VIASTRADA

TRAFFIC ENGINEERING AND PLANNING

Review of Cycle Signs and Markings

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Summary

The Road User Rule (2004) and the supporting Traffic Control Devices (TCD) Rule (2004) gave cycle lanes a legal status through the application of cycle lane symbols. Some road controlling authorities (RCAs) and transportation practitioners are using or proposing to use cycle symbols for reasons other than defining legal cycle lanes.

A traffic engineering tool used overseas is an advisory pavement marking treatment indicating or advising road users of the potential presence of cyclists and of the location where cyclists may be expected to ride on a road. Under New Zealand's present rules, this tool cannot be used.

In addition to this, many RCAs are devising non-standard signs and markings for cycling, in some cases to address similar issues. It could be argued that this should simply be tolerated. However, the situation would suggest that there is a need for signs and markings covering a broader regime than is currently allowed for in legislation and approved TCDs. There is ample evidence that road users cannot process all current TCDs in the road environment at many locations. Standardisation of TCDs supported by good guidance in the TCD Manual minimises the proliferation of signs and markings, helping to make decision-making easier for road users.

This report reviews all signs and markings relevant to cycling to determine whether current legislation and supporting TCDs meet the needs of RCAs and road users.

The review concludes that some rules and practices should be continued. This includes legally defining cycle lanes by road markings, and not requiring signs for this purpose as is common in most other countries.

On the other hand, a number of rules and/or TCDs should be changed, particularly the:

a) Use of markings instead of signs to legally designate shared paths;

b) Review and development of rules around shared spaces and zones;

c) Simplification of the give way rules (beyond what is already proposed to come into effect in March 2012) to improve priority for cyclists on a path;

d) Development of a way-finding sign system for cycle routes;

e) Requirement for yellow no-stopping lines to be marked in kerbside cycle lanes; and

f) Development of a code of conduct with supporting TCDs for shared path use behaviour.

The report concludes that while there is a strongly identified need for shared lane (advisory) markings, there is a potential diversity of practitioner views. Further investigation would inform the decision as to whether shared lane markings should be adopted. This investigation may include debate amongst a wider stakeholder group, literature review and formal trial(s). Five options for differentiating cycle lane and shared lane markings are identified and compared. Any trial(s) should employ draft design guidelines to ensure appropriate usages. The key recommendations with respect to shared lane markings are:

g) Undertake an international literature review of efficacy to determine whether shared lane markings should be trialled in New Zealand.

h) Any trial should include research on the most effective symbol and means of cycle lane differentiation including at least the testing of a sharrow symbol.

i) If shared lane markings are approved for inclusion in the rules, develop design guidelines and standards in the TCD Manual.

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1 Introduction

1.1 Background

The Road User Rule (2004) and the supporting Traffic Control Devices (TCD) Rule (2004) gave cycle lanes a legal status through the application of cycle lane symbols. Some road controlling authorities (RCAs) and transportation practitioners are using or proposing to use cycle symbols for reasons other than defining legal cycle lanes, e.g. to establish cycle advisory awareness.

Feedback from an initial paper to the TCD steering group in September 2010 was to investigate and confirm what the issues and limitations are with the current signs and markings and establish what is most desirable from a road user perspective. So rather than introducing an additional pavement marking, it was the TCD steering group's directive to have the existing practice reviewed in its entirety first.

Auckland City Council (ACC, most of whose transport functions are now part of Auckland Transport) once proposed to trial advisory cycle symbols. Sinclair Knight Merz (SKM) prepared a report in 2007 for ACC entitled "Advisory Cycle Symbol Proposed Trial".

1.2 Objective

The objective of this commission is to review the current signs and markings of cycle facilities in New Zealand and make recommendations to the TCD Steering Group on options for traffic control devices, and/or the legal framework and rules that will enable a clearer understanding to all road users on the meaning and application of cycle facility signs and markings (TCDs).

1.3 Context

Road users have varying interpretations of the use and legal connotations of some current TCDs. As an example some drivers believe they can park in kerbside cycle lanes, contrary to the legislation, so one solution would be to require the use of broken yellow lines. Any future road marking needs to have the flexibility of being able to be applied to existing types of facilities (e.g. cycle lanes) and other facilities that are currently either unmarked (e.g. guidance where cyclists are to claim a lane) or are as yet rare in New Zealand (e.g. separated bicycle facilities).

If the rules were to be changed and a future cycle symbol not only defined a special vehicle lane for cyclists but has a broader meaning, then recommendations are required on what legal framework should be put in place instead. Traffic control devices that could be considered are markers (e.g. audio tactile profiled markings) or paint markings (e.g. dashed with solid lines), coloured surfacing and signs. These are not mutually exclusive from retaining the current legal meaning of a cycle symbol.

There have been suggestions that a cycle symbol that includes an outline of a human being could reflect a broader meaning and understanding of the intent of the facility. Of the permanent warning signs for 'vulnerable road users', the PW-35 (cyclists) sign is the only one to not show a human figure.

There are several locations in New Zealand trialling different marking styles.

1.4 Review methodology

The work started with a review of the relevant legislation. It was then checked what traffic control devices are available to Road Controlling Authorities (RCAs) through the *Manual of Traffic Signs and Markings* (MOTSAM). This was compared against the various environments, both existing for some time (e.g. cycle lanes) and relatively new (e.g. separated bicycle facilities) and whether the needs of all these environments are met with the existing legislations and traffic control devices.

In mid-June 2011, letters requesting information regarding trials of novel or non-standard cycle facility signs and markings were sent out to the following eight local authorities:

- Auckland Transport *(Ina Stenzel and Steve Patton)*
- Christchurch City Council *(Michael Ferigo)*
- Hastings District Council *(Matthew Rodwell, Owen Mata and Frans Krause)*
- Masterton District Council *(Hamish Pringle)*
- Nelson City Council *(Andrew James)*
- New Plymouth District Council *(Carl Whittleston)*
- Palmerston North City Council *(Sandi Morris)*
- Taupo District Council *(Claire Sharland)*

Information requested included:

- Locations and road environment
- Design of signs and markings
- Results of analysis and conclusions
- Photos

In addition to the responses received, other non-standard TCDs identified through ViaStrada's involvement with a number of councils on other projects have been compiled. The relevant examples are listed in sections 5.5 and 6.

A selection of New Zealand and overseas non-standard signs is presented in Appendix C. This selection has been compiled over time separate from the review; the signs contained have not necessarily been reviewed and the appendix is provided for information only.

Throughout the report, issues are discussed and where appropriate, recommendations are made using the following formatting:

#. Recommendations are formatted like this

American legislation is sometimes referred to in this report. Where direct quotations are provided, the text has been amended to New Zealand English in order to not distract the reader with unusual spelling.

2 Legislation Overview

The legislative requirements for provision of, and compliance with, traffic control signs and markings in New Zealand are set out in the TCD Rule 2004 (Rule 54002) and the Road User Rule (2004) and subsequent amendments. This section first introduces the rules and then describes those sections of the rules which are relevant to cycling.

The policy and location requirements of the traffic control devices are detailed in the Manual of Traffic Signs and Markings (MOTSAM): Parts 1 and 2 and the Traffic Control Devices Manual, which are described in further detail in Section 4 of this report.

2.1 Traffic Control Devices Rule

The requirements for the design, construction, installation, operation and maintenance of traffic control devices in New Zealand are set out in the TCD Rule and subsequent amendments. The TCD Rule also sets out and details the responsibilities of Road Controlling Authorities (RCAs) in the provision of traffic control devices:

> The objective of the rule is to contribute to a safe and efficient road network by ensuring that traffic is controlled by means of traffic control devices that are safe, appropriate, effective and uniform and are applied in a consistent manner.
>
> The purpose of this rule is to contribute to the safe and efficient operation of our road network by:
>
> - requiring uniformity in the form, appearance and placement of traffic control devices;
> - establishing minimum standards for traffic control devices;
> - specifying who may authorise and install traffic control devices;
> - ensuring that road controlling authorities have regard to safe practice in the design and installation of traffic control devices and how they are used for traffic management.

2.2 The Road User Rule

The Road User Rule (2004) applies to all road users and stipulates how traffic must operate on a road. Subclause 3.1 (1) states:

> If traffic at any place is controlled by a traffic control device, a person (including a pedestrian) using the road at that place must comply with the instructions given by that traffic control device that apply to them.

2.3 Road User Rule Amendment 2011

The Land Transport (Road User) Amendment Rule 2011 includes two main changes relevant to cycling as follows.

2.3.1 Give way rule change

The change to the give way rule will come into operation on 25 March 2012 should not have any implications for the current traffic control devices that relate to cycles.

The rule change may improve safety for cyclist travelling straight through at intersections, as left turning motorists will have much improved certainty of their turning manoeuvre without having to scan their mirrors for other vehicles on their outside. This should help raise their awareness to the presence of cyclists. This may help with introducing kerbside facilities that currently would not be considered appropriate due to the current complex decision making processes that turning drivers are confronted with.

2.3.2 Bus signal changes

One change that has implications for cyclists in the amendment, which come into force on 1 October 2011, is the change around 'T' or 'B' traffic signals.

Riders of motorcycles, mopeds and cycles using a bus lane that is controlled by a 'B' (bus) signal will be allowed to proceed on a white 'B' signal.

These riders still need to comply with a yellow or red 'B' signal. Unless excluded by signage, riders of motorcycles, mopeds and cycles are allowed to use the bus lane. Allowing these riders to proceed on a white 'B' signal will prevent them from blocking the way of a bus if there's a bus behind them, and improve traffic flow.

Until 1 October 2011, the rule only allows buses using a special vehicle (bus) lane controlled by a 'B' signal to proceed on a white 'B' signal unless the signals include the displays shown below which were included in the Traffic Control Devices Amendment 2010:

Special vehicle displays (diagram S4-10, Schedule 3)

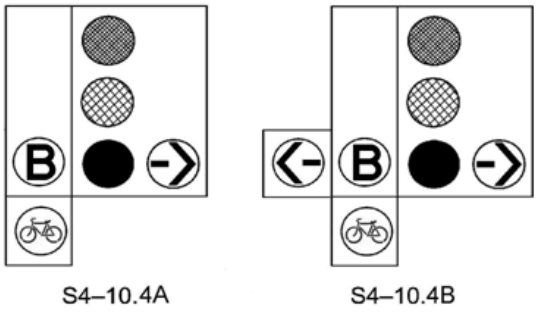


Figure 1: Signal faces from the TCD Rule

A green ‘cycle’ symbol for cycles may be installed below a white ‘B’ symbol for buses as depicted in diagram S4-10.4A or S4-10.4B.

3 Legislation and Cycle Facilities

3.1 Cycle lanes

Cycle lanes are a type of traffic lane, with the hierarchy of lanes shown in Figure 2.

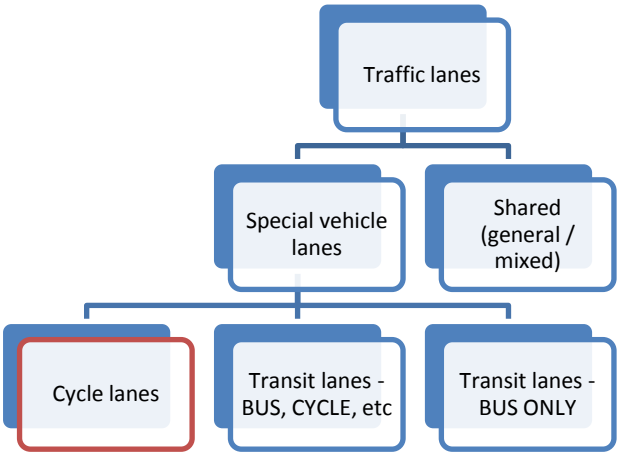


Figure 2: Hierarchy of lanes

The means of defining a traffic lane is stipulated in the TCD Rule section 7:

> **7.11 Lane lines**
>
> A lane line may be:
>
> (a) marked or indicated by one or more traffic control devices in 7.1(3)(a) to (i); or
>
> (b) marked with:
>
> (i) a white broken or continuous single line that is not less than 100 mm wide; or
>
> (ii) a regular pattern of raised white pavement markers.
>
> **7.12 Lanes**
>
> 7.12(1) A lane, including a cycle lane, may be indicated to road users by one or more traffic control devices used singly or in combination, including:
>
> (a) traffic control devices in 7.1(3); or
>
> (b) other markings that comply with section 5.
>
> 7.12(2) If the use of a lane is restricted to a specific class or classes of vehicle, the traffic control devices that indicate the restriction must comply with section 11.

