

SECTION 2

INTERCHANGES

June 2009

INTERCHANGES

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2. INTERCHANGES

2.1 GENERAL

An interchange is a combination of ramps and grade separation at the intersection of two roads that separates major crossing and turning movements and enables maximum traffic volumes to operate safely.

Interchanges are classified by generic type but they usually vary in layout according to specific traffic operational requirements and site conditions. The two main types of interchange are listed below:

2.1.1 MOTORWAY/EXPRESSWAY TO LOCAL ROAD INTERCHANGES:

- Diamond
- Parclo
- Trumpet
- Bridged Roundabout

2.1.2 MOTORWAY TO MOTORWAY INTERCHANGES:

- Directional
- Semi-directional
- 'Y' and 'T'
- Cloverleaf

2.2 SIGN SPREADING

Sign spreading is an optional concept whereby major overhead signs are spaced so that drivers are not overloaded with a group of signs at a single location. An assessment of the relevant costs between the standard and alternative concepts should be made prior to adopting the latter.

Sign spreading should be implemented at closely spaced exits and at multi-exit interchanges by:

- ensuring that the Exit Direction sign is the only sign other than the Exit sign in the vicinity of the gore area; and
- installing the Advance Exit sign for the next exit, or a 'Pull-Through' sign, at a location some distance past the exit nose but where both signs can be viewed at the same time by an approaching driver. Where an interchange crossroad goes over the through route the sign can usually be placed on the overbridge structure.

FIGURE 2.1 (a) illustrates the standard sign layout, while FIGURE 2.1 (b) illustrates an alternative sign spreading concept.

2.3 'PULL-THROUGH' SIGNS

'Pull-Through' signs are overhead mounted signs used to indicate the continuation of the through route when it might not be obvious to approaching drivers. They are usually only necessary where an exit and the through route appear to be of almost equal importance and at closely spaced exits where drivers usually need some additional through route guidance.

A 'Pull-Through' sign should be positioned centrally over the left lane of the continuing through route and shall display:

- a route marker;
- cardinal direction when relevant; and
- the stage destination name used for the guide signing system in the area.

Where an intermediate destination is also shown it shall be positioned above the stage destination name.

'Pull-Through' signing is illustrated in FIGURES 2.2 (a), 2.2 (b), 2.3, 2.4 and 2.5.

2.4 TYPICAL INTERCHANGE LAYOUTS AND SIGNING

2.4.1 GENERAL

Most interchanges have both exiting and entering traffic. In the areas where this traffic conflicts with traffic on a motorway or expressway it is essential to have consistent geometric layouts and signing, for safe and efficient traffic operation reasons.

2.4.2 STANDARD EXITS AND ENTRANCES

Standard geometric layouts for exits and entrances on motorways and expressways with exit numbering are shown on New Zealand Transport Agency (NZTA) Drawing M1 *Standard Exit and Entrance Geometric Details and Traffic Signs With Exit Numbering*, which is shown in FIGURE 2.6 (a). The standard ground mounted signing, which is only applicable on motorways and expressways with one-lane or two-lane one-way carriageways, is also shown. Overhead signing must be used on motorways and expressways with three or more lane one-way carriageways.

No radius is to be provided at the transition between the motorway and the off ramp taper, it shall be an obtuse angle.

On two lane on and off ramps the regulatory speed signs shall be erected on both sides of the on and off ramps.

Where exit numbering is used it shall be implemented on ALL motorways and/or expressways within the region.

Typical rural and urban interchange layouts are illustrated in FIGURES 2.7 and 2.8. These show the minimum signing required at these types of interchange for safe and efficient traffic operations.

2.4.3 STANDARD ENTRANCES WITH RAMP SIGNALS

Standard geometric layouts for entrances on motorways and expressways with ramp signals are shown on NZTA Drawing M2 *Standard Ramp Meter Entrance Details*, which is shown in FIGURE 2.6 (b).

Due to the increased signage when there are ramp signals, the regulatory speed signs may be erected on the same poles as the 'MOTORWAY BEGINS' and 'MOTORWAY ENDS' signs. The speed sign shall be erected above the 'MOTORWAY BEGINS' and 'MOTORWAY ENDS' signs.

Another alternative in regions where their use has been approved is the new combination threshold signs for 'speed limit/motorway or expressway name/no pedestrians/no cycling' and 'speed limit/motorway ends' mentioned in Section 1.18.2(a).

2.4.4 CLOSELY SPACED EXITS

Where the spacing between two or more successive exit gore area noses is two kilometres or less it is normally necessary to provide guide signing for two exits at, or in advance of, the prior exit.

The signing for closely spaced exits shall conform as closely as possible to the layouts shown in FIGURES 2.9 (a) and (b). Special details of this signing are described below:

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(i) Exits 800 m to 1800 m apart

Refer to FIGURE 2.9 (a).

The overhead mounted signs located at the standard off-ramp location for gantry mounted exit direction signs should be arranged as shown in FIGURE 2.3.

(ii) Exits less than 800 m apart

Refer to FIGURE 2.9 (b).

The second advance exit sign for the first exit shall be overhead mounted with the signs arranged as shown in FIGURE 2.5.

The exit direction sign for the first exit and the first advance exit sign, and the 'Pull-Through' sign for the next exit shall be overhead mounted with the signs arranged as shown in FIGURE 2.4.

2.4.5 LANE DROP EXITS

Overhead mounted signs must be used to indicate a lane drop situation where one lane, usually the left hand lane, of a multi-lane one-way road diverges from the main route. The appropriate 'EXIT ONLY' panel must be displayed on all advance exit and exit direction signs relating to the exit. Examples of signs with 'EXIT ONLY' panels are shown in FIGURES 3.11 and 3.21.

The optional ground mounted MI - 5 sign detailed on FIGURE 3.6 may also be used in lane drop situations, as an additional reminder to drivers that the left lane is not part of the through carriageway. This sign should be located approximately midway between the second advance exit sign and the exit direction sign.

The signing required for a lane drop situation is illustrated in FIGURE 2.10.

2.4.6 TWO-LANE EXITS

A two-lane exit is a standard exit with an additional exit lane added on its left hand side, for capacity and/or traffic management reasons. Drivers approaching a two-lane exit in Lane 1 of the main road carriageway, i.e. the left hand lane, are in a lane drop situation and must, therefore, exit the main road. Drivers in Lane 2 are in a normal exit situation and may either exit or continue on the main road.

Overhead mounted signs must be used for two-lane exits. The MI - 13.1 advance exit and MI - 15.1 exit direction signs used at two-lane exits must display an appropriate 'EXIT ONLY' panel.

The optional ground mounted MI - 5 sign, detailed on FIGURE 3.6, may be erected as an additional reminder to drivers that the left lane must exit. The sign should be located approximately midway between the second advance exit sign and the exit direction sign.

An MI - 22 'Pull-Through' sign may be used to indicate the continuing through route direction.

The signing required for a two-lane exit is illustrated on FIGURE 2.11.

2.4.7 DIVERGE EXITS

A diverge exit is one where a multi-lane one-way road splits into two separate multi-lane roads, one of which is the continuation of the approach road. Signing in advance of a diverge indicates the lane(s) that drivers must manoeuvre their vehicles into prior to the diverge area to be on the correct route for their intended destination.

