

Traffic Note 32

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Use of fluorescent material on traffic signs - guidelines

1 Summary

The Land Transport Safety Authority (LTSA) has developed the following guidelines for the use of fluorescent material on traffic signs, with the assistance of a working party comprised of material manufacturers and road controlling authority engineers.

The guidelines:

- briefly describe fluorescence and conclusions of research into the effect of fluorescent materials used on signs (section 2);
- describe circumstances where fluorescent materials may be appropriate for signs (section 3);
- detail the uses for fluorescent retro-reflective materials on signs approved by the LTSA, in particular:
 - **fluorescent retro-reflective orange** (section 4.1);
 - **fluorescent retro-reflective yellow-green** (section 4.2);
 - **fluorescent retro-reflective yellow** (section 4.3).
- comment on use of non-reflective fluorescent material on signs which are used for short periods of time (section 5);
- raise the issue of fluorescent materials on roadside advertising and urge road controlling authorities to consider the impact of such use, particularly if fluorescent traffic signs are to be used in the same area (section 6); and
- identify the potential use of fluorescent material as a backing for standard signs (but before proposing a policy the LTSA intends reviewing existing backing board practices and guidelines) (section 7).

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2 Fluorescence

Fluorescent colorants have a unique property that converts some of the absorbed ultra-violet range light to emissions of longer light waves visible to the human eye. Natural light during dawn, dusk, overcast skies or inclement weather contains a higher proportion of UV energy than does normal bright daylight. In these conditions, therefore, fluorescent sign sheeting material appears more visible to the human eye than normal sign sheeting material.

Research conducted in the US and Norway^{1,2,3} drew the following conclusions:

- fluorescent signs had the highest peripheral detection performance against a city background, autumn foliage and spring background;
- fluorescent colours were detected more often and were recognised with greater accuracy at longer distances when compared to standard colours and detection distances could be up to 40% longer;
- fluorescent colours were more conspicuous when compared to standard colours;
- fluorescent colours provided visibility benefits, especially for older drivers;
- fluorescent colours were not so eye-catching that drivers became preoccupied by them;
- higher percentages of drivers recalled passing a fluorescent traffic sign indicating a greater cognitive impression.

3 When to use fluorescent material on signs

When assessing daytime visibility requirements for traffic signs, the use of fluorescent retro-reflective sheeting is an option that may be considered in the following situations:

- (a) poor visibility, and in particular:
 - during twilight hours; or
 - when heavily overcast or shaded conditions are common; and
 - data indicates over-representation of relevant crash types during these times.
- (b) an enhanced level of conspicuity is required due to:
 - contrast issues (e.g. snow, foliage, commercial lighting); or
 - high levels of competing demands on drivers' attention (e.g. heavy traffic, commercial activity);
- (c) older drivers comprise a significant proportion of the road users.

4 Approved uses of fluorescent materials on signs

4.1 Orange

(a) Temporary traffic control

The *Code of Practice for Temporary Traffic Management*⁴ (CoPTTM) introduced national requirements for the use of fluorescent retro-reflective orange on a number of critical signs. Frequently work sites will experience a wide range of the situations described above, but, perhaps most importantly, the need for enhanced conspicuity due to the competing demands for drivers' attention.

With the exception of 4.1 (b) below, fluorescent retro-reflective orange will be reserved solely for signs used in terms of the CoPTTM. This decision is supported by past New Zealand practice of reserving orange for road work sites. It is also consistent with practice in Australia and USA and supported by European recommendations⁵ of a unique, standardised colour for road works.

(b) Pedestrian crossing belisha beacon discs

Fluorescent retro-reflective orange has been officially approved for use in only one other situation – belisha beacon discs – at pedestrian crossings. In this situation the colour closely resembled that of belisha beacons.

4.2 Yellow Green

(a) Permanent roadside warning signs – vulnerable road users

In the USA fluorescent retro-reflective yellow-green has become an accepted alternative for use on signs relating to 'vulnerable road users' – namely pedestrians and cyclists. Use for other purposes has not been approved. In addition the US *Manual of Uniform Traffic Control Devices*⁶ (MUTCD) states:

When fluorescent yellow-green is used a systematic approach featuring one background colour within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green background within a selected site area should be avoided.

The fluorescent materials working group convened by LTSA recommended adoption of the MUTCD approach. Consequently, fluorescent yellow-green has been approved solely for use on permanent roadside warning signs where they warn of pedestrians and cyclists.⁷

In New Zealand, approval was given to use fluorescent yellow-green on the trial school speed zone in Christchurch. Use in this environment is consistent with the MUTCD and was supported on this basis.

(b) Vehicle mounted signs

(i) Overdimension vehicles

Some vehicles operating under overdimension permits set by the LTSA are required to mount one or more appropriate signs. Since 1998⁸ these signs have been required to have at least fluorescent yellow-green backgrounds if only used in daylight and to have retro-reflective fluorescent yellow-green backgrounds if used at night. The nature of overdimension vehicles or loads requires they be highly conspicuous under a range of traffic and environmental conditions. This is consistent with the use of fluorescent material.

(ii) School buses

The traffic regulations have, since 1972⁹, described school bus signs as having yellow fluorescent backgrounds. There has been no requirement for them to be retro-reflective. As these signs frequently fold away when not in use, the poor longevity of non-reflective fluorescent materials is less of a problem. However, it does appear many bus operators are using retro-reflective yellow rather than fluorescent material.