Cycle lanes are defined as special vehicle lanes in the TCD Rule section 2: Definitions:

> **Special vehicle lane** means a lane defined by signs or markings and restricted to a specified class or classes of vehicle; and includes a bus lane, a transit lane, a cycle lane, and a light-rail vehicle lane.

As such, a cycle lane is a specific area of road set aside for use by a special class of vehicle. The RUR stipulates that special vehicle lanes are limited to the designated classes of vehicles, except clause 2.3 (4) allows a driver to drive wholly or partly in a lane that is otherwise unavailable (e.g. a cycle lane) if the driver -

> (a) drives in the lane to cross it to-
>
> (i) make a turn; or
>
> (ii) leave a road; or
>
> (iii) enter a marked lane or line of traffic from the side of the road; or

(iv) enter a marked lane or line of traffic from another marked lane; or

(v) park in a place clear of a special vehicle lane, if the lane that the driver crosses is a special vehicle lane; or

(vi) enter a specified stopping place or loading zone to pick up or drop off passengers or a load, if the driver is driving a passenger service vehicle or goods vehicle and the lane that the driver crosses is not reserved for a vehicle of that class; and

(b) drives in the lane for the minimum length necessary to complete the manoeuvre and for no more than a maximum length of 50 m; and

(c) gives way to vehicles entitled to use the lane

The TCD Rule sets out the requirements for traffic control devices for special classes of vehicle and road user as follows:

Section 11 - Traffic control devices for special classes of vehicle and road user

11.1 Provision of signs and markings

A road controlling authority that is providing a special route or setting aside a specific area of roadway for a class or classes of road user that is intended to impose restrictions on other road users must provide signs and markings as specified in 11.2, 11.3 or 11.4.

11.2 Special vehicle lanes

11.2(1) If defining a part of a road as a special vehicle lane, a road controlling authority must, at the start of the special vehicle lane and after each intersection, along its length:

(a) mark on the road surface a white symbol, that complies with Schedule 2, defining the class or classes of vehicle for which the lane has been reserved; and

(b) if for other than a 24-hour restriction, install a special vehicle lane sign that complies with Schedule 1:

(i) defining the class or classes of vehicle for which the lane has been reserved; and

(ii) stating the periods for which the reservation applies.

11.2(2) A road controlling authority may provide the following traffic control devices to discourage use of a special vehicle lane by other vehicles, or to draw attention to the likely presence of vehicles entitled to the use of the lane:

(a) additional white special vehicle lane symbols described in 11.2(1)(a) or signs described in 11.2(1)(b) along the length of the lane; or

(b) if for a 24-hour restriction, special vehicle lane signs; or

(c) a surface treatment that provides a contrasting colour or texture to that of adjacent lanes used by other vehicles:

(i) at locations along the length of the lane; or

(ii) along the length of the lane.

Figure 3: Special vehicle lane markings

The TCD Rule requires that from July 2009, all new cycle lane symbol markings should be in the form of the M2-3 cycle lane symbol; however the two older stencils are still in regular use, although no longer accommodated in the rules.

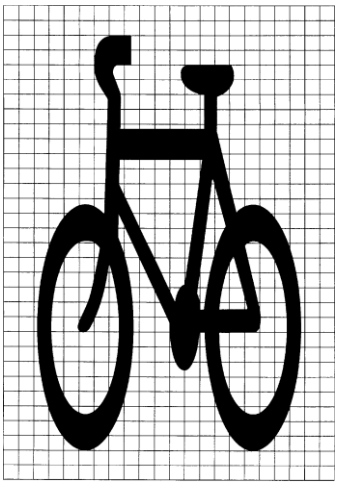


Figure 4: M2-3 cycle symbol as defined in the TCD Rule

In summary:

A cycle lane intended for use all day every day is legally defined by the cycle pavement marking symbols (refer Figure 4) at the start of the special vehicle lane and at the point at which the lane starts again after each intersection and thus the RCA **must** install cycle pavement marking symbols at these locations.

The RCA **may** provide additional cycle pavement marking symbols and cycle lane signage.

Discussion and recommendations

With respect to use of cycle lanes by other vehicles for the purposes of turning or changing lanes, the confusion and enforcement difficulties associated with the application of the rule for Auckland's bus lanes has resulted in proposals to provide TCDs indicating the start of the 50 m maximum distance from intersections.

Providing additional TCDs to explain the rule (akin to the "give way to pedestrians" signage sometimes employed at crosswalks) or mark out the 50 m distance is not supported because of the potential for TCD proliferation and habituation.

In comparison to the provisions for driving in a bus lane prior to making a turn, driving in a cycle lane results in overhanging into the adjacent lane and the potential creation of hazardous situations (e.g. reducing the ability of cyclists to avoid left turning heavy vehicles). It also impedes the flow of the designated class of road users for that lane (cyclists), especially when queuing for a left turn adjacent to a wide mixed through and left lane (Figure 5).

Figure 5: Driving in a cycle lane to make a left turn is conditionally permitted by the RUR

Although much of the difficulty can be avoided through good design and improved education, the cyclist safety and travel time disbenefits of the present rule are considered to outweigh the motorist benefits.

1. **Amend the RUR to not allow driving in a cycle lane for the purposes of making a turn or leaving a road.**

With respect to the means of designating a cycle lane, New Zealand is in the fortunate position where a pavement marking alone is sufficient. Most other countries require signs, generally due to pavement markings being covered by snow occasionally, and this adds to the clutter of signs in urban areas. The principle of maintaining the ability to define a cycle lane by road markings should be maintained, but whether or not there should be changes to the existing cycle logo will be discussed at a later point.

The cycle symbol is used to denote a class of vehicle that is entitled to use a lane. As can be seen in Figure 3, this might be a mixture of classes, such as cycles, buses and taxis. It can be seen that the cycle symbol does not necessarily designate an exclusive cycle lane. However, a cycle symbol by itself designates a lane which may only be used by cyclists, except for near driveways and intersections as provided for in legislation.

2. **Continue designating cycle lanes by road markings only.**

The form of road markings which designate a cycle lane is defined in the existing TCD rule as a cycle symbol within a legally marked lane (typically designated by one or two white lane lines). Other means of designating or emphasising cycle lanes are conceivable such as a green lane line within the white line. Such approaches could relieve the cycle symbol itself from the "duty" of specifying the class of road users entitled to use the special vehicle lane, freeing the symbol up for other purposes such as advisory markings. Please refer to section 6.1 of this review for further discussion and recommendations.

There is a view that adding a human form to the M2-3 cycle symbol may improve driver behaviour. Such inclusion may be considered irrespective of subsequent conditional recommendations of this review regarding research into the most effective symbol for shared lane markings. If a human form is included, the cycle logo should also be updated on relevant signs.

3. **Undertake research into whether the inclusion of a human form on the cycle symbol improves driver behaviour.**

3.2 Shared paths

The TCD Rule sets out the requirements for traffic control devices for cycle paths and shared paths as follows:

11.4 - Facilities for cycles, wheeled recreational devices and mobility devices

Paths shared by cycles and other users

11.4(1) For a shared path used by cycles, a road controlling authority:

(a) must install an appropriate sign, or combination of signs, defining the class or classes of path user, that complies with Schedule 1:

(i) at the start of the shared path; and

(ii) after each roadway or any other pathway with which it intersects; and

(iii) at the end of the shared path; and

(b) may install signs at other intervals along the shared path.

11.4(2) If pedestrians, cycles, wheeled recreational devices or mobility devices are restricted to a specific side or part of a path, or where the path is separated for users travelling in different directions, a road controlling authority:

(a) must provide signs and appropriate markings indicating the nature of the restriction:

(i) at the start of the path; and

(ii) after each roadway or any other pathway with which it intersects; and

(iii) at the end of the restriction; and

(b) may mark cycle, pedestrian, wheeled recreational device or mobility device symbols at other intervals along the path.

Cycle, pedestrian, wheeled recreational device and mobility device signs

11.4(3) A road controlling authority may install on the same pole a combination of signs that relate to cycles, to pedestrians, to riders of wheeled recreational devices or to riders of mobility devices.

Parking on footpaths, cycle paths or shared paths

11.4(4) A road controlling authority may install facilities for the parking, standing or storage of cycles, wheeled recreational devices or mobility devices on a footpath, footway, cycle path or shared path.

Control where a cycle path or shared path crosses a roadway

11.4(5) When a cycle path or a shared path used by cycles crosses a roadway, a road controlling authority may, as appropriate, control either the movement of users of the path or traffic along the roadway by means of stop or give-way signs or by the installation of traffic signals, in the same manner as described in 10.5 for an intersection.

Where a path is shared by cycles and pedestrians, the RCA **must** install an appropriate sign or combination of signs.

If separate sides of a path are reserved for cyclists and pedestrians, or for path users travelling in different directions, the RCA must provide signs and appropriate markings at the start of the path and at the point at which the path starts again after it intersects a roadway or another pathway.

The RCA **may** mark cycle and pedestrian symbols at other intervals along the path.

Figure 6: Shared pathway in Nelson

In summary:

When a path is available to cyclists (and other users), the RCA **must** install appropriate signs at the beginning, the end of the path, and at intersections with roadways.

The RCA **may** provide cycle pavement marking symbols.

Discussion and recommendation

Unlike with cycle lanes, the rules require RCAs to signpost shared path, as opposed to using pavement markings. As the vast majority of shared paths would be sealed, it appears non-sensible to always require signs. Sign clutter minimised by amending the rules so that pavement markings (using logos for cycles and pedestrians) are used to define shared paths. Where the path surface is not suitable for pavement markings, signs should be stipulated to be used to define the shared nature of the pathway. Where the path is suitable for pavement markings, signs should not be required.

4. **Amend the RUR so that a shared path is defined by pavement markings only, unless the path surface dictates that signs are required.**

3.3 Shared space

Land Transport (Road User) Rule 2004: Section 1.6 interprets a shared zone as follows:

> ***shared zone*** *means a length of roadway intended to be used by pedestrians and vehicles*

Rule 10.2 states:

> *(1) A driver of a vehicle entering or proceeding along or through a shared zone must give way to a pedestrian who is in the shared zone.*
>
> *(2) A pedestrian in a shared zone must not unduly impede the passage of any vehicle in the shared zone."*

However, shared zones or shared spaces are not currently mentioned in the TCD Manual or MOTSAM and as such there are no traffic control devices for cyclist or other road users in a shared space. A sign has been gazetted, but most staff within the profession would be unaware of that, as the TCD Manual or MOTSAM are the reference guides usually referred to. As bicycles are considered to be vehicles under the legislation, cyclists are governed in a shared space by the same requirements as motorists. Any zone access restrictions which are intended to be applied differently to cyclists than motorists may need to be defined.

The Auckland City Council has amended their Traffic Bylaw 2006 to include the following explanatory text supplementing the RUR (italicised text is from the RUR):

Shared zones

25.1 **Shared zone** has the same meaning as in the Land Transport (Road User) Rule 2004.

The Land Transport (Road User) Rule 2004 states: "shared zone means a length of roadway intended to be used by pedestrians and vehicles."

25.18A.1 The council may by resolution specify any road owned or controlled by the council to be a shared zone.

Shared zones are regulated by Rule 10.2 of the Land Transport (Road User) Rule 2004 that states:

25.18A.2 Except where the council has by resolution specified otherwise, no person may stand or park a vehicle in a shared zone.

Figure 7: Elliot Street in Auckland – opening celebrations for a shared space

In summary:

The Road User Rule recognises shared space, with the term 'shared zone' used in the rules.

Although a sign has been gazetted, there is no guidance in MOTSAM or the TCD Manual on how or in what circumstances it is appropriate to signpost a shared space.

