diverge nose;
- (i) one mile Advance Direction Sign gantries at non-strategic junctions;
- (j) half mile Advance Direction Sign gantries at non-strategic junctions displaying MIDAS and tactical legends only (including tactical diversion legends);
- (k) final Advance Direction Sign gantries at a two lane parallel diverge, displaying MIDAS and tactical legends only (including tactical diversion legends).

The above criteria does not apply in Scotland.

3.28 Gantry lane signalling is shown on Drawings 1 to 5 and Drawing 7.

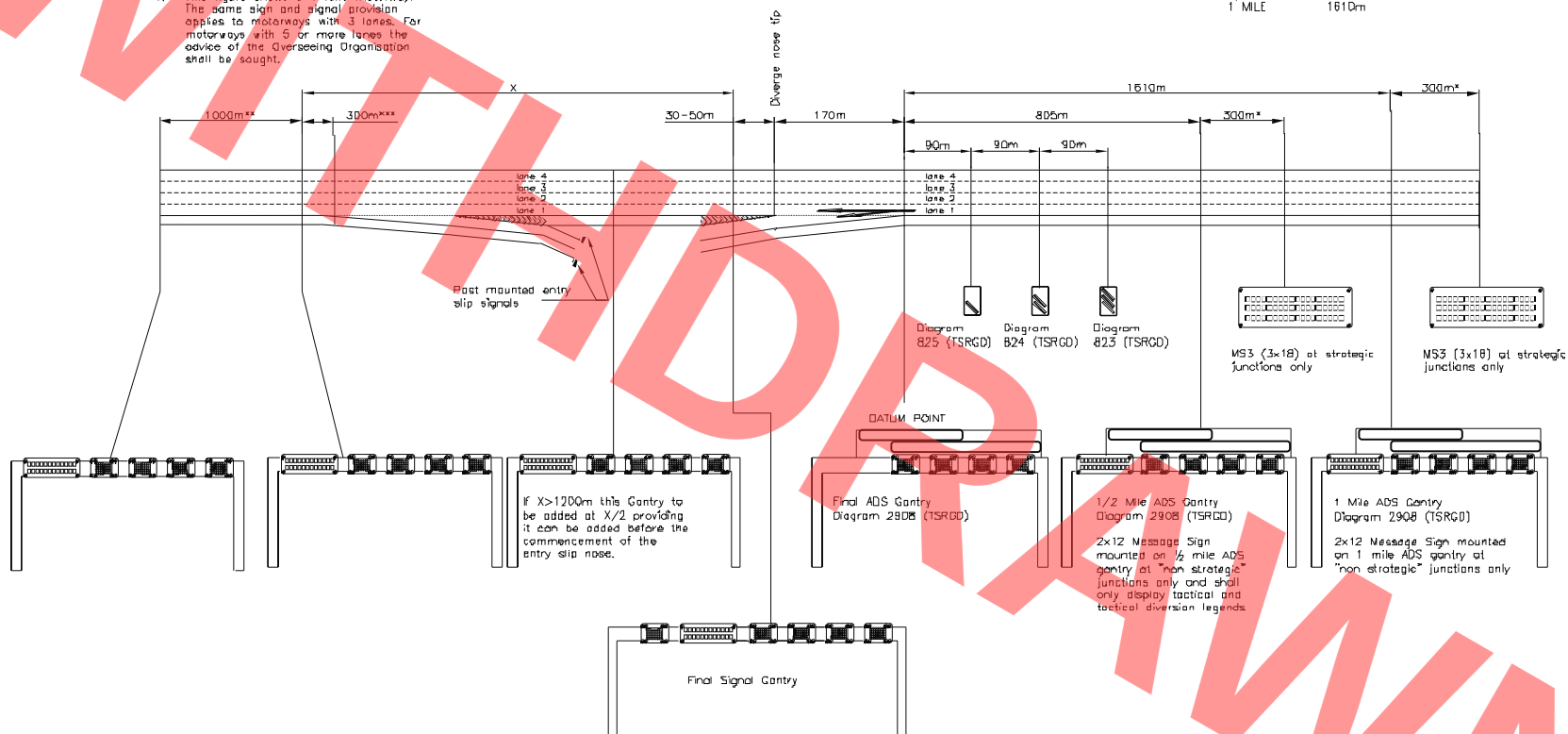
4. DRAWINGS

- | | |
|-----------|---|
| Drawing 1 | Sign and Signal Gantries at Motorway
Single Lane Taper Diverge and Merge |
| Drawing 2 | Sign and Signal Gantries at Motorway
Two Lane Taper Diverge and Single
Lane Merge |
| Drawing 3 | Sign and Signal Gantries at Motorway
Two Lane Parallel Diverge and Merge |
| Drawing 4 | Sign and Signal Gantries at Motorway
Lane Drop and Lane Gain from a
Single Lane Entry Slip Road |
| Drawing 5 | Sign and Signal gantries at Motorway
Parallel Lane Drop and Lane Gain from
a Two Lane Entry Slip Road |
| Drawing 6 | Motorway with Verge Mounted ADS
and Cantilever VMS |
| Drawing 7 | Signals at the Start of a Motorway |

IMPERIAL	METRIC
100 YARDS	90m
200 YARDS	180m
300 YARDS	270m
1/3 MILE	535m
1/4 MILE	400m
1/2 MILE	805m
2/5 MILE	1070m
1 MILE	1610m