Overhead mounted signs must be used for diverge exits.

Diverge exits are not lane drop situations and 'EXIT ONLY'

panels shall not be used on the MI - 13 advance exit signs used for these exits.

MI - 15 type exit direction signs, located at the start of the exit gore area border road markings, must be used at diverge exits.

The leading face of crash cushions at diverges must be marked with black and reflectorised yellow stripes 100 mm wide as shown in MOTSAM Part 2: *Markings* FIGURE 5.6.

Typical signing required for a diverge exit is illustrated on FIGURE 2.12.

2.4.8 SERVICE CENTRE EXITS

The layout and signing for a typical service centre exit is illustrated on FIGURE 2.13.

2.4.9 MOTORWAY TO MOTORWAY INTERCHANGE EXITS

The effects of taking the wrong exit at a motorway to motorway interchange cannot usually be easily corrected. When a driver takes the exit to another route they are normally unable to return to their original route until they can reverse their travel direction. This is usually only achievable at the first interchange on the new route, which may be a considerable distance from the motorway to motorway interchange.

The signing for motorway to motorway interchanges will vary according to:

- the number of traffic lanes on each road, and
- the type of interchange and its geometric layout.

The following general principles should be applied to the signing of motorway to motorway interchanges:

1. Exits should be signed as normal motorway or expressway exits, as described in Section 2.4.2.
2. Signs shall display no more than three lines of legend in the following manner:
 - The stage destination name used for the guide signing system on the other motorway must be shown.
 - One additional destination on the other motorway may be shown immediately above the stage destination name.
 - A route marker, and the cardinal direction when appropriate, shall be shown as the first line of the sign when these are implemented.
3. The name(s) of the intersecting motorway(s) may also be indicated, provided no more than three lines of legend are displayed on the sign.
4. MI - 22 'Pull-Through' signs to indicate the continuing through route must be provided at all motorway to motorway interchange exits.

2.4.10 TOLL ROUTE SIGNING

The layout and signing for a typical toll route is illustrated in FIGURE 2.14.

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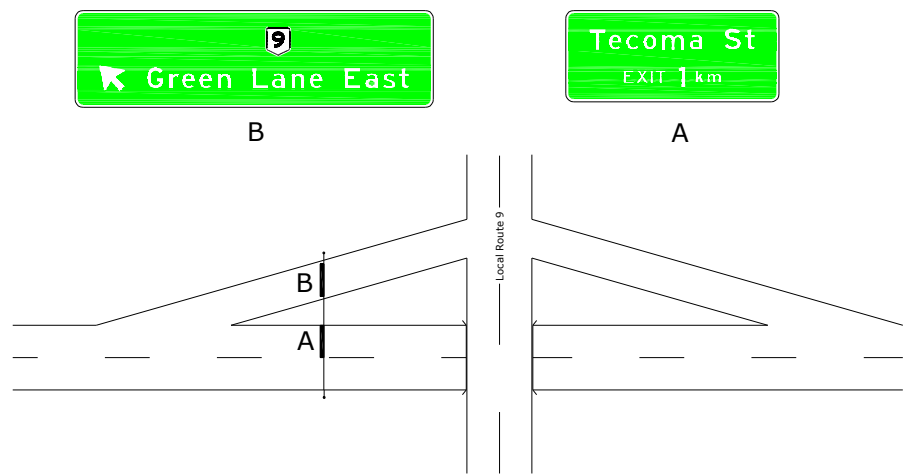


FIGURE 2.1 (a): STANDARD SIGN LAYOUT

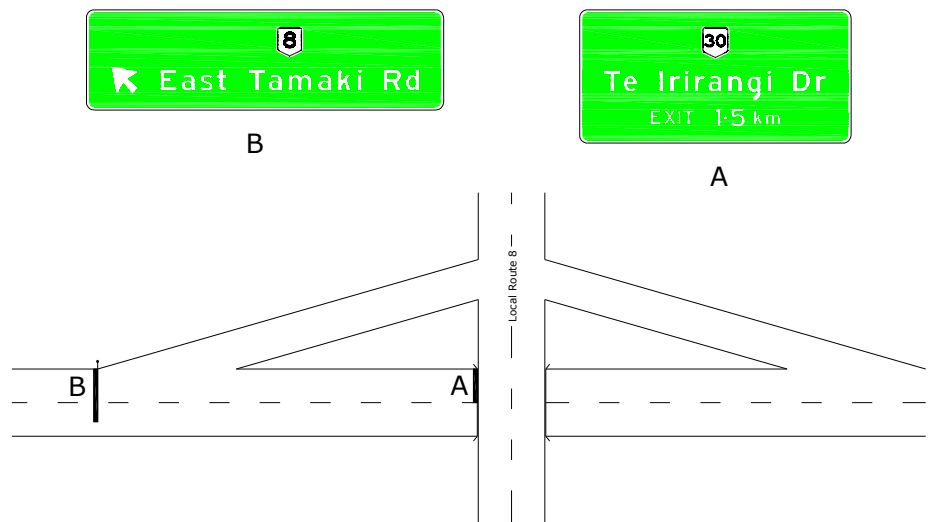


FIGURE 2.1 (b): ALTERNATIVE SIGN SPREADING CONCEPT



FIGURE 2.2 (a): TYPICAL 'PULL-THROUGH' SIGN

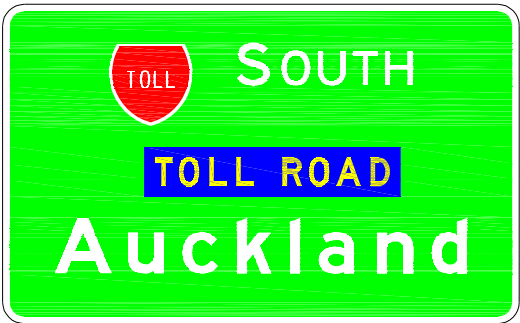
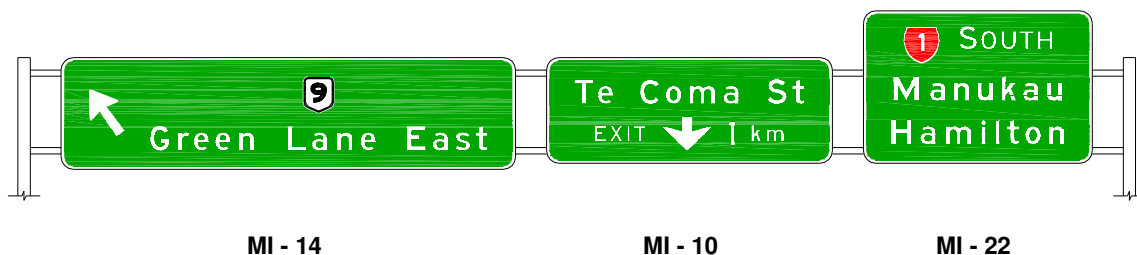


FIGURE 2.2 (b): TOLL ROAD 'PULL-THROUGH' SIGN

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NOTES:

1. Where a crossroad overpass is at least 800 m from the second exit, the MI - 10 sign should be relocated, either onto the overpass structure or to a cantilever mounting just in advance of the overpass structure, see Note 3 to Figure 2.9.
2. No sign should be located just beyond any structure crossing a motorway or expressway.

