



# Traffic Engineering, Operations & Safety Manual

## Chapter 3 Marking

### Section 2 Pavement Markings

#### 3-2-1 Longline Marking

April 2024

##### GENERAL

The purpose of this policy is to provide specific guidance for the uniform application of long line markings on State Highways under DOT jurisdiction. The WISMUTCD Section [3B](#) contains further guidance on longline markings.

##### Centerline Markings

Centerline markings **shall** be a 6" wide yellow line. Dashed lines **shall** be 12.5' long with a 37.5' gap.

Centerlines markings **shall** be marked on:

- All highways under DOT jurisdiction
- Through all intersections with local roads on two-lane state highways.
- On undivided multilane highway with a double yellow line

Centerline markings **shall not** be marked through:

- Intersections where the state highway is more than two lanes
- Intersections where Interstate, US, or State Highways intersect
- Signalized intersections
- All way stop
- Intersections with opposing left turn lanes.
- Stop lines or marked crosswalks.

Further information on centerline markings are located in Section [3B.01](#) of the WISMUTCD.

##### Edge line Markings

The WISMUTCD Section [3B.06](#), describes edge line markings in more detail. Edge line markings **shall** be a 6" white line on the edge of the roadway except the left most edge line on a divided highway **shall** be yellow.

Edge line markings **shall**:

- Continue through all driveways (commercial or private) except major commercial driveways (big box stores, etc.) with a full width turn lane.
- Be used on freeways and expressways
- Be used on rural arterial roads with a traveling width of at least 20 feet and an ADT > 6,000 vehicles per day

Edge line markings **shall not** continue through:

- Intersecting roadways with ~~more than~~ two lanes or more
- Intersections where Interstate, US, or State Highways intersect
- Intersections with opposing left turn lanes
- Signalized intersections
- Stop controlled intersections
- Commercial driveways meeting intersection design standards with full width paved turn lanes.

Edge lines *should* be used in urban areas or semi urban areas that do not have curb and gutter as required in WISMUTCD Section [3B.07](#). Edge lines *should* be used in urban areas where a single paved width is 16 ft or greater.

Edge Lines Adjacent To Urban Curb & Gutter Sections

POSTED SPEED	IS THERE CONTINUOUS LIGHTING?	
	YES	NO
≤ 30 mph	No	Optional
35 mph or 40 mph	Optional	Recommended
≥ 45 mph	Recommended	Required

##### Lane Line Markings

Lane lines **shall** be marked to delineate traffic traveling in the same direction. Lane lines **shall** be a 6" wide white line that is 12.5' long with a 37.5' gap between lines. Lane lines **shall** be marked on all state highways under DOT jurisdiction. Lane lines **shall** be marked through minor intersections and major T-intersections on the state

highways.

### **Dotted Lane Lines**

According to the WISMUTCD Section [3B.04](#), a dotted line (3' line, 9' gap) *maybe* used as a substitute lane line or a continuation of an edgeline. This line **shall** be 6" wide and **shall** be used to separate a through lane that continues beyond an intersection or interchange from an adjacent lane under the following conditions:

- A deceleration or acceleration lane
- A through lane that becomes a mandatory turn or exit lane ( [SDD 15C31 sheet b](#))
- Auxiliary lane
- Tapered Exit and On Ramps ([SDD 15C31 sheet a](#))
- Parallel Exit (Deceleration) Ramps ([SDD 15C 31 sheet b](#))

### **Dotted Lines**

Dotted lines "cat tracks" **shall** be added to provide guidance through intersections where the edge of the traveled lane is unclear. A dotted line *may* extend through an uncontrolled movement of a state highway intersection with another highway. If these lines are used through an intersection they **shall** be 2' lines with a 6' gap and the same width as the line that is being extended see in [SDD 15C8 sheet c](#). Dotted lines "cat tracks" **shall** be installed when there are multiple left turn lanes and at side by side ramps..

