

TECHNICAL NOTE

TRAFFIC SIGNS BEYOND MOTSAM

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ABSTRACT

The NZTA is involved in progressively replacing the *Manual of Traffic Signs and Markings* (MOTSAM) with a new series of documents under the title *Traffic control devices manual* (TCD Manual). A key factor in this project is the need to involve practitioners and users in the process. The note outlines the project and its timelines. It describes how it is involving practitioners but, perhaps more importantly, also how it is obtaining road user input. Surveys of road user comprehension of traffic signs, based on an international standard test methodology are described and the results discussed. The possible role such surveys could have in developing Land Transport Rule, the TCD Manual and general public awareness campaigns is described and input from the Conference sought.

TCD MANUAL

Background

At the consultative stages of the *Land Transport Rule: Traffic Control Devices 2004* (TCD Rule) it was proposed the *Manual of Traffic Signs and Markings* (MOTSAM) [NZTA (2010)] be incorporated by reference into the TCD Rule. There was a good level of support for the general concept but there was concern about MOTSAM not being perceived as an industry-wide document.

The comments received during this process suggested there was a need to review the status of MOTSAM and a desire to ensure any subsequent document reflected the requirements for specification and guidance of all road controlling authorities and traffic practitioners. Options for such a review were presented in a discussion document in 2005. As a result of the input received Land Transport NZ agreed to manage a project aimed at replacing MOTSAM.

Traffic control devices specifications

When the Traffic Regulations were first promulgated in 1976 there was a very close match between its descriptions of signs and the then existing National Roads Board's *Signs Manual*. Over time this match has been difficult to maintain. The latter has become more of an issue as MOTSAM was increasingly perceived as a document being driven primarily by state highway needs. The limitations of change through the regulatory process have also frustrated those wishing to meet perceived gaps between permitted signs and their operational needs. Similar comments apply to marking and other traffic control devices.

To address these issues a document, titled *Traffic control devices specifications* (TCD Specifications) [NZTA (2009)] is under development. TCD Specifications will contain the precise details of approved or mandated signs, signals, markings and certain other traffic control devices. What the document will not contain is guidelines or policy on how the devices are used.

It appears unlikely TCD Specifications will be incorporated in the TCD Rule in the short term. However, if the document is developed using a sufficiently open, collaborative and consultative process there would be an increased likelihood of industry acceptance, greater consistency and a much improved chance for future incorporation within the standards and legislative framework.

Traffic control devices manual

MOTSAM contains a considerable amount of good practice guidance and, in many cases, specific state highway policy couched in terms of mandated practice. While it is appropriate for an individual RCA to clearly describe its accepted practice, this practice is not always necessary or applicable for all authorities. This point was made in many submissions on the TCD Rule.

There is an ongoing need for a document, or documents, which give good practice guidelines for RCAs on how traffic control devices are used. It is proposed to replace MOTSAM by the *Traffic control devices manual* (TCD Manual) [NZTA (2008)]. In 2009 new Austroads Guides replaced previous documents and it was aimed for these to provide an overarching guidance and policy framework within which individual jurisdictional practices around Australasia could fit.

In Australia the equivalent of MOTSAM is the *AS1742 Manual of uniform traffic control devices* (Parts 1-13) series. The Austroads Guides are very much framed around having such a detailed series of standards and guides available to practitioners but, because New Zealand has some specific technical and legal difference the AS1742 series is not applicable here. However, the proposed structure and content of TCD Manual, shown in the table below, has being strongly influenced by AS1742.

Table 1: Structure of the Traffic control devices manual (at December 2009)

Part	Title	Schedule
1	General requirements for signs	to be published early 2010.
2	Guide and direction signs	to be published early 2010
3	Advertising signs	to be published early 2010
4	TCDs for general use: at intersections	to be prepared 2010/11
5	TCDs for general use: between intersections	to be prepared 2010/11
6	Speed management	to be prepared 2010/11
7	Parking - currently published as Part 13 will be renumbered next revision	update post-TCD Rule Amendment 2010
8	COPTTM - currently published as a separate document	to be reviewed/updated by June 2010
9	Level crossings	published
10	Motorways & expressways (previously published as MOTSAM Part III)	update published 9 December 2009
	Specifications: Signs	Ongoing updates
	Specifications: Signals	2010
	Specifications: Markings	2010
	Glossary	Ongoing updates as parts published
	References	Ongoing updates as parts published

TCD Steering Group

Problems have arisen when an individual authority or group of authorities develop a 'standard' or guideline with an assumption this will be acceptable at a national level. Efforts in this area have been more successful where a good level of consultation has occurred, but the status of the resulting document often remains uncertain.

To develop and maintain TCD Specifications and Manual for TCD and ensure they meet the desired objective as industry accepted documents a Traffic Control Devices Steering Group (TCD Steering Group), representative of the industry has been established. With a clear definition of responsibilities and industry acceptance of the process and their part in it, industry becomes the 'owner'.

The TCD Steering Group is to be responsible for:

- providing overall guidance and strategic direction for the development and maintenance of the documents TCD Specifications and TCD Manual;
- overseeing a management programme of research and trials for new traffic control devices, and recommending their adoption by NZTA;
- providing input to the New Zealand contribution to the ongoing review programme of the Austroads documents: Guide to Traffic Management, Guide to Road Design and Guide to Road Safety.

In completing these tasks the TCD Steering Group are required to ensure a consultative approach is taken in the development of documents and documents meet industry needs.

The TCD Steering Group is comprised of experienced practitioners in traffic control devices. The following agencies and organisations are represented:

- NZTA (two representatives one, the convenor, representing Regional Partnerships and Planning Group and one representing Highways and Network Operations Group).
- Local Government NZ / Ingenium / IPENZ (three representatives)
- NZ Road Markers Federation Inc (one rep)
- NZ Road Safety Manufacturers Association (one rep)
- NZ Automobile Association (one rep)
- Roothing New Zealand (one rep)

The Group is supported by two NZTA staff members of the Network Standards and Safety team.

Working Groups

Each part of the manual is to be prepared using an industry-wide consultative process using a working group made up of practitioners with specific expertise in the subject matter.

As an example Part 13 of the TCD Manual *Parking control* was developed by the Parking Working Group. This group was made up of representatives of NZTA (Convenor), Ministry of Transport, Local Government New Zealand (three representatives), New Zealand Parking Association (three representatives) and the Automobile Association.

Consultation

It is essential industry is actively involved in the process. Apart from involvement through the Steering group and Working Groups all drafts of the TCD Manual will be presented for public consultation. The NZTA has a current list of over 700 recipients who receive notifications of consultation drafts and invites any interested party to register their interest.

Once responses are received from consultation the authors analyse the comments and recommend appropriate changes for consideration by the working group responsible for that document. Their decisions will result in a further draft. Final sign-off by the Working Group and TCD Steering Group must be obtained before the document is published.

The document is only published electronically and will be available on the NZTA website.

Transitional management of MOTSAM

As MOTSAM contains state highway operational policy and the NZTA and other users have a need for MOTSAM to remain useable while TCD Specifications and Manual for TCD develop. This requires the transition from MOTSAM to the new documents to be managed effectively to ensure users have clear and non-contradictory guidance and, where appropriate, policy.

It has been decided to publish MOTSAM at least as image files on NZTA's website in the meantime. While links between sections of MOTSAM would be limited it will be possible to establish links to the new documents as they are developed. This should provide more flexibility in the timing of the overall project. Otherwise the project would need to be completed as quickly as possible to reduce potential transitional problems.

COMPREHENSION OF TRAFFIC SIGNS

Background

At various times over the past there have been attempts to obtain information about road users' understanding of traffic signs. However, there has been no attempt to address this as a routine process. This has been largely due to the perceived difficulty and cost of doing this and perhaps a perception that little of value could be obtained. NZ has largely adopted use of international symbols and simply accepting an existing overseas symbol or use of words that, at least to those designing the sign, conveyed a clear message appears to have sufficed.

At various meetings of traffic practitioners there has often been debate about the meaning of a number of signs but no attempt was made to assess how road users understood the meaning of these signs. NZTA and its predecessor organisations often received enquiries seeking clarification on the meaning of traffic signs and a number of informal reports and media statements suggested some signs were not well understood. This sometimes saw changes to publications such as the *Road code* and the provision of some general publicity (eg pamphlets for foreign drivers).

Notwithstanding the existence of international standard ISO 9186 and an Australian standard AS2342 [8] based on ISO 9186 there was no attempt to test understanding until two surveys that occurred during 2003 - 2004. The first of these (Warren & Radu) tested among a small group of road users, understanding of messages that were to be used on the Wellington ATMS. The second survey was involved in the development NZS 8603:2004 where ISO 9186 was used to assess signs that were to be included in the standard for symbols used for recreational signs. Both of these highlighted gaps between the general public's perception of some symbols and messages and those assumed by engineers and others involved in creating traffic signs.

The former survey has been expanded more recently to inform development of the NZTA variable message operational policy and will, no doubt, be reported in more detail elsewhere. The second led to the Land Transport New Zealand (now part of NZTA) in 2007 commissioning Furzhill Consultancy Ltd (who had been involved in the Standards NZ survey) to conduct a survey aimed at assessing road user comprehension of some traffic signs.

2007 survey







A range of 28 traffic signs were selected for inclusion in the survey. These included a number of existing signs, many of which had been the subject of debate or correspondence about their comprehension, and some new or proposed signs.

Images of a selection of the signs were presented one at a time in a web-based survey to each respondent who were asked to describe what they thought each sign meant. On completion of the survey all responses were evaluated by assessors using the methodology described in ISO 9186:2001. A 'comprehension score' was calculated where 1.000 would describe a sign where there had been perfect comprehension. A score of 0.000 would imply non-comprehension while it is theoretically possible to achieve -1.000 where the sign is interpreted to mean the exact opposite of that intended. The results and a detailed description of the survey and assessment process are contained in Matcham (2007).

The survey produced some interesting outcomes, a sample of which is shown in Table 2. Some signs often perceived as not understood scoring reasonably well (eg the 'one way bridge' signs); some which should be well understood doing poorly (the 'de-restriction' sign);

and, others which have received high levels of comprehension in overseas tests doing badly (the 'no entry' sign without text and 'cars in queue').

Table 2: Sample of results from 2007 survey

Sign	Sign meaning	Score
	Single lane (one-way bridge) – drivers should give way to vehicles travelling in the opposite direction	0.839
	One way bridge (single lane) – drivers should give way to vehicles travelling in the opposite direction	0.801
	One way bridge (single lane) – vehicles travelling in the opposite direction should give way	0.700
	The maximum speed limit is 100km/h	0.406
	Warning – there could be queues of vehicles ahead	0.410
	No entry – drivers may not proceed beyond the sign	0.255

Some of the outcomes could, it was felt, have been affected by not having the sign set in a context which might aid its understanding. There was also a belief that simply asking what the sign meant rather than what action was expected of drivers seeing the sign might also have led to less clear responses and subsequent poor assessment of many responses. The general conclusion from the survey was that it produced some worthwhile results. It was considered further surveys should be conducted but this time the signs should also be presented in context and respondents also be asked what action they should take.

2009 survey

The next survey was conducted with changes made as suggested from the 2007 survey. Here the respondents were presented with the sign and a photograph of the sign mounted in a typical location where it could be expected. See Figure below.

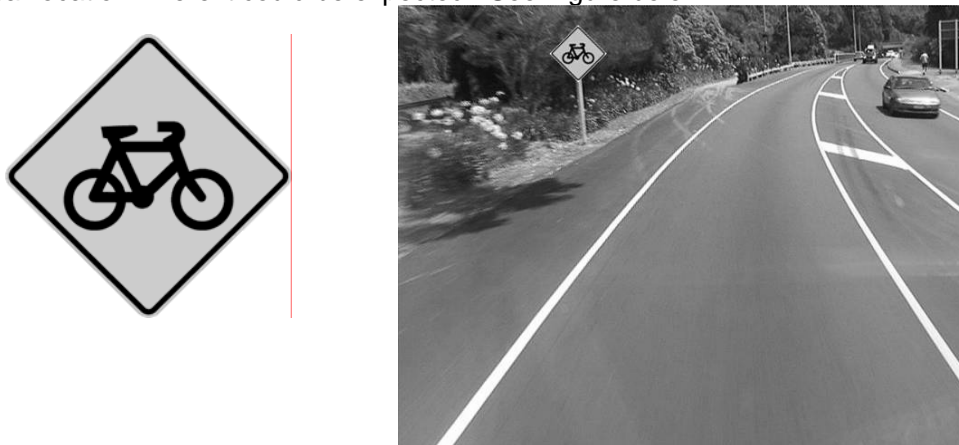










Figure 1: Cycle sign (above) superimposed in appropriate location in road image (right)

A number of signs used in the 2007 survey were included for comparison purposes. In this survey a number of signs being considered for the upcoming TCD Amendment Rule were

included as well a number of other proposed signs. The results and a detailed description of the survey and assessment process are contained in Matcham (2009).