FIGURE 2.3: TYPICAL FIRST ADVANCE EXIT DIRECTION SIGN ASSEMBLY FOR THE NEXT EXIT WHEN EXITS ARE 800 m TO 1800 m APART

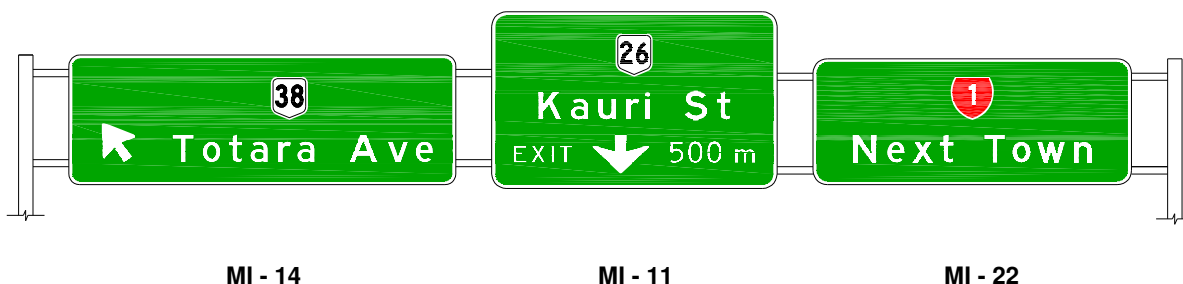


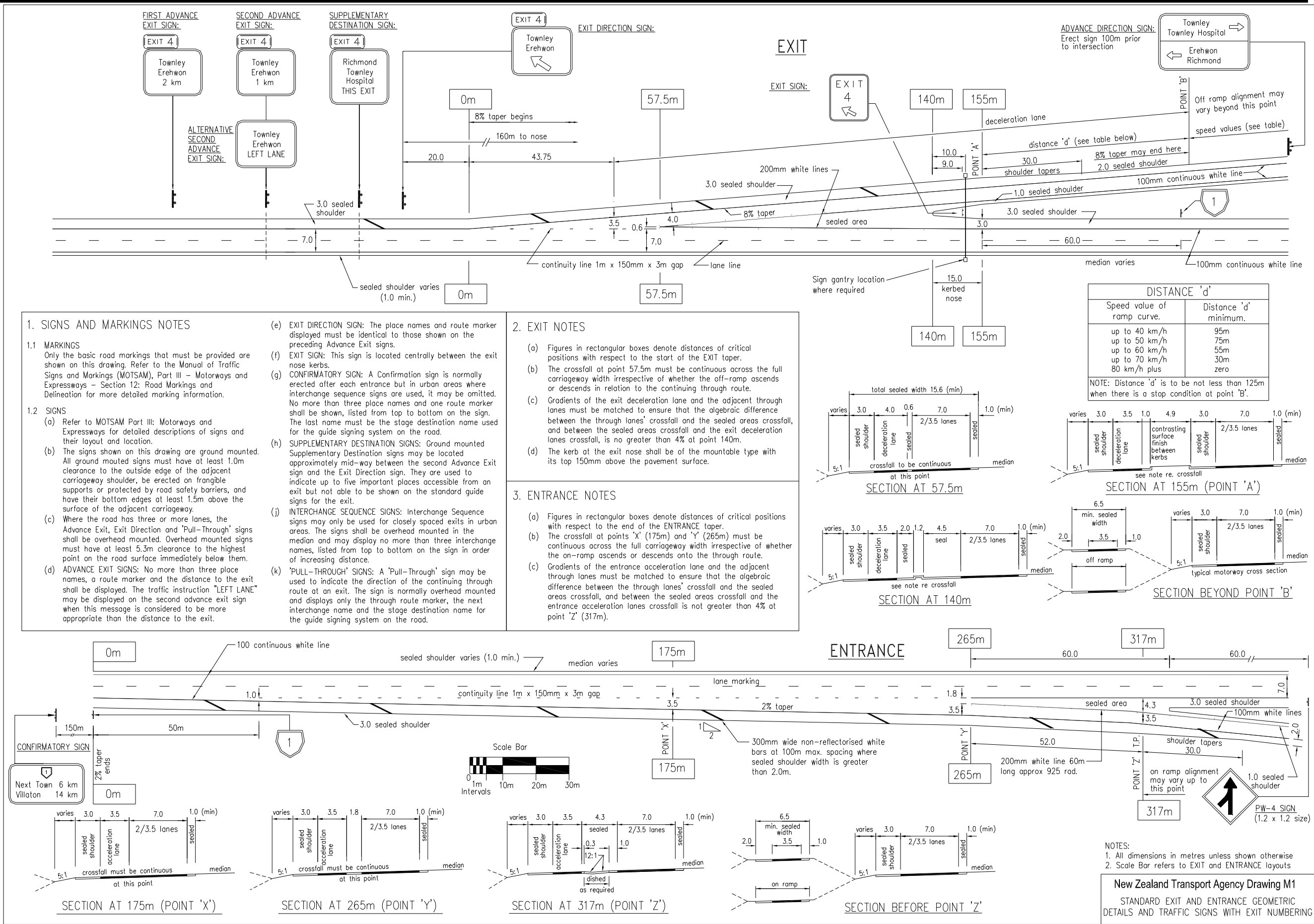
FIGURE 2.4: TYPICAL SECOND ADVANCE EXIT SIGN ASSEMBLY FOR THE FIRST EXIT WHEN EXITS ARE LESS THAN 800 m APART



NOTE: When the exit is a two-lane exit the signs shall be replaced with a single MI - 13.1 diagrammatic type sign.

FIGURE 2.5: TYPICAL FIRST ADVANCE EXIT SIGN ASSEMBLY FOR THE NEXT EXIT WHEN THE EXITS ARE LESS THAN 800 m APART

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STANDARD MOTORWAY AND EXPRESSWAY EXITS AND ENTRANCES
- GEOMETRIC LAYOUT AND SIGNING DETAILS WITH EXIT NUMBERING

FIGURE 2.6 (a)