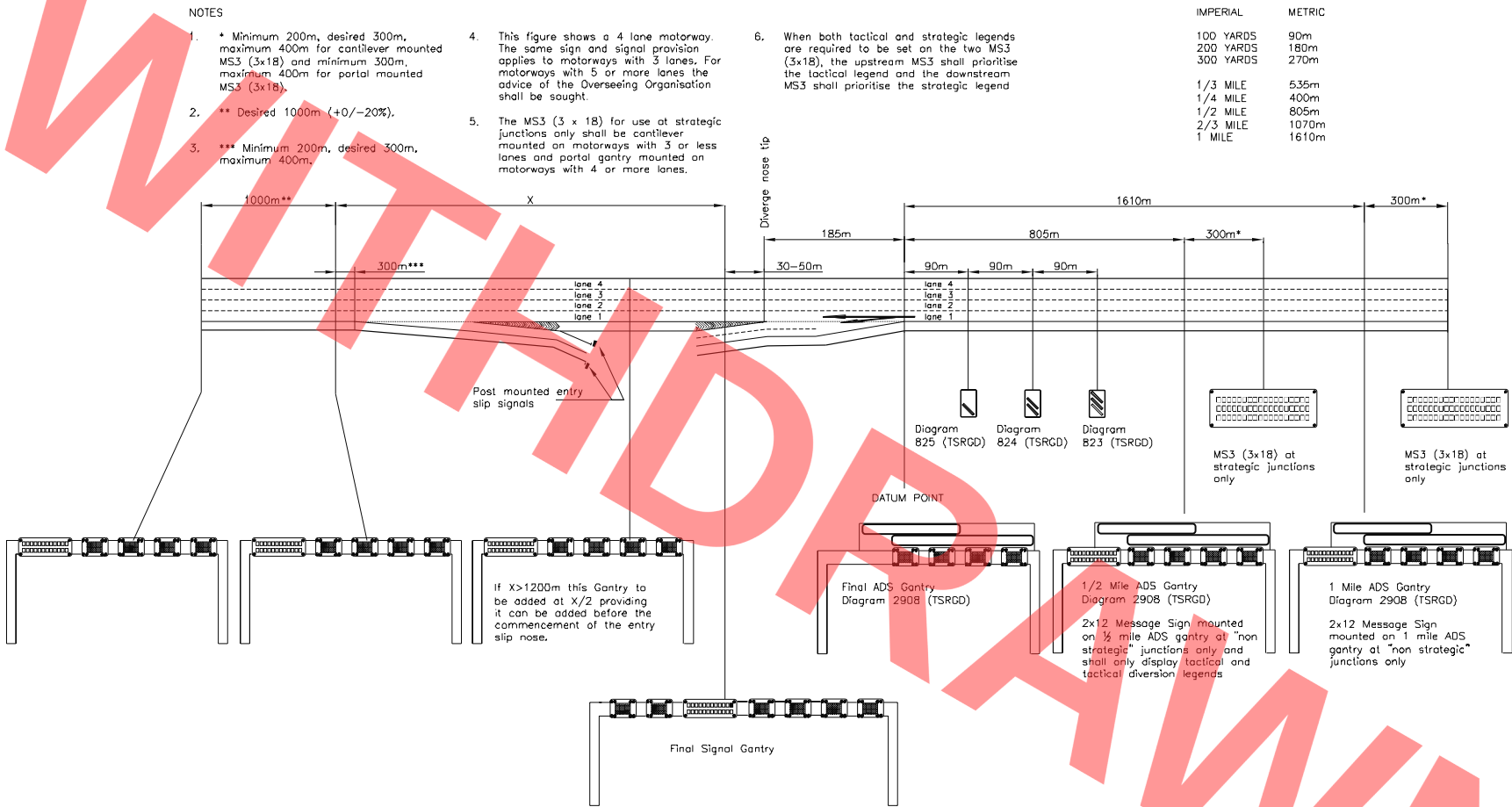
NOTES

- * Minimum 200m, desired 300m, maximum 400m for cantilever mounted MS3 (3x18) and minimum 300m, maximum 400m for portal mounted MS3 (3x18).
- ** Desired 1000m (+0/-20%).
- *** Minimum 200m, desired 300m, maximum 400m.
- This figure shows a 4 lane motorway. The same sign and signal provision applies to motorways with 3 lanes. For motorways with 5 or more lanes the advice of the Overseeing Organisation shall be sought.
- The MS3 (3 x 18) for use at strategic junctions only shall be cantilever mounted on motorways with 3 or less lanes and portal gantry mounted on motorways with 4 or more lanes.
- When both tactical and strategic legends are required to be set on the two MS3 (3x18), the upstream MS3 shall prioritise the tactical legend and the downstream MS3 shall prioritise the strategic legend.



Drawing 1

SIGN AND SIGNAL GANTRIES AT MOTORWAY SINGLE LANE TAPER DIVERGE AND MERGE



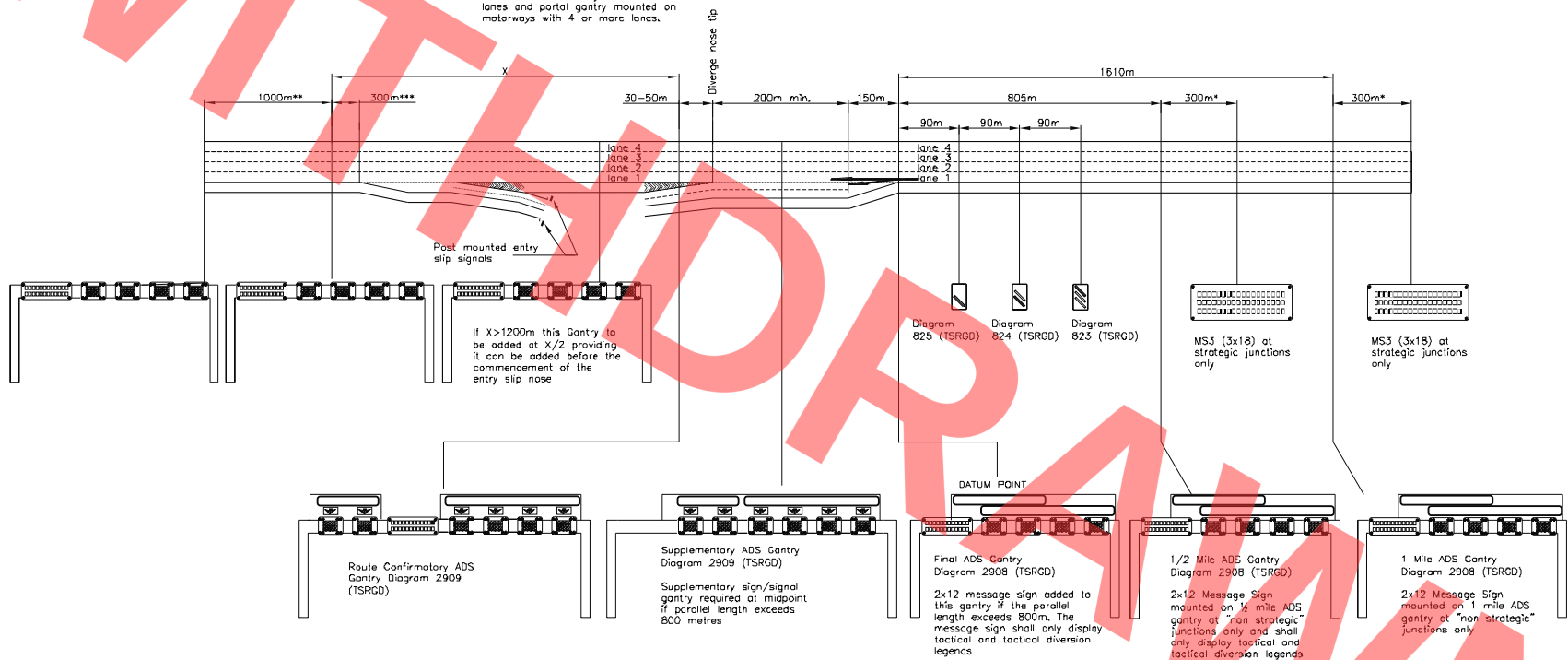
Drawing 2

SIGN AND SIGNAL GANTRIES AT MOTORWAY TWO LANE TAPER DIVERGE AND SINGLE LANE MERGE

IMPERIAL	METRIC
100 YARDS	90m
200 YARDS	180m
300 YARDS	270m
1/3 MILE	535m
1/4 MILE	400m
1/2 MILE	805m
2/3 MILE	1070m
1 MILE	1610m

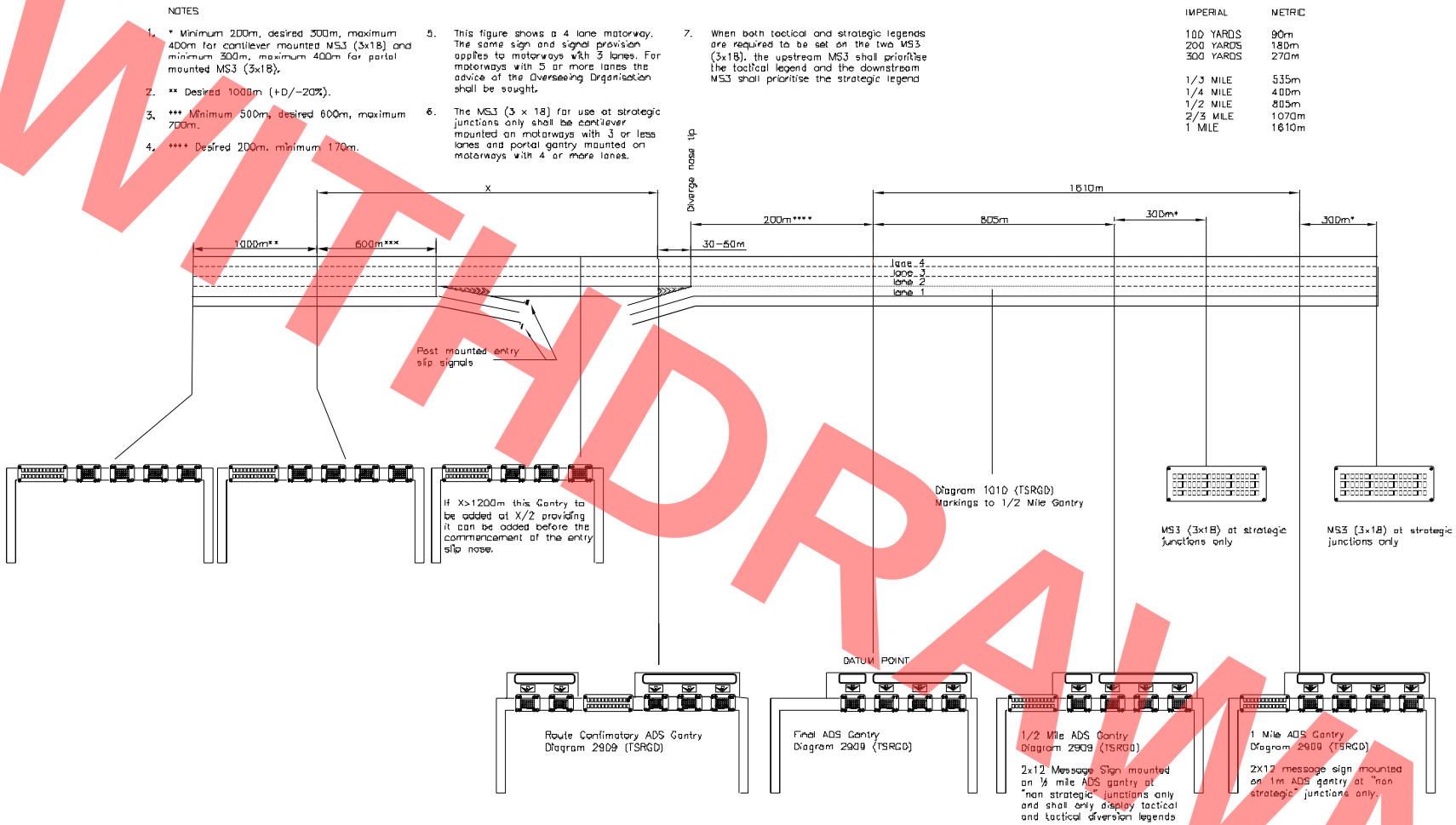
NOTES

- * Minimum 200m, desired 300m, maximum 400m for cantilever mounted MS3 (3x18) and minimum 300m, maximum 400m for portal mounted MS3 (3x18).
- ** Desired 1000m (+0/-20%).
- *** Minimum 200m, desired 300m, maximum 400m.
- This figure shows a 4 lane motorway. The same sign and signal provision applies to motorways with 3 lanes. For motorways with 5 or more lanes the advice of the Overseeing Organisation shall be sought.
- The MS3 (3 x 18) for use at strategic junctions only shall be cantilever mounted on motorways with 3 or less lanes and portal gantry mounted on motorways with 4 or more lanes.
- When both tactical and strategic legends are required to be set on the two MS3 (3x18), the upstream MS3 shall prioritise the tactical legend and the downstream MS3 shall prioritise the strategic legend.



Drawing 3

SIGN AND SIGNAL GANTRIES AT MOTORWAY TWO LANES PARALLEL DIVERGE AND MERGE



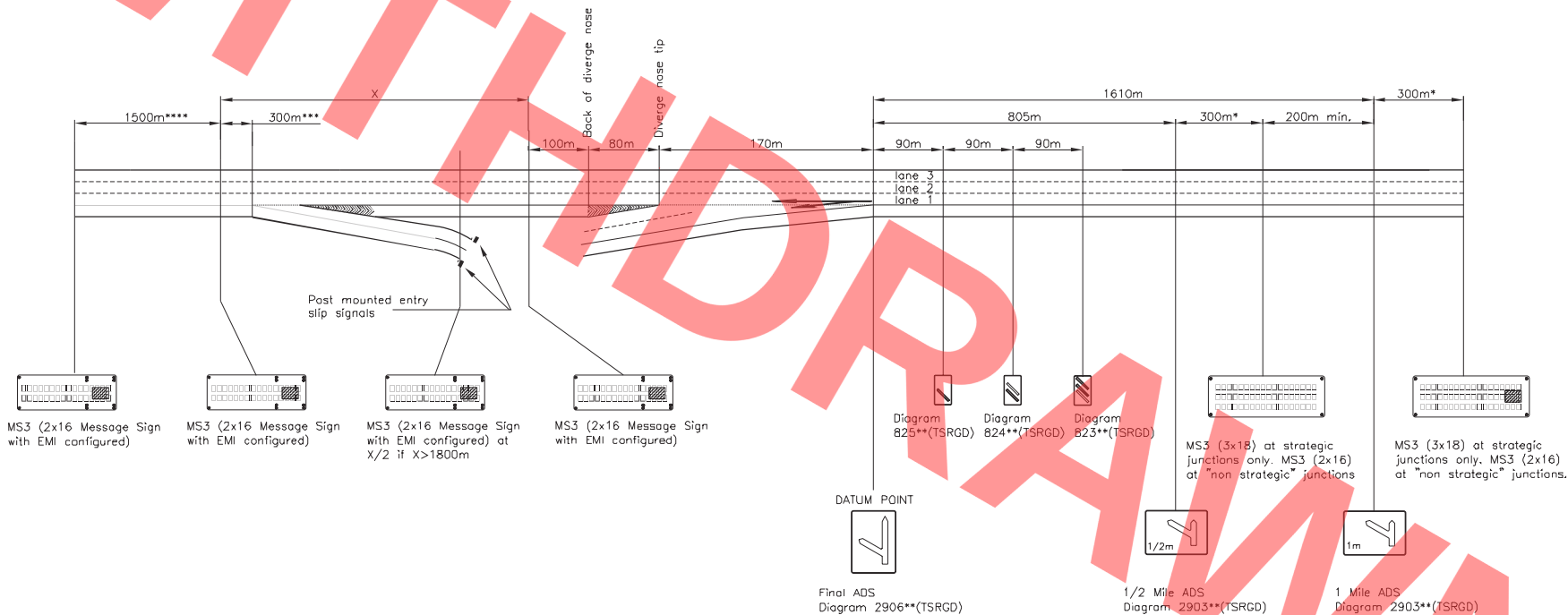
Drawing 4

SIGN AND SIGNAL GANTRIES AT MOTORWAY LANE DROP AND LANE GAIN FROM A SINGLE LANE ENTRY SLIP ROAD

NOTES

1. Existing VMS may be MS2's.
2. * Minimum 200m, desired 300m, maximum 400m.
3. ** Signs 2903 and 2906 to be replaced by 2901 and 2904.1 respectively and countdown markers removed at lane drop diverges and road markings to be as shown in figures 4 and 5.
4. *** Minimum 200m, desired 300m, maximum 400m.
5. **** Desired 1500m (+0/-20%).
6. When both tactical and strategic legends are required to be set on the two MS3 (3x18), the upstream MS3 shall prioritise the tactical legend and the downstream MS3 shall prioritise the strategic legend

IMPERIAL	METRIC
100 YARDS	90m
200 YARDS	180m
300 YARDS	270m
1/3 MILE	535m
1/4 MILE	400m
1/2 MILE	805m
2/3 MILE	1070m
1 MILE	1610m

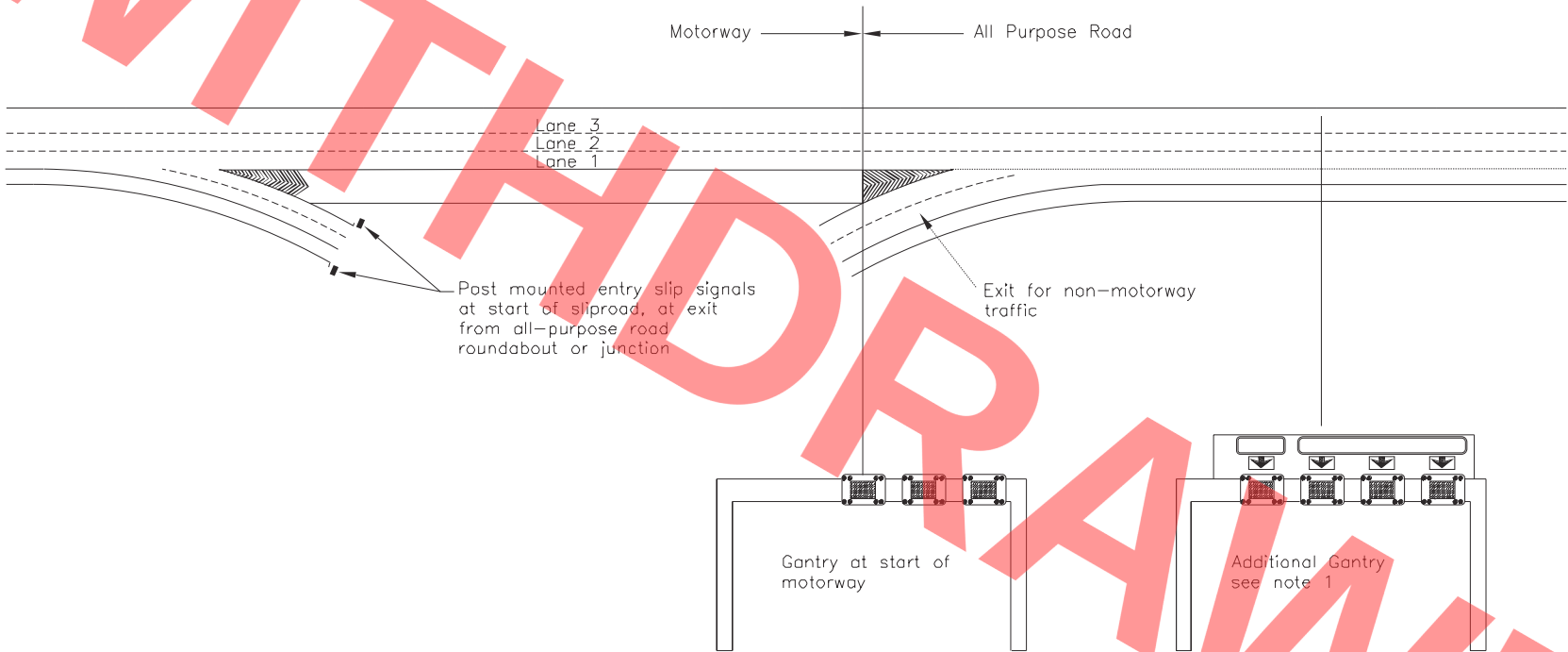


Drawing 6

MOTORWAY WITH VERGE MOUNTED ADS AND CANTILEVER VMS

NOTE

1. An additional gantry will be required in advance of the start of motorway except where the speed limit of the approach road is less than 40mph. This gantry will also be used for mounting direction signs and its location will be dictated by signing requirements. Special site approval will be required before signals may be sited on such a gantry. Where the approach road is a high speed road more than one additional gantry may be required.
2. This figure shows a 3 lane motorway. The same sign and signal provision applies to motorways with 4 lanes. For motorways with 5 or more lanes the advice of the Overseeing Organisation shall be sought.



Drawing 7

SIGNALS AT THE START OF A MOTORWAY

5. REFERENCES

5.1 Design Manual for Roads and Bridges (DMRB):
TD 18 - Criteria For The Use Of Gantries For Traffic
Signs And Matrix Traffic Signals on Trunk Roads and
Trunk Road Motorways (DMRB 9.1), available from
The Stationery Office.

5.2 Design Manual for Roads and Bridges (DMRB):
TA 74 - Motorway Signalling (DMRB 9.4.3), available
from The Stationery Office.

5.3 The Traffic Signs Regulations and General
Directions 2002 (SI 2002 No 3113), available from The
Stationery Office.

5.4 The Traffic Signs Regulations (Northern Ireland)
1997 - (SR 1997 No 386), available from The
Stationery Office.

6. GLOSSARY

Strategic Junction

6.1 For the purpose of this TD, for the Highways Agency and the Scottish Executive, Strategic Junctions are those where:

- (a) two or more Highways Agency core roads/ Scottish trunk roads intersect; or
- (b) a Highways Agency core road/Scottish trunk road intersects with a local authority road and the junction has local authority agreement to be designated as part of a strategic diversion route; or
- (c) a Highways Agency core road intersects with a Highways Agency non-core road and has the agreement of the Secretary of State to be designated as a Strategic Junction;

and the junction has the facility to provide the start of a signed alternative route to the desired destination or direction. The desired destinations and directions shall be limited to those shown on the fixed signing for the junction.

7. ENQUIRIES

All technical enquiries or comments on this Standard should be sent in writing as appropriate to:

Chief Highway Engineer
The Highways Agency
123 Buckingham Palace Road
London
SW1W 9HA

G CLARKE
Chief Highway Engineer

Chief Road Engineer
Scottish Executive
Victoria Quay
Edinburgh
EH6 6QQ

J HOWISON
Chief Road Engineer

Chief Highway Engineer
Transport Wales
Welsh Assembly Government
Cathays Parks
Cardiff
CF10 3NQ

M J A PARKER
Chief Highway Engineer
Transport Wales

Director of Engineering
The Department for Regional Development
Roads Service
Clarence Court
10-18 Adelaide Street
Belfast BT2 8GB

G W ALLISTER
Director of Engineering