The results from this survey showed a similar mix of surprising levels of comprehension, a sample of which is shown in Table 3. The outcome has seen the approval of two new signs ('road narrows – 2 to 1' and 'road narrows – 3 to 2'), the removal of an option being considered prior to the survey (truck mounted attenuator 'down arrow'); and, in the TCD Amendment Rule a number of proposals for inclusion (the 'P\$' symbol for paid parking, the optional use of the supplementary 'Give Way' plate below a 'roundabout give way' sign) and an issue for comment (what form should a 'shared space' sign take?).

Table 3: Sign ordered by comprehension score - 2009 survey

Sign	Sign meaning	Score
	Paid parking allowed for up to 60 minutes	0.878
	Road narrows ahead, three lanes reduce to two lanes (or the left and centre lanes reduce to one lane)	0.843
	Road narrows ahead, two lanes reduce to one lane	0.770
	About to enter a roundabout – give way	0.743
	About to enter a roundabout – give way	0.730
		
	Pedestrians and vehicles share same space	0.703
	Truck with down arrow sign will guide me through the roadworks site	0.101

One interesting aspect of providing a context image arose with the sign (and its similar options) and context shown in the Figure above. It appeared that many respondents believed the sign advised drivers the shoulder was actually a cycle lane. In the picture the sign actually warns drivers that cycles are expected on the road ahead because a pinch point occurs due to the road narrowing for a bridge.

Additionally, the family of cycle warning signs presented (the existing 'cycle' and alternatives depicting 'cycle with cyclist' or 'cyclist and car') had comprehension scores (0.685, 0.691 and 0.714 respectively) which were within the margins of error for the scores. This does suggest that, although the 'cyclist and car' symbol did best, there is insufficient ground to suggest we alter the existing sign.

CONCLUSION

This paper has described the process being taken to move the content of MOTSAM into a new series of documents - the TCD Manual and TCD Specifications - using a collaborative model involving practitioners at all stages of their development. The sign survey described goes one step further with a deliberate attempt to involve the road user in the process for assisting with sign design.

NZTA proposes to continue with this collaborative model but it does require input from practitioners to ensure the objectives are achieved. Your input is invited. The authors encourage comment on the process; actively seek comment during the consultative phases; and, would welcome comment on the results to date and on any future signs that could be included in future sign comprehension surveys.

REFERENCES

- AS1742 *Manual of uniform traffic control devices* (Parts 1-13), Standards Australia, Sydney
- AS 2342: 1992 – *Development, testing and implementation of information and safety symbols and symbolic signs*, Standards Australia, Sydney 1992.
- Austrroads Guides <http://www.nzta.govt.nz/resources/austrroads-road-engineering-guides/>
- ISO 9186: 2001 *Graphical symbols: test methods for judged comprehensibility and for comprehension*
International Organization for Standardization, 2nd edition 2001
- Land Transport Rule: *Traffic Control Devices 2004* <http://www.nzta.govt.nz/resources/rules/traffic-control-devices-index.html>
- MATCHAM P (2007), Furzehill Consultancy Limited, *Evaluation of the comprehension of existing and proposed road signs*, December 2007
- MATCHAM P (2007), Furzehill Consultancy Limited, *Evaluation of the Recognition and Comprehension of existing and proposed road signs* June 2009
- NZS 860: 2004 *Design and Application of Outdoor Recreation Symbols*, Standards New Zealand, Wellington 2004
- NZTA (2008) *Traffic control devices manual* New Zealand Transport Agency, amended to December 2008, <http://www.nzta.govt.nz/resources/traffic-control-devices-manual/index.html>
- NZTA (2009) *Traffic control devices specifications* New Zealand Transport Agency, amended to August 2009, <http://www.nzta.govt.nz/resources/traffic-control-devices-manual/sign-specifications/>
- NZTA (2010) *Manual of Traffic Signs and Markings (MOTSAM)*, New Zealand Transport Agency, amended to January 2010, <http://www.nzta.govt.nz/resources/motsam/part-1/index.html>
- WARREN P and RADU M *Psycholinguistic investigation of variable message signs*, IPENZ Transportation Conference, 2003, Christchurch