Discussion and recommendations

Shared spaces are as yet uncommon in New Zealand, but they may have a greater role to play as the public realm is increasingly rebalanced towards all transport modes and street uses (Ministry for the Environment, 2010).

RCAs are seeking means of defining the zone where the rules of the shared space apply. MOTSAM and the TCD Manual do not currently include a TCD for this purpose. By way of example, the German entry and exit signs are given in Figure 8 and Figure 9 below, respectively.

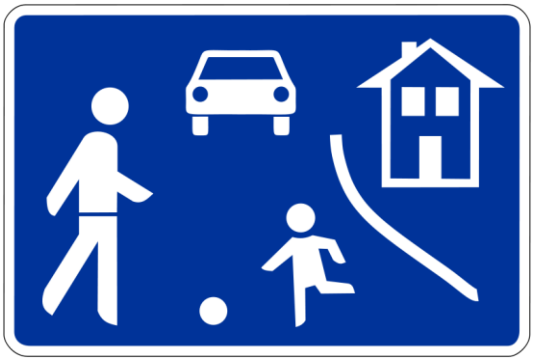


Figure 8: German sign indicating the entrance to a shared space

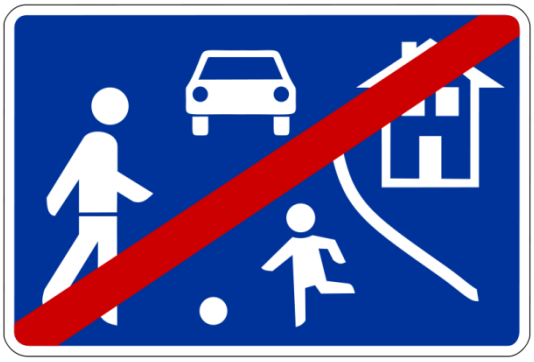


Figure 9: German sign indicating the exit from a shared space

It may be argued that employing yet more signs in a cluttered environment conflicts with the shared space principle of starting with the absolute minimum of traffic control devices and adding only what is absolutely necessary (Department for Transport, 2010). The implication is that slow shared spaces should be self-explaining. However, councils such

as Auckland and Nelson[1] are already beginning to develop requirements for signage intended to inform road users of the changed environment.

The following entry sign was gazetted in New Zealand (New Zealand Gazette 3/2/2011, No. 11, page 257):

Figure 10: Gazetted shared zone sign

5. **Include the gazetted shared zone sign in the TCD Manual.**

The current NZ legislation on shared zones does not explicitly govern cycling, speed limits, or parking (of bicycles or motor vehicles). It is noteworthy that clause 25.18A.2 of the Auckland bylaw suggests that cyclists may not be able to stand or park their bicycles even though it may otherwise be desirable and/or encouraged. Auckland Transport advises that they are not aware of any regulations or TCDs which refer to cyclists with respect to shared zones.

The following is a précis of the law governing shared spaces in Germany:

- Pedestrians can use the full width of the street, with child play specifically allowed.
- The speed limit is walking pace.
- Drivers are not to impede or endanger; if necessary, drivers have to wait.
- Pedestrians are not to unnecessarily impede drivers.
- Parking (of motor vehicles) is allowed only in specifically designated areas; stopping for dropping off passengers, loading or unloading is allowed anywhere.

It can be seen that the Auckland approach of allowing parking only where designated is also reflected in the German legislation. It should be noted that the most common form of designating a car park in such a zone in Germany is to insert the blue parking sign as a tile into the surface, thus avoiding the need to put up signs. Parking restrictions should apply to motor vehicles, as they require significant space per person carried, and not include bicycles (which, in New Zealand, are vehicles, too).

6. **Review the rules governing shared space in their entirety, including speed limits and parking of vehicles.**

[1] http://www.nelsoncitycouncil.co.nz/residential-shared-zones/

3.4 Separated Bicycle Facilities

The give way rule is linked to the definition of roadway in New Zealand, resulting in cycle facilities located on the roadway giving cyclists priority over turning traffic, whereas facilities behind the kerb assign priority to vehicles on the roadway. This has traditionally resulted in RCAs being biased towards cycle lanes, as paths would have significantly lowered the LOS for existing cyclists (who are the ones most likely to voice their opinion during public consultation).

Figure 11: Buffered and flag protected cycle lane between footpath and clearway, Melbourne

Figure 12: Kerb protected cycle lane, Melbourne

Discussion and recommendation

With more Separated Bicycle Facility (SBF) types being considered in New Zealand, road user may increasingly become confused:

- Will practitioners agree whether an SBF is always regarded as being part of the roadway (Figure 13)?
- If there is confusion amongst practitioners, how can we expect road users to interpret the legal situation correctly?

Figure 13: Cycle path in Christchurch

- The legislation is also not entirely clear with respect to whether a cycle path elevated above other traffic lanes by a kerb but separate from a footpath would be considered a SVL, with consequent implications for markings.

The understanding of TCDs will be enhanced if there is consistency across the different facility types. A facility might be readily swapping from off-street to on-street (e.g. a path might convert to an on-street facility prior to a side street to overcome the LOS issues that off-street facilities have), and what legally defines the two facilities should not change when the transition occurs.

Our current give way rules are not without ambiguity, as intersections are defined around the term ‘roadway’, which in turn is defined as *that portion of the road used or reasonably usable for the time being for vehicular traffic in general.* Is a cycle path that is available to cyclists thus available to ‘general traffic’, or would general traffic be defined that it requires the inclusion of motor vehicles?

Most European countries, on the other hand, have give way rules that are very simple: If you turn, you give way to everybody (including cyclists and pedestrians) proceeding straight ahead along a corridor.

SBFs are popular in the US and in Australia because they have been shown to increase participation in cycling amongst people who would not otherwise cycle. It is important that the legal framework does not put up any barriers for the introduction of SBFs in New Zealand.

7. **Review the rules and the TCD Manual to accomodate separated bicycle facilities.**
8. **Simplify the give way rules so that a turning road user should give way to road users proceeding straight ahead along the same corridor.**

4 MOTSAM and TCD Manual

This section deals with the role of the Manual of Traffic Signs and Markings (MOTSAM) and the Traffic Control Devices (TCD) Manual guidelines and standards in applying the legislation. Appendices A and B respectively contain inventories of current cycle signs and markings that are relevant to cycling.

4.1 MOTSAM Parts 1 and 2

Part 1 – Traffic Signs and Part 2 – Markings give details of approved signs, symbols and markings and guidance on their selection and location. These parts of MOTSAM were last updated in August 2010 and are being progressively replaced by the Traffic Control Devices Manual. Part 2 – Markings notes the following interpretation:

> In this manual the words *'shall'*, *'must'*, *'should'* and *'may'* have the following meanings:
>
> - **SHALL or MUST** - Indicates that the statement is mandatory, i.e. it is defined by legislation or NZTA policy, e.g. hazard markings.
> - **SHOULD** - Indicates that the statement is a recommendation, i.e. it is not mandatory, and that it is good practice, which is supported by relevant guidelines and current practice.
> - **MAY** - Indicates an option that is non-mandatory and has no recommendation but is considered good practice which can be varied in differing situations or by local road controlling authority practice.

4.2 TCD Manual

The TCD manual is intended to provide guidance on industry best practice, including, where necessary, practice mandated by law in relation to the use of traffic control devices.

The TCD Manual has been effective from October 2010. As noted above, this document is progressively replacing MOTSAM Parts 1 and 2 and is planned for completion in 2013. Headings of the TCD Manual are as follows (completed sections are in bold):

- **Part 1: General requirements for traffic signs**
- **Part 2: Direction, service and general guide signs DRAFT**
- **Part 3: Advertising signs**
- Part 4: Traffic control devices for general use – at intersections
- Part 5: Traffic control devices for general use – between intersections
- Part 6: Speed management
- Part 7: Parking (see Part 13)
- Part 8: Code of practice for temporary traffic management (COPTTM)
- **Part 9: Level crossings**
- Part 10: Motorways and expressways
- **Part 13: Parking (to be renumbered as Part 7 in 2011)**

One potential issue with this structure is that a given TCD may be appropriate to several sections (e.g. both at intersections and midblock.

5 Shared ("Advisory") Lane Markings

5.1 Introduction

It is not always possible (or necessary) to provide an exclusive cycle facility. Where cyclists and motorists have to share space, it may be useful to manage this interaction. Austroads (2011) describes the management of such situations:

> Advisory treatments are used to indicate or advise road users of the potential presence of cyclists and of the location where cyclists may be expected to ride on a road. They use pavement markings, warning signs or guide signs, and as such have no regulatory function. The purpose of these treatments is usually to define a bicycle route rather than a type of facility to which specific road rules apply. The form of the treatment is a matter for local jurisdictions (p. 29).

This review is motivated in part by the desire to not leave advisory markings up to local jurisdictions so that a nationally-consistent approach is taken.

Throughout this review, the terms sharrow, advisory marking, and shared lane marking are used interchangeably but mean the same thing.

5.2 Shared lane marking description and rationale

Means of managing the interaction of cyclists and motorists have been devised overseas which employ a shared lane marking. The marking symbols are shown in section 5.3.

Shared lane markings are used within travel lanes shared by cyclists and motorists to indicate the position that cyclists should take, encouraging them to claim a lane when necessary.

In Queensland, a shared lane marking is part of a treatment known as a Bicycle Awareness Zone (BAZ). In the US, shared lane markings are known as sharrows. A sharrow is NOT a "shared road" marking; it is a shared lane marking (Kingsbury, 2010). This is a critical distinction given the different meanings ascribed to shared space and shared roads.

After a successful trial in San Francisco, the National Committee on Uniform Traffic Control Devices (NCUTCD) Bicycle Technical Committee recommended the adoption of a USA national standard for sharrows (subsequently approved, 19 January 2007, and incorporated into the *Manual on Uniform Traffic Control Devices* or *MUTCD*). The technical committee recommendation stated the rationale (with *left* and *right* transposed and italicised to suit NZ conditions):

> Traffic lanes are often too narrow to be shared side-by-side by bicyclists and passing motorists. Where parking is present, bicyclists wishing to stay out of the way of motorists often ride too close to parked cars and risk being struck by a suddenly opened car door (being "doored"). Where no parking is present, bicyclists wishing to stay out of the way of motorists often ride too close to the roadway edge, where they run the risks of being run off the road, being clipped by overtaking motorists who misjudge passing clearance, or of encountering drainage structures, poor pavement, debris, and other hazards.
>
> Riding further to the *right* avoids these problems, and is legally permitted where needed for safety. However, this practice can run counter to motorist expectations. A pavement marking that indicates the legal and appropriate bicyclist line of travel, and cues motorists to pass with sufficient clearance, is needed. In recognition of this need, several symbols and variations are being used by numerous local agencies around the country. (NCUTCD, 2005, p. 1)

According to the NCUTCD, the sharrow may be used to:

- Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist's impacting the open door of a parked vehicle,
- Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane,
- Alert road users of the lateral location bicyclists are likely to occupy within the travelled way,
- Encourage safe passing of bicyclists by motorists, and
- Reduce the incidence of cycling against the flow of traffic (wrong way cycling).

As part of the San Francisco trial, a study by the Center for Education and Research in Safety (2002) found that sharrows:

- Increased the distance between bicyclists and parked cars by 0.2 m
- Increased the distance between overtaking motorists and bicyclists by 0.6 m
- Reduced wrong way cycling by 80%

While these results are encouraging, a literature review may reveal more recent research undertaken since sharrows have become more widely used. A recommendation to undertake this is given in section 5.7.

5.3 Shared lane marking symbols

MainRoads Queensland has published guidance (2009) on shared lane road markings, which are yellow bicycle symbols (rather than regulatory white). The situations where these may be used are limited (refer section 5.6). Figure 14 shows a BAZ marking without edgeline or parking, intended to encourage motorists to drive closer to the median.

Figure 14: BAZ marking without lane edge line

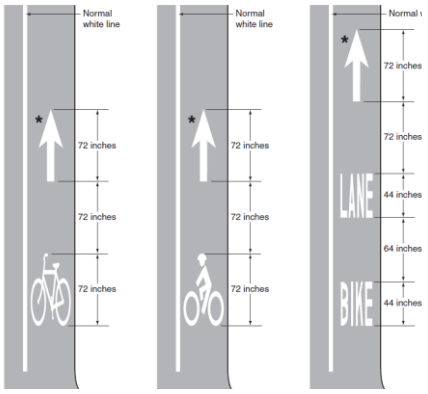
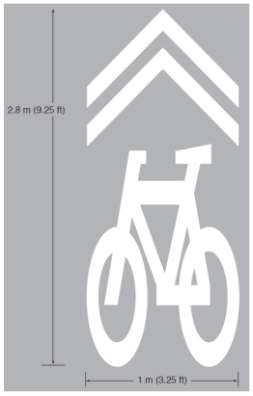
Figure 15 shows a BAZ marking intended to encourage cyclists not to ride in the door zone. It would appear that the traffic lane is wide enough to fit a cycle lane of adequate width, so this figure may not be representative of the aims a BAZ is intended to address.

The guidance notes that a review is due in May 2011 and every 24 months thereafter. Direct contact with Main Roads was not attempted as part of this review.

Figure 15: A BAZ marking (with lane line and parallel parking)

Reviewed approaches to using a bicycle logo for advisory purposes are shown in Table 1.

Table 1: Reviewed approaches to differentiating exclusive and shared lane markings

Approach	Regulatory cycle lane	Advisory shared lane
US MUTCD	White painted bicycle symbol with or without helmeted human figure, or BIKE LANE text, contained within white lane line(s).	White painted bicycle symbol (2.8 m by 1 m) without human figure, with double chevrons. This is colloquially known as a “bicycle in a house”.
	 **Figure 16: MUTCD cycle lane markings**	 **Figure 17: MUTCD shared lane marking**
Main Roads Queensland	White painted bicycle symbol, pole mounted signs and unbroken lane line. It is positioned within white cycle lane line(s) and may have a no-stopping line.	Yellow painted bicycle symbol generally straddling an otherwise unbroken white edge line, although it may also be without a white line.
	Austroads standard cycle symbol.	**Figure 18: Main Roads BAZ marking**
Hastings trial	MOTSAM standard white bicycle symbol (M2-3) within a white lane line marked special vehicle lane.	Green (but otherwise standard) bicycle symbol.
	 **Figure 19: M2-3 cycle symbol**	 **Figure 20: Hastings trial shared lane marking symbol**

Discussion

The inclusion of arrow shaped chevrons in the US sharrows may be beneficial in terms of intersection guidance and general public comprehension. Chevrons and the absence of white lane lines enclosing a space only wide enough for cycling provide differentiation from the markings to designate a cycle lane. The chevrons are easily added to those shared lane markings already installed in New Zealand (Hastings, the C roundabouts and some locations in Palmerston North). Building on the existing cycle symbol is a simple solution which has already undergone some significant testing in the US and is considered appropriate for use in New Zealand, too.

Behavioural research and/or trial(s) could be undertaken to corroborate this conclusion. Such research could consider a wider range of possible symbols (possibly incorporating a human figure) than considered in the SKM report and US study.

The design of a shared lane marking trial in New Zealand will have to address a number of issues beyond the most effective advisory symbol, including how to sufficiently differentiate advisory and regulatory markings. Table 1 above presented three such approaches. These approaches are included along with other possible options in Table 2.

Table 2: Options for regulatory and advisory cycle markings

	Regulatory cycle lane			Advisory shared lane		
Option	Cycle symbol[1]	"ONLY"[2]	Other markings[3]	None	Cycle symbol[1]	Other symbol[4]
1	✓			✓		
2	✓	✓			✓	
3	✓	✓				✓
4	✓		✓		✓	
5	✓		✓			✓

Notes:

1. A cycle symbol (whether in a cycle lane or shared lane) may be retained as is or revised to include a human figure.
2. For designation of classes of road user within a SVL, the supplementary "ONLY" text (as used for BUS ONLY lanes) could be added to the cycle symbol.
3. Other markings means that instead of using a cycle symbol to stipulate the road user class (cyclists) permitted to use the special vehicle lane, a cycle lane would be defined by other markings such as green lane lines instead of or within the white lines defining a SVL
4. Other symbol could be a cycle symbol plus chevrons, a cycle symbol of different colour or size, a cycle symbol straddling a lane line, or any combination of these. If different colours were used, colour blindness should be considered.

Option 1 (Do Minimum) is based on a cycle symbol as the regulatory marking, and no marking for the advisory situation. This would represent the current situation.

Options 2 and 3 would add the text "ONLY" below (plan view) for cycle lanes. This is a simple solution, although concern may be raised that although ONLY is used for exclusive bus lanes it creates additional financial burden to mark cycle lanes and is not consistent with minimising the use of English text in TCDs.

Options 4 and 5 allow cycle symbols to be used for advisory purposes by employing other markings within the special vehicle lane to designate it as a cycle lane. The cycle symbol remains in use in the cycle lane but no longer is the legal mechanism for

designation. Initially, two other options which did not use cycle symbols in cycle lanes were considered, however such a situation could not be envisaged.

Options 3 and 5 are preferred over 2 and 4 because the addition of a chevron(s) could be useful in terms of communicating direction. At a minimum, any trial should include these two options. Option 5 is preferred over option 3 because the use of other markings such as green lines may be more conspicuous than simply the word ONLY,

These options are not exhaustive. For example, options 3 and 5 could be combined. A further option not given in the table is to address some of the issues for which advisory markings are desired solutions through:

- expansion of the use of ASBs to roundabouts
- addition of a supplementary plate picturing crossing of rail tracks at right angles

However, this does not address situations where there is insufficient space for a cycle lane such as adjacent to parallel parking, and therefore has not been included in the table (while we acknowledge that the Do Minimum option does not address this case either).

The next sections of this review present selected expert opinions from New Zealand, potential applications of shared lane markings, and the need for robust implementation guidelines. Finally, a summary discussion (section 5.7) ties these topics together with the debate over the rationale for shared markings and makes recommendations.

5.4 Expert opinions of shared lane markings in New Zealand

The following provides useful background into the subject of advisory lane markings. These extracts may not be the current view of the experts cited and do not represent the whole of professional opinion. As is mentioned later in this review, other viewpoints have been raised and further debate may be required.

Tim Hughes (30 November 2009):

> I agree that it is safer to get cyclist to merge and own the lane - but we do not have a marking regime that encourages this behaviour. We need a way of terminating a cycle lane that gives the clear message that the cyclist is joining the traffic lane.

Tim Hughes (19 March 2010):

> The topic of a cyclist advisory road marking symbol is often raised with me. In Australia the cycle road marking symbol is advisory and the legal instrument is the sign.
>
> This permits them to use a cycle symbol on the roadway as advice to cyclists and motorists about where they are expected to ride where there is not room to establish an exclusive lane for cyclists. They can be used to indicate where in the roadway it is safest to ride, guide cyclists to the appropriate part of lanes at intersections and when placed in the middle of narrow lanes to indicate to everyone that the cyclist should "seize the lane".
>
> The latter is the use of cycle markings being trialled for the C-roundabout.
>
> In my view such an advisory cyclist road marking symbol would be most useful - but in the NZ context the existing cycle road marking has a definite legal meaning. It makes the lane in which it is located into a special vehicle lane for cyclists. It precludes other vehicles from using it in most circumstances. This avoids the need for lots of cycle lane signs, saving cost and clutter. But it means we should not use the standard symbol as an advisory sign as shown in the photo (changing the colour does not change the legal situation).
>
> The proposal received suggests changing the legal meaning of the existing cycle marking symbol – without specifying to what it should be changed. It is difficult to conceive of any change that would not also affect how we define a special vehicle lane and probably require a sign instead.
>
> I would prefer a completely new symbol as an advisory marking. I suggest a cyclist on bicycle as viewed from behind. I am no artist – but I have adapted a sign and marking I saw in the Netherlands, to illustrate the idea... No doubt it can be improved – but it gives an indication of the type of marking that may be possible. I like the placing of such a marking within a green blob.

Figure 21: Possible shared lane marking (T. Hughes)

Simon Kennett (30 March 2010):

> When cycling downhill I think taking the lane is the best option – sharrows would help persuade a cyclist that that is the safe place to be (and suggest to motorists that cyclists aren't being arrogant S.O.B.s for taking the lane). Cycling uphill is a different story - speed differentials are huge and the danger of a cyclist getting doored is low, so keeping far left is in order. And if the road can accommodate a single cycle lane, it makes sense to me to put it in the uphill direction.

5.5 Potential applications

The use of a sharrow marking may be useful to encourage cyclists to claim the lane (a "vehicular cycling" skill), communicate the legitimacy of this practice to motorists, provide route guidance to cyclists, and remove the requirement to comply with exclusive turn arrows. These situations are further described as follows. In the following examples, the applicability of, detailed design and form of the shared markings are not given.

5.5.1 Roundabouts

At some roundabouts, cyclists might be safer when they take the lane (Figure 22), rather than staying out of the circulating path of motorists (Campbell et al., 2011). Efforts to encourage this cycling behaviour have included the marking of a standard cycle symbol in the centre of Auckland's trial "C-Roundabout" approach lanes (Campbell, 2005). However, this application of the cycle logo is not currently supported by the legislation (refer section 3.1).

Figure 22: Issue: skill and confidence required to navigate a multi-lane roundabout (Hamilton)

The inclusion of this example does not necessarily mean that this roundabout would be appropriate for shared lane markings. Before roundabouts are suitable for a shared lane marking, the speed differential between motorists and cyclists needs to be within a yet to be defined range.

A non-standard approach to the issue of lane positioning is found on Palmerston North's Cook Street roundabouts, which include approach cycle lanes which do not terminate 30 m before the limit line as recommended by MOTSAM. The approach cycle lane is between an exclusive left turn and a straight/right general traffic lane. The major cyclist flow is straight through.

Figure 23: Roundabout approach cycle lane with arrows to encourage vehicular lane positioning (Palmerston North)

To encourage cyclists to take the lane, arrows are placed in the part of the cycle lane bounded by broken white continuity lines. Road user understanding of such arrows could be surveyed and compared to the placement of a shared lane marking.

As part of the iWay Model Communities programme, Hastings District Council (HDC) is trialling road markings to encourage and legitimise vehicular cycling practice at a large single lane roundabout. The marking is bright green in the centre of the circulating lane (Figure 24). A subsequent site visit several weeks later showed that the markings had been significantly worn down by circulating motor traffic and consequently were no longer conspicuous.

Figure 24: Green cycle symbol in roundabout (Hastings)

Shared lane markings are not the only way to encourage cyclists to take the lane and legitimise this for drivers. Currently, advanced stop boxes are permitted without lead in (approach) cycle lanes at traffic signals. Therefore, a cycle symbol is already being used in an intersection facility rather than for the purpose of designating a special vehicle lane.

In their successful iWay Model Communities funding application, HDC proposed the use of advanced stop box markings on roundabout approaches to encourage cyclists to claim the lane (Figure 25).

The concept also includes a kerb ramp for less confident cyclists to join a shared path and navigate the roundabout using the pedestrian facilities.

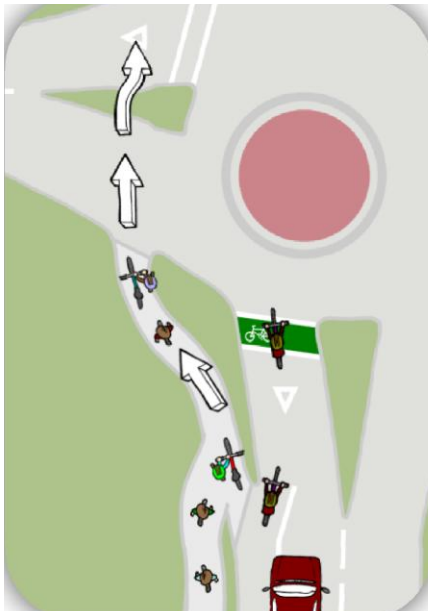


Figure 25: Cycle friendly roundabout proposal (Hastings)

5.5.2 Mixed traffic lanes adjacent to parking without space for cycle lanes

Main or high street shopping areas with parallel parking often do not have sufficient width to provide a formal cycle lane. An example is the traffic calmed Main Street, Upper Hutt with raised pedestrian courtesy crossings and approximately 3.5 m traffic lanes (Figure 26).

Figure 26: A traffic calmed street with parallel parking and insufficient room for cycle lanes, Main Street, Upper Hutt

Even in a very slow speed environment, some cyclists will not feel comfortable impeding traffic and will either ride too close to car doors, ride on the footpath, or not ride along the street at all.

Shared lane markings placed at least 3.4 m from the kerb face have been shown to encourage cyclists to avoid the door opening zone and improve motorist overtaking clearances in San Francisco (Figure 27). In addition to lateral positioning measurements, the effect of legitimising safer cycling in terms of number of cyclists using the roadway would be a useful measure to include in any studies.

Figure 27: Sharrow in mixed traffic lane adjacent to parallel parking, San Francisco

In California, sharrows are only permitted on urban streets with adjacent parallel parking (State of California Department of Transportation, 2005).

The City of Long Beach, CA, has installed a 'green sharrow lane' on a four lane median-divided road with parking (Figure 28). The outer lanes have a continuous 1.5 m wide green strip marked in the centre, encouraging cyclists to claim the lane and stay out of the door opening zone (Miller, 2009). These green lanes are available for all traffic. The use of green sharrow lanes may dilute the current meaning of special vehicle lanes and is not supported without compelling research outcomes. Further information on this FHWA approved trial was not found.

Figure 28: A 'Sharrow Lane', Long Beach, CA

In a variation on the Queensland "Bicycle Advisory Zone" (BAZ), the Hastings District Council also proposes the application of cycle symbols within narrower general traffic lanes. The principal claimed benefits are low cost implementation, improved awareness of the potential presence of cyclists, encouragement to pass safely, and the appearance of narrower traffic lanes for traffic calming purposes. The treatment is intended to be a temporary measure until more formal provision for cycling can be provided through the road renewal or significant capital project programmes.

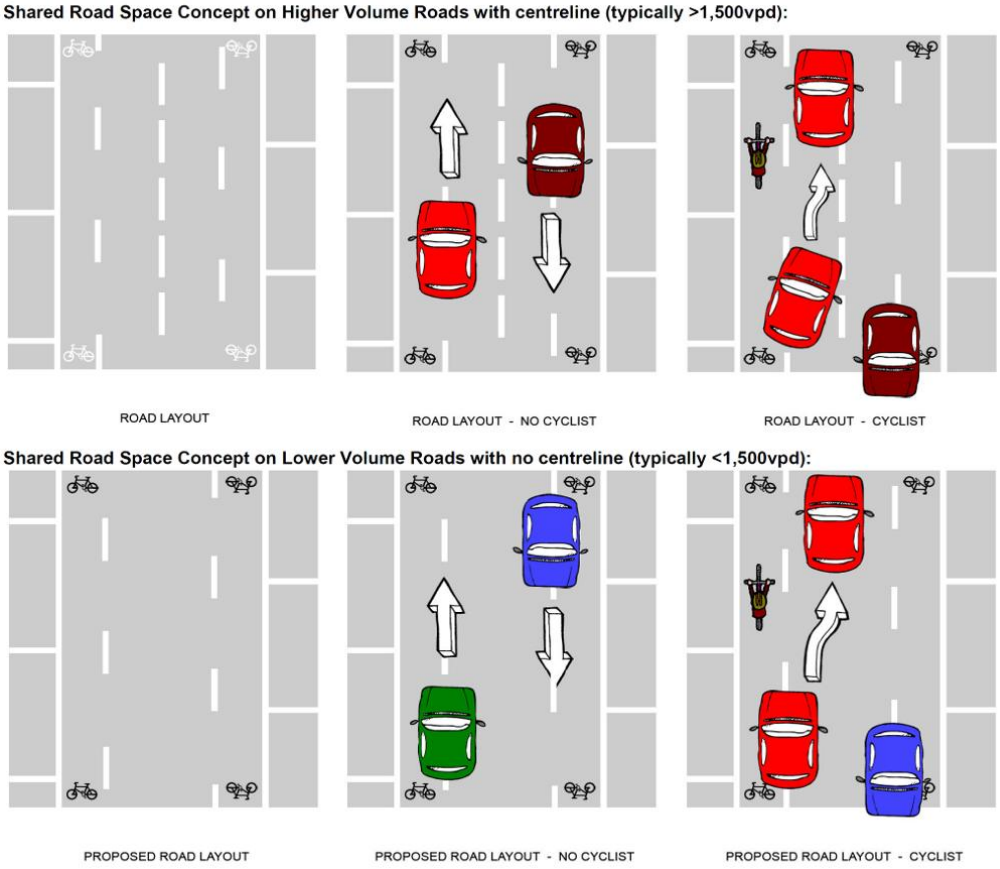


Figure 29: Shared traffic lane concept, Hastings

This proposal is another example of New Zealand practitioners seeking a means of providing for cycling in a constrained road layout. The graphic is not dimensioned, but if approved for trial the shared lane marking should be positioned clear of the parked vehicle door zone as per the kerb face to centre of marking recommendations of the MUTCD (minimum 3.4 m).

5.5.3 Pinch points created by intermediate width traffic lanes

Traffic lanes of intermediate widths (3.5 m) are wide enough to encourage motorists to pass cyclists, but not wide enough to do so safely. Where a wide road becomes too narrow for motorists and cyclists to share a lane side by side, it is seen as desirable for cyclists to "take the lane", thereby discouraging motorist overtaking within the lane.

Figure 30 shows an example of the only bridge available to cyclists to cross a river between the coast and 100 km inland. This local road bridge is in an 80 km/h speed environment, has an AADT of around 10,000 veh/day and 3.2 m lane width (6.4 m between kerbs). PW-35 cyclists warning signage is provided at both ends of the bridge.

Figure 30: Narrow Waimakariri River bridge, Canterbury

Active and static permanent warning signs (refer section 6.4.5) are useful to warn motorists that cyclists are on the bridge. However, they may not be as effective as a shared lane marking in terms of encouraging cyclists to take the lane. Cyclists who ride close to the kerb encourage motorists to attempt an unsafe pass. A trial could help determine the relative effectiveness of various TCDs in increasing passing clearances and the incidence of unsafe passing.

Where a kerb build-out encroaches into a wide sealed shoulder on a local road, Hastings District Council is trialling an approximately standard size cycle symbol in non-standard bright green marked in the centre of a traffic lane to communicate and legitimise vehicular cycling (Figure 31).

Figure 31: Green cycle symbol in centre of narrow lane at pinch point, Hastings

5.5.4 Clearways

Sharrows may be useful to change carriageway allocation by time of day (e.g. parking + cycle off-peak, and cycle + additional traffic lane (no parking) during peaks. The current cycle logo is not suitable for this, as it precludes parking at all times.

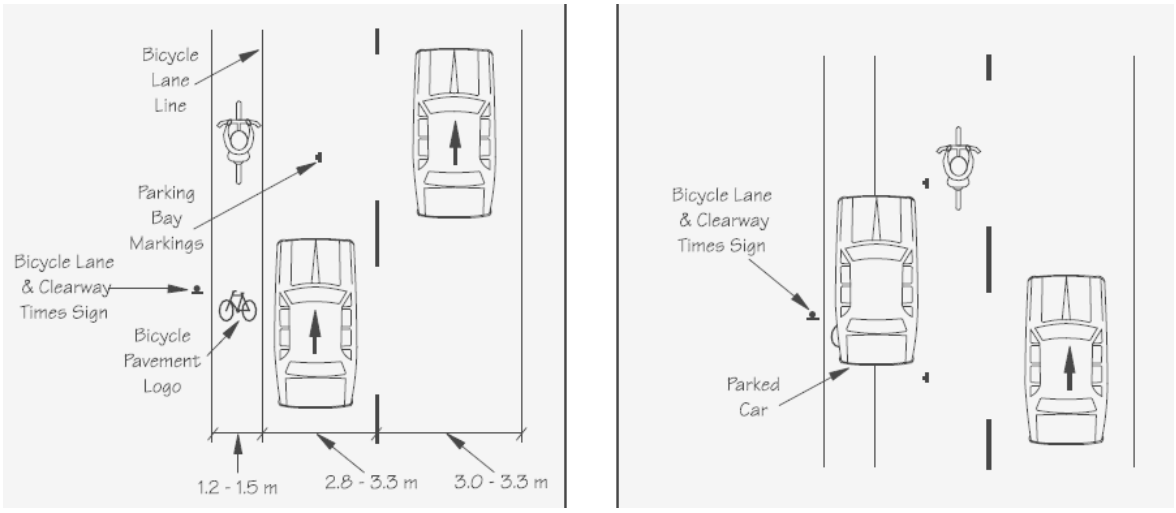


Figure 32: Australian peak period bicycle lanes - Figure 4.9 of Austroads (2011)

5.5.5 Tram or rail lines

Sometimes, it might feel counter-intuitive to claim a certain position on the road. An example of this is a tram extension under construction in Christchurch.

The 'normal' positions for cyclists to take would be between the left rail and parked cars. The dimensions of the High Street extension are such, though, that cyclists would be fully within the car door opening zone.

Christchurch City Council is aware of this and expects that cyclists should ride in between the tram tracks, but they don't know how to communicate this.

Figure 33: Space between rails and indented car parks/kerbs is too narrow, Christchurch

Sharrows can be used to guide cyclists closer to a right angle crossing of rail or tram lines. Figure 34 is an example from Seattle (mirror image for clarity).

The current means of addressing the danger posed by shallow angle rail crossings is the PW-08 "Railway tracks – cyclists take care" sign. However, this sign does not communicate to novice riders how to safely navigate tracks. Following motorists who encounter a cyclists who does take the lane to cross at a more perpendicular angle may not understand why the cyclist may have momentarily impeded their progress.

Figure 34: Sharrows at rail lines, Portland (Eckerson, 2010)

5.5.6 Cycle route wayfinding and bicycle boulevards

Local roads with little traffic, or narrow roads sometimes form part of a cycle network. It might not be desirable or possible to provide a specific cycle facility.

Sharrows could be used to indicate route continuity, and to inform motorists that it's expected of cyclists to be on the road.

Sharrows have been used on bicycle boulevards where full lane markings are considered inappropriate to the neighbourhood context (Figure 35).

Figure 35: Sharrow on a bicycle boulevard, Portland (photo: Scott Cohen)

5.5.7 Intersection guidance

Sharrows could help remove the requirement to comply with exclusive turn arrows (the Swiss use coloured cycle logos and a scaled down directional arrow where this occurs; see Figure 36 for an example in Winterthur, Switzerland).

Sharrows (or perhaps just the chevrons as in Figure 37 and Figure 38) could assist cyclists to maintain a straight line through an intersection rather than veering towards the kerb, or to navigate particularly complex intersections.

There may be some debate as to whether such markings should be contained between continuity lines or be provided without continuity lines. It may be confusing to place intersection guide symbols between what appears to be lane lines, if such a lane is not actually a cycle lane.

Figure 36: Intersection markings for straight through cyclists in an exclusive turn lane, Switzerland (photo: Axel Wilke)

Figure 37: Intersection chevrons, Sands Street (photo: Steven Vance)

Figure 38: Intersection chevrons, New York City (photo: Steven Vance)

Discussion and recommendations

Under the current rules (RUR Rule 2.4 and TCD Rule 7.12(3)), all road users must comply with all road markings. Some RCAs respond to this by not marking an exclusive left turn arrow in lanes where all motorists ought to turn left from, so that cyclists may legally proceed straight ahead. Other RCAs continue to mark exclusive left turning lanes with a left arrow, and cyclists proceeding straight ahead from those lanes are technically in breach of the law. Cyclists choose to be in the turn lanes rather than the adjacent straight through lanes, as the former provide a lower speed differential between motorists and cyclists, and are thus safer.

Ideally, space would be provided to give cyclists a straight through approach cycle lane, however this is not always possible. Shared lane markings may be a useful TCD in lieu of providing a straight through cycle lane and would be supported by an amendment to the RUR to permit cyclists to proceed straight ahead from exclusive turning lanes. This amendment is recommended whether or not shared lane markings are adopted, so that all RCAs may mark turn arrows yet permit cyclists to legally proceed straight ahead.

9. **Amend the rules to permit cyclists to proceed straight from exclusive turn lanes.**

5.6 Shared traffic lane markings – guidelines

In the USA, the MUTCD prohibits the use of sharrows on shoulders, designated cycle lanes, or on roadways with speed limits above 50 km/h. It further stipulates that if used in a shared lane with on-street parallel parking, they "shall be placed so that the centres of the markings are at least 3.4 m from the face of the kerb, or from the edge of the pavement where there is no kerb" (2005).

The California state DOT policy directive (2005) only permits sharrows to be used on urban roadways with on-street parallel parking, and specifies centres of the markings a minimum of 3.3 m from the kerb face.

Main Roads Queensland Bicycle Awareness Zones (BAZ) guidelines (2009) suggest that BAZ treatments are applicable only in a very limited number of circumstances:

- (Where) all other options for achieving a formal bicycle facility have been thoroughly investigated;
- (For use as) retrofit only facilities for application to the existing road surface. BAZ must not be used in greenfield or capital improvement projects;
- (Are generally appropriate where) the proposed route for the BAZ forms part of a cycle network identified within the local cycle network plan...;
- On roads with speed limits of 60 km/h or less...(and) where traffic volume (is less than) 3000 AADT;
- On routes where the majority of cycling specific infrastructure…has been implemented. The BAZ should connect to a cycle facility at each end, and must not start or end at a point of high risk to inexperienced cyclists; and
- As a last resort, and preferably as a temporary measure to enhance continuity along the cycle route until better facilities can be provided.

The Main Roads Queensland guidelines provide design layout guidance, some of which is not as generous as the MUTCD in terms of providing parallel parked vehicle door opening zone clearance.

Discussion

If a shared lane marking is approved for inclusion in the legislative rules and TCD Manual, standards and guidance should be developed which address:

- What threshold of traffic speeds and volumes under which shared markings are appropriate;
- Whether shared markings are permitted with parallel parking only or allowed in situations such as roundabouts, pinch points, approach lanes and train tracks; and
- Applicable design layouts and minimum kerb face to centre of marking dimensions.

As the development of such guidelines and standards is contingent on whether shared lane markings are approved, a recommendation is provided in section 5.7.

5.7 Shared lane markings summary discussion and recommendations

The rationale for a shared lane marking has been explained by the NCUTCD, Main Roads Queensland, Hastings District Council and NZ experts as cited in this review.

It may be argued that better street design is preferable to the introduction of a marking which seeks to compensate for design inadequacies, poor cyclist skills, or motorist behaviours. A road should be so well designed that it is intuitive and safe to use for all (e.g. the self-explaining roads and safe system approaches).

On the other hand, street design is often constrained by the trade-off of conflicting objectives. Streets for cycling and well educated road users may be an ideal that cannot be achieved universally or in a timely fashion, and therefore a shared lane marking could be a useful tool (if restricted to appropriate uses only – refer section 5.6).

The issues involved are complex and may be subject to further debate. A selection of views which may be made for and against shared lane markings is given in Table 3.

Table 3: Views for and against shared markings for a selection of issues

Issue	Against shared markings	For shared markings
Roundabout lane positioning	Install traffic signals or reduce roundabout design speed; consider expanding existing ASB instead	Roundabouts are safer overall than traffic signals and a reduction in design speed may not be feasible given the network context
Narrow lanes adjacent to parallel parking	Remove parking and/or reduce speeds instead	Parking removal may be infeasible and lower speeds do not address perceptions about the legitimacy of taking the lane if needed for safety
Train tracks	Existing PW-08 warning sign sufficient; use of TCDs to address traffic skill issues may be inappropriate	Warning sign does not communicate to cyclists and motorists the legitimacy of taking the lane on approach to cross at perpendicular angle
Potential confusion as to meaning	A shared lane marking may be confused with the cycle lane symbol; potential lower vigilance by motorists if markings not present	Taken in combination, the existing cycle logo contained within a special vehicle lane may remain obvious, while a sufficiently different marking is needed for shared lane use

In light of the potential diversity of practitioner views, further investigation would inform the decision as to whether shared lane markings should be adopted. This investigation may include debate amongst a wider stakeholder group, literature review and formal trial(s).

In section 5.3, five options for differentiating cycle lane and shared lane markings were presented. If a trial is approved, testing should include at least options 3 and 5 (advisory markings using variations on the cycle symbol such as chevrons). The trial(s) should employ draft design guidelines to ensure appropriate usages.

10. **Undertake an international literature review of efficacy to determine whether shared lane markings should be trialled in New Zealand.**
11. **Any trial should include research on the most effective symbol and means of cycle lane differentiation including at least the testing of a sharrow symbol.**
12. **If shared lane markings are approved for inclusion in the rules, develop design guidelines and standards in the TCD Manual.**

6 Other Non-standard Signs and Markings

This section describes road user behaviour issues (whether perceived or actual) which are not addressed in the current legislative context and guidelines. Local road controlling authorities (RCAs) attempt to address these issues through ad-hoc innovation or adoption of markings employed overseas. The examples given are primarily from New Zealand, although some are from the USA.

6.1 Cycle lane markings

6.1.1 Conspicuity of cycle lane markings

Auckland Transport staff were not aware of any trials or solutions in Auckland which could contribute to this review.

They were not aware of any documentation regarding the usage by cyclists of shared spaces in the Auckland central area (Elliot Street, Darby Street, Ford Street and Lorne Street) and at Eden Park.

The 'extended' coloured marking and symbol shown in Figure 39 is in the Auckland Regional Transport Authority Draft Regional Urban Cycle Design Guidelines (AECOM, 2009) and is proposed for inclusion in the new Auckland Transport Code of Practice.

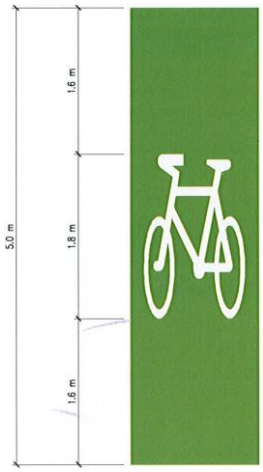


Figure 39: Proposed Auckland Transport cycle lane marking

New Plymouth District Council (NPDC) provided details of a recently undertaken infrastructure project that saw 8 km of cycle lanes along the busiest routes painted with green strips (including Coronation Ave and St Aubyn, Morley, Vivian, Powderham and Tukapa streets).

NPDC advised that the green paint is a colour not yet used in New Zealand and was chosen as it should really stand out to the road users. The paint is a long wearing product. To test the durability of the paint, some high wear areas have also been painted. When designing the layout of the green strips, particular attention was paid to intersections where there is a potential for conflict between the different user types.

The performance of the painted lanes will be reviewed after the coming (2011/12) summer. ViaStrada is not aware whether that refers to the performance of the paint product or of the lanes themselves.

Figure 40: St Aubyn St intersection, New Plymouth

Current cycle lane marking guidance recommends that green surfacing should be used at potential conflict points to remind turning motorists of the possible presence of cyclists.

In Hastings, standard cycle lane markings are supplemented by a solid green line through higher conflict risk side road junctions and dashed green lines in midblock areas (Figure 41). Green strips with cycle logos are also provided to reinforce the lane. The intent is to provide conspicuity with a minimum amount of costly paint. Anecdotal evidence indicates that people are noticing the lanes more, although it is not clear whether this is a novelty effect.

Figure 41: Dashed and continuous green lines within standard cycle lane at side road

6.1.2 Parking lane width and door zone

Christchurch City Council uses non-MOTSAM standard cycle lane markings:

- A dashed inside line is added to cycle lanes alongside on-street parallel parking, primarily to allow for oversize vehicles parking and overhanging the cycle lane and secondly as a buffer for opening car doors (Figure 42).
- Use of yellow dashed lines (no parking) over the length of kerb side cycle lanes to 'advertise' no parking in cycle lanes.

Figure 42: Dashed white line and offset cycle symbol, Wainoni Rd, Christchurch

6.1.3 Surface colour

Palmerston North City Council (PNCC) provided details of a trial of cycle lane marking on College St that started in 2006. The trial primarily involved a study of cyclist and vehicle positioning on the road when there was either no cycle lane, cycle lane or cycle lane with green surface colouring full length. The initial findings suggest that green surfacing increases the lateral distance between cyclists and overtaking motorists (Skilton & Morris, 2007). A final report is anticipated to be ready for publishing early 2012.

Figure 43: Research on lane positioning with and without green cycle lane colour, Palmerston North

Palmerston North has a policy of using green coloured surfacing at periodic intervals along all cycle lanes on the Principal Cycle Network.

The usage of coloured surface is non-standard, with colouring provided upstream and downstream but not across side road intersections (Figure 44). The length of colour is typically 10-15 m for each segment. This policy allows shorter total lengths of coloured surface and increased durability as colour is not placed in motor vehicle turning areas, with a cost saving benefit.

PNCC has also experimented with non-standard cycle lane and edge line treatments at junctions with the aim of improving connectivity for left turning cyclists.

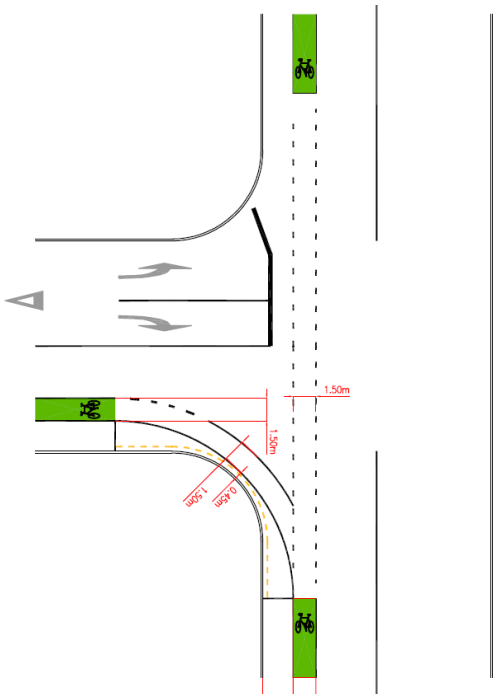


Figure 44: Coloured is used before and after side road junctions, Palmerston North

6.1.4 Parking in kerbside cycle lanes

Taupo District Council provided information regarding treatments used to prevent vehicles parking in a 2.2 m wide cycle lane in Spa Road. No stopping lines were marked for the full length of the cycle lanes and green coloured surfacing added at every cycle symbol. According the council, this has resulted in a marked reduction of the number of parked motor vehicle infractions.

Discussion and recommendations

As evidenced by the coloured surface trials and proposals undertaken in Auckland, Palmerston North and Hastings, the objective of maximising cycle lane conspicuity at the minimum cost is a common RCA concern. The variation in colour is reducing as Christchurch has switched to the otherwise universal (in NZ) use of green, however there remains significant variation in the shading and the products used. Further research on the durability and efficacy of cycle lane colouring would be of interest to all RCAs with substantial cycle lane networks.

13. **Undertake or support trials into the efficacy of various layouts for coloured surfacing in cycle lanes.**

14. **Define minimum standards for coloured surface product performance including skid resistance, durability and visibility.**

The relative prevalence of parking in cycle lanes between RCAs is not known, however anecdotally there are “problem locations” in most cycle networks. The case for using well-understood broken yellow no-stopping lines in cycle lanes has been described by Wilke and Ferigo (2009). However, RCAs may cite concerns over increased cost or visual impact of additional pavement markings without a thorough analysis of the issues.

15. **Amend the TCD Rule to require yellow no-stopping lines in kerbside cycle lanes.**

The Christchurch solution of adding a third (dashed) line to a cycle lane adjacent to parking was to prevent trucks receiving parking tickets for overhanging into the cycle lane. It is not desirable to always use wider parking lanes so that trucks are accommodated everywhere, as that would require some 1.0 m of additional cross section, rendering the implementation of cycle lanes not feasible on many corridors. It is also undesirable to prosecute truck drivers when their vehicle does not physically fit within a parking lane. The RUR should be amended to address this issue, by requiring drivers to park their vehicles as close as practicable to the kerb or edge of road, minimising but accommodating possible overhang into an adjacent cycle lane.

16. **Amend the RUR to specify that vehicles must be parked as close to the kerb as practicable.**

6.2 Signal detector markings

Cyclists sometimes cite unresponsive traffic signals as a reason for running red lights. Observation indicates that few cyclists know where to position the bike to actuate a detector loop.

As per section 7.1.7 of Austroads (2009), pavement markings such as the white diamonds used in New Zealand (Figure 45) are used for this purpose, however whether cyclists understand these symbols has not been surveyed.

In the US, a bicycle detector pavement marking (Figure 46) "may be placed on the pavement indicating the optimum position for a bicyclist to actuate the signal. An R10-22 sign...may be installed to supplement the pavement marking". The bicycle symbol includes a human figure, where the bicycle symbol for exclusive cycle lanes does not.

Figure 45: White diamond bicycle detector symbols supplemented with a cycle logo, Christchurch

Figure 46: MUTCD Figure 9C-7 Bicycle Detector Pavement Marking

Figure 47: MUTCD Figure 9B-2 Regulatory Bicycle Facility Sign R10-22 (optional)

Discussion and recommendations

A marking indicating the location of signal detectors may improve cyclist compliance with traffic signals. No published research was found on the efficacy of various means of accomplishing this.

Subject to the other implications of this review (e.g. whether a cycle symbol or variant may be used for purposes other than designating a class of vehicle entitled to use a special vehicle lane), a cycle symbol may be more understandable to the general public than the currently employed white diamonds.

Research should be undertaken on cycle detector pavement markings including the current white diamonds and alternative symbols. If cycle symbols are permitted to be used for means other than designating the class of road user entitled to use a lane, adopt a small cycle symbol centred on a broken white line to indicate where cyclists should position themselves to actuate traffic signals. If cycle symbols are not permitted for means other than designating the class of road user entitled to use a lane, undertake research and/or trials into the most understood detector pavement marking.

17. **Adopt a small cycle symbol centred on a broken white line or undertake research into alternatives for the cycle detector pavement marking.**

6.3 Path markings

Nelson City Council has reported shared path user conflicts. The proposed solution is to improve existing signs, add new signs at entry points and increase the use of shared path stencil markings. The markings are based on *Cycle Notes No.10 Shared Path Behavioural Signs* (VicRoads, 2001).

The ideal solution to minimising conflict is path widening, although conflict can occur even on paths of generous width. That said, there would be few paths in New Zealand with high volumes of pedestrians and cyclists that complied with the recommendations of *Cycle Notes No.21 Widths of Off-Road Shared Use Paths* (VicRoads, 2010).

Refer to section 6.4.3 for further discussion and recommendations.

Figure 48: Path user behaviour markings, Railway Path

6.4 Signs

This section describes road user behaviour issues (whether perceived or actual) which are not addressed in the current legislative context and guidelines. Local road controlling authorities (RCAs) attempt to address these issues through non-standardised ad-hoc innovation or adoption of signs employed overseas.

6.4.1 Home zones

Home zone signage is not currently specified in the guidelines. Christchurch City Council has employed a home zone sign in Bangor Street in the Avon Loop inner city residential area since the 1980s in conjunction with extensive physical traffic calming measures (Figure 49).

The sign consists of home zone icon on a permanent warning sign, with a supplementary plate below including the works “SLOW ZONE”.

Figure 49: Home zone sign, Christchurch

Discussion

As previously discussed (section 3.3), the gazetted signage for shared zones should be included in the guidelines.

6.4.2 No exit signage not applicable to some road users

For streets which do not have an exit for motor vehicles but do have a cycle and/or pedestrian path linkage, the existing MOTSAM NO EXIT sign (IG-1) exit signage is not appropriate. CCC has amended this IG-1 to include the text "Except (pedestrian and cycle symbols)".

Figure 50: No exit except peds and cycles

Discussion and recommendation

It would be useful to be able to signpost when culs-de-sac or other no-exit streets for motorists are through routes for pedestrians and/or cyclists. The RD71 EXCEPT CYCLES supplementary sign is a regulatory (red-bordered) sign and not suitable for this purpose. It is recommended that logos be used in lieu of text for this purpose.

18. **Include "Except" cyclists and/or pedestrians supplementary signs for information and regulatory signs in the TCD Manual.**

6.4.3 Path user behaviour

Masterton District Council's two-way shared path on Colombo Road (alongside an on-road cycle lane) features path user behaviour signage based in part on VicRoads (2001) guidance.

Figure 51: Shared path sign, Masterton

Shared path signage used on the Manawatu River and Pioneer Highway paths combine all four signs suggested by VicRoads (2001).

These signs are located at major entry points to the path and are large enough to be seen at some distance (i.e., for people cycling).

Figure 52: Shared path sign with combined educational messages, Nelson

Discussion and recommendation

Although only two shared path user behaviour signs are cited here (for brevity), many councils are faced with complaints from path users over other users behaviours. For example:

- Auckland Transport promotes the 'share with care' message on new facilities such as the new Albany Highway shared path
- New Plymouth aims to rename the Coastal Walkway to a less mode-specific title
- Nelson City provides shared path behavioural advice on the council website http://www.nelsoncitycouncil.co.nz/shared-pathways/ and has included shared path operation in the council bylaws http://www.nelsoncitycouncil.co.nz/assets/Our-council/Downloads/bylaws/draft-parking-and-vehicle-control-bylaw-2011.pdf
- To address path user behaviour issues on the Wellington waterfront, Cycle Advocates Network (CAN) has launched a courteous path use campaign including this video: http://can.org.nz/article/cruise-the-waterfront

The root cause of conflicts can often be traced to insufficient path width. However, there is a demonstrated proactive approach being taken to path user education on even a 3 m wide path (such as the Pioneer Highway example cited). Standardised TCDs and accompanying guidance would help ensure that council bylaws and TCD practices are in compliance with the advice given in the Cyclist Road Code (NZTA, 2009b) and RUR.

19. **Standardise shared path behaviour TCDs and provide supporting guidance in the TCD Manual.**

6.4.4 Safer Route to School

Although Upper Hutt City Council was not contacted for the formal survey, we have noted in a separate project undertaken for the council that non-standard signage is used to identify 'Safer Route to School' (refer Figure 53), indicating to children those routes that are suitable for them.

Figure 53: Safer route to school sign, Upper Hutt

Discussion and recommendation

Route signage for cyclists is generally not well developed in New Zealand. Consideration could be given whether this would be an appropriate project. Whether 'Safer Routes to School' signage should be formalised as part of this investigation could be a matter for such a project to determine.

It is noted that many overseas jurisdictions have delayed the development of national route signage guidelines for many years, usually resulting in a multitude of systems present throughout a country by the time the national guidelines appear. New Zealand has the chance of preventing this from happening, as so far very few route signage systems are in place.

20. **Develop guidelines for cycle route signage systems.**

6.4.5 Cyclist warning signage

Upper Hutt City Council uses non-standard permanent warning signage (using the colour scheme for temporary warning) along mixed traffic roadways without specific cycle facilities (Figure 54). These are positioned at local road gateways just off higher speed state highways and on local streets designated as cycle routes.

These signs are clearly inappropriate and should thus be removed.

Figure 54: Watch for cyclists, Upper Hutt

Active warning signage has recently been installed on several narrow bridges including SH60 and the Boundary Rd bridge in Hamilton. These are typically inductive loop activated (by the cyclist) illuminated cycle symbols on a black background, and may be preceded by a standard PW-35 cyclist warning sign. At the SH60 site, vehicle drivers exhibited marked improvement in overtaking behaviours after installation of the active warning sign. (Gardener & Kortegast, 2010).

Figure 55: Active warning sign on Appleby bridge, SH60

Non-standard supplementary signs with the text "EXTREME CARE CYCLISTS MERGING" are added to warning signs in Canterbury, with an example of a temporary sign in Figure 56 and a permanent warning sign in Figure 57.

Figure 56: Extreme care cyclists merging temporary warning sign, Christchurch

Figure 57: Extreme care cyclists merging permanent warning sign, Waimakariri Bridge

Discussion and recommendations

Permanent and temporary warning signs should be reviewed to ascertain whether all the cases are covered adequately. Some of the messages could be supported by the use of sharrows.

21.	**Review relevant permanent and temporary warning supplementary signs.**

7 Summary of Recommendations

This review found that RCAs perceive a need for non-standard TCDs. The following recommendations have been made throughout this report, grouped by category.[3] The page numbers on which the recommendations were first made are given so that the preceding explanatory text may be referenced for context.

7.1 Recommended changes to the legislative rules

7.2 Recommended changes to the Traffic Control Devices Manual

7.3 Recommended further research and/or trials

[3] The numbering is not consecutive because the recommendations have been numbered in the report in the order they have been made, irrespective of category.

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Appendix A Inventory of Current Cycle Signs

A.1. Inventory of current cycle signs

Traffic signs are currently classified by function into the following six main groups:

- Regulatory – General, Parking and Heavy Vehicle
- Warning – Temporary and Permanent
- Guide
- Motorist Service
- Tourist
- General Information

A full inventory of the codes for the various signs and specifications is available on the NZTA website.[4]

A.2. MOTSAM Part 1 - Section 2: Regulatory signs (General & Parking)

This section contains the following cycle related signs. Regulatory parking signs are now included in the TCD Manual Part 13 – Parking.

MOTSAM sign ref	TCD Code	TCD Rule	Description	Image
RG-24	RJ11	R5-1	No cycling	
RG-26	RLU1	R4-9	Lane use Cycle Lane	
RG-26A	RLU2	R4-9.1	Lane use Cycles Only	
RG-26C	RLU3	R4-11	Lane use Shared Pedestrian and Cycle Path standard	
RG-26D	RLU4	R4-11.1	Lane use Shared Pedestrian and Cycle Path defined position	

[4] Please refer to www.nzta.govt.nz/resources/traffic-control-devices-manual/sign-specifications/

MOTSAM sign ref	TCD Code	TCD Rule	Description	Image
RG-26.1 RP-3.2	RG21	R6-12.4	Cycle route supplementary – begins (general RP-3.2 shown)	
RG-26.2 RP-3.3	RG22	R6-10.3	Cycle route supplementary – ends (general RP-3.3 shown)	
RG-26A	RLU2	R4-9.1	Cycles only	
RG-26B		RJ4	Cycles must exit	
none	RD71	R3-5.2	Except cycles supplementary sign	
	SU10		Cycle sign	
RP-9	PP2	R6-52	Class restricted cycle stand standard (shown). Other versions have arrows pointing left, right or double arrows.	

A.3. MOTSAM Part 1 - Section 5: Temporary Warning Signs

MOTSAM noted in the January 2010 update that Section 5 was expected to be superseded during 2010 when it would be merged with COPTTM and be published as Part 8 of the TCD manual.

The NZTA website currently advises that COPTTM will be updated by January 2012 and will be Part 8 of the *Traffic control devices manual (TCD Manual)*

This section contains the following six cycle related signs:

MOTSAM sign ref	TCD Code	TCD Rule	Description	Image
TW-2.13.1A	T227	W2-1.13A	Other hazard – cycle race (for standard)	
TW-2.13.1B		W2-1.13B	Other hazard – cycle race (for backing board)	

MOTSAM sign ref	TCD Code	TCD Rule	Description	Image
TW-2.16.1	T230	W2-1.16	Other hazard – cyclist ahead	
TW-32	TU41	W5-8.11	NMU cycle route turn left	
TW-32	TU42	W5-8.11	NMU cycle route turn right	
TW-32	TU43	W5-5.12	NMU cycle route veer left	
TW-32	TU44	W5-8.12	NMU cycle route veer right	
TW-32	TU45	W5-8.13	NMU cycle route ahead lh	
TW-32	TU46	W5-8.13	NMU cycle route ahead rh	

A.4. MOTSAM Part 1 - Section 6: Permanent Warning Signs

This section contains the following two cycle related signs:

MOTSAM sign ref	TCD Code	TCD Rule	Description	Image
PW-35	WU6	W16-7	Cyclists	
PW-08	WX5	W15-11	Railway tracks – cyclists take care	

Note: the W15-11 RAILWAY TRACKS – CYCLIST TAKE CARE sign is also included in TCD manual Part 9- Level crossings.