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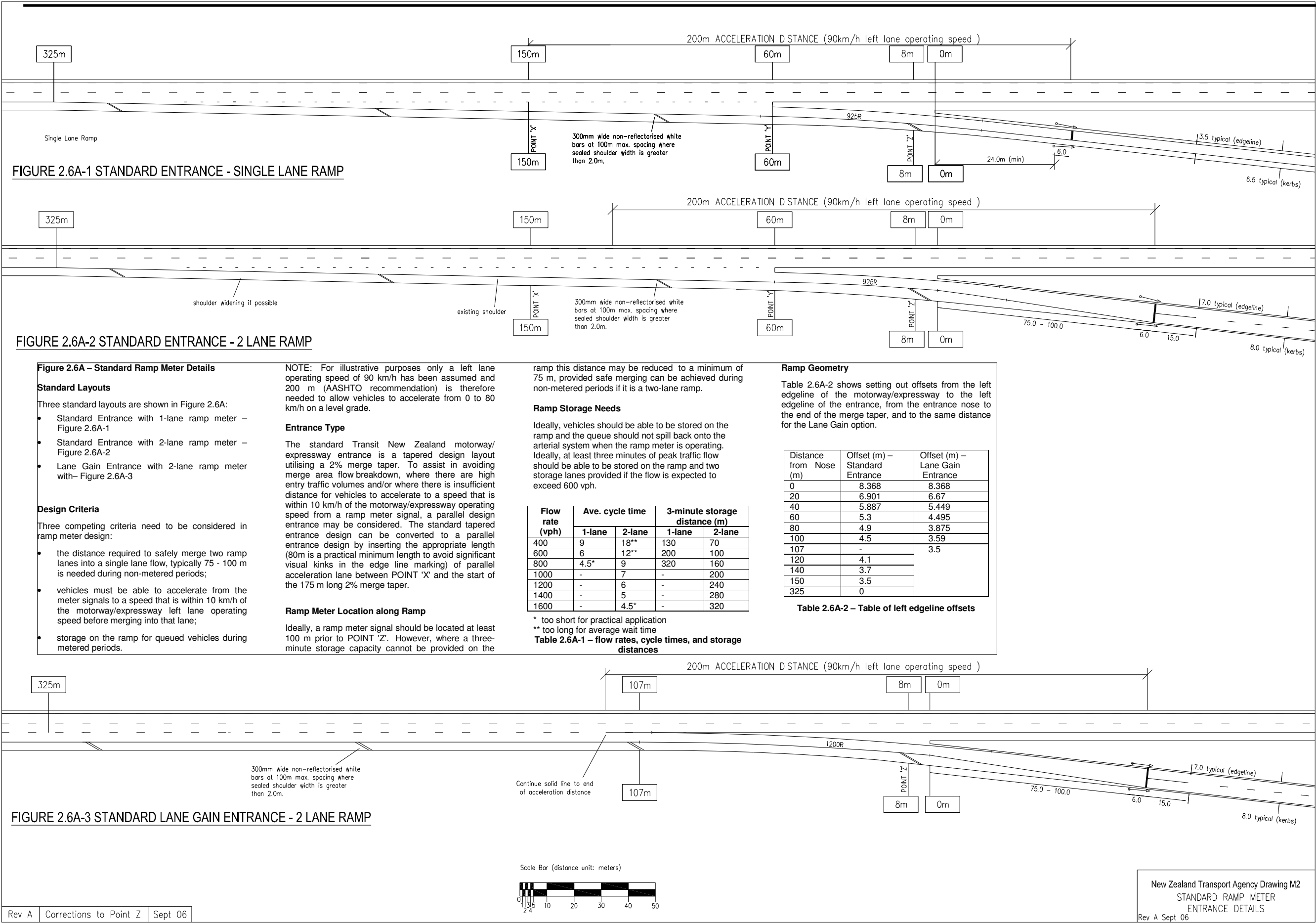
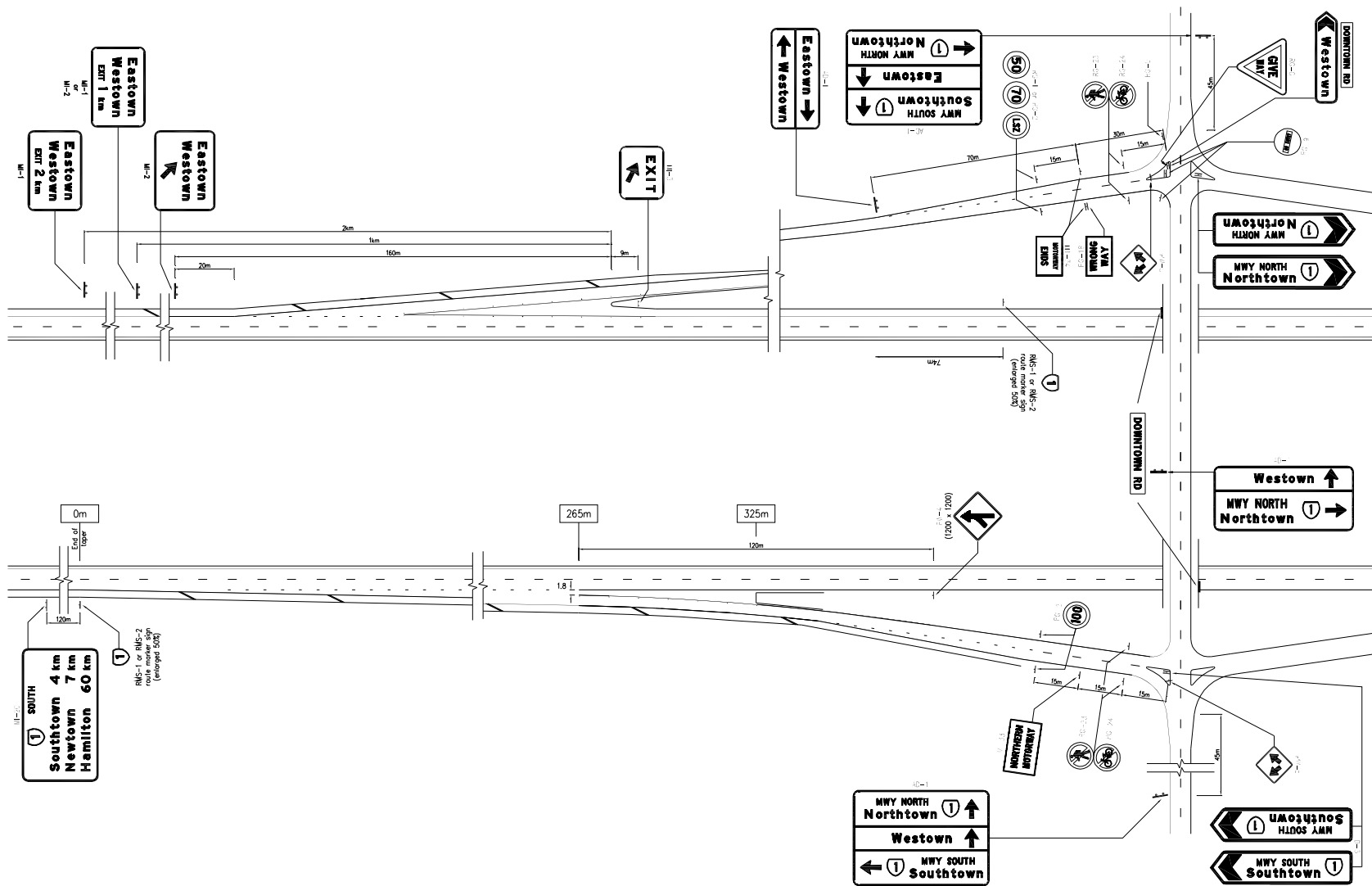


