



BUFFERED ADVANCE STOP BOX

Design Guidance Note

WAKA KOTAHI NZ TRANSPORT AGENCY

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BACKGROUND

Given the shift to cycling within New Zealand, it is imperative that New Zealand's transport network facilitates this growing trend, while at the same time improving safety for cyclists.

One intervention to improve cycle safety at signalised intersection is advance stop boxes (ASBs). ASBs allow cyclists to occupy an advantageous position at the front the traffic queue from which they can safely be seen by other roads users and also allow them to pull away from the signals ahead of other road users.

While cyclists who are in the ASB do have an improved level of visibility to most other road users, there is a potential area of concern where trucks and other large vehicles may fail to see cyclists in the ASB. This is due to the fact that these drivers' line of sight is higher than that of other standard road users, which makes visually scanning the area directly in front of their vehicles difficult (see Figure 1 and Figure 2). This concern is supported by the fact that one in ten urban cycling death or serious injury (DSI) crashes occur at signalised intersections and 33 to 40 % of cycling fatalities involve a truck.

Another ongoing concern is vehicle encroachment into ASBs, which often results in cyclists queueing in less appropriate areas (e.g. the pedestrian crossing space).

More information around ASBs can be found in [Cyclist waiting facilities at intersections](#) on the Waka Kotahi Cycle Network Guidance.

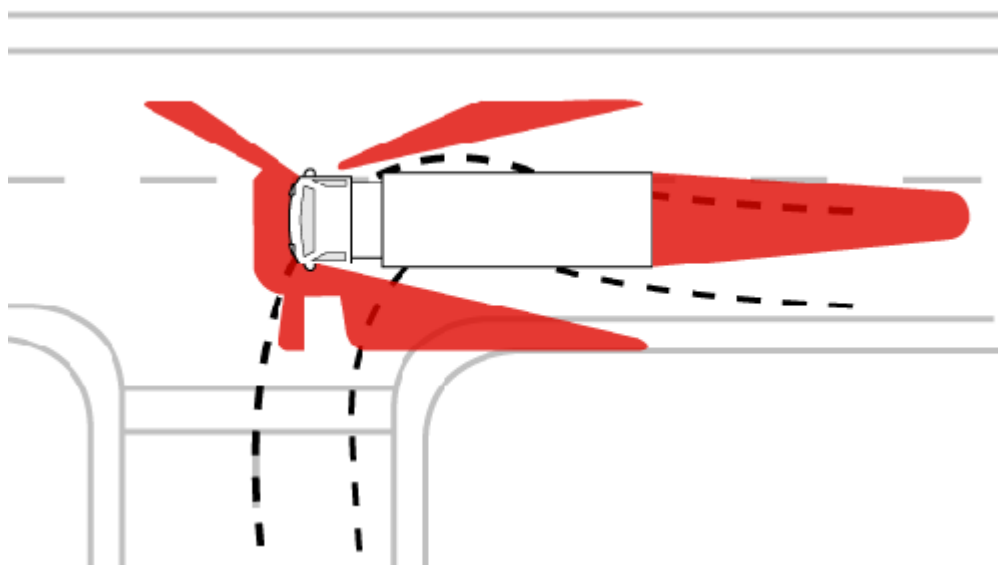


Figure 1: Diagram of driver blind spots for a large vehicle¹

¹ Image sourced from <https://can.org.nz/article/safety-tips-for-cyclists-truck-and-bus-drivers>



Figure 2: Example of reduced view of cyclist positioned in front of a heavy goods vehicle²

PURPOSE

Many trucks have significant blind spots around the cab. There is concern that where cyclists ride up to an ASB, they are riding into a truck's blind spot. To address this, a new ASB treatment is needed which results in greater space between cyclists and trucks.

This design guidance note provides a treatment solution for ASBs in which a buffer zone is placed between the 'limit line' and the ASB to improve the likelihood of drivers detecting cyclists within the ASB as well as decreasing the level of vehicle encroachment into ASBs.

