Department of Transport

Audio Tactile Line Marking (ATLM)

RDN 03-10
June 2020

1. Purpose

The purpose of this note is to provide guidance for the design and consistent application of Audio Tactile Line Marking (ATLM) to address the risk of head-on crashes and run-off road crashes. Head-on and run-off road crashes represent a significant proportion of fatal and serious injuries on Victorian roads.

This RDN does not cover other applications for audio tactile linemarking such as transverse lines or cycle lanes.

ATLM involves installing a series of raised extruded thermoplastic bars which give an audible sound and vibration when traversed by a vehicle. This low-cost treatment follows Safe System principles and should be considered as one of a number of available options in achieving Towards Zero deaths and serious injuries.

ATLM is considered to be a supporting treatment towards Safe System as it provides some crash reduction without providing a physical separation by a space or barrier between opposing traffic lanes. It is suggested that ATLM reduces not only the likelihood of head-on and run-off road crashes but also the severity as it may provide some drivers opportunity to apply emergency braking or steering to reduce the impact[1].

Audio Tactile Line Marking together with sealed shoulders is considered to be a default treatment to improve safety for rural roads[2]. Audio Tactile Line Marking can be installed on new installations as well as a retrofit installation.

A decision to adopt ATLM should be made at the route/corridor level rather than at a project level to ensure there is consistency in application of the treatment along a route.

2. Definition

2.1 Audio Tactile Line Marking (ATLM)

Audio Tactile Line Marking (ATLM) is the combination of linemarking and raised profile thermoplastic ribs to provide greater lane delineation and a sensory indicator (both tactile and auditory indicators) of lane departure (crossing edge line or crossing centre line). Audio Tactile Line Marking is also referred to as raised profile edge line or centre line, tactile edge lines or tactile centre lines, rumble strips or audio tactile profiled (ATP) road markings.

2.1.1 Audio Tactile Centre Line Marking (ATCL)

Audio Tactile Centre Line (ATCL) involves a continuous installation of black audio tactile ribs placed down the centre of an undivided road, with white linemarking either on or adjacent to the ribs.

The continuous black audio tactile ribs in the centre of the road provides sound and vibration to alert drivers who have crossed the road centre line with the aim to prevent head-on crashes and run-off road crashes to the right.

See Appendix B Section 1 for standard layouts.

2.1.2 Audio Tactile Edge Line Marking (ATEL)

Audio Tactile Edge Line (ATEL) involves a continuous installation of black audio tactile ribs placed offset to white edge linemarking (for new installations) and on-line or offset to white edge linemarking (for retrofit installations).

ATEL combined with sealed shoulders aim to reduce the likelihood of run-off road crashes by alerting drivers of lane departure and providing them with an area to recover.

See Appendix B Section 2 for standard layouts.

2.2 Wide Centre Line Treatment (WCLT)

Wide Centre Line Treatment (WCLT) is two parallel lines (whether broken or continuous) with a separation width (wider than standard linemarking) to create greater separation between opposing traffic lanes. WCLT retains the road rules associated with the standard linemarking configuration.

Wide Centre Line Treatment uses white audio tactile ribs and should be designed in accordance with *RDN 03-09 Wide Centre Line Treatment*.

3. ATLM Considerations

At a minimum Audio Tactile Line Marking should be considered on high-speed rural roads (above 80km/h) and typically on roads with traffic volumes greater than 500 vehicles per day. Audio Tactile Line Marking has been historically used as a counter measure for run-off road crashes but is now considered a default treatment for high-speed rural roads. ATLM applications have been focused on high-speed rural roads but may be considered for metropolitan areas.

3.1 Pavement

3.1.1 Existing Seal

Before installing Audio Tactile Line Marking on an existing sealed road it is important to understand the following characteristics of the existing seal;

Table 1: Existing Seal Characteristics and Considerations

Characteristic	Consideration
What is the existing seal width?	See Appendix A, Table 2 for the minimum width of existing seal
What is the existing sealed shoulder width?	A minimum 0.3m of sealed shoulder behind the audio tactile ribs is required
How clean is the seal?	Audio Tactile ribs may have issues bonding to the surface
How old is the seal?	Flush seals (low texture seals) may have issues with tactile ribs bonding to the surface
What type of material is the existing seal?	Plucking of tactile occurs more on low texture seals (concrete, asphalt, bleeding seals). Old granite seals also should be avoided
Longitudinal cracking	Tactile ribs may come off

3.1.2 Scheduled Maintenance

ATLM should only be applied if there are no known plans to reseal or rehabilitate the road within a two-year time frame. The project team should consult the region about future work and maintenance plans.

If there is scheduled maintenance to reseal the road, ATLM should be installed after the reseal. Additional seal should be provided as recovery area behind the audio tactile ribs in accordance with the cross sections in Appendix A.

Where ATLM is installed on local roads, councils will be responsible for the ongoing maintenance.

3.2 Accesses and Intersections

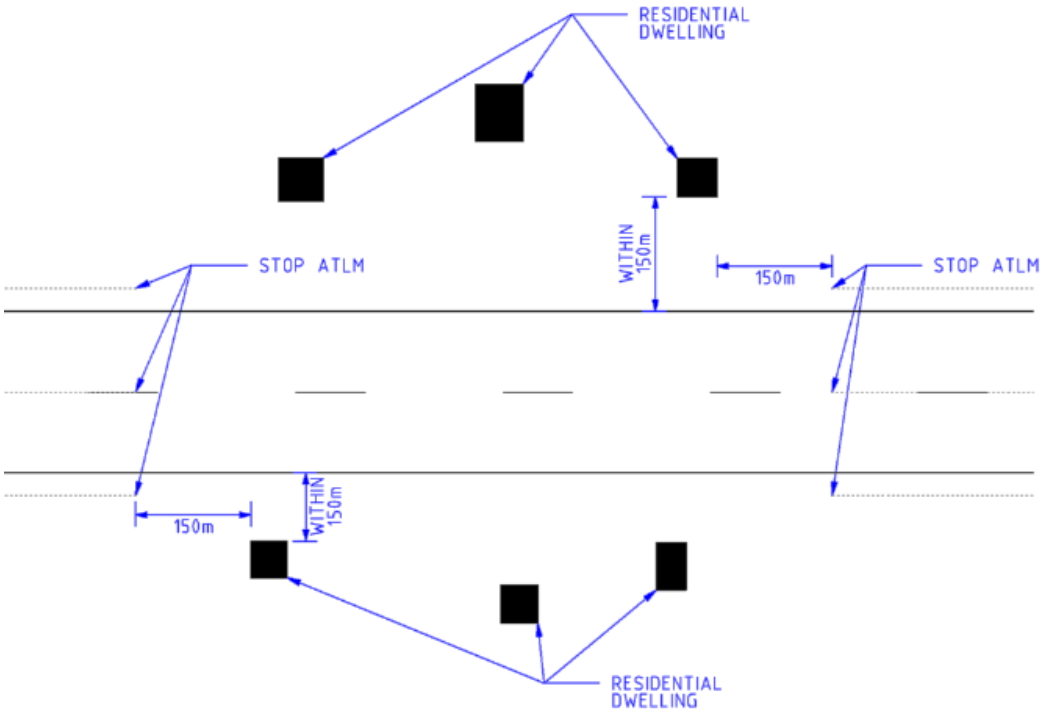
ATLM should be discontinued at least 20m clear of major access (for example a high trafficked commercial, industrial or agricultural access) and intersections. See Appendix F.

However, gaps should not be left for minor accesses such as driveways to residential properties located greater than 150m from the road (See Section 3.3).

3.3 Noise Considerations

Audio Tactile Line Marking should be stopped 150m from residential dwellings where dwellings are within 150m of the road. Where there is a cluster of residential dwellings, ATLM should be stopped 150m from the first and last residential dwelling that is located within 150m of the road.

Figure 2: ATLM Installation where there is a cluster of residential properties



Where there are noise complaints resulting from tracking over ATLM, VicRoads should evaluate the complaint and, where appropriate, remove the ribs in accordance with Section 6.

3.3.1 Winding Roads

Winding roads or winding sections of a road are tight horizontal curves that are separated by short lengths of straight. Installations on winding roads with narrow lane widths should be avoided.

In retrofit situations, a site investigation may determine locations where vehicles are tracking close to the edge of the seal due to the narrow seal width and the tight curves (See Appendix E).

At these locations, ATEL should not be installed due to excess noise and reduced life of audio tactile ribs generated from tracking by larger vehicles.

3.4 Cyclist Considerations

In rural areas, the project team should engage the region and stakeholders to determine what provisions should be made for cyclists.

Below are the guidelines for the width of sealed shoulders in rural areas where the seal is being widened for cyclists along a route;

Table 2: Sealed shoulder width to accommodate cyclists

Absolute Minimum Sealed Shoulder	0.7m
Desirable Minimum Sealed Shoulder	1.0m
Desirable Sealed Shoulder	1.5m

A major consideration for cyclists is that the sealed area that is provided should be kept clear of debris and in good condition.

In urban areas, shoulders and cycle lanes should be designed in accordance with *Austroads Guide to Road Design Part 6A*.

3.5 Motorcyclist Considerations

A report[3] by the New Zealand Transport Agency into whether audio tactile ribs affected vehicle stability concluded that audio tactile ribs do not significantly contribute to motorcycle vehicle instability. A summary indicated that

> "This research found no evidence from the existing crash records, in the literature, or from the validated computer simulation modelling, that ATP roadmarkings as currently used in New Zealand create any significant instability issues for motorcycles."