FIGURE 2.6 (b) STANDARD MOTORWAY AND EXPRESSWAY ENTRANCES - GEOMETRIC LAYOUT AND SIGNING DETAILS WITH RAMP SIGNALS

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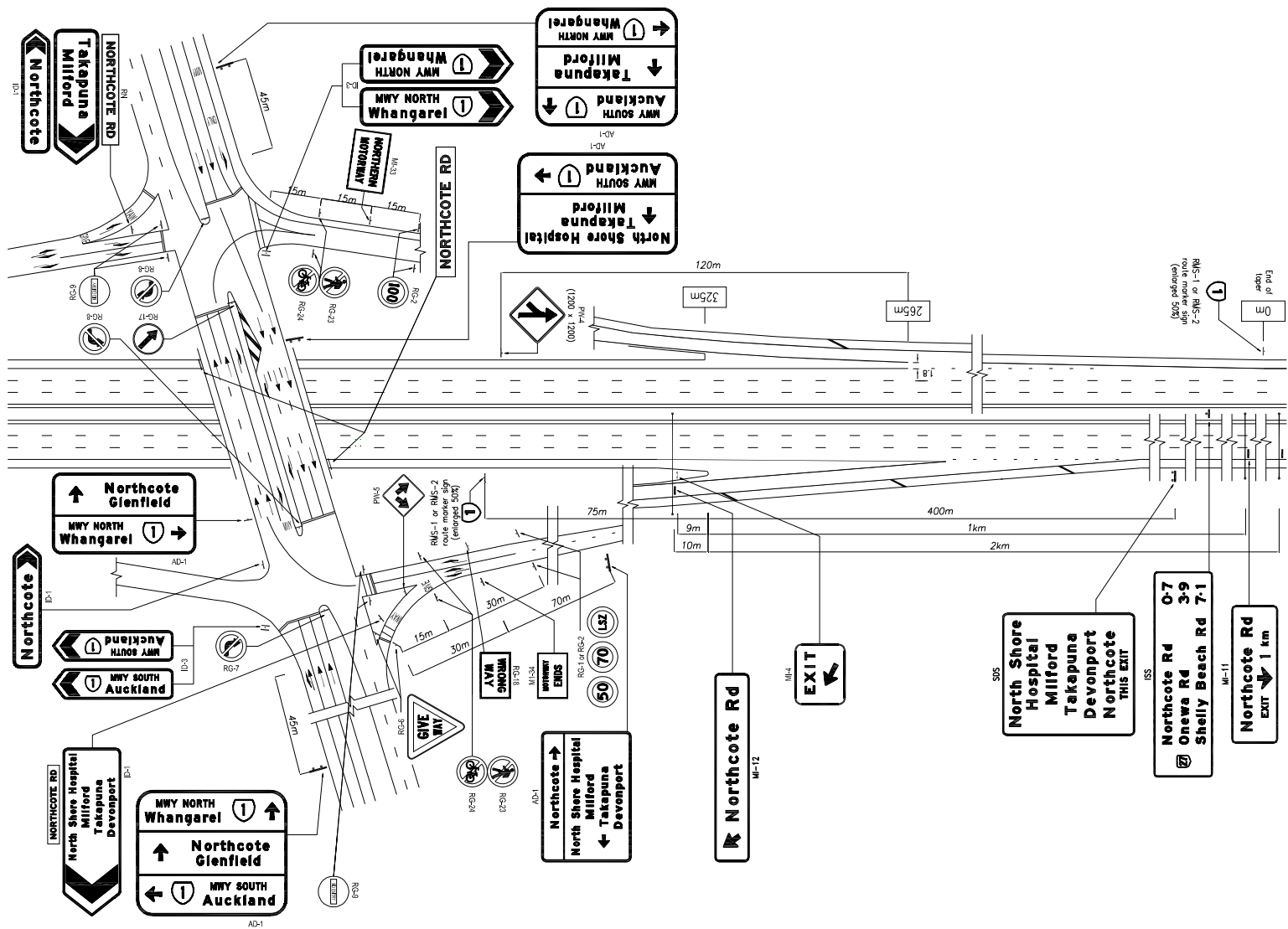
NOTES:

1. Exit numbers are not shown for clarity reasons.
2. EXIT SPEED advisory signs may be used on off-ramps, when warranted.
3. RG - 9 signs must be sited and angled to cover all potential wrong-way turning movements.
4. When the ramp terminal intersections do not have traffic islands refer to MOTSAM Part I: *Traffic Signs* for location details for RG - 6, RG - 9 and ID - 3 signs.
5. The MI - 33, RG - 2, RG - 23 and RG - 24 signs can be combined as shown in FIGURE 6.16.
6. The MI - 34 and RG - 1 or RG - 2 signs can be combined as shown in FIGURE 6.17
7. The RG - 18, RG - 23 and RG - 24 signs can be combined as shown in FIGURE 6.18.

TYPICAL EXIT AND ENTRANCE SIGNING
FOR A RURAL INTERCHANGE

FIGURE 2.7

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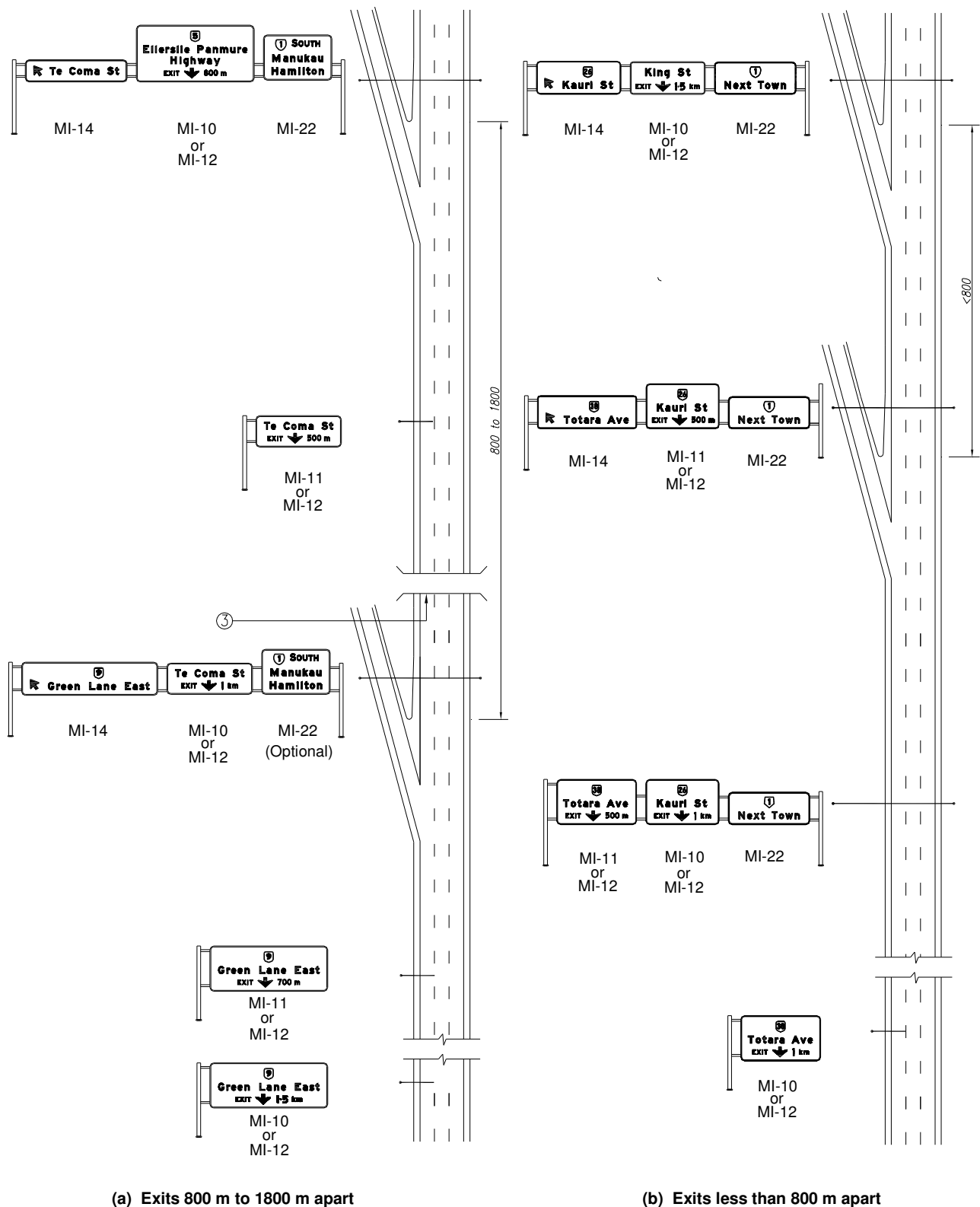
NOTES:

1. Exit numbers are not shown for clarity reasons.
2. EXIT SPEED advisory signs may be used on off-ramps, when warranted.
3. RG-9 signs must be sited and angled to cover all potential wrong-way turning movements.
4. When the ramp terminal intersections are not signalised the signs close to, and within, the intersection must be carefully sited so as not to obscure driver sight distances to opposing traffic.
5. Overhead mounted ISS signs are located in the median midway between interchanges.
6. The MI - 33, RG - 2, RG - 23 and RG - 24 signs can be combined as shown in FIGURE 6.16.
7. The MI - 34 and RG - 1 or RG - 2 signs can be combined as shown in FIGURE 6.17
8. The RG - 18, RG - 23 and RG - 24 signs can be combined as shown in FIGURE 6.18.

FIGURE 2.8
TYPICAL EXIT AND ENTRANCE SIGNING
FOR AN URBAN INTERCHANGE

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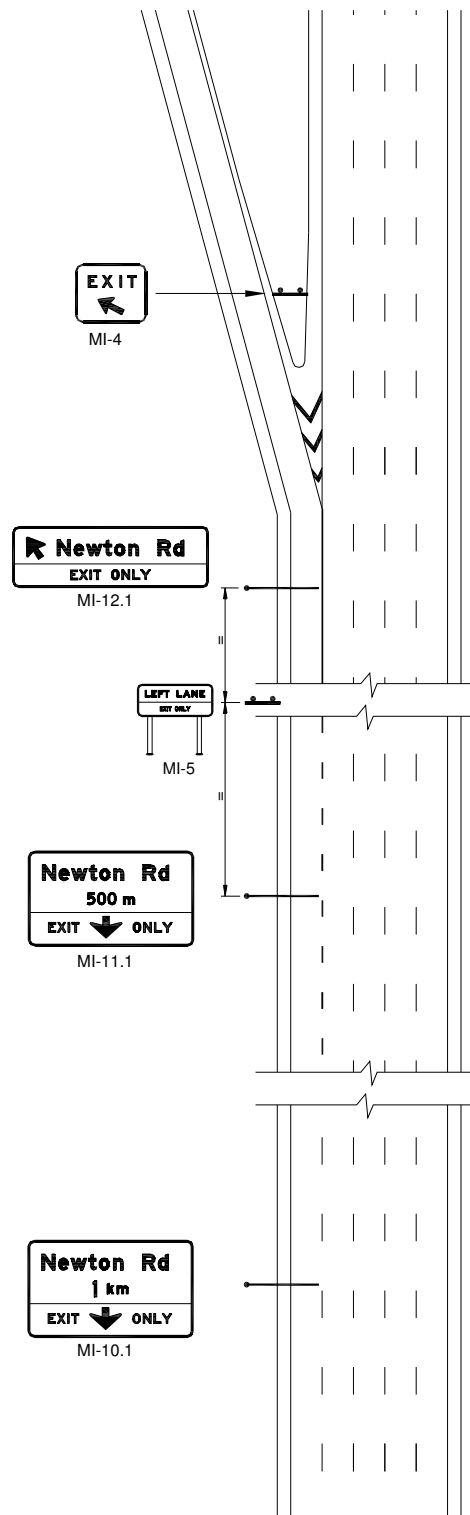
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NOTES:

1. Exit number signs are not shown for clarity reasons.
2. Exits spaced less than 800 m apart should avoided whenever practicable.
3. The preferred alternative location for the first advance exit sign for the second exit and the optional 'Pull Through' where a crossroad overpass is at least 800 m from the exit to which the sign refers.
4. Exit, SDS and ISS signs are omitted for clarity - refer to FIGURE 2.8 for typical sign details and locations.
5. Dimensions are in metres.

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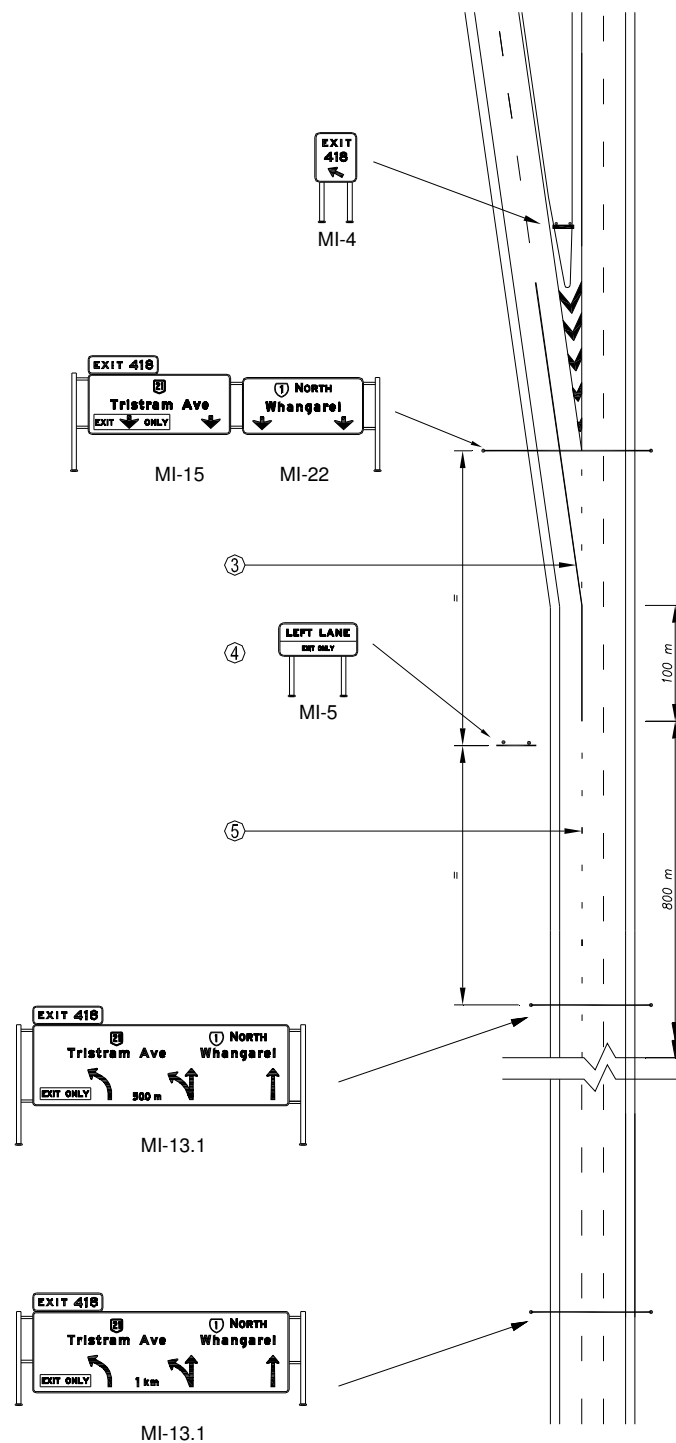
NOTES:

1. The exit lane may be part of the main road carriageway or an auxiliary lane developed some distance in advance of the exit.
2. Advance exit and exit direction signs display yellow 'EXIT ONLY' panels.
3. A ground mounted MI - 5 sign may be used to reinforce the 'EXIT ONLY' message for drivers in the left lane. The sign should be located approximately midway between the second advance exit sign and the direction sign.
4. Refer to FIGURE 12.9 for layout and road marking details.
5. SDS and ISS signs may be added as required - refer to FIGURE 2.8 for typical sign details and locations.

FIGURE 2.10 SIGNING FOR A LANE DROP EXIT

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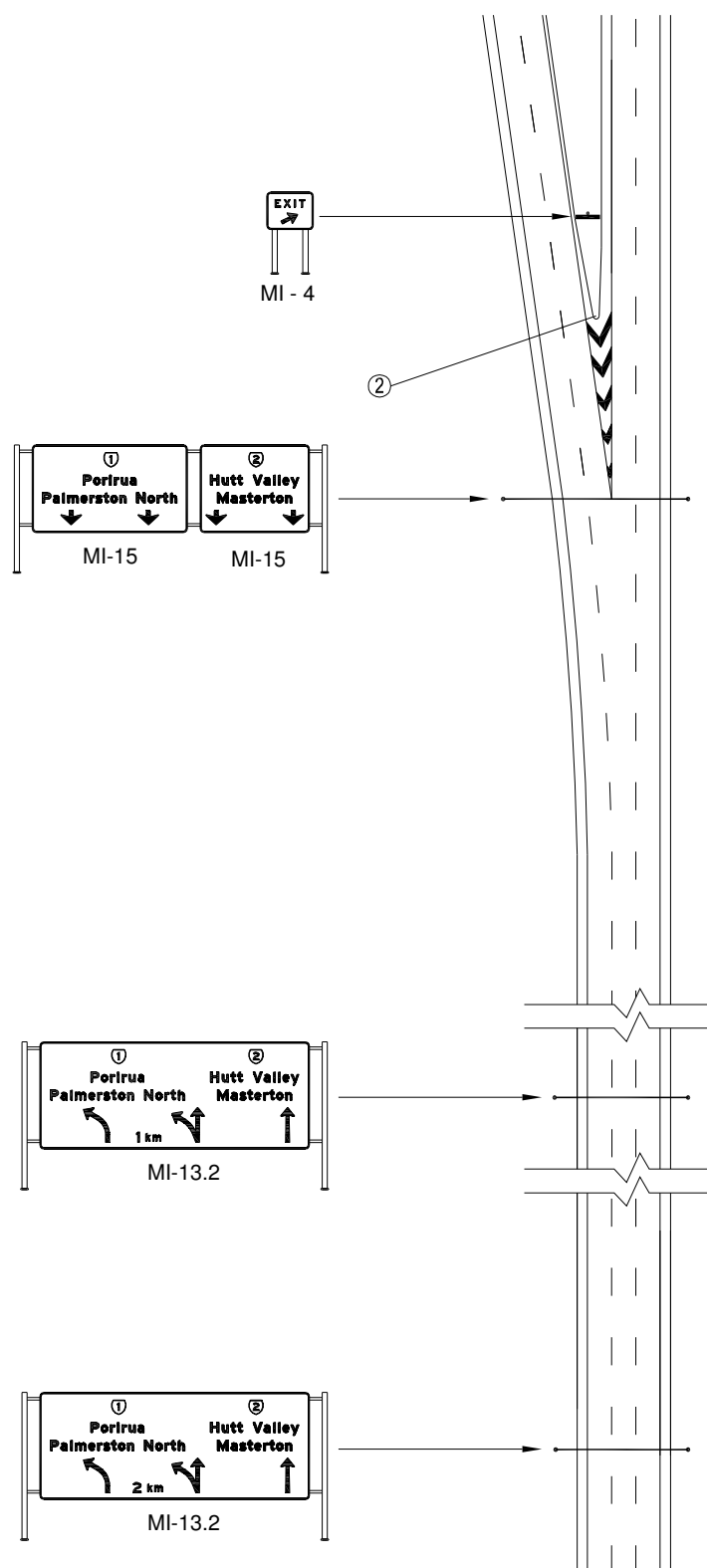
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NOTES:

1. The left hand exit lane is a lane drop situation. The lane may be part of the main road carriageway or an auxiliary lane added to the main road carriageway some distance in advance of the exit.
2. An auxiliary lane should be fully developed prior to the location of the first advance exit sign.
3. 200 mm reflectorised white solid lane line.
4. Optional ground mounted sign which may be used to reinforce the 'EXIT ONLY' message for drivers in the left lane. The sign should be located approximately midway between the second advance exit sign and the exit direction sign.
5. 200 mm reflectorised white continuity line.
6. Refer to FIGURE 12.4 for layout and road marking details.
7. SDS and ISS signs may be added as required - refer to FIGURE 2.8 for typical sign details and locations.

