Technical Direction

Traffic Engineering

TTD 2020/04 | Version No. 1 – 25 August 2020

Installation of Audio Tactile Linemarking

Summary:	Audience:
This Technical Direction specifies the installation requirements for audio-tactile linemarking on NSW State Roads. Additionally it supersedes in full TETD2019/01, and Section 5.2.6 of the Delineation guide Part 5 V1.6.	All parties involved in the design and installation of audio tactile linemarking on NSW State Roads.

Purpose

This Technical Direction provides the requirements and additional guidance for installation of audio-tactile linemarking (ATLM). This Technical Direction supersedes in full TETD 2019/01 and supersedes the relevant provisions of Delineation guide Part 5 (V1.6) Section 5.2.6 Profile Linemarking.

This Technical Direction must be read in conjunction with:

- Transport, Delineation guide, Part 5 (V1.6.); and
- Transport, QA Specification R145 Pavement Marking (Performance Based)

Approvals:

Owner:	Director Traffic Engineering Services	Review Date:	25 August 2022
Authorised by:	Director of Engineering	Effective Date:	25 August 2020

Summary of changes

This Technical Direction includes the following revisions:

- Additional guidance on ATLM types and features;
- Offset discontinuous ATLM specified as the preferred ATLM treatment;
- Minimum sealed shoulder widths required for installation reduced from 1.0 m to 0.5 m; and
- Clarification of consultation and approval requirements for ATLM installation within 200 m of a residential building, including the preparation of a strategy to manage potential complaints.

Background

ATLM is a thermoplastic line or similar, consisting of raised ribs at regular intervals. It can be installed to enhance edge lines, lane lines and centre lines of any linemarked carriageway.

The purpose of ATLM is to reduce 'run-off-road' or cross carriageway crashes by providing a noise (audio) and vibratory (tactile) warning to road users who have strayed from the road due to fatigue or poor visibility due to rain or fog. It is a highly effective road safety countermeasure that is low cost and easy to install.

Driver fatigue is a significant factor in run-off-road crashes in rural areas. ATLM is therefore suitable for rollout on NSW rural roads particularly where there is a lack of physical measures to separate vehicles from roadside hazards or opposing traffic flow. The sustained treatment of ATLM is critical to its effectiveness to mitigate crash migration.

Types of ATLM

ATLM is installed as either a continuous treatment or a discontinuous treatment. A continuous treatment is raised ribs installed over a base layer of the same material. Continuous treatments must only be installed as white. A discontinuous treatment must be raised ribs only and must be installed directly on the road surface. Discontinuous treatments may be installed as white or black. An example of a continuous and a discontinuous ATLM treatment is shown in Figure 1.

Figure 1: Examples of ATLM installation.

Left: on an edge line (continuous).Right: adjacent to an edge line (discontinuous)

A discontinuous treatment enables the ATLM to be installed adjacent to or offset from the outside of the linemarking. Offset discontinuous ATLM offers the following benefits:

- Reduces the occurrence of nuisance hits;
- Improves the effective product life span and reduces maintenance;

- Reduces the frequency of noise emitted due to nuisance impacts; and
- Allows for future reseals without replacing ATLM (where placed at offsets greater than 100 mm).

ATLM material selection for pavement surface

To optimise the performance and life of the ATLM, consideration should be given to the most appropriate ATLM material or treatment for the pavement surface and location. Examples of suitable pavement surfaces for various ATLM material types are provided in Table 1.

Prior to the installation of ATLM, consideration must be given to planned pavement resurfacing and reconstruction activities that are scheduled for the location (up to a 3 year horizon). Where the ATLM will be significantly impacted or removed completely as part of future works, collaboration with relevant internal stakeholders should be undertaken to determine an appropriate option that delivers value for money. Where future resurfacing works are planned, the installation of offset ATLM has the potential to mitigate impacts.