A.5. MOTSAM Part 1 - Section 10: General Information Signs

This section contains the following three cycle related signs:

MOTSAM sign ref	TCD Code	TCD Rule	Description	Image
IG-20	AU11	A43-1	Cyclists – use left shoulder	
IG-21	AU12	A43-2	Cyclists – use ramp	
IG-22	AU2R	A43-3	Cyclists – cross here with care arrow right	
IG-22	AU2L	A43-3	Cyclists – cross here with care arrow left	

A.6. MOTSAM Part 1 – Sections with no cycle signs

The following sections of MOTSAM Part 1 contain no cycle related signs:

- MOTSAM Part 1 - Section 4: Regulatory signs – Heavy Vehicle
- MOTSAM Part 1 - Section 7: Guide signs
- MOTSAM Part 1 - Section 8: Motorist service signs
- MOTSAM Part 1 - Section 9: Tourist signs

We assume that the MOTSAM sign reference codes will eventually be replaced by the TCD manual codes, however there is certainly scope for confusion between the TCD rule number, the TCD code number and the MOTSAM sign reference number.

A.7. TCD manual: Part 1 - General requirements for traffic signs

TCD manual Part 1: Section 6.0 covers two newer forms of traffic control device that can include cycle and / or symbols.

Variable traffic signs

A variable traffic sign is defined in subclause 4.3(2) of the TCD Rule as a sign capable of displaying a different message to meet traffic management needs at different times. It may be either a permanent sign or a temporary sign. Variable traffic signs are often also referred to as dynamic message signs.

Active signs

Active signs (those that incorporate flashing lights or light emitting diode (LED) components) display messages only when relevant. These types of signs enhance road user awareness of the specific risk applicable when the signs are operating.

Although there are currently formal restrictions on this type of warning sign, they may be used to enhance road user awareness of cyclist hazards.

Figure 58: Example of an active sign

A.8. TCD manual: Part 2 - Direction, service and general guide signs

Subclause 4.2(10) of the TCD Rule states that an RCA "*must install and maintain signs, as it considers necessary or desirable, to inform road users of destinations, routes, street names, distances, the names of localities or other information of value to road users.*"

Examples of cycle (special vehicle) route signs and intersection direction signs are shown in TCD manual Part 2: Section 4.

The design template for the sign cycle symbol is TCD code SU11 and is available on the NZTA website.

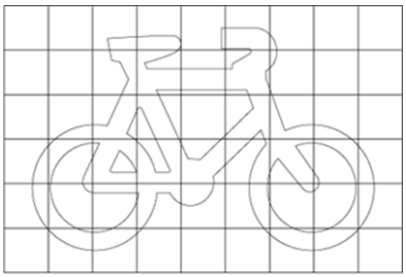

Figure 59: TCD manual sign code SU11

Intersection direction signs are described in TCD manual Part 2 (Figure 60).

Figure 60: Route signage example – from Table 4.9 of TCD manual (NZTA, 2010b)

[5] Please refer to www.nzta.govt.nz/resources/traffic-control-devices-manual/sign-specifications

Appendix B Inventory of Current Cycle Markings

B.1. General

Cycle lanes are provided where road space is formally allocated to cyclists.

Markings for cycle lanes are specified in the following two sections of MOTSAM Part 2 – Markings:

Sections 2.10 – Cycle Lanes

Section 3.18 – Cycle Lanes at Intersections

B.2. MOTSAM Part 2: Section 2.10 – Cycle Lanes

Section 2.10 sets out the recommendations for marking of cycle lanes between intersections. These are summarised below:

2.10.01 – General

This section refers to the TCD Rule.

2.10.02 – Recommended Configuration for Cycle Lanes

This section provides a basic guide to the provisions for cycle lanes at kerbside, adjacent to car parking and at pedestrian crossings.

2.10.03 –Cycle Lane Lines

This section describes how cycle lanes should be marked. It notes that the right hand side of a cycle lane should be marked with a 100 mm wide continuous reflectorised white line, however the left hand side of a cycle lane may be marked with either a 100 mm wide continuous or broken reflectorised white line. This may have implications when considering the marking of advisory cycle facilities.

2.10.04 –Cycle Lane Symbol

This section prescribes the symbol to be used, the spacing they should be marked at and the size it should be marked at for varying locations. The cycle symbol is detailed in TCD Rule 2004: Schedule 2 – M2-3 Cycle lane symbol.

2.10.05 – Diagonal bars

These should not be marked within a cycle lane.

2.10.06 – Coloured Surfacing

This should be used *"where motorists may be unaware of the likely presence of cyclists, or where cyclists are likely to feel under stress from potential conflicts with motor vehicles".*

The specified colour is green (AS2700 S 1996 colour G13 Emerald or similar).

2.10.07 – Intersections

Refers to Section 3.18.

2.10.08 – No-Stopping Lines

No-stopping lines are not legally required for kerbside cycle lanes, however there is a strong rationale for marking them (Wilke & Ferigo, 2009) and several RCAs do so.

2.10.09 – Bus Stops

Bus stops may be marked in kerbside cycle lanes where there are less than 10 buses per hour. Layover (timing point) bus stops are not permitted.

In legal terms, a cycle lane stops and starts either side of the bus stop.

B.3. MOTSAM Part 2: Section 3.18 – Intersections

Section 3.18 provides guidance for cycle lanes at intersections, summarised below.

3.18.01 – General

Special attention should be paid to the marking of cycle lanes at intersections as this is where cyclist may come into direct contact with motorised traffic.

3.18.02 – Edge Lines

Tapers should not cross cycle lanes and continuity lines should be used where a left turn lane crosses a cycle lane.

3.18.03 – Cycle Lane Lines

The cycle lane line separating traffic from cyclists should be a solid line (2.10.03) or a continuity line if crossed by a left turn lane (3.18.02).

3.18.04 – Diagonal bars

These should not be marked within a cycle lane.

3.18.05 – Cycle Lane Symbol

Symbols should be marked at the recommencement of cycle lanes after an intersection, in advance stop boxes, and in other locations as required.

3.18.06 – Coloured Surfacing

This should be used "where motorists may be unaware of the likely presence of cyclists, or where cyclists are likely to feel under stress from potential conflicts with motor vehicles". Coloured surfacing is not to be used on the cycle lane approaches to roundabouts as cycle lanes are to be terminated prior to roundabouts.

3.18.07 – Cycle Lanes at Roundabouts

Cycle lanes are not to be marked on the circulating lanes of roundabouts. Cycle lanes on approaches to roundabouts should be terminated 30 m from the limit lines, or at a connection to an off-road alternative path. Kerbside cycle lanes can be marked on the departure side of roundabouts.

3.18.08 – Advanced Stop Boxes and 3.18.09 – Advanced Stop Lines

These sections set out the recommendations for advanced stop boxes (ASBs) and advanced stop lines (ASLs).

3.18.10 – Hook Turns

At busy multi-lane signalised intersections, it may be difficult for some cyclists to move to the right turn lane and a hook turn facility can be provided to assist with the manoeuvre. This allows cyclists to make a right turn in two stages.

3.18.11 – Cycle Lane Arrow Markings

Recommends arrows where additional cycle lanes are provided for turning movements

3.18.12 – Cycle Lanes at Signalised Intersections

Recommends appropriate transitions between midblock and intersection locations. Kerbside cycle lanes must not be used where an exclusive left turn lane exists. The combined width of the cycle lane and adjacent general traffic lane should not be greater than 4.8 m to discourage motorists from driving in kerbside cycle lanes at intersections.

3.18 – Figures 3.31 to 3.38

Diagrams indicate the marking of cycle lanes, symbols, ASBs, ASLs and hook turns.

Appendix C Inventory of Non-standard Signs

This international selection of non-standard signs has been developed separate from the review commission and has been provided for general information only.

<table>
<tr><td> 
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<tr><td>bikes belong too PASS SLOW & WIDE, Taupo</td><td>Watch Out for Bikes, Golden Bay</td></tr>
<tr><td> 
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<tr><td>SHARE THE ROAD</td><td>Don’t Burst Their Bubble</td></tr>
<tr><td> 
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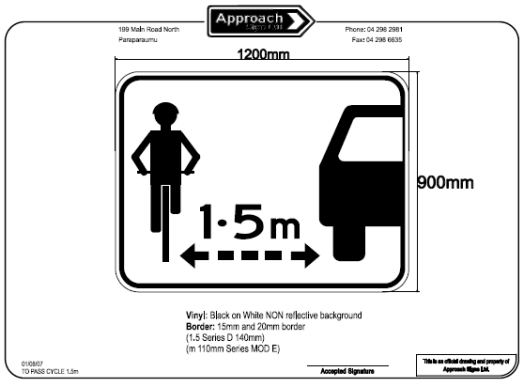
<tr><td>MOTSAM PW35 with supplementary pass with care sign</td><td>TO PASS, Taupo</td></tr>
</table>

	
1.5 m passing clearance, Approach Signs Ltd	WATCH FOR CYCLISTS, Upper Hutt
	
SHARE THE ROAD, UK	give a damn – look twice for cyclists
	
Memphis TN, USA	Share the Road sign, USA Originated as supplement to existing bicycle sign in North Carolina. Similar to MUTCD standard signage

<table>
<tr><td> 
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<tr><td>US MUTCD Bicycles May Use Full Lane Sign (R4-11).

Typical usage includes on steep downhill segments of urban streets.</td><td>COEXIST
critique of STR signage:
http://www.humantransport.org/bicycledriving/library/Share_Road.pdf</td><td>Streets are for everyone (SAFE), USA</td></tr>
<tr><td> 
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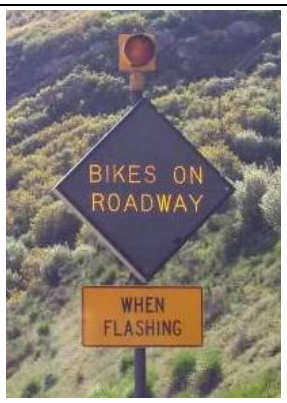
<tr><td>Active warning sign at tunnel, Colorado USA</td><td colspan="2">Bike route disc as supplementary sign below lane designations, Gent Belgium</td></tr>
<tr><td> 
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<tr><td>Bikes on Roadway active warning sign, USA</td><td colspan="2">Safer route to school, Upper Hutt</td></tr>
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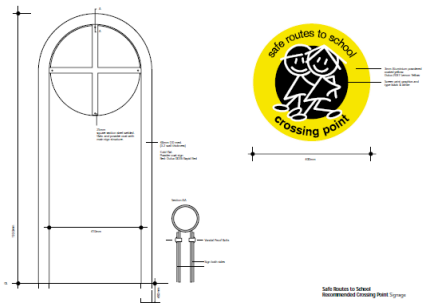
<tr><td colspan="2"> 
</td><td> 
</td></tr>
<tr><td colspan="2">Fietsstraat
Bikes have priority</td><td>Safe routes to school (SRTS) Christchurch</td></tr>
<tr><td colspan="2"> 
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<tr><td colspan="2">Shared area, Upper Hutt</td><td>Shared zone, Napier</td></tr>
<tr><td colspan="2">  </td><td>  </td></tr>
<tr><td colspan="2">Woonerf, Gent Belgium</td><td>Shared zone, Switzerland</td></tr>
<tr><td>  </td><td>  </td><td rowspan="2"> 
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<tr><td>Shared zone start, Germany</td><td>Shared zone end, Germany</td></tr>
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