



INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 21-10

April 13, 2021

TO: All Design, Operations, and District Personnel, and Consultants

FROM: /s/ David Boruff
David Boruff
Manager, Office of Traffic Administration
Traffic Engineering Division

SUBJECT: Zipper Merges for Transportation Operations Plans

REVISES: *Indiana Design Manual (IDM) Chapter 503, Section 503-4.02*

EFFECTIVE: Lettings on or after September 1, 2021

IDM Section 503-4.02 has been revised to include the optional use of zipper merges as a corridor/network management mitigation measure for a transportation operations plan (TOP). The revision is included for reference at the end of the memo. A TOP is part of the transportation management plan (TMP) for projects deemed to have significant work zone impacts under the current work zone safety regulations, 23 CFR 630.1010. IDM Section 503-2.02 includes additional information about significant projects.

The zipper merge is a traffic mitigation measure that can be used when a lane reduction is expected to generate a queue for at least two hours a day for five days of the week and approval is given by the district Traffic Engineer. The measure is ideal for congested ramp merge situations as well as certain congested construction merge conditions. The zipper merge is not intended for high-speed free flow merge conditions.

INDOT Operations Memorandum 20-02 includes a sample layout for construction signs as well as shop drawings of the construction signs for a zipper merge. Appropriate sign spacing distances, longitudinal buffer lengths, and merge taper lengths should be shown on the plans (in lieu of referencing the IMUTCD).

The use of portable changeable message signs (PCMS) displaying zipper merge messages that vary based on travel conditions in the work zone (e.g. free flow, slow, or stopped traffic) may also be used. PCMS used in conjunction with a zipper merge must be able to communicate with speeds sensors to provide real-time travel speed information. For these applications, the PCMS should be shown on the plans and a unique special provision for speed sensor compatible PCMS should be included in the contract.

The approved list for solar powered traffic control devices will be updated to reflect speed sensor compatible PCMS devices.

IDM [Chapter 503](#), Traffic Maintenance - Current Version, has been updated to reflect updates concerning zipper merges. An excerpt of the changes is shown at the end of this memo along with Operations Memo 20-02.

Questions regarding project-specific applications for zipper merges should be discussed with the appropriate district Traffic Engineer. Dave Boruff, Office of Traffic Administration Manager, dboruff@indot.in.gov, may be contacted with general questions.

Chapter 503 Revisions

503-4.02 Other Traffic Mitigation Measures [Rev. Apr. 2021]

One of the key components of the TOP is the proposed mitigation measures. Examples of possible mitigation measures are as follows:

1. Demand Management Strategies.
 - a. transit service improvements;
 - b. transit incentives;
 - c. shuttle services;
 - d. ridesharing/carpool programs or incentives;
 - e. park and ride promotion strategies;
 - f. high-occupancy vehicle (HOV) lanes; and
 - g. variable work hours.

2. Corridor/Network Management Strategies.
 - a. signal coordination improvements;
 - b. ITS, including real time work zone systems;
 - c. temporary traffic signals;
 - d. off-site intersection improvements;
 - e. bus turnouts;
 - f. vehicle height, width, and weight restrictions;
 - g. separate truck lanes;
 - h. dynamic lane closure system;
 - i. late (zipper) merges using construction signs or dynamic late (zipper merges) using PCMS; and
 - j. coordination with adjacent construction sites.

3. Work Zone Safety Management Strategies.
 - a. variable speed limits;
 - b. temporary traffic signals;
 - c. temporary traffic barrier;

- d. moveable traffic barrier;
 - e. attenuators, impact and truck-mounted;
 - f. temporary transverse rumble strips;
 - g. warning lights;
 - h. ITS;
 - i. automated flagger assistance devices (AFADs)
 - j. courtesy patrol;
 - k. construction safety inspectors;
 - l. traffic monitors; and
 - m. on-site safety training;
4. Incident Management Strategies.
- a. ITS;
 - b. courtesy patrol;
 - c. emergency responders coordination;
 - d. surveillance, i.e., closed circuit cameras and loop detectors;
 - e. enhanced mile-post markers;
 - f. media coordination;
 - g. designated local detour routes;
 - h. contract support for incident management;
 - i. incident/emergency management coordinator;
 - j. incident/emergency response plan;
 - k. dedicated breakdown area;
 - l. contingency plans;
 - m. stand-by equipment; and
 - n. stand-by personnel.