### **Channelizing Lines**

Channelizing lines **shall** be white and 10" in width. Channelizing lines **shall** be used in the following locations:

- In advance of an exit ramps or intersections to distinguish a lane. (3 foot line with a 9 foot gap) [SDD 15C8](#).
- In advance of freeway route splits with dedicated lanes.
- To separate a through lane that continues beyond an intersection from an adjacent auxiliary lane between two intersections [SDD 15C8](#).
- Exit gore markings **shall** extend fifty feet past the unpaved neutral area and 300 feet to begin the gore line, as shown on [SDD 15C31](#).
- Entrance gore marking **shall** follow [SDD 15C31](#).
- To separate turn lane and through movements.
- To separate dual turn lanes.

Channelizing markings **shall not** be marked through:

- Signalized intersections.
- Intersections at a 4 way stop.
- Stop lines or marked crosswalks.

### **Dotted Extension Lines**

Dotted extension lines **shall** be used at roundabouts at a 2' line with a 2' gap. Dotted extension lines are 18" in width. Refer to [FDM 11-26-35](#) and SDD 15C22 for more guidance on placement. WisDOT will maintain all dotted extension lines at a state maintained roundabout.

### **Bike Lane**

If bike lanes are marked, they are typically at least 5 ft wide, and a minimum of 4 feet from a longitudinal joint. Use a 5 foot width at 45 mph or higher. Refer to [SDD 15C29](#) in the FDM. The words "BIKE LANE" or the bike symbol *maybe* used to delineate the bike lane. Signing *may* also be used to supplement the marking. The DT2500 form **shall** be completed to permit locals to install/maintain bike lanes and the DT2137 form **shall** be completed to permit the locals to install/maintain Shared Lane Markings.

The usage of green pavement marking for bike lanes or bike boxes **shall not** be allowed on state maintained roadways unless locals install and maintain the markings.

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## **3-2-2 No-Passing Zone Standards**

**March 2021**

### **GENERAL**

No-passing zones are marked and signed on state-maintained highways to indicate where a driver cannot safely complete a passing maneuver under normal light and weather conditions. Passing Zones allow the driver to make a decision based on rules of the road and circumstances, such as oncoming traffic, reduced visibility due to fog, low light, rain or smoke, turning traffic, or vehicles entering from side roads or driveways. **No-passing zones *should not* be marked to eliminate all possible conflicts.**

However, certain conditions warrant short zones or no-passing zone extensions. Although sufficient sight distance *may* be present at these locations, the passing operation is not appropriate under state law or for safety reasons as documented in an engineering study.

[Wisconsin Statute 346.10](#) allows passing another vehicle at a rural (non-business regional, non-residential regional) intersection, unless the intersection is designated by signals, stop signs, yield signs, or warning signs. Routinely marking zones through minor intersections and/or driveways would significantly reduce legal passing areas available to the driver, increasing non-compliance and unsafe passing in less favorable locations where adequate sight distance *may not* be available.

## SIGHT DISTANCE

Each Region has a No-Passing Zone Sight Distance Map or spreadsheet listing the sight distance criteria on state-maintained highways. Typical sight distances are shown in the following table, but other criteria such as ADT or geometrics *may* change or alter those requirements.

**Table 1. Sight Distance**

Posted Speed Limit (MPH)	No-Passing Zone Sight Distance		Minimum Distance Between Zones	
	(mile)	(feet)	(mile)	(feet)
25-30	0.10	528	0.10	528
35-40	0.13	686	0.10	528
45-50	0.16	845	0.13	686
55	0.21*	1,110*	0.15	792

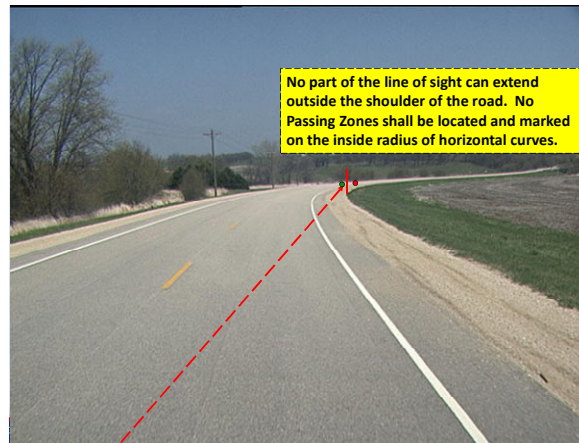
\* When authorized by the designated Regional Signing/Marking Engineer, the 55 MPH No-Passing Zone, sight distance **may be increased from 0.21 to 0.26 miles** on certain higher volume highway segments, due to higher frequency of crashes and/or a demonstrated history of excessive speeding above the posted limit.