However, on winding roads with motorcyclists, consideration should be made at these locations whether ATLM should be installed.

3.6 Design Life

The expected design life for new ATLM is 5-7 years, depending on the traffic volume, road geometry and traffic lane width.

3.7 Black vs White Audio Tactile Ribs

Both black and white ribs have been used in the past for Audio Tactile Line Marking (ATLM) and Wide Centre Line Treatment (WCLT).

However, for any new works, **black audio tactile ribs should be used for Audio Tactile Line Marking and white audio tactile ribs should be used for Wide Centre Line Treatment**.

The benefits of using black audio tactile ribs over white audio tactile ribs for Audio Tactile Line Marking are listed below;

a) Black ribs allow for continuous audio tactile on both broken and unbroken centrelines (see Section 5.1)
b) Black ribs reduce material costs for ATCL (one row of audio tactile ribs for black vs two rows of white audio tactile ribs for double two-way barrier and double one-way barrier)
c) Black ribs reduced material costs for ATEL (due to not using white retroreflective beads in black audio tactile ribs)
d) Black ribs provide the ability to offset audio tactile ribs from the edge lines which will extend the audio tactile ribs life (due to less hits)
e) Offsetting the black audio tactile ribs allows for a reseal without having to replace the audio tactile ribs
f) Offsetting the black audio tactile ribs reduces the noise by increasing the distance between ATCL & ATEL
g) Reduced initial and ongoing maintenance cost for black ribs over white ribs

White audio tactile ribs are to be used for Wide Centre Line Treatments to improve visibility and to reinforce linemarking (See *RDN 03-09 Wide Centre Line Treatment*).

4. Design and Application Considerations

This section covers the design and application considerations for new installations (as part of new works, a road upgrade or a reseal) and for retrofit installations.

Considerations should be made as to the weather conditions when installing the audio tactile ribs. Installations in colder weather resulted in the thermoplastic ribs hardening before bonding with the surface. Installations in hotter weather may not allow the ribs to harden enough before trafficked on.

For the general considerations see Section 3.

4.1 Design and Application Considerations for ATCL Installations

4.1.1 Minimum Seal width for ATCL

The minimum width of seal for the implementation of Audio Tactile Centre Line is 6.2m[4].

The *VicRoads Supplement Part 2.2 to AS1742.2, Clause 5.3.2.4* states that seal widths of 5.5m or greater should have a dividing line. However, widths less than 6.2m require shoulders to have adequate width and strength to cope with higher usage as a result of a dividing line. Audio Tactile Ribs placed on the centre line may encourage vehicles to track closer to the edge of seal. As a result, the minimum width of seal aims to reduce edge deterioration and allow vehicles to track within the sealed roadway.

On higher class roads with higher volumes (>1500 AADT), Audio Tactile Centre Line should be installed with Audio Tactile Edge Line and seal widths should be determined by the considerations in Section 3 and the cross sections in Appendix A.

4.1.2 Application of ATCL

Black audio tactile ribs are to be placed on the road surface and two coats of white paint (with the desired linemarking configuration – See Appendix B Section 1) should be applied once the ribs have hardened and bonded to the surface.

It is recommended that were ATCL is installed, edge lines should be installed or re-painted to ensure linemarking condition is consistent for edge lines and centre lines.

4.2 Design and Application Considerations for ATEL Installations

Audio Tactile Edge Line (ATEL) can be installed as part of a new installation or a retrofit installation.

When ATEL is installed as part of a retrofit installation, the project team should ensure that there is a minimum of 300mm behind the audio tactile ribs to allow vehicles to recover. It is desirable that there is 500mm behind the audio tactile ribs. Audio tactile ribs may have to be installed on-line-marking in retrofit situations where there is minimum seal behind edge linemarking (See section 5.2.1).

Considerations should be given to the possibility of increased noise as a result of on-linemarking installations. This is of particularly importance when lane widths are less than 3.5m, and in winding sections of road. If additional noise is likely to result in noise complaints, then audio tactile ribs should not be installed in those areas. Potential areas of concern should be identified before installation and be marked out on site to ensure the installation takes into consideration these areas. ATEL should not be installed in areas of residential dwellings (See Section 3.3) where tracking may generate undesirable noise for residents.

ATELs should be applied to both sides of the carriageway where practicable.

4.2.1 ATEL and Divided Carriageways

Audio Tactile Edge Lines can be installed on divided carriageways as a treatment to address run-off road and lane departure crashes. ATEL can be installed adjacent to barriers to provide an immediate alert of lane departure and minimise nuisance hits to barriers.

See Appendix C Section 3 and 4.

4.3 Design and Application Considerations for WCLT Installations

See *RDN 03-09 Wide Centre Line Treatment* for design and application considerations.

5. Standard Layouts

Audio tactile ribs are placed either

a) offset from line marking
b) on-line in retrofit installations

The spacing of audio tactile ribs are specified in the *Traffic Engineering Manual VicRoads Supplement to AS 1742.2 Clause 5.2.8 Profile Line Marking*.

However, only 8mm high x 100mm long x 50mm wide black audio tactile ribs at 250mm centres should be used for ATCL and ATEL.

Figure 2: Audio tactile rib dimensions and spacing

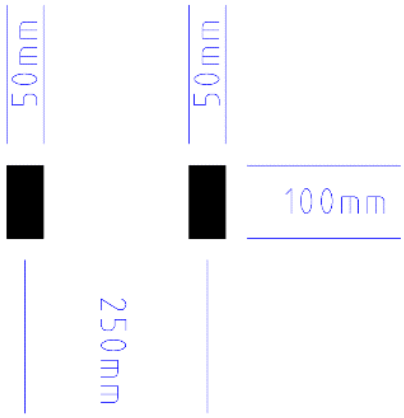


Photo 1: Black Audio Tactile Ribs

8mm high x 100mm long x 50mm wide white audio tactile ribs at 250mm centres should be used for WCLT.

Photo 2: White Audio Tactile Ribs on WCLT

5.1 Layouts for ATCL

This section outlines the configurations for Audio Tactile Centre Line (ATCL). These configurations are the same for new and retrofit installations. The configurations are found in Appendix B Section 1.

Centre linemarking should be installed as per *Traffic Engineering Manual VicRoads Supplement to AS 1742.2 Clause 5.3.3 Barrier Lines*.

Photo 3: ATCL Two-Way Dividing Line with black ribs

Photo 4: ATCL Two-Way Barrier Line with black ribs

Section 4.1 outlines the application and considerations of ATCL.

5.2 Layouts for ATEL Installations

New edge linemarking may be installed in a number of scenarios;

a) As part of a new road construction
b) As a new installation where there is no existing edge line
c) As part of a reseal or scheduled seal maintenance

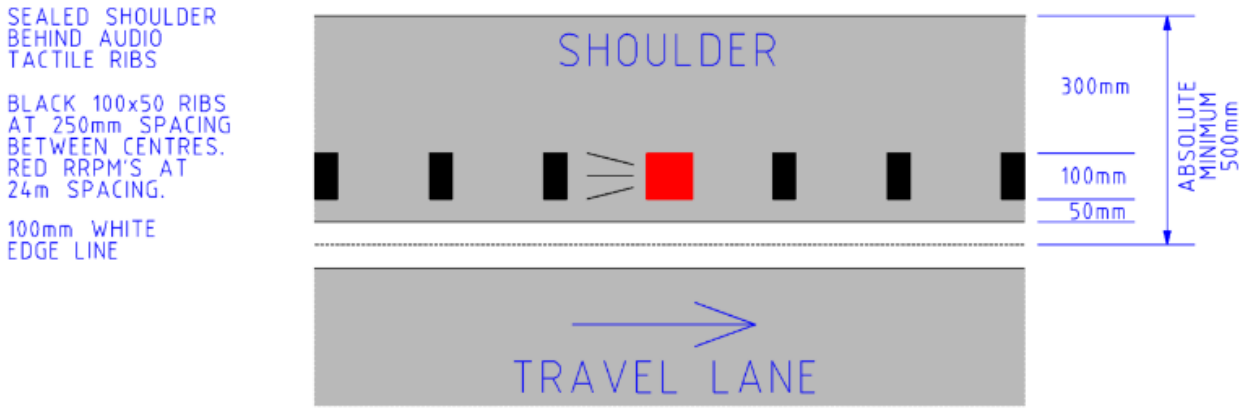
If new linemarking is being installed, then the black audio tactile ribs should be offset by 50mm (maximum offset is 200mm) to the linemarking. This is to:

a) reduce nuisance hits of audio tactile ribs generating unnecessary noise (when compared to on-line placement of ribs)
b) reduce wearing and plucking of ribs (when compared to on-line placement of ribs)
c) create greater separation between audio tactile ribs when combining ATCL with ATEL reducing noise
d) allow for a future reseal without having to replace the audio tactile ribs
e) provide adequate sealed area behind the audio tactile ribs for cyclists

Photo 5: ATEL with offset black ribs

0.5m is the absolute minimum sealed shoulder required for the installation of offset audio tactile ribs. This allows for the minimum 0.3m recovery area behind the audio tactile ribs.

Figure 3: ATEL Installation - Absolute minimum sealed shoulder 0.5m



5.2.1 Layouts for ATEL Retrofit Installations with minimum existing sealed shoulder

Where audio tactile edge lines are installed on existing sealed shoulders, it may be required to install the ribs on the linemarking to provide sufficient recovery area behind the audio tactile ribs (absolute minimum 0.3m, desirable minimum 0.5m).

Photo 6: ATEL with on-line painted black ribs

Figure 4: Retrofit ATEL Installation - Absolute minimum sealed shoulder 0.35m with on-line audio tactile ribs

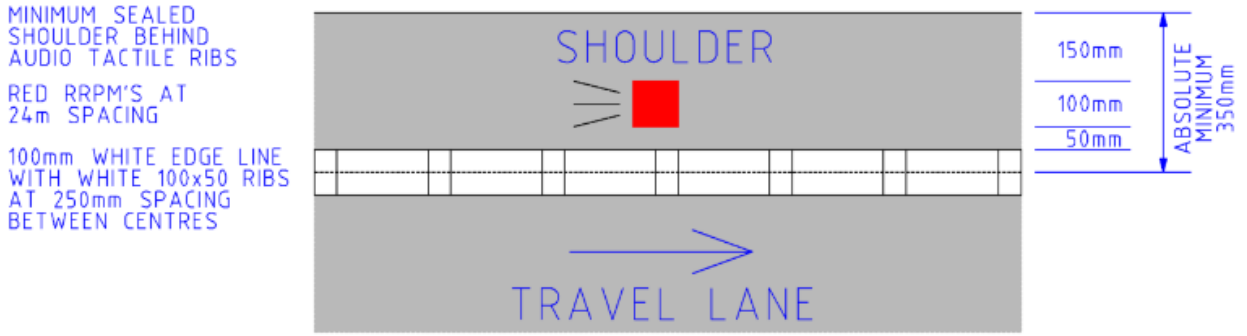
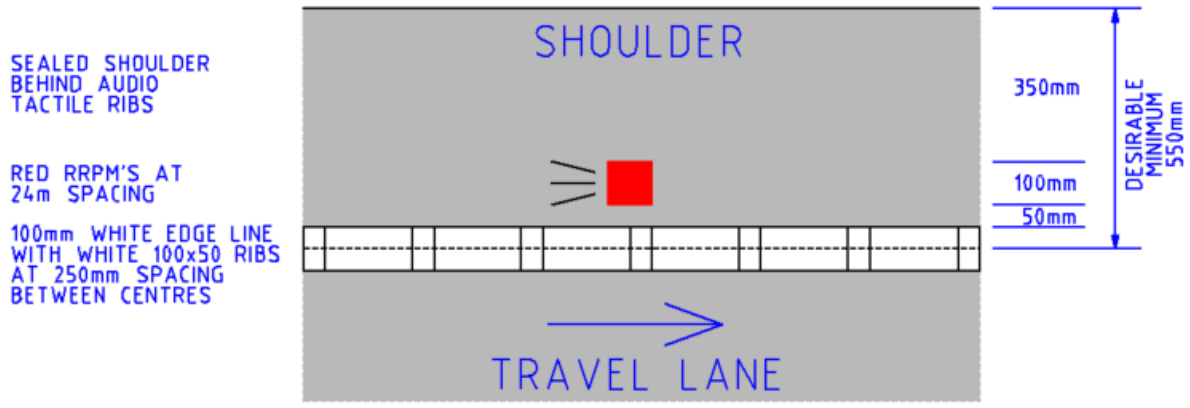


Figure 5: Retrofit ATEL Installation - Desirable minimum sealed shoulder 0.55m with on-line audio tactile ribs



6. Removal of ATLM

The removal of audio tactile ribs should be considered when there are complaints about noise as a result of vehicle tracking over the audio tactile ribs. Where possible, audio tactile ribs should be removed as soon as possible after a complaint is received. If required, a site visit can be undertaken and a noise assessment be conducted to determine the level of noise. However, removing the audio tactile ribs should done as a default with minimal investigation if a complaint by a resident is received.

Audio tactile ribs should be removed by grinding off the ribs and a suction sweeper be used to clean the road surface of debris.

Photo 7: Grinding off and removing audio tactile ribs

Grinding off audio tactile ribs is the preferred method of removal and has been proven to have a good result post removal. Other methods of audio tactile rib removal may be used but consideration must be given as to how this may impact or damage the pavement.

Centre linemarking and edge linemarking should be reapplied if necessary, after the ribs have been removed.

7. Common Failure of Audio Tactile Ribs and Construction Issues

This section outlines common causes of failure that have been identified learnings from previous application of ATLM. The project team should be aware of these issues when designing and installing audio tactile ribs.

7.1 Cracking of existing seal

Photo 8: Cracking on existing crown

Cracking of the existing seal along the crown or edge line can cause premature failure and plucking of audio tactile ribs.

7.2 Shattering due to temperature

Photo 9: Shattering of audio tactile ribs

Issues may occur with shattering of audio tactile ribs due to installation during extreme temperature. Installations on hot days may not allow enough time for the adhesive to harden so that the audio tactile ribs may pluck when trafficked. The opposite occurs on cold days where the tactile hardens before it adheres to the surface. The construction team need to check with the manufacturer about the specifications for temperature at the time of installation.

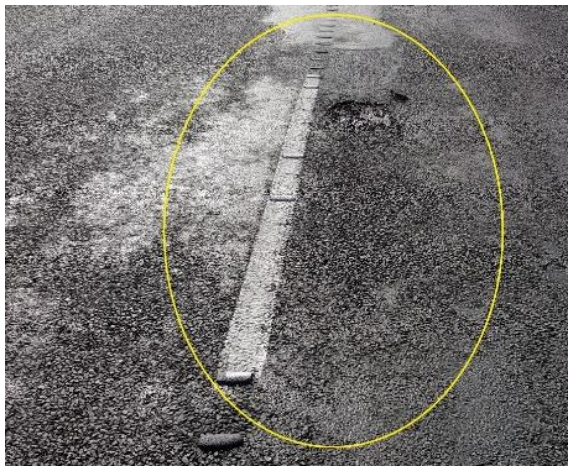
7.3 Adhesion on older seals

Photo 10: Adhesion of audio tactile ribs on older seals

On some older seals, issues have been found with adhesion of audio tactile ribs to the existing seal.

7.4 Adhesion on lower texture seals

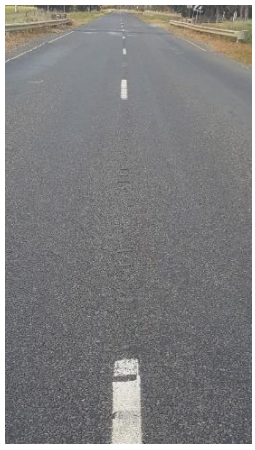
Photo 11: Plucking of audio tactile ribs on low texture seals



Plucking of tactile ribs has occurred more on low texture seals (concrete, asphalt, bleeding seals). Installation of audio tactile on bridge decks should be avoided.

7.5 Shattering and plucking due to audio tactile rib mixture

Photo 12: Missing audio tactile ribs due to premature failure



Issues with durability of audio tactile ribs have been found on some installations where the mixture for the audio tactile ribs has led to an unacceptable rate of premature failure (either by plucking or shattering of ribs).

8. References and Footnotes

1. “Guidance on Median and Centreline Treatments to Reduce Head-on Casualties” – 2.3 Raised Profile Centrelines and Edgelines AP R519-16 Austroads 2016
2. “Towards Safe System Infrastructure: A Compendium of Current Knowledge” – Section 6.2.4 AP R560-18 Austroads 2018
3. “Stability of motorcycles on audio tactile profiled (ATP) roadmarkings” NZ Transport Agency research report 526 May 2013
4. This may be wider than 6.2m on Heavy Vehicle designated routes. Heavy Vehicle area should be consulted on designated heavy vehicle routes. Refer to VicRoads website for designated heavy vehicle routes.

Appendices

APPENDIX A	Cross Sections
APPENDIX B	Linemarking Layouts for ATLM
APPENDIX C	Plan Layouts for ATLM
APPENDIX D	Design Checklist
APPENDIX E	Winding Roads
APPENDIX F	ATLM at Intersections

Revision History

Version	Date	Description of Change
0.1	Jan 2019	Working Release
1.0	Jun 2020	First Version
Additional Notes on Current Version Section 3 – Additional comment on the use of ATLM in metropolitan areas		

Contact Details

Road Design and Safe System Engineering

Department of Transport

60 Denmark St, Kew Vic 3101

Email: safesystemdesign@roads.vic.gov.au

Appendix A: Cross Sections

The cross sections in Table 1 have been developed based on Figure V4.6: Typical Rural Cross Sections in the VicRoads Supplement to Austroads Guide to Road Design, Part 3 – Rev. 4.0 January 2017. Where cyclists are present along a route, sealed shoulder widths may be designed in consultation with the region to cater for cyclists requirements (See Section 3.4).

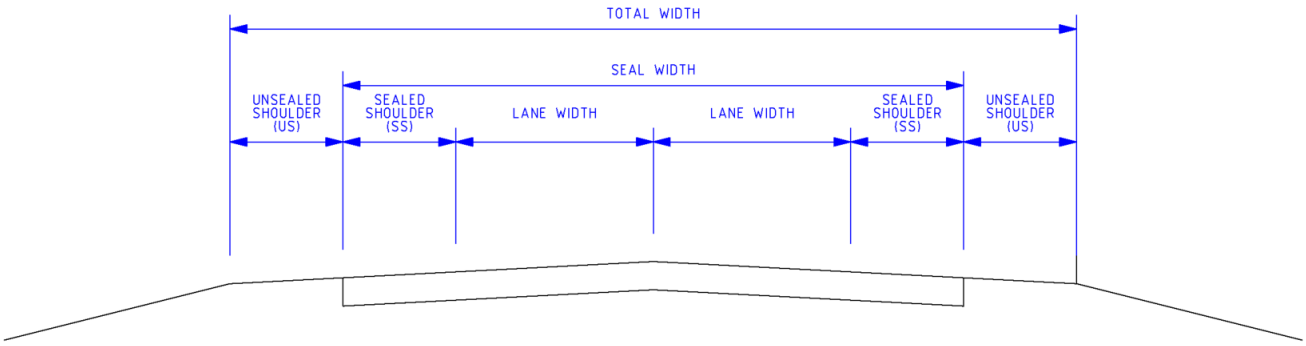


Table A.1: Cross Sections for New and upgraded seal incorporating Audio Tactile Line Marking

	Road Class Volume	Total Width	Seal Width	Shoulder	Lane Width	Lane Width	Shoulder	Comment
1.1	B or C <1500 AADT	8.2	7.2	1.0 (0.5 US + 0.5 SS)	3.1	3.1	1.0 (0.5 US + 0.5 SS)	Minimum Recommended
1.2	B or C <1500 AADT	9.2	7.2	1.5 (1.0 US + 0.5 SS)	3.1	3.1	1.5 (1.0 US + 0.5 SS)	Recommended
1.3	B or C >1500 AADT	10.0	9.0	1.5 (0.5 US + 1.0 SS)	3.5	3.5	1.5 (0.5 US + 1.0 SS)	Minimum Recommended
1.4	B or C >1500 AADT	11.0	9.0	2.0 (1.0 US + 1.0 SS)	3.5	3.5	2.0 (1.0 US + 1.0 SS)	Recommended
1.5	A <1500 AADT	9.6	8.6	1.5 (0.5 US + 1.0 SS)	3.3	3.3	1.5 (0.5 US + 1.0 SS)	Minimum Recommended
1.6	A <1500 AADT	10.6	9.6	2.0 (0.5 US + 1.5 SS)	3.3	3.3	2.0 (0.5 US + 1.5 SS)	Recommended
1.7	A >1500 AADT	11.0	10.0	2.0 (0.5 US + 1.5 SS)	3.5	3.5	2.0 (0.5 US + 1.5 SS)	Minimum Recommended
1.8	A >1500 AADT	12.0	10.0	2.5 (1.0 US + 1.5 SS)	3.5	3.5	2.5 (1.0 US + 1.5 SS)	Recommended

Table A.2: Cross Sections for Retrofit Audio Tactile Line Marking Installations

	Road Class Volume	Seal Width	Shoulder	Lane Width	Lane Width	Shoulder	Comment
2.1	A, B or C <1500 AADT	6.9	0.35 Sealed Shoulder	3.1	3.1	0.35 Sealed Shoulder	Absolute minimum seal requirements for on-line ATEL and ATCL
2.2	A, B or C <1500 AADT	7.3	0.55 Sealed Shoulder	3.1	3.1	0.55 Sealed Shoulder	Desirable minimum seal requirements for on-line ATEL and ATCL
2.3	A, B or C >1500 AADT	7.7	0.35 Sealed Shoulder	3.5	3.5	0.35 Sealed Shoulder	Absolute minimum seal requirements for on-line ATEL and ATCL
2.4	A, B or C >1500 AADT	8.1	0.55 Sealed Shoulder	3.5	3.5	0.55 Sealed Shoulder	Desirable minimum seal requirements for on-line ATEL and ATCL

Appendix B: Linemarking Layouts for ATLM

1. Layouts for Audio Tactile Centre Line (ATCL)

Figure B.1.1 – Two-Way Dividing ATCL

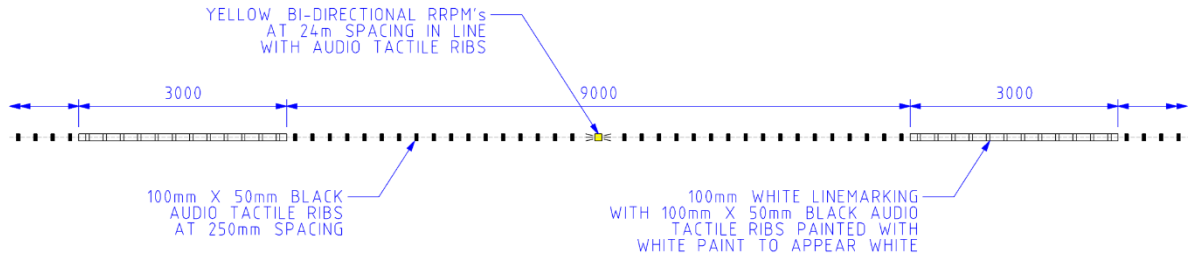


Figure B.1.2 – Single Two-Way Barrier ATCL

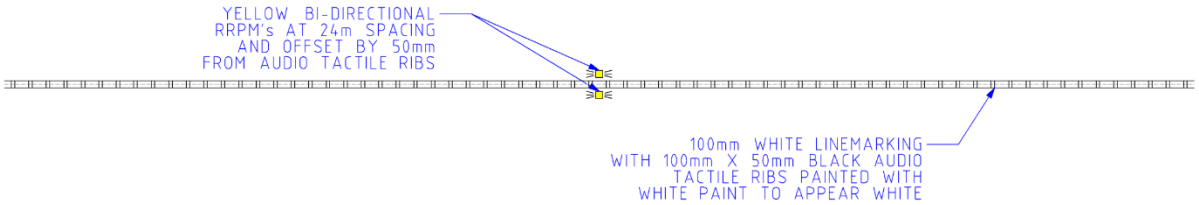


Figure B.1.3 – Double Two-Way Barrier ATCL

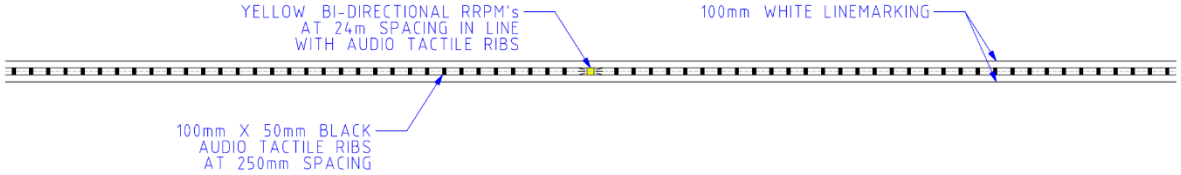


Figure B.1.4 – Double One-Way Barrier ATCL

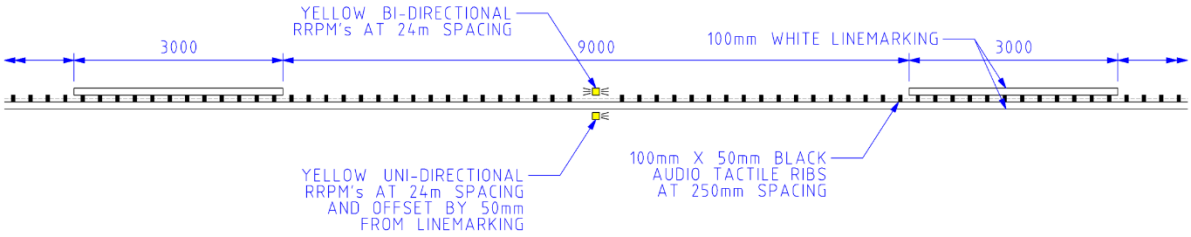
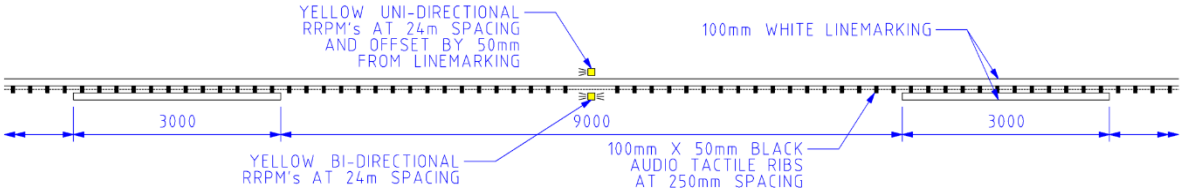


Figure B.1.5 – Double One-Way (Reverse) Barrier ATCL



2. Layouts for Audio Tactile Edge Line (ATEL)

Figure B.2.1 – Standard ATEL

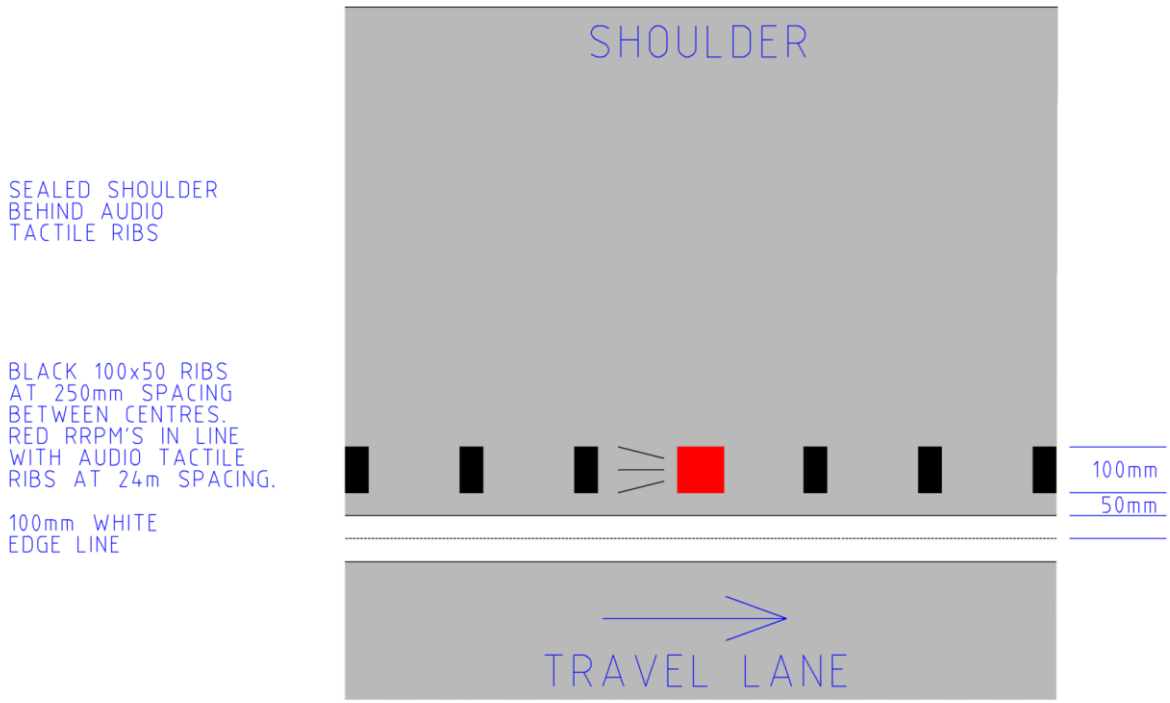
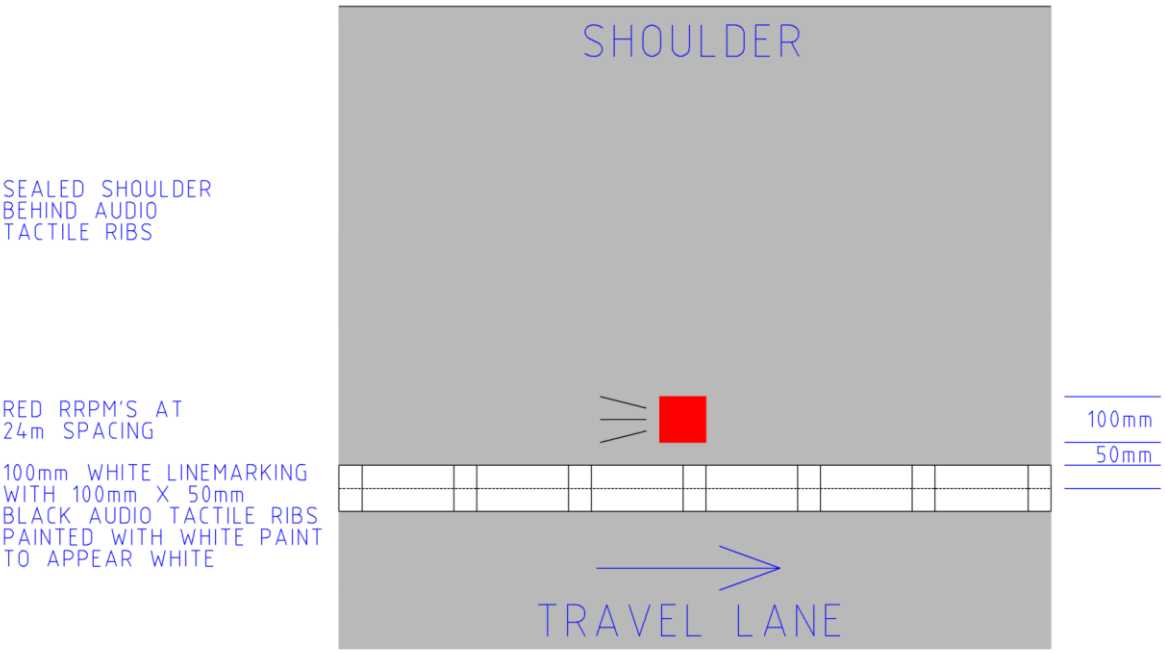


Figure B.2.2 – On-line ATEL (for areas of minimum seal width)



Appendix C: Plan Layouts for ATLM Application

1. Plan Layout for Audio Tactile Centre Line (ATCL) on Narrow Sealed Roads

Figure C.1.1 – Plan Layout for Narrow Sealed Roads with Two-Way Dividing ATCL

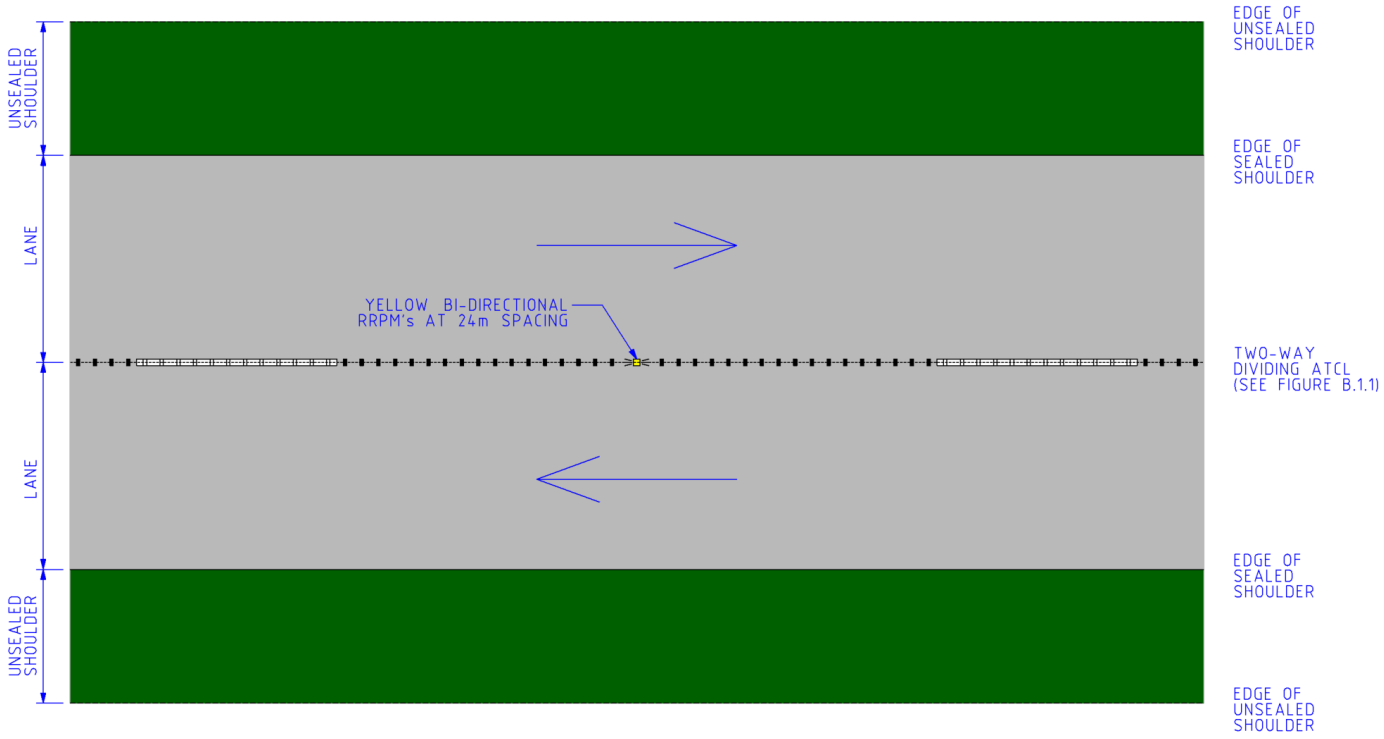
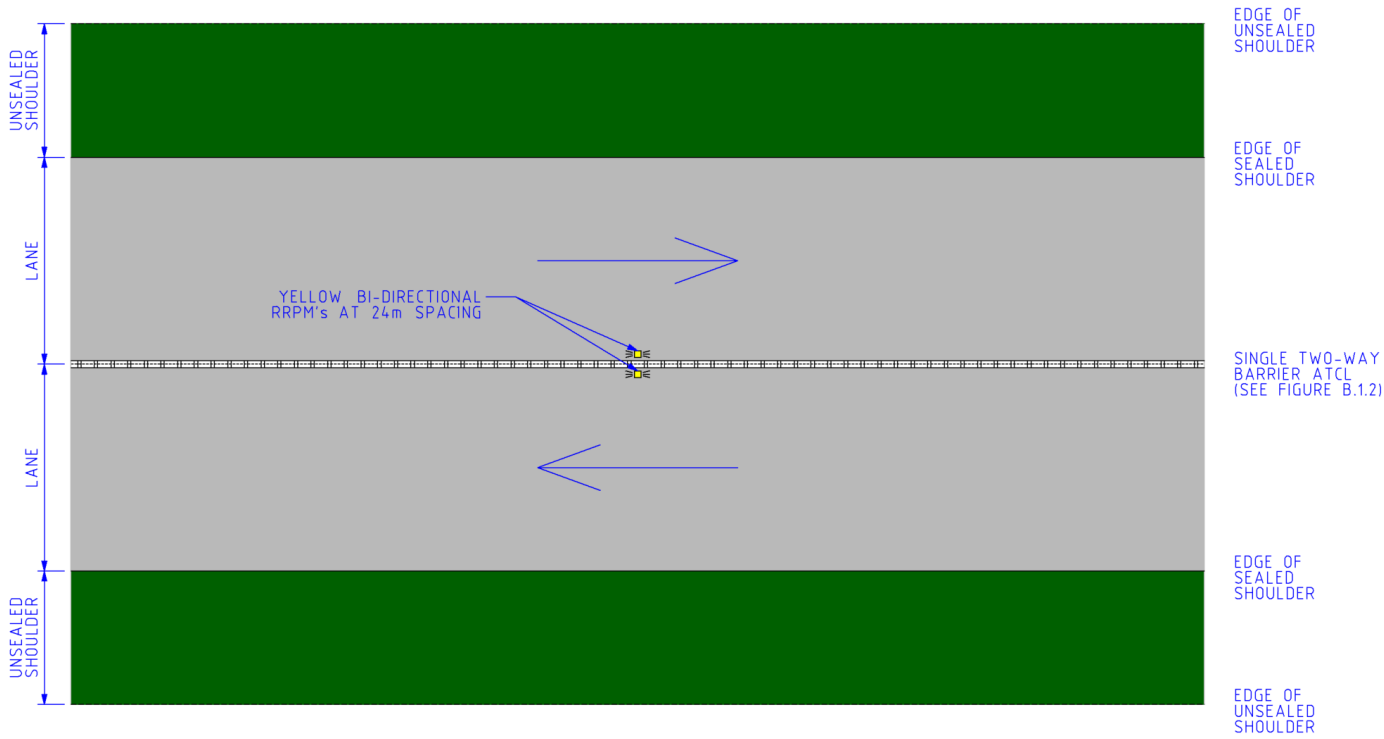