A school bus sign with a pair of flashing lights (modelled on the Australian standard) is being proposed by the LTSA¹⁰ as an optional device for operators. It is proposed the background material for this sign and any replacement of existing signs should be retro-reflective fluorescent yellow-green. This is consistent with both the vehicle mounted sign and vulnerable road user warning sign regime.

4.3 Yellow – permanent warning signs

There are circumstances where the use of a retro-reflective fluorescent background may be justified for permanent warning signs other than those described in 4.2 (a) above. Road controlling authorities should consider the criteria described in Section 2 above in deciding whether to use fluorescent yellow. The impact and enhanced conspicuity a fluorescent sign may have when compared with existing signs in an area must be considered. This will require a more rigorous review of the relative need or significance of signs along a stretch of road than normal to ensure road users are not overloaded by information or distracted from other critical information.

5 Fluorescent signs not retro-reflective

5.1 “School patrol” signs

The circular “school patrol – STOP” signs which are used at pedestrian crossings and school crossing points (kea crossings) by authorised and trained school patrols may be fluorescent red in colour.

5.2 “Children crossing” signs

Where school crossing points (kea crossings) or marked pedestrian crossings have not been established, but there are concerns about the safety of children crossing the road, many controlling authorities have installed folding signs with the words ‘**CHILDREN CROSSING.**’ To raise their conspicuity and visibility these signs have used a fluorescent red material that is not retro-reflective.

The signs should not be used at night and they should be open for short periods only when children are likely to be present. The fluorescent material used is adequate for this limited purpose. If the sign remains open for extended periods, not only does it lose any effectiveness on driver behaviour but it also fades significantly in a short time, as it does not have the lasting properties of approved retro-reflective sheeting.

5.3 “Kea crossing” flags

A key component of kea crossings is the fluorescent flag mounted when the school patrol is operating. The material used for this flag is fluorescent and, while the regulatory colour is listed as orange, most flags appear to range in colour from deep pink through red to orange. The material is not retro-reflective.

The flags are used only in daylight hours for short periods on school days and must not be displayed outside the times when the school patrol is operating. For this limited purpose retro-reflective properties are not required.

6 Use of fluorescent materials on roadside advertising

Regulation 130 (3) of the *Traffic Regulations 1976* states “*No person shall use any reflective material on any sign, hoarding, or similar structure used or intended to be used for the purpose of advertising in such a position that it is likely to reflect the light from the lamps of any motor vehicle on a road.*”

No such provision applies to fluorescent materials. Fluorescent materials have been used in roadside advertising for some time and it is unlikely any ban could be imposed now, nor would it be effective. However, the principles detailed in RTS 7¹¹, particularly section 5.2 on colours of advertising signs and devices, should be followed when considering whether an advertising sign is acceptable. The removal or alteration of an advertising sign that uses materials of a similar colour (including fluorescent and/or reflective materials) or layout to approved traffic sign materials may be necessary to prevent confusion and ensure that traffic signs are easily distinguished from advertising signs.

7 Fluorescent material as backing boards

In some European countries fluorescent materials have been used as backing boards for conventional signs. A range of sites was trialled in Auckland with retro-reflective fluorescent yellow-green material as backing boards for Stop and Give Way signs.¹² This suggested the technique may have value for specific situations.

This, and a number of general issues regarding backing boards, is beyond the scope of these guidelines. Further investigation of backing boards practices here and overseas is proposed, with the aim of producing guidelines.

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- ¹ Eccles and Hummer, *Safety Effects of Fluorescent Yellow Warning Signs at Hazardous Sites in Daylight* Transport Research Board, paper 01-2236, Washington.
 - ² Schnell, Ohme, Guyluva, Donaubauer, Weise, Darby and Noelting *Driver Looking Behaviour in School Zones with Fluorescent Yellow Green and Normal Yellow Signs*, Transport Research Board paper 01-2584, Washington.
 - ³ Jennsen and Brekke *Field Evaluation of the Effect of Fluorescent Retro-reflective Traffic Control Devices on Driver Attention and Behaviour*, Sintef in Norway.
 - ⁴ Transit New Zealand *Code of Practice for Temporary Traffic Management*, Wellington, July 2000.
 - ⁵ ARROWS (Advanced Research on Road Work Zone Safety Standards for Europe) Project Report *Road Work Zone Safety Practical Handbook* European Commission Directorate General for Transport, 1998.
 - ⁶ Federal Highway Administration, *Manual of Uniform Traffic Control Devices - Millennium Edition*, June 2001.
 - ⁷ Contained in *Notice of Approval of Reflectorised Materials for Use on Traffic Signs* published in *NZ Gazette*. At the time of publication of these guidelines the latest approval was dated 5 August 2001. The latest notice may be accessed at www.ltsa.govt.nz/publications/traffic_notes.html attached to *Traffic Note 12*.
 - ⁸ *Approval of Vehicle Mounted Signs Used With Respect to the Movement of Overdimension Vehicles and Loads*, *NZ Gazette*, 9 July 1998, No 91, page 2084.
 - ⁹ *Traffic Regulations 1956 Amendment No 23*, SR1972/252, 1972.
 - ¹⁰ *Road User Rule Consultation Paper - Discussion Paper*, LTSA, June 2001.
 - ¹¹ RTS 7 (Road and Traffic Standard No 7) *Advertising Signs and Road Safety: Design and Location Guidelines*, LTSA and Transit New Zealand, 1993.
 - ¹² Lavi, Barak and Parker, Alan, *Intersection Safety: Fluorescent Reinforcement for Stop and Give Way Signs*, paper presented to Traffic Management Workshop, 3M New Zealand Ltd, August 2000.