This treatment has been evaluated by WSP and found to improve safety via increasing the distance between stopped motor vehicles and cyclists positioned in the ASB (see Table 1, Figure 3 and Figure 4) thereby decreasing the chances of drivers in large vehicles failing to see cyclists in ASBs. This should also reduce incidences of cyclists encroaching over the 'cycle limit line' into the pedestrian crossing zone (see Figure 3 and Figure 4).

Table 1: Levels of encroachment into standard vs Buffered ASB by vehicle type

Vehicle type	Encroachment into standard ASB	Encroachment into the Buffered ASB	Relative reduction of encroachment into ASB
Trucks	40 %	13 %	68 %
Buses	24 %	4 %	83 %
Cars	20 %	0 %	100 %

² Image captured and supplied by Simon Kennett of Waka Kotahi



Figure 3: Example of road user behaviour at standard ASB



Figure 4: Example of road user behaviour at a Buffered ASB

APPROPRIATE CONDITIONS OF USE

The Buffered ASB can be applied to an existing ASB and should be considered as the first possible treatment type for any new ASBs.

It is strongly recommended that a Buffered ASB be considered over a standard ASB treatment at locations that have an annual average daily traffic (AADT) count of 300 or more heavy vehicles

Detailed design considerations for ASB retrofit

- Given the extended length of the Buffered ASB, care needs to be taken the new marking length does not extend the limit line further than 5 m from the primary signals.
- Signal loops in the carriageway may need to be recut as the limit line is moved further back from the signals.

- With the limit line moving further back from the ASB, signal timings should be reviewed for possible negative impacts as road users now have to travel a greater distance to clear the intersection.
- There is the potential for ghost markings when the limit line is moved. All possible effort should be taken to reduce the chance of ghost markings as these can lead to road users incorrectly positioning themselves in the buffer zone.
- Sight lines should be taken into account when moving the limit line further back from the primary signals as the new limit line location may have a detrimental effect on said sight line.

Detailed design considerations for ASB retrofit and new implementation

- Care should be taken to not have staggered limit lines in multilane setups as road users may try to align themselves to those in the other lane leading to encroachment into the buffer zone

DETAILED DESIGN ELEMENTS

Cycle limit line

The 'cycle limit line' should retain its width of 100 mm with a 200 mm gap between it and the pedestrian crossing zone.

ASB (green box)

The desired length of the ASB is 2.9 m. However, having an ASB of 3.4 m or 2.4 m would also be acceptable if the length of the entire marking (Cycle limit line, ASB and Buffer zone) is 4.0 m or greater.

The ASB should not be smaller than 2.4 m as this would raise concerns around the conspicuity and capacity of the ASB to keep cyclists out of large vehicles blind spots.

Buffer zone

Length

The buffer zones minimum distance from the edge of the 'limit line' to the back of the ASB must be 1 m with the desired length being 1.5 m.

This would give an overall marking length of 4.5 m in ideal circumstances.

Colour

The buffer zone should not receive any colour treatment and thus be left blank. This should encourage cyclists to move forward into the ASB as they do with a standard ASB.

Limit line

The 'limit line' should be in accordance with the requirements outlined in the Traffic Control Devices 2004 rule, most significantly being that the limit line be "as close as practicable" to the primary traffic signal.

Where an ASB is installed, Waka Kotahi's Traffic Control Devices Steering Group have approved a maximum distance between the limit line and primary signal of 5 m. This is different to Austroads

Guide to Traffic Management Part 10 guidance, which recommends a maximum distance of 3m between the primary signal and limit line.

Multiple lanes

Where the Buffered ASB extends across multiple lanes, where possible, all limit lines should be in line with each other.

If the limit lines are staggered this may encourage non-cyclist road users to encroach into the buffer zone if other road users in the adjacent lanes are positioned further forward than they are.

Possible Buffered ASB length configurations

A set of possible Buffered ASB lengths can be seen in Table 2.