Figure C.1.2 – Plan Layout for Narrow Sealed Roads with Single Two-Way Barrier ATCL



2. Plan Layout for Audio Tactile Line Marking on Undivided Road

Figure C.2.1. – Plan Layout with Two-Way Dividing ATCL and Audio Tactile Edge Line (ATEL)

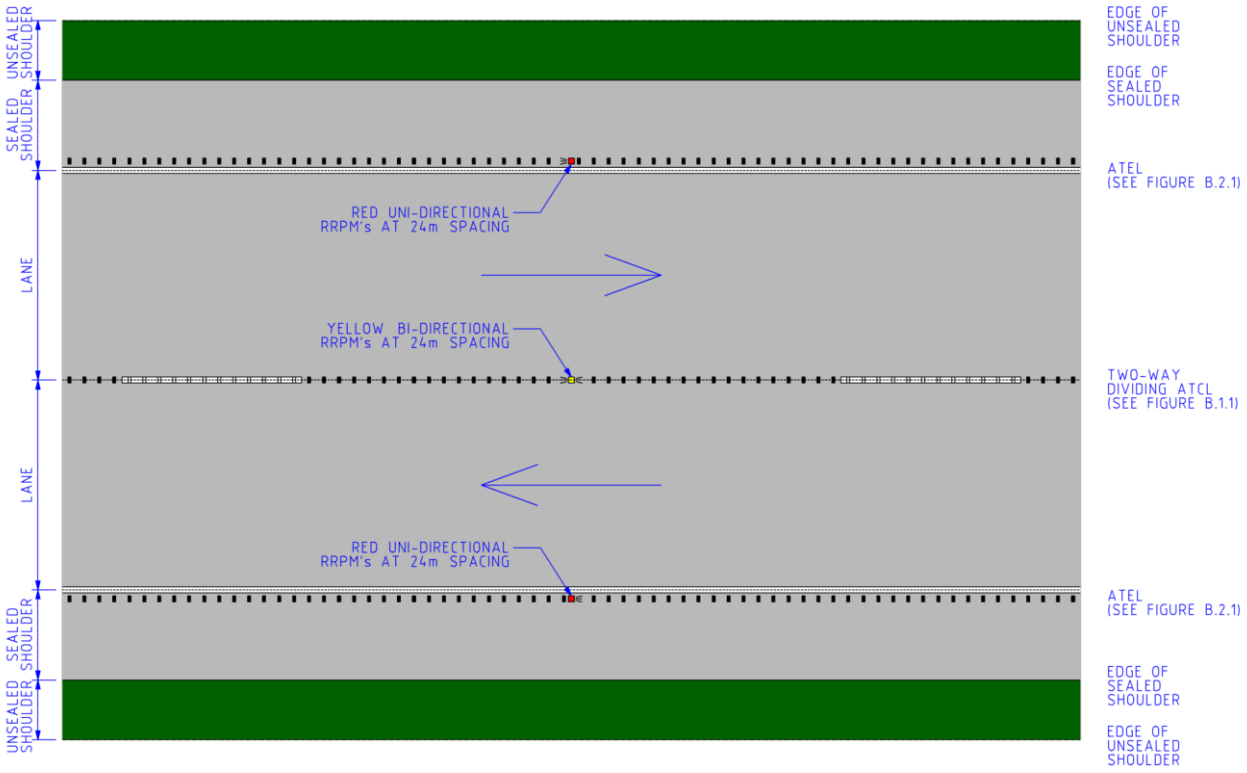


Figure C.2.2. – Plan Layout with Double Two-Way Barrier ATCL and Audio Tactile Edge Line (ATEL)

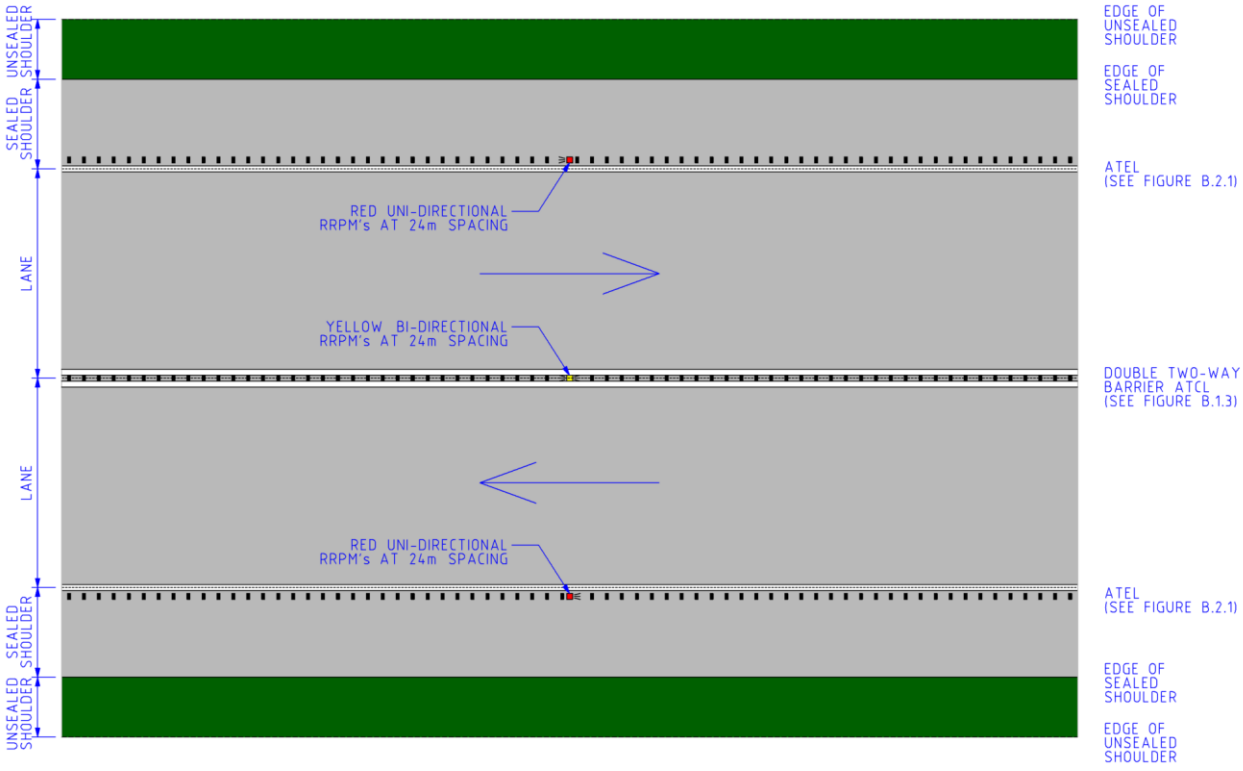


Figure C.2.3. – Plan Layout with Double Two-Way Barrier ATCL and Audio Tactile Edge Line (ATEL)