Not all of these strategies will be applicable to every project. Other strategies can be considered to accommodate operations on a project-by-project basis.



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Eric Holcomb, Governor
Joe McGuiness, Commissioner

DATE: September 1, 2020

OPERATIONS MEMORANDUM 20-02
SIGNS

TO: District Deputy Commissioners
District Technical Service Directors
District Highway Maintenance Directors
District Traffic Engineers
District Traffic Operations Managers

FROM: Daniel P. McCoy
Director, Traffic Engineering Division

SUBJECT: Zipper Merge Signs

PURPOSE AND BACKGROUND

The normal driving practice in Indiana is to merge early when encountering a merge sign with the *Indiana Driver's Manual* reflecting this in the chapter on safe vehicle operation. This behavior occurs in both mainline lane drop situations, typically during construction, and also with a ramp merge to the mainline. However, in congested areas the practice of merging early leads to the uneven distribution of vehicles between the open lane(s) and the lane that is ending, resulting in a queue length that is longer than if the distribution of vehicles among the lanes is more even. Furthermore, in situations where a heavy ramp volume is merging, the tendency to merge early is often paired with a lower speed at the merge point, degrading operations of the mainline lane more so than if the entire acceleration length and taper is used. At locations where the space to store vehicles is limited, or in situations where mainline flow is impacted by poor merge operation, signage for zipper style merges where drivers in each lane take turns at the merge point may be used in accordance with the following procedure.

This treatment is less likely to be suitable for rural Interstate Highway applications. Instances of these merge situations, typically for a lane drop in a construction zone, require a significant distance of advance warning for the merge with an accompanying drop in speed for safety. The advanced warning is intended to prepare drivers for the condition well in advance of the merge rather than rushing to the merge point in both lanes. There are situations where rural application may be appropriate such as four lane divided highways where prevailing speed is lower or on arterials where interruptions in flow are more expected.

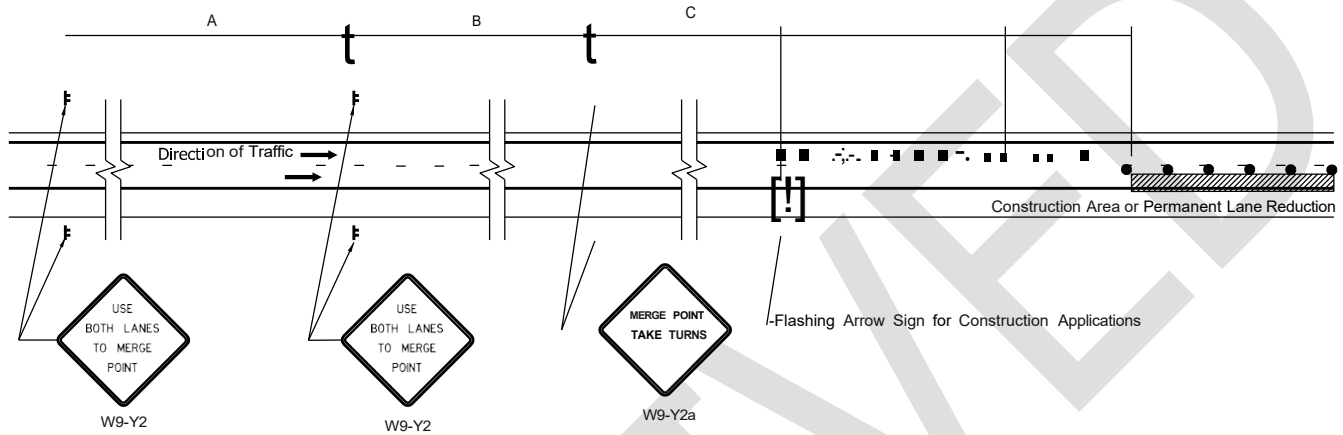
PROCEDURE

1. Zipper merges may be used on construction projects where there is a lane reduction and queuing is anticipated for at least two hours a day for five days a week. The zipper merge signs may be used on the plans with approval from the district traffic engineer. See Appendix A for typical sign placement. The use of portable changeable message signs (PCMS) with zipper merge messages that vary based on travel conditions in the work zone (e.g. free flow, slow, or stopped traffic) may also be used.