Table 2: Possible Buffered ASB lengths

ASB length (including cycle limit line) (m)	Buffer zone length (m)	Total length (excluding limit line) (m)
3.5	1	4.5
3	1.5	4.5
3	1	4
2.5	2	4.5
2.5	1.5	4

MARKING SPECIFICATIONS

Green colour

Recommend use of AS 2700-1996 G26 Apple Green³

Marking durability

Recommend long-life materials, such as: spread and sprinkle (1.5 mm thick paint, with coloured aggregate) or Thermoplastic (binder, pigments, aggregate mixed together).

For application advice see also NZTA P33: 2017⁴, as the warranty period for coloured surfaces outlined here is 5 years.

Marking dimensions

Figure 5 shows the ideal dimensions for the Buffered ASB, where it is reasonably practicable to do so.

The cycle symbol (M2-3) is as per Traffic Control Devices (TCD) manual Section 6.5.2, which is replicated for reference in Figure 6.

³ Alternatives like AS 2700-1996 G13 Emerald can become dark under yellow sodium lighting

⁴ <https://www.nzta.govt.nz/assets/resources/specification-for-coloured-surfacings-p33/NZTA-P33-Coloured-surfacings-May-2017.pdf>

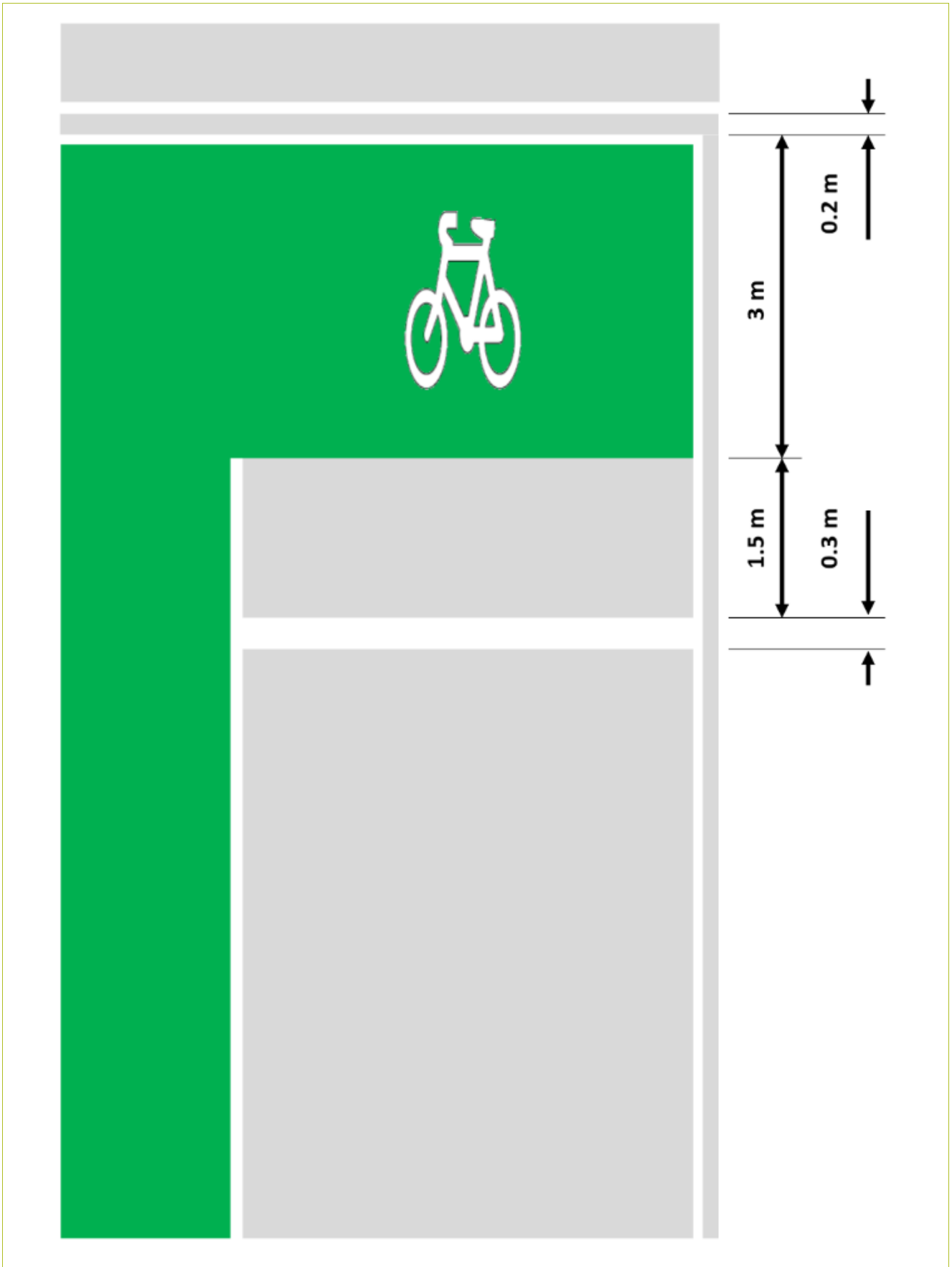


Figure 5: Ideal dimensions for Buffered ASB (a 3 m ASB with 1.5 m buffer zone)

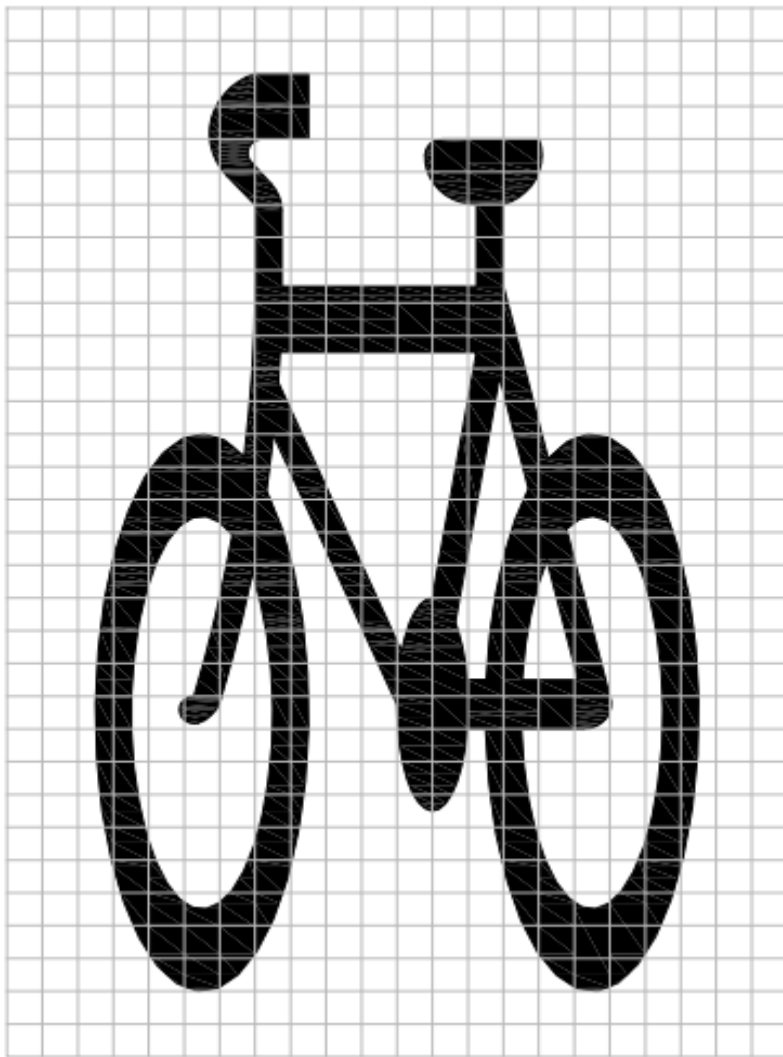


Figure 6: M2 – 3 Cycle symbol for Buffered ASB (Grid Size 50 mm minimum)