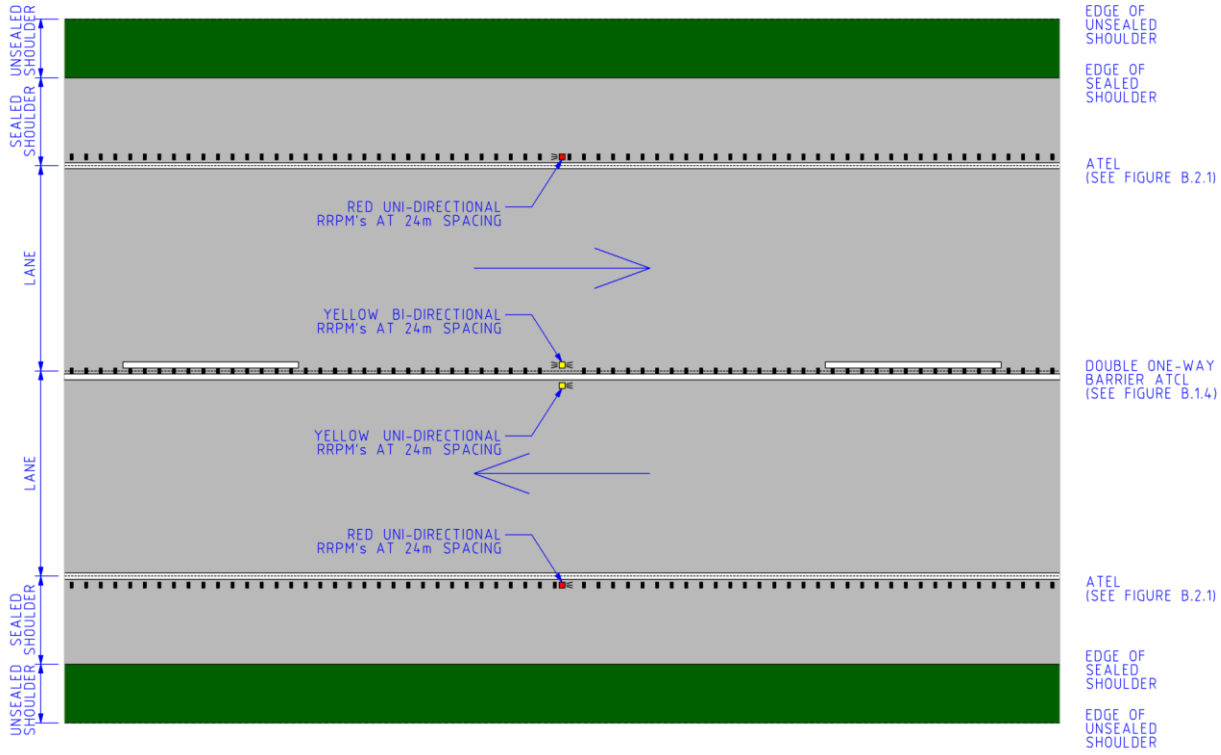
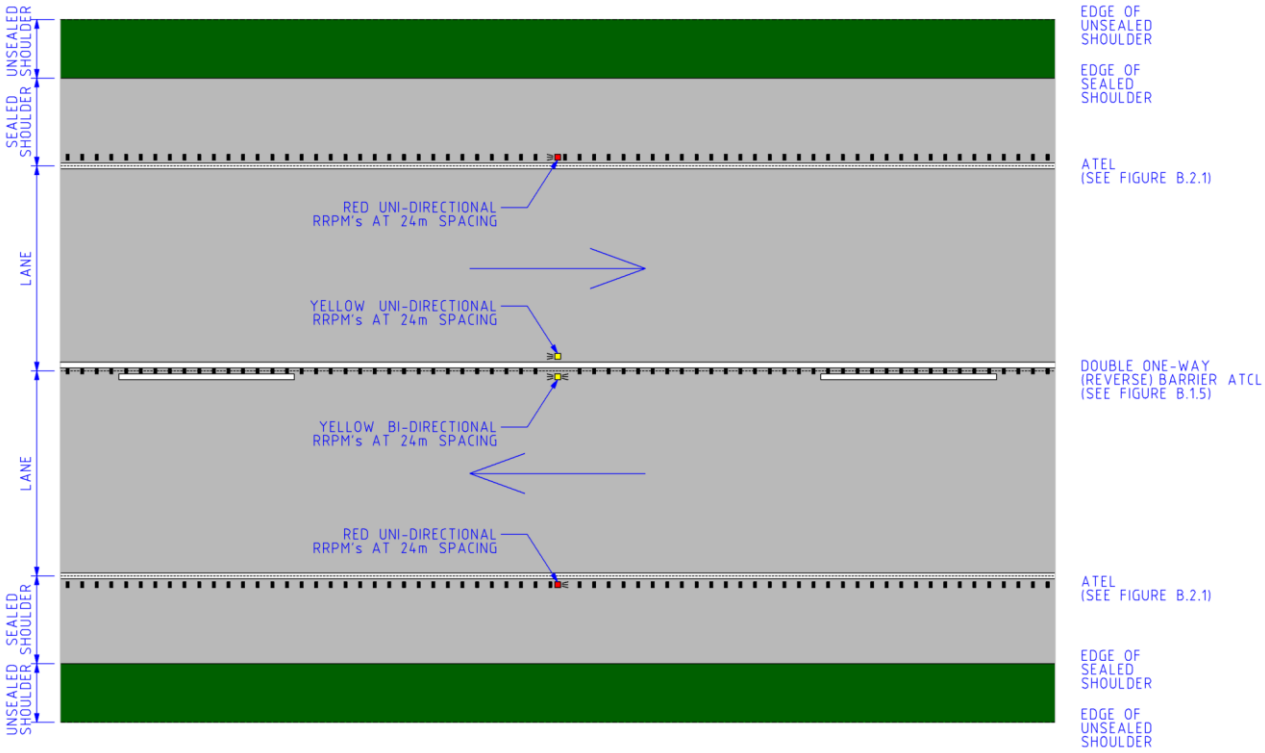
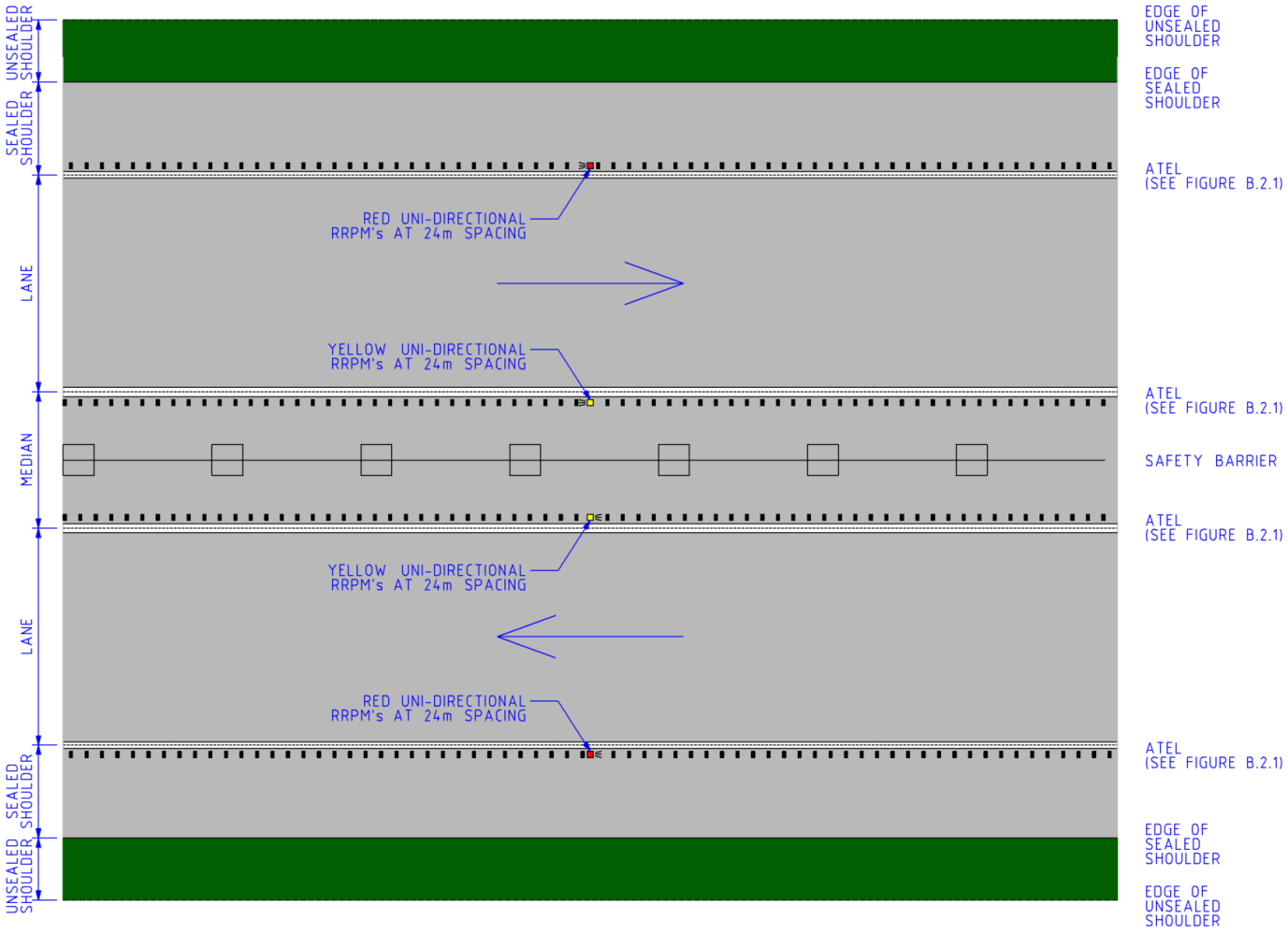


Figure C.2.4. – Plan Layout with Double One-Way Barrier (Reverse) ATCL and Audio Tactile Edge Line (ATEL)