2. Zipper merges may be used on a permanent basis in urban areas where there is a lane reduction and queuing occurs for at least two hours a day for five days a week and the queue frequently leads to traffic blocking intersections or ramps. The approved zipper merge sign designs and sizes are shown in Appendix B. The use of changeable message signs with zipper merge messages that vary based on travel conditions in the work zone (e.g. free flow, slow, or stopped traffic) may also be used.
3. When a zipper merge is used for either temporary or permanent applications, the district traffic engineer must notify the district media relations director of the location and assist, as needed, with any targeted public education plan for the location.

DPM/dhb/jeb

cc: Brad Steckler, J.D. Brooks, Joe Wheatley, Mike Carter, and Ed King



ZIPPER MERGE (TYPICAL APPLICATION)

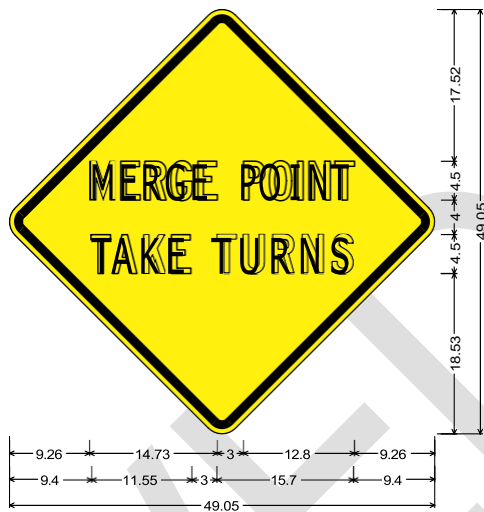
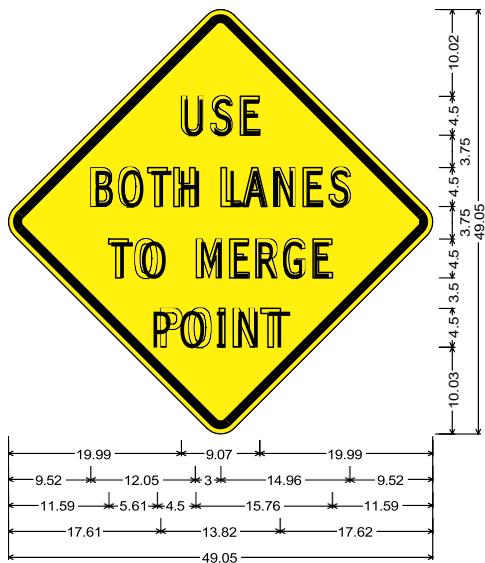
NOTES:

1. See IMUTCD Table 6C-1 for sign spacing distances, A, B, and C.
- (1) Longitudinal buffer length for construction applications. See IMUTCD Table 6C-2.
3. See IMUTCD Table 6C-4 for merge taper L distance.

**ZIPPER MERGE
SIGN PLACEMENT**

Appendix A

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36.00" across sides 2.25" Radius, 0.88" Border, 0.63" Indent, Black on, Fluorescent yellow;
 "USE", C; "BOTH" C " " B "LANES", C;
 "TO MERGE", C; "POINT", C;