Table 1: ATLM materials for use on pavement surfaces

ATLM Material Type	Suitable Pavement Surface	Features
Thermoplastic — white	Asphalt and sealed	• Provides delineation • Lifespan of up to 5 years (typically 3 years warranty) • Nuisance impacts can increase due to proximity of ATLM to lane lines
Thermoplastic — black	Asphalt and sealed	• Does not provide delineation • Lifespan of up to 5 years (typically 3 years warranty) • May be offset to minimise nuisance impacts • May be placed between dividing centre line
Cold applied plastic — white	Asphalt, concrete and sealed	• Provides delineation • Life span of up to 8 years (typically 5 years warranty) • More expensive than thermoplastic • Poor adhesion to fresh asphalt and sealed surfaces. Requires a 30 to 90 day delay to allow pavement to cure prior to application
Cold applied plastic — black	Asphalt and sealed	• Does not provide delineation • Life span of up to 8 years (typically 5 years warranty) • May be offset to minimise nuisance impacts • More expensive than thermoplastic • Poor adhesion to fresh asphalt and sealed surfaces. Requires a 30 to 90 day delay to allow pavement to cure prior to application
Milled strip*	Asphalt, concrete and sealed subject to adequate thickness	• Does not provide delineation • Life span is the same as the life of the pavement • Can still be effective if resealed over once • May be offset to minimise nuisance impacts and perceived pavement issues • Provides whole of life cost benefits • Installation pricing competitive to thermoplastic for asphalt and sealed pavements, more expensive for concrete

**Approval must be obtained from Statewide Delivery and/or Traffic Engineering Services before using this treatment or other alternatives*

Specification for installation

ATLM may be installed on rural high speed roads. ATLM must be installed and maintained in accordance with the QA Specification R145 Pavement Marking (Performance Based).

Offset discontinuous ATLM should be the treatment installed where possible.

Audio tactile edge lines (ATEL)

Black ATLM may be used as an ATEL treatment. Where this is the case, it must be installed in accordance with Figure 2. Black ATLM must be installed between 50 mm and 200 mm offset from the edge line. These offsets must only be used for black ATLM as it does not provide the same delineation function as white ATLM.

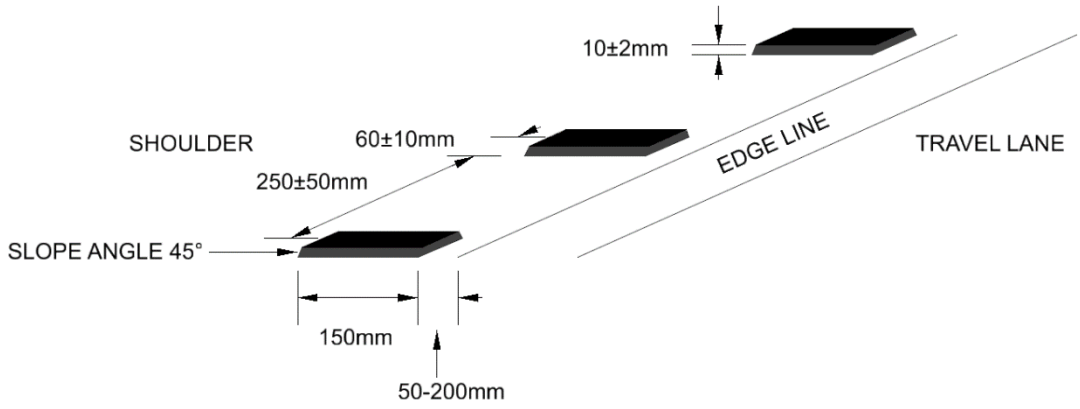

Figure 2: Specification for installation of black ATLM on edge lines

An example of offset discontinuous black ATLM is shown in Figure 3.

Figure 3: Example of black ATLM installed on edge lines

Discontinuous white ATLM may be used as an ATEL treatment where an increased delineation effect is desired. Where this is the case, the white ATLM must be installed in accordance with Figure 4. Due to its delineating effect white ATLM must be installed with an offset distance no greater than 50 mm from an edge line.

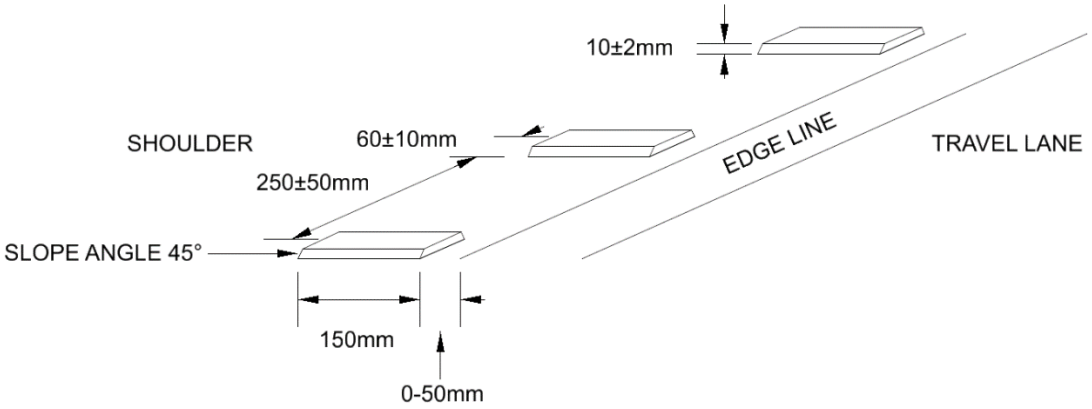

Figure 4: Specification for installation of discontinuous white ATLM

The installation of continuous white ATLM may be used where site specific conditions preclude the use of discontinuous ATLM. Contact must be made with Traffic Engineering Services or Statewide Delivery to discuss the use of continuous white ATLM as part of an ATEL treatment.

