

# DESIGN BULLETIN #100/2019

## Median Acceleration Lane Design Guidelines

### PURPOSE

This Design Bulletin is to provide guidelines for the utilization of Median Acceleration Lanes (MAL) on divided highways under Alberta Transportation's jurisdiction.

### BACKGROUND

MALs have been built on intersections along Alberta Highways in the past decades. The existing MALs have been approved through the Design Exception process due to there being no design guidelines available at the time. No specific safety or operational concerns have been identified for existing MALs as of today.

In alignment with the provincial goal of Vision Zero to continuously reduce the fatal and severe collisions over the long term, the Department is issuing design guidelines for the utilization of MALs within the provincial highway network.

### Definition

MAL is an auxiliary lane on the median side that allows left turning vehicles from the minor road to accelerate along the divided highway before merging to the right into the through lane. It is also sometimes called left turn acceleration lane.

### Applicability

MALs may be utilized at un-signalized intersections on divided highways that experience a high proportion of rear end, angle collisions, or side swipe collisions related to the speed differential caused by left turning vehicles onto the highway. Left turning drivers from the side road accelerate until the desired highway speed is obtained. When acceleration occurs directly in the through lane, it may cause disruption of the through traffic flow. To minimize impacts to highway operations, MAL may be considered. MAL should be of sufficient length to permit acceleration of turning vehicles to reach a reasonable speed to allow efficient merging into mainstream through traffic conditions before reaching the end of the effective parallel acceleration lane. The length is more critical when the traffic volumes (both through and turning) are high. Conversely, when the traffic volumes are very low, a shorter MAL may be more appropriate.

### Installation Conditions

The following conditions shall be used to establish the need for a median acceleration lane on Alberta highways. MALs may be considered where the first two conditions plus any of the last three conditions stated below exist.

- There is left turning traffic from minor road merging with high speed divided highway through traffic.
- There are limited gaps available in the major road traffic stream.
- There is a significant collision history of sideswipe or rear end type crashes.
- There is insufficient intersection sight distance at the intersections for some of the design vehicles making the left turn off the minor roadway.
- There are enough large vehicles originating on the minor roadway for it to be an operational concern for the major road.

## Design Considerations

MALs should normally be sufficiently long to permit all turning vehicles to accelerate to at least 70 percent of the design speed of the major road.

Recommended MAL length is included in Table 1.

Table 1 Recommended Effective MAL Length excluding Taper Length

Highway Design Speed (km/h)	Assumed Merge Speed (km/h)	Typical minimum MAL* (m)	Desirable MAL* (m)
80	60	200	230
90	67	260	295
100	74	345	395
110	81	430	490
120	88	545	620
130	92	610	695

\*: Desirable length should be used where appropriate. Typical minimum length can be used if there are site specific constraints or if the traffic volumes are low. A “low” traffic condition may include any or several of the following:

- Major highway two way AADT < 10,000 vehicle per day (vpd);
- Intersecting road (where the left turning traffic is generated for the consideration of MAL) two way AADT < 1,000 vpd;
- Cross product of major highway and intersecting road < 10 million vpd;
- Number of large vehicles\*\* per day on intersecting road making the left turn is less than 20;
- If the length of a MAL is constrained below the minimum due to physical or other limitations, a Design Exception may be requested.
- All traffic volumes are the existing traffic volumes.

\*\* Large vehicles are defined as the sum of tractor trailer (TT), single unit (SU), half of the number of bus (B), and half of the number of RV (large vehicles=TT+SU+0.5B+0.5RV).

For grades less than or equal to 3%, Table 1 can be used to determine the MAL length. For grades greater than 3%, MAL length should be adjusted to accommodate the impacts of grade as per Table 2.

Table 2 Adjustment Multiplier for Grades >3%

Highway Design Speed (km/h)	% Grade	Upgrade	Downgrade
80	>3% & <5%	1.4	0.65
90		1.4	0.6
100		1.5	0.6
110		1.5	0.6
120		1.5	0.6
130		1.6	0.6
80	≥5%	1.5	0.55
90		1.6	0.55
100		1.7	0.5
110		2	0.5
120		2.15	0.5
130		2.3	0.5

Lane width of MAL shall be 3.5 m. A 210 m long 60:1 taper shall be utilized at the end of the MAL to tie to the through lane. Standard shoulder width of 2 m should be used for the full MAL parallel lane and the taper length. A concept plan showing MAL is shown in Figure 1 of the Appendix.

Appropriate pavement markings and signage should be designed as per the Department's recommended practices in this webpage:

<http://www.transportation.alberta.ca/Content/docType233/Production/118BeCourteousMergeTrafficAheadSign.pdf>

The guidelines as indicated in this Bulletin are effective immediately.

**Contact**

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**References**

1. American Association of State Highway and Transportation Officials, A policy on Geometric Design of Highways and Streets, Washington, DC, 2018
2. Hanson, C., Median Acceleration Lane Study Report, MNDOT, July 2002
3. Intersectional Transportation Engineer, Effectiveness of Median Storage and Acceleration Lanes for Left-Turning Vehicles, March 1985

4. Maze, T.H., et al, Rural Expressway Intersection Synthesis of Practice and Crash Analysis, Iowa DOT, October 2004
5. MNDOT, Traffic Safety Fundamentals Handbook, August 2008
6. National Cooperative Highway Research Program (NCHRP) Synthesis 505, Review of Truck Characteristics as Factors in Roadway Design, Transportation Research Board (TRB), Washington, D.C., 2003.
7. NCHRP 500, A Guide for Addressing Unsignalized Intersection Collisions, TRB, Washington, D.C., 2003.
8. NCHRP 524, Safety of U-Turns at Unsignalized Median Openings, TRB, Washington, D.C., 2004
9. NCHRP 650, Median Intersection Design for Rural High-Speed Divided Highways, TRB, Washington, D.C., 2010
10. Tarko, A., et al, Analysis and Methods of Improvement of Safety at High-Speed Rural intersections, Research Report, Report No. FHWA-/IN/JTRP-2012/01, Federal Highway Administration (FHWA), January 2012
11. U.S. Federal Highway Administration (FHWA), Strategy B5 Provide Left-Turn Acceleration Lanes at Divided Highways Intersections
12. U.S. Washington State DOT, Design Manual, July 2017
13. U.S. MNDOT, Road Design Manual, June 2000

Date of Issue: January 25, 2019

Attachments:

1. Drawing No D-9.1g Typical Median Acceleration Lane on Four-Lane Divided Highway

Recommended:

Approved:

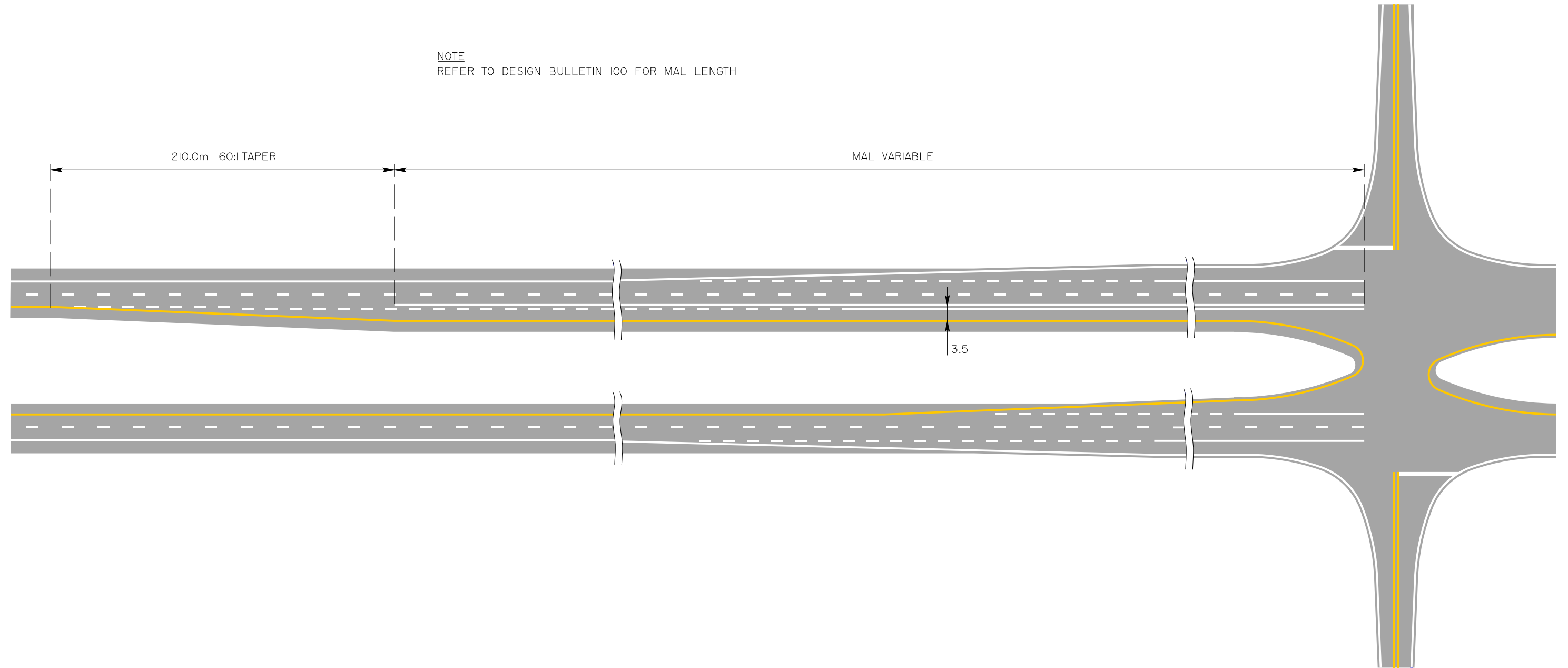
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NOTE  
REFER TO DESIGN BULLETIN 100 FOR MAL LENGTH



△2			
△1			
No.	REVISIONS	BY	DATE

Approved:  
  
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Effective Date: JAN 25, 2019

**TYPICAL PLAN  
MEDIAN ACCELERATION  
LANE (MAL)  
ON FOUR- LANE DIVIDED HIGHWAY**

Prepared By: PG	Checked By: LM	Scale: N.T.S.	Dwg No.: D-9.1.g
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