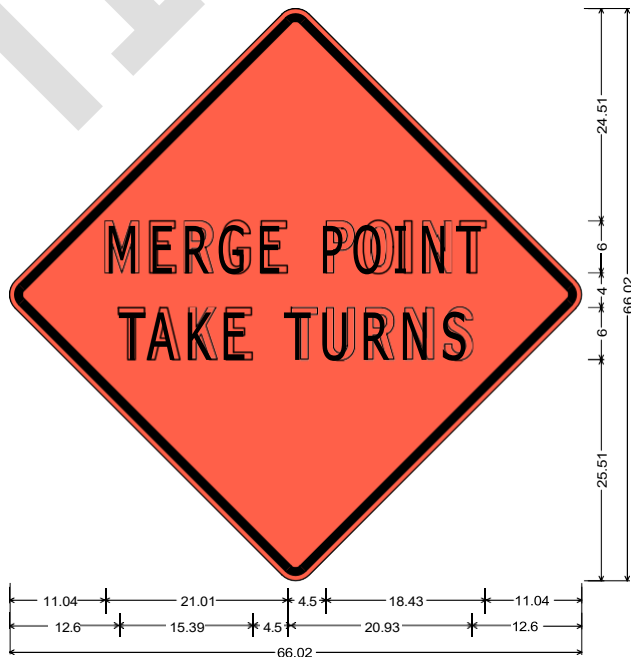
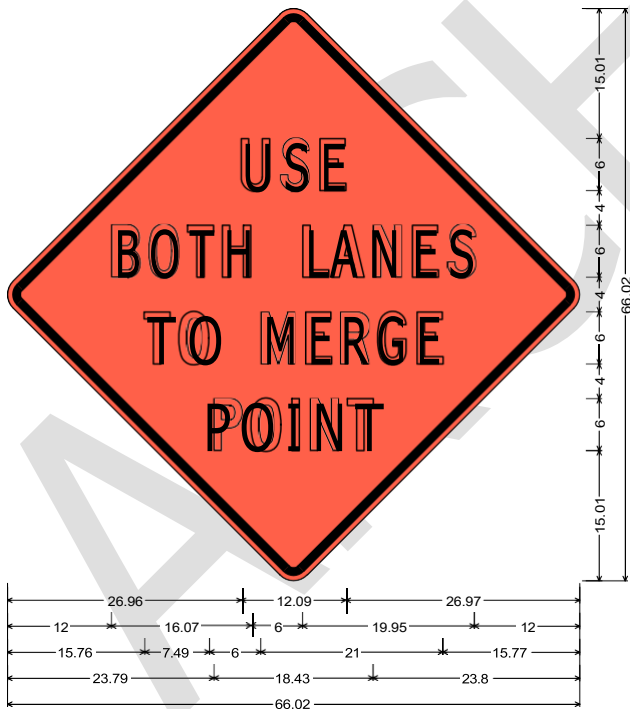
36.00" across sides 2.25" Radius, 0.88" Border, 0.63" Indent, Black on, Fluorescent yellow;
 "MERGE POINT", C 70% spacing; "TAKE TURNS", C;

Table of letter and object lefts

Table of letter and object lefts

U	S	E						
19.99	23.40	26.81						
B	O	T	H	L	A	N	E	S
9.52	12.74	16.10	19.11	24.57	27.08	30.65	34.06	37.07
T	O	M	E	R	G	E		
11.59	14.60	21.70	25.57	28.58	31.80	35.21		
P	O	I	M	T				
17.61	20.83	24.38	25.96	29.18				

M	E	R	G	E				
9.26	12.84	15.62	18.62	21.74				
P	O	I	N	T				
26.99	29.98	33.25	34.54	37.54				
T	A	K	E	T	U	R	N	S
9.40	11.91	15.48	18.70	23.95	26.96	30.37	33.78	37.19



48.00" across sides 2.25" Radius, 0.88" Border, 0.63" Indent, Black on, Fluorescent orange;
 "USE", C; "BOTH LANES", C; "TO MERGE", C; "POINT", C;

48.00" across sides 2.25" Radius, 0.88" Border, 0.63" Indent, Black on, Fluorescent orange;
 "MERGE POINT", C; "TAKE TURNS", C;

Table of letter and object lefts

Table of letter and object lefts

U	S	E						
26.96	31.51	36.05						
B	O	T	H	L	A	N	E	S
12.00	16.30	20.78	24.79	34.07	37.41	42.18	46.72	50.73
T	O	M	E	R	G	E		
15.76	19.78	29.25	34.40	38.41	42.71	47.25		
P	O	I	N	T				
23.79	28.09	32.82	34.93	39.22				

M	E	R	G	E	P	O	I	N	T
11.04	16.20	20.21	24.50	29.05	36.55	40.84	45.57	47.68	51.98
T	A	K	E	T	U	R	N	S	
12.60	15.94	20.70	24.99	32.49	36.51	41.05	45.60	50.14	

Appendix B

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