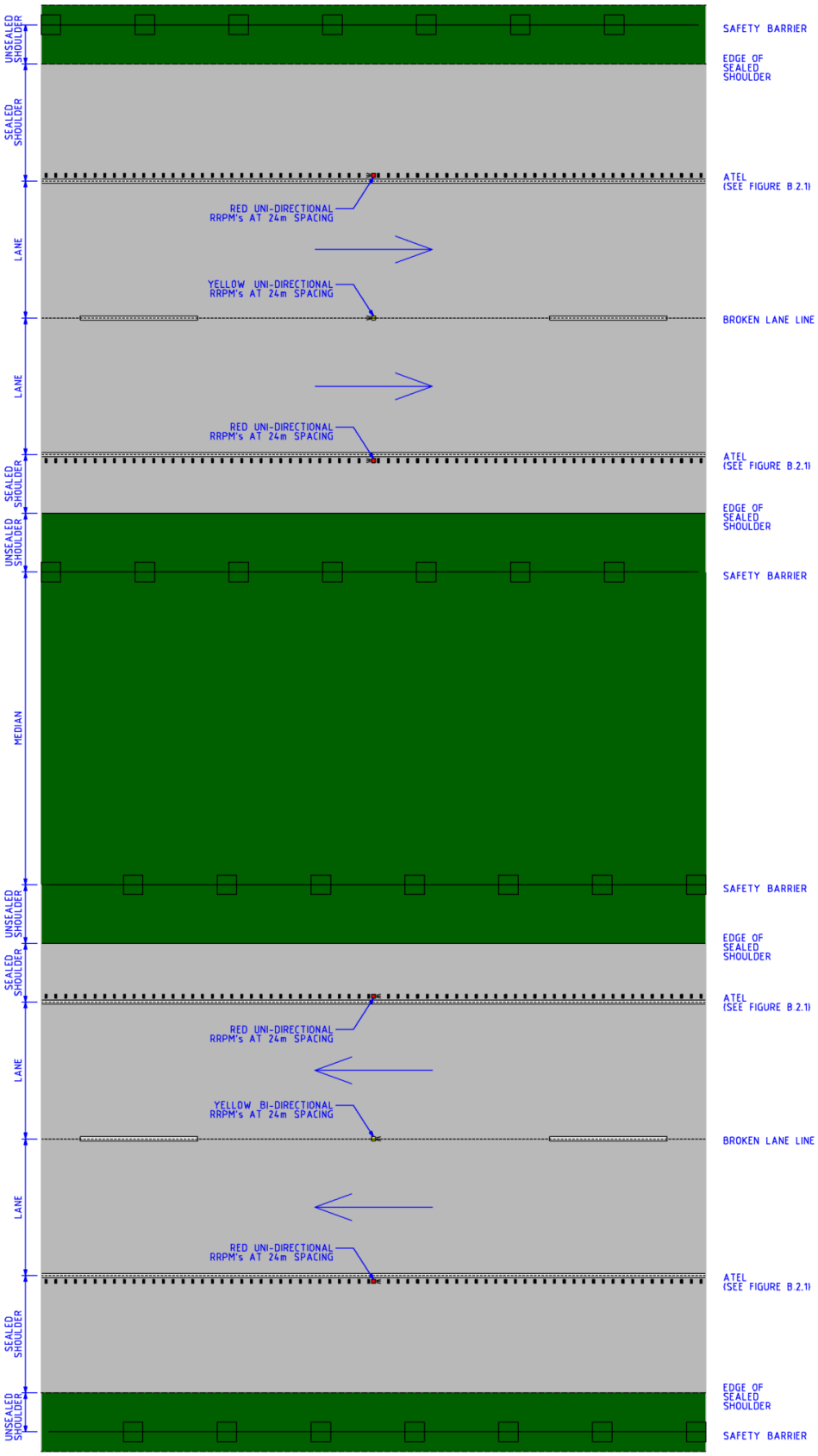
3. Plan Layout for Audio Tactile Line Marking and Central Barrier in Narrow Medians

Figure C.3.1 – Plan Layout with Audio Tactile Line Marking (ATLM) and Central Barrier in Narrow Medians



4. Plan Layout for Audio Tactile Line Marking and Divided Roads

Figure C.4.1 – Plan Layout with Audio Tactile Line Marking (ATLM) and Divided Roads



Appendix D: Design Checklist

This is a design checklist to help project teams identify criteria for the design and application of Audio Tactile Line Marking.

Table D.1. – Design Checklist

Criteria	Result
Presence of cyclists along on A, B or C route < 1500 AADT	Absolute minimum seal 7.6m, Desirable minimum seal 8.1m
Presence of cyclists along on A, B or C route > 1500 AADT	Absolute minimum seal 8.4m, Desirable minimum seal 9.0m
Residential properties within 150m of road	No ATEL or ATCL
Existing seal width less than 6.2m	No ATCL
Existing seal shoulder less than 0.3m	No ATEL
Existing seal shoulder 0.35-0.55m	On-line-marking ATEL
Existing seal shoulder 0.5-1.5m	Offset ATEL

Appendix E: Winding Roads

Engineering judgment needs to be exercised when determining whether to install ATLM on winding sections of road. Audio tactile ribs should be considered on curves as they provide a sensory feedback to drivers of lane departure. However, this needs to be balanced with the potential for excessive noise to be generated due to vehicle tracking over the ribs.

Photo E.1: Example of a winding road

New Installations of ATLM on Winding Roads

For new installations, or where additional sealed shoulder is being constructed, curve widening should be applied in accordance with Austroads Guide to Road Design Part 3 Section 7.9, taking into consideration the size of vehicles along the route. Audio tactile ribs should be offset as per the layouts in Section 5.2.

Retrofit Installations of ATLM on Winding Roads

In retrofit situations, winding sections should be investigated by conducting a site visit to determine whether vehicles are tracking close to the edge of seal. This will be evident by wearing on existing edge linemarking as well as damage to the seal edge or edge drop-off. In these situations, it should be determined whether audio tactile ribs can be offset (with enough seal behind the ribs for recovery) to minimise tracking, reduce wear of audio tactile ribs and lower noise. If edge linemarking is to be reapplied, lanes may be able to be widened around the curves to ensure tracking is within the linemarking. If this is not possible, or it is considered that larger vehicles will still track over the audio tactile ribs, then ATEL should not be installed in these locations.

As well as analysing the existing site conditions for evidence of tracking paths, the following criteria is useful to determine whether vehicles may track over the proposed audio tactile ribs;

a) Horizontal Radius – existing horizontal radii should be equal to or greater than the minimum radius values in Section 7.6.1 of the Austroads Guide to Road Design. Horizontal radius may be able to be measured using a CAD program
b) Vehicle Size – the design and check vehicle for the route should be checked. Larger vehicles require a wider tracking area around horizontal curves
c) Lane Widths – Narrower lane widths will result in larger vehicles tracking over the linemarking around horizontal curves

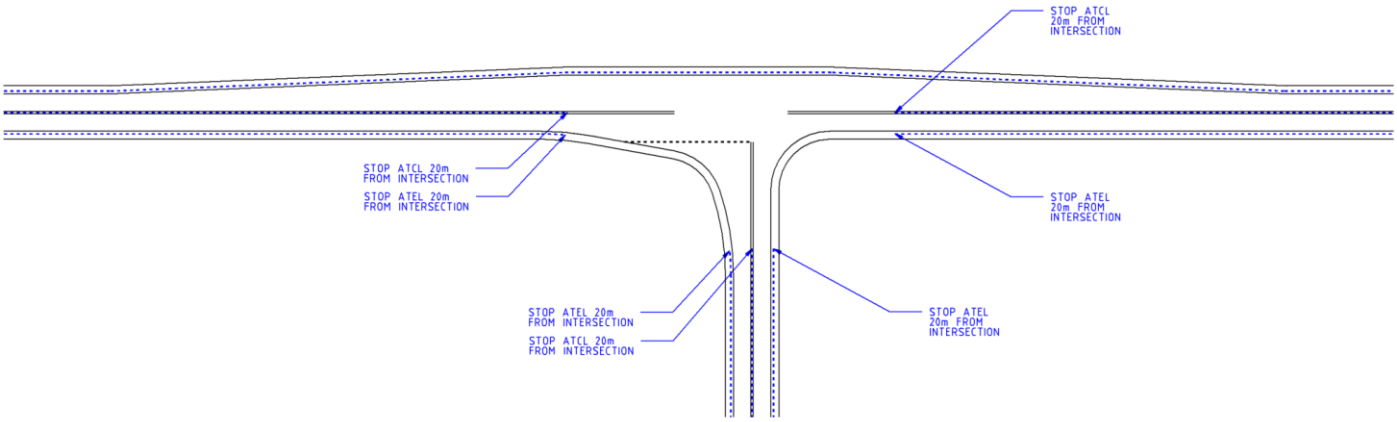
Note that dynamic tracking for large vehicles is greater than the static vehicle width.

A combination of tight radii, narrow lane widths and larger vehicles may result in excessive noise being generated by vehicles tracking over audio tactile ribs and will reduced the design life of the ribs and line marking.

Appendix F: ATLM at Intersections

Audio Tactile Line Marking is to be finished 20m from the intersection and at the start of turn pockets. This is to reduce the noise created by turn paths, particularly those of larger vehicles.

Figure F.1: Audio Tactile Line Marking at a basic right turn intersection



Audio Tactile Line Marking is to finish at the start of traffic median islands where intersections have turn lanes.

Figure F.2: Audio Tactile Line Marking at a channelized right turn intersection