Audio tactile centre lines (ATCL)

Black ATLM should be the treatment installed for ATCL as it allows for a sustained treatment through areas with and without overtaking permitted.

White ATLM may be used as part of ATCL, provided it is not installed on dividing (separation) lines. Using white ATLM as part of ATCL might create installation and maintenance difficulties as the treatment will vary between white ATLM and black ATLM if the centre line changes from dividing (barrier) lines to dividing (separation) lines.

Wide centre line treatment (WCLT)

For a WCLT, black ATLM must be installed in accordance with Figure 5.

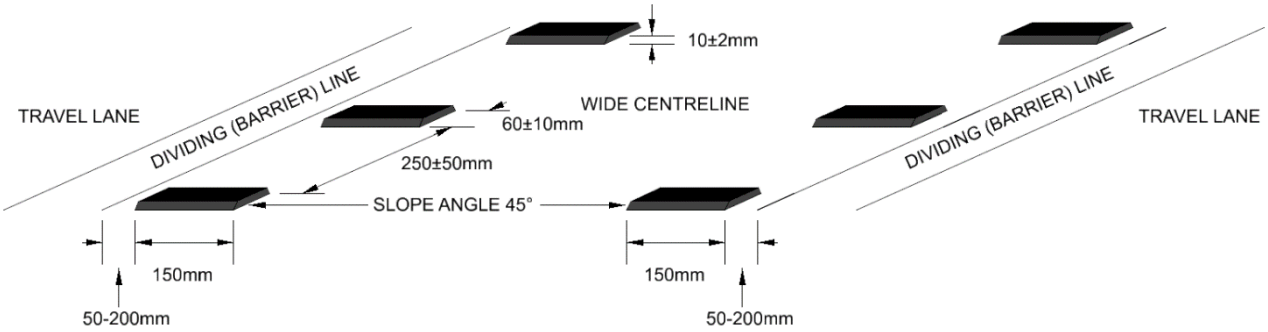

Figure 5: Black ATLM placement for WCLT

An example of offset discontinuous black ATLM as part of a WCLT is shown in Figure 6.

Figure 6: Example of black ATLM placement for WCLT

In locations where overtaking is permitted, black ATLM should be installed to continue the audio tactile effect. Where this is the case, the black ATLM must be installed in accordance with Figure 7.

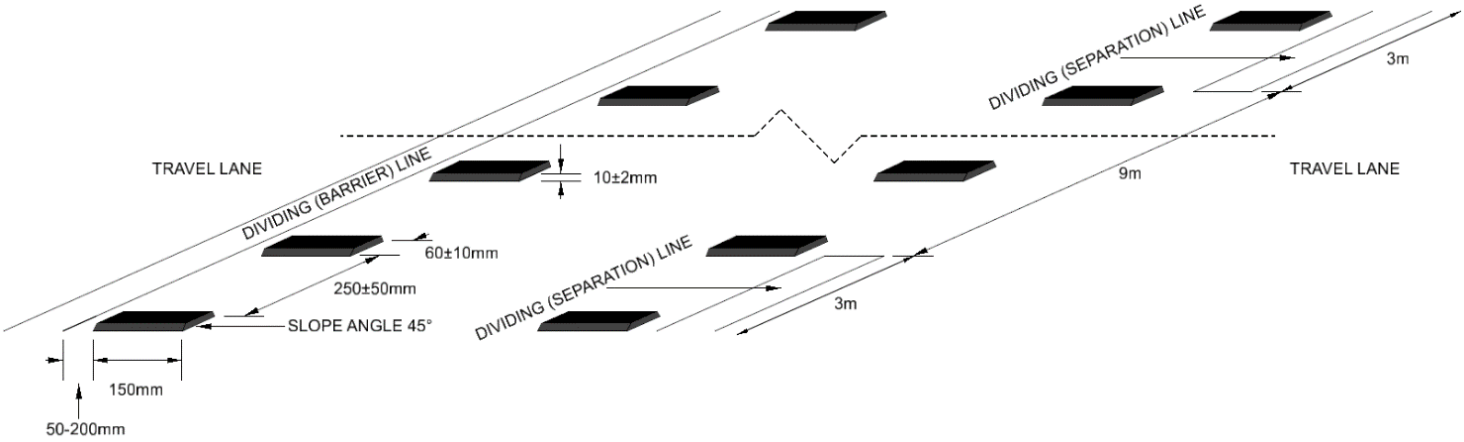

Figure 7: Black ATLM placement where overtaking is permitted for WCLT

Discontinuous white ATLM may be used as part of a WCLT where an increased delineation effect is desired. Where installed as part of a WCLT, discontinuous white ATLM must be installed offset from the dividing (barrier) line in accordance with Figure 8.

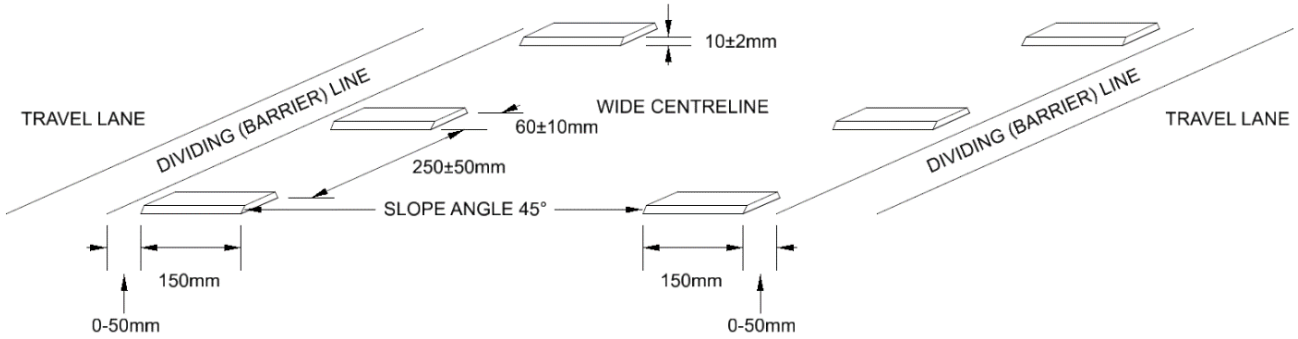

Figure 8: White ATLM placement for WCLT

Where a WCLT has a total width of 1 m or less, the ATLM must be installed in accordance with the provisions for standard and enhanced dividing (barrier) lines.

Standard and enhanced dividing (barrier) lines

Black ATLM may be used for standard dividing (barrier) lines (BS, BB) and enhanced dividing (barrier) lines (BS1, BB1). Where this is the case, the black ATLM must be installed in accordance with Figure 9. With this approach, the black ATLM should be placed prior to the installation of centre line markings. When placed prior to the installation of centre line markings, the black ATLM must be the same width as the gap between the dividing line markings.

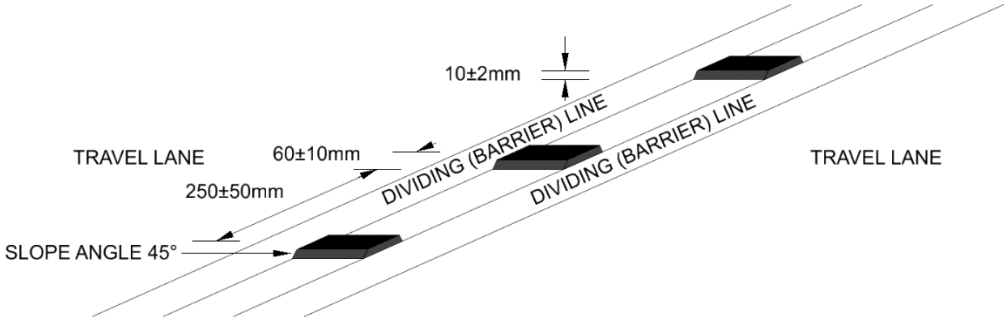

Figure 9: Black ATLM placement for standard centre line treatments on rural high speed roads

Where black ATLM is being retrofitted to existing centre line markings, the width of the ATLM may be reduced to 80 per cent of the width of the gap between the dividing line markings in order to avoid the ATLM encroaching on to the line markings.

Black ATLM may also be used for enhanced dividing (barrier) lines (BB2). In this instance, the black ATLM must be 150 mm wide and placed centrally.

In locations where overtaking is permitted, black ATLM should be installed to continue the audio tactile effect. Where this is the case, the black ATLM must be installed in accordance with Figure 10.

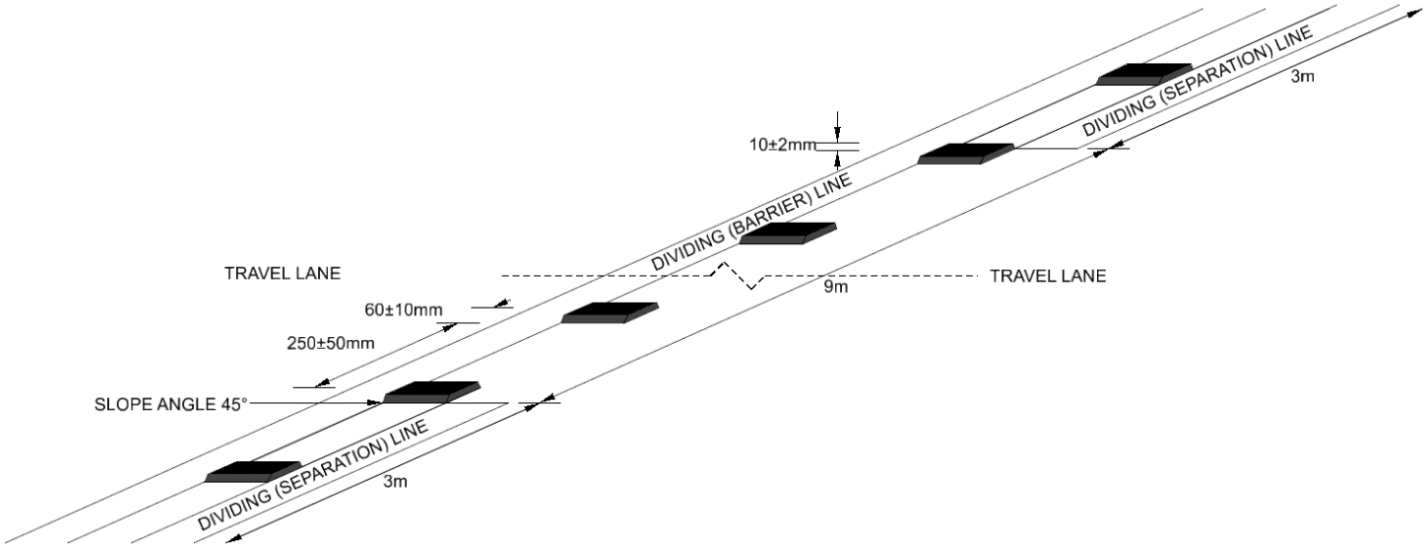

Figure 10: Black ATLM placement for BS line marking on rural high speed roads

Continuous white ATLM may be installed on standard dividing (barrier) lines (BS, BB) and enhanced dividing (barrier) lines (BS1, BB1, BB2). Where this is the case, the white ATLM must be installed in accordance with Figure 11. The white ATLM must be the same width as the lane line marking.

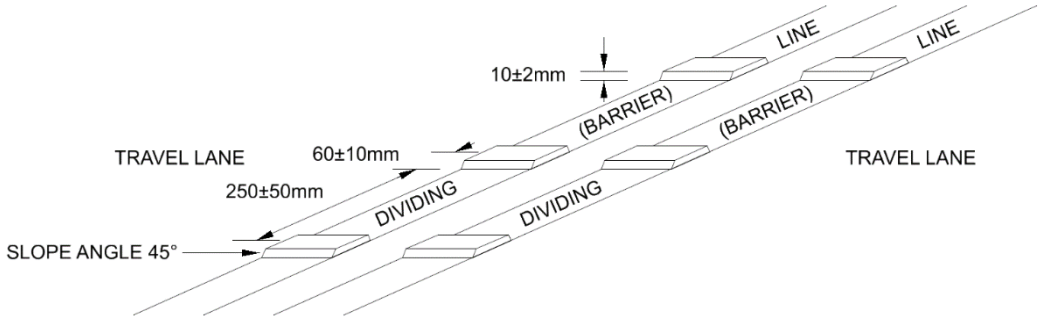

Figure 11: White ATLM placement for standard centre line treatments

Standard dividing (separation) lines

White ATLM must not be installed with standard dividing (separation) lines (S1, S6) for the following reasons:

- The delineating effect of white ATLM between the line markings might cause driver confusion; and
- Spacing the ATLM such that it is only installed on the line markings does not provide an adequate audio-tactile effect for a centre line treatment.

Black ATLM may be installed with standard dividing (separation) lines (S1, S6). Where this is the case, the black ATLM must be placed in accordance with Figure 12. The black ATLM must be placed prior to the installation of line marking (i.e. the line marking is placed on top of the black ATLM).

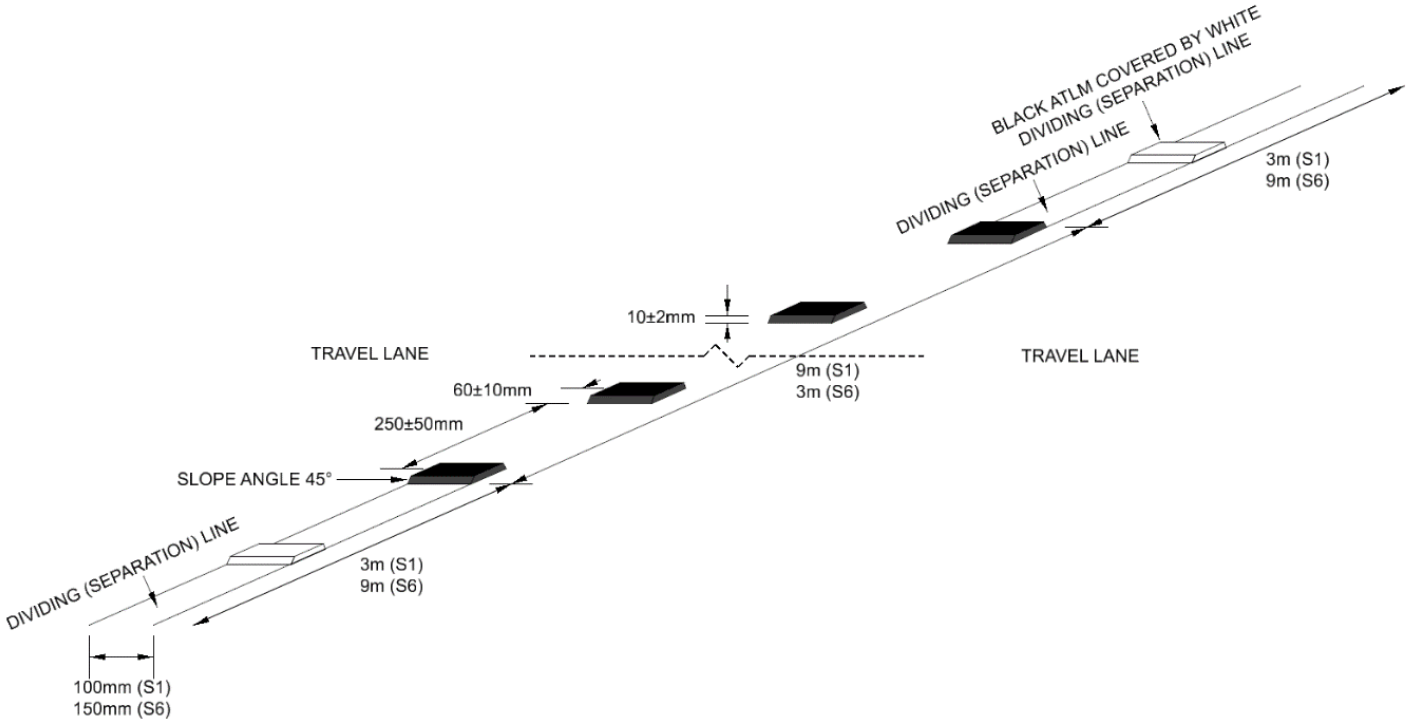

Figure 12: Black ATLM placement for dividing (separation) line treatments

Installation considerations

Shoulder width

ATLM must not be installed where the sealed shoulder width is less than 0.5m.

When selecting the ATLM offset, the provision of sufficient width for recovery of vehicles and reducing nuisance hits must be considered. The minimum remaining sealed shoulder width on the outside of ATLM installations must be a minimum of 0.3 m.

Additionally, when determining appropriate shoulder widths for ATLM installation, consideration should be given to the following:

- Cyclists and pedestrians;
- Use of barriers;
- Design speed;
- Road alignment;
- Traffic volumes and composition;
- Road cross-section; and
- Roadside environment.

Raised pavement markers (RPMs)

The installation of discontinuous ATLM might conflict with existing or proposed RPMs. Where this is the case, the ATLM must be offset or a raised rib must be omitted to avoid the conflict, as shown in Figure 13 and Figure 14. Statewide Delivery can provide advice on application options.

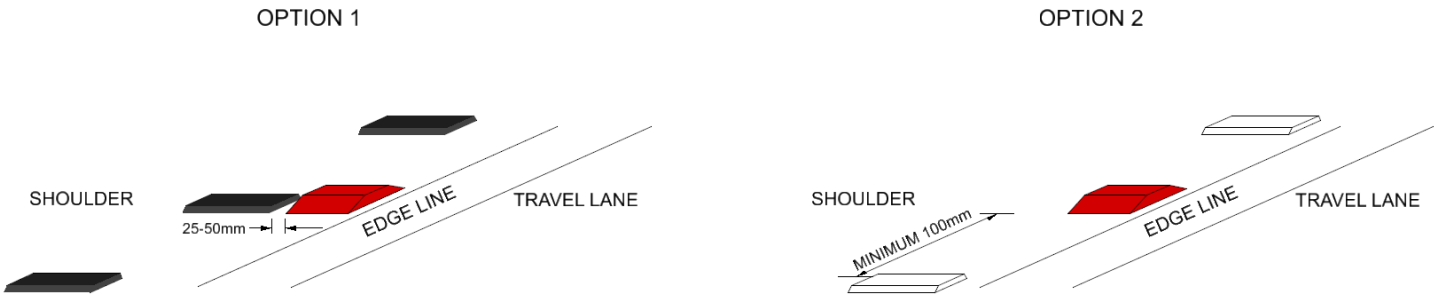

Figure 13: ATEL placement options to avoid RPM conflict

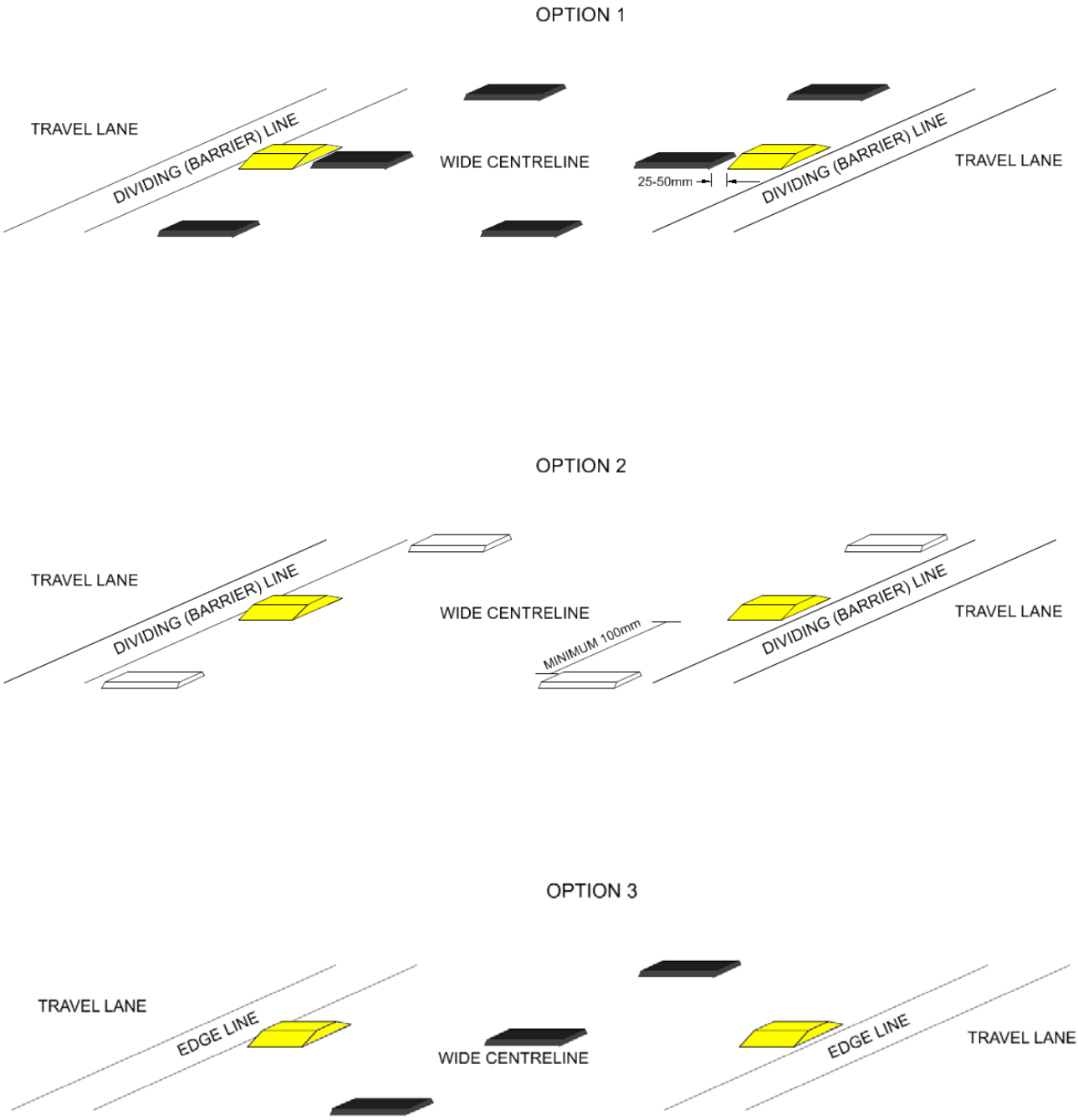

Figure 14: ATCL placement options to avoid RPM conflict

Pavement joints

ATLM must not be located on concrete pavement joints. Varying offset widths may be used to mitigate any conflict. Where a conflict cannot be mitigated, contact must be made with Traffic Engineering Services or Statewide Delivery to discuss options.

Location constraints

The noise generated by vehicles traversing ATLM must be considered when selecting locations for installation.

ATLM should not be installed where the following conditions are present as there is an increased likelihood that vehicles will frequently traverse the ATLM:

- On the inside of curves of radii less than 450 m. The likelihood of vehicles traversing the ATLM will vary depending on speed zone, lane width, use of lane widening and design vehicle;
- Where there is a left turn deceleration lane or other higher speed exit into driveways or access roads servicing significant traffic generating developments (ie such as service centres);
- Where the number of access points exceeds 20 per km; or
- Within 50 m of the approach and departure to intersections.

Where ATLM is planned in any of the above situations a site specific assessment must be completed to determine if the safety benefits associated with the installation outweigh the potential adverse noise and maintenance impacts.

Nearby residents

ATLM must not be installed within 200 m of a residential building. However, subject to the requirements of this Technical Direction, ATLM may be used where the frequency and severity of fatigue-related crashes are such that a sustained treatment being installed nearer than 200 m from a residential building is considered beneficial on safety grounds.

Where ATLM is planned within 200 m of a residential building the following must be undertaken;

- A site specific assessment must be completed to determine if the safety benefits associated with the installation outweigh the potential adverse noise impacts;
- Community consultation activities must be undertaken with impacted residents. The type of consultation activities must be determined in collaboration with the Regional Environmental and Regional Communication Services teams. Examples of activities that should be undertaken include:
  - Provision of fact sheets;
  - Face to face meetings;
  - Letter box drops; or
  - Door knocking.
- A strategy must be developed in consultation with Regional Environmental and Regional Communication Services teams to manage potential complaints and propose mitigation measures to address them.

These documents, including the outcomes of the community consultation, must form part of the approval memo to depart from the requirements of this Technical Direction to be submitted to the Director Traffic Engineering Services to seek endorsement prior to approval.

Approvals

Where a requirement of this Technical Direction cannot be achieved, the departure must be approved in accordance with standard project requirements, except where ATLM is planned within 200 m of a residential building.

Where ATLM is planned within 200 m of a residential building, its use must be endorsed by the Director Traffic Engineering Services and approved by the Regional / Precinct Director. The application process to seek this approval is provided below.

Director Traffic Engineering Services

A technical memo must be submitted for endorsement to the Director Traffic Engineering Services that demonstrates the need for ATLM installation, which includes the following information:

- Site map, showing location of proposed ATLM and proximity to residential buildings;
- Description of the construction techniques used in residential buildings, in particular whether they are of lightweight construction (such as weatherboard or similar) or masonry construction;
- Crash history;
- Traffic volumes and vehicle composition;
- Plans of any proposed roadworks;
- Cross section of works, noting location of ATLM and offset to lane
- Outcomes of consultation with affected property owners; and
- Strategy to manage complaints and propose mitigation measures.

Regional / Precinct Director

An approval memo must be submitted for consideration and must include:

- Technical endorsement memo with recommendation from Director Traffic Engineering Services;
- Any other relevant project specific information;

Following approval, the approval memo must be submitted to the Regional Environment team to be considered as a part of the environmental assessment

References

Delineation Section 5 Enhanced Delineation Devices (Requiring prior approval) Version 1.6, February 2015, Roads and Maritime Services, Sydney NSW.

Austroads Guide to Traffic Management Part 10: Traffic Control and Communication Devices, Second Edition, August 2016, Austroads Ltd Section 6.3.7

Contact Us:

If you have any questions or would like more information on this document please contact Transport for NSW:

roads-maritime.transport.nsw.gov.au

techinfo@transport.nsw.gov.au

13 22 13

Customer feedback
Locked Bag 928,
North Sydney NSW 2059

If you need help understanding this information, please contact the Translating and Interpreting Service on 131 450 and ask them to call us on 1800 131 782

August 2020
20.314