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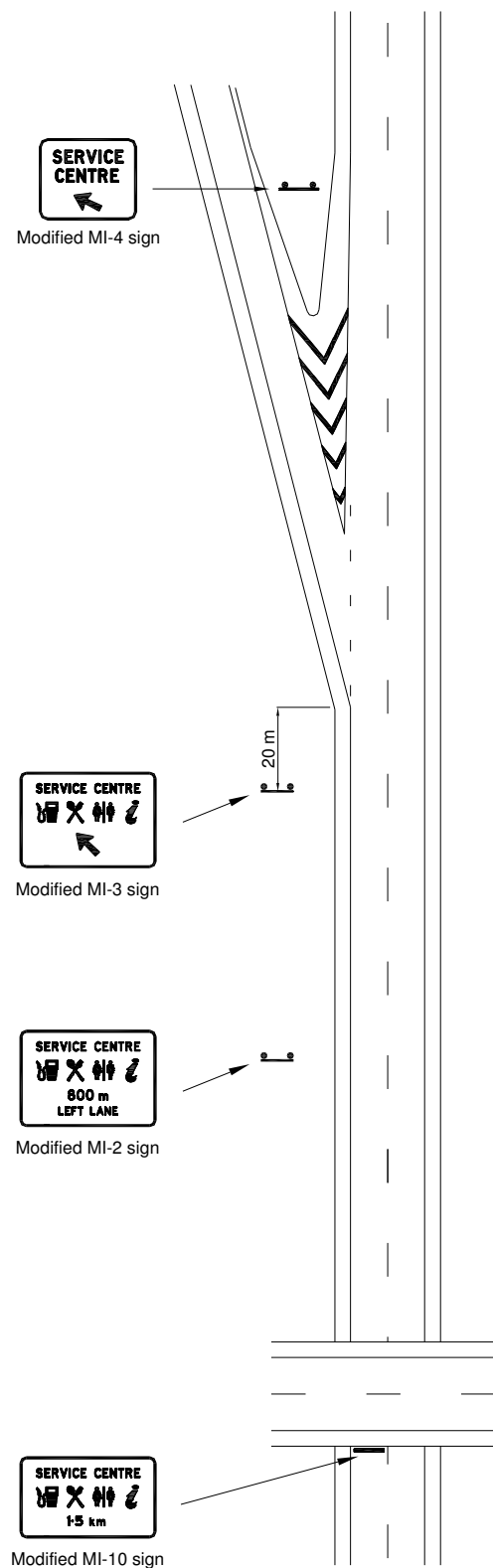
NOTES:

1. In this example of a motorway interchange diverge exit SH 1 curves off to the left but it is the continuing through route. SH 2 starts at the interchange and hence diverges from SH 1.
2. Nose cone or leading face of crash cushion to be marked with black and reflectorised yellow stripes 100 mm wide as per MOTSAM Part 2, FIGURE 5.6.
3. Refer to FIGURE 12.10 for layout and road marking details.
4. SDS and ISS signs may be added as required - refer to FIGURE 2.8 for typical sign details and locations.

FIGURE 2.12 TYPICAL SIGNING FOR A DIVERGE EXIT

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**NOTES:**

1. Service Centre advance exit and exit direction and exit signs generally follow the format, layout and location of MI - 1/MI - 10, MI-2, MI - 3 and MI - 4 signs.
2. All signs shall be fully reflectorised and have white legends, symbols and borders on blue backgrounds.
3. No more than four (4) symbols may be shown on a sign.
4. This example illustrates a situation where a crossroad overpass is available for overhead mounting the first advance exit sign.

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NOTES:

1. This toll route signing system has been developed using the traffic signing principles described and detailed in MOTSAM.
2. The guide sign colour scheme is based on that shown in the *VicRoads Traffic Engineering Manual Volume 2, Chapter 12.4.7*. However, for New Zealand its use is restricted to signs identifying the start and finish of toll roads and those outlining toll charges, payment facilities and other signs directly relating to the tolling facility.
3. A toll route is considered to be a 'Named Route' as defined in the Touring Route Signing Policy which is in MOTSAM Part 1: *Traffic Signs*.
4. The signing proposed is generic and equally applicable to state highways with green background guide signs and local authority roads with blue background guide signs.
5. Example is shown with exit numbering and cardinal direction options, which is standard within the NZTA Auckland Region.
6. Southbound traffic will be diverted along SH 17 to its intersection with SH 1 at the Silverdale interchange.

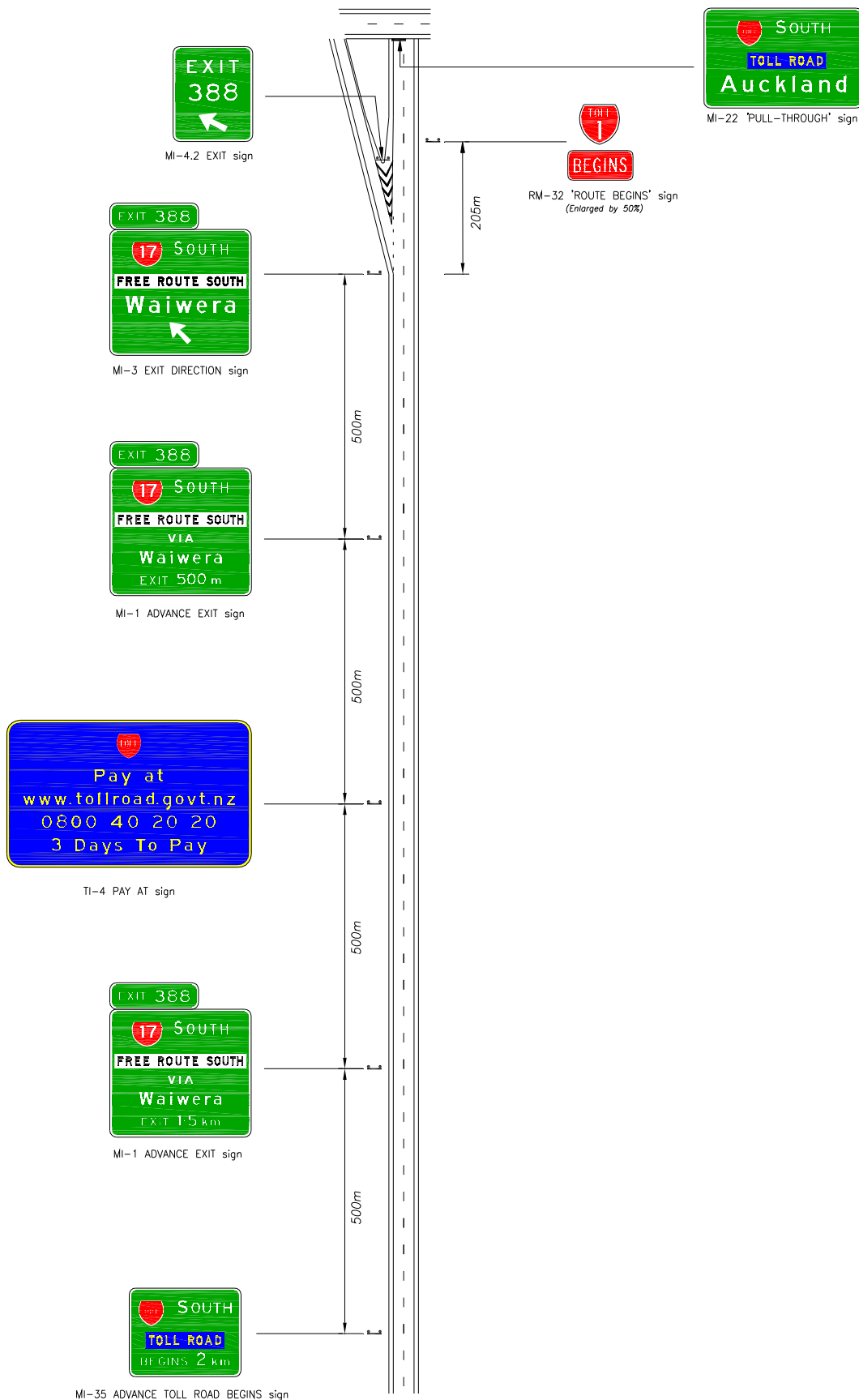


FIGURE 2.14 TYPICAL SIGNING FOR A TOLL ROUTE