## REQUIRED EQUIPMENT

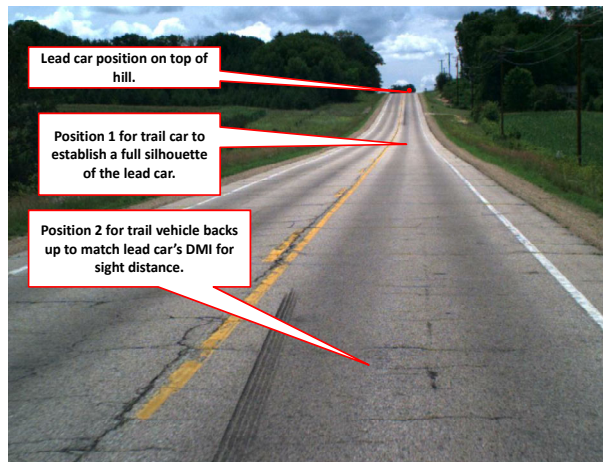
1. Use two vehicles that provide a target on the lead vehicle 42 inches above the roadway. The observer's eye in the trailing vehicle **shall** be 42 inches above the roadway. Whatever type of target is used, it **shall** have a sharp cutoff when it disappears and appears.
2. A Distance Measuring Instrument (DMI) **shall** be used and **shall** have an accuracy of at least 10 feet per mile. The DMI **shall** decrease the measured distance when the vehicle backs up.
3. Two-Way communication equipment is required for the two vehicles.
4. At a minimum, a full-width flashing yellow light bar with 360-degree visibility **shall** be used. Additional signs and flashing lights on the vehicles are recommended.

## CRITERIA FOR LOCATING AND MARKING NO PASSING ZONES

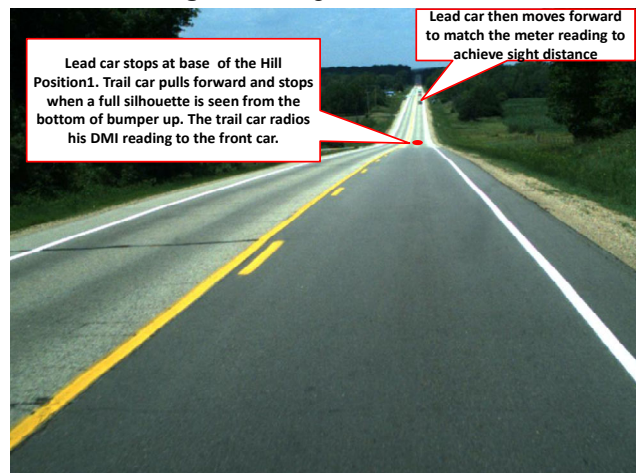
- Prior to beginning work on locating no passing zones, the project engineer or Region Signing/Marking Engineer **shall** be contacted to determine if there are any special no-passing zones to mark under the contract.
- Follow the no passing zone sight distance shown in Table 1.
- The termini of no-passing zones **shall** be established to an accuracy of +/- 50 feet (0.01 mile).
- When the distance between two successive no-passing zones is less than the minimum distance shown in Table 1, connect the two zones.
- For roadways with speed limit changes, the proper no-passing zone sight distance in Table 1 **shall** be maintained.
  - Posted speed limit is increasing:  
When the lead vehicle reaches the increased speed sign, the trail vehicle would back up until the appropriate no-passing zone sight distance is achieved.
  - Posted speed limit is decreasing:  
When the trail vehicle reaches the decreased regulatory speed sign, the lead vehicle would back up until the appropriate no-passing zone sight distance is achieved.
- On horizontal curves, no part of the line of sight **shall** extend outside the shoulder (see Figure 1). No passing zones **shall** be located and marked on the inside radius of horizontal curves. If the horizontal curve requires a No Passing Zone, the starts and ends of the zones **shall** be recorded in the cardinal direction.

**Figure 1. Horizontal Curve**

- On vertical curves, whenever the target light disappears from sight, the crew **shall** check for blind spots. For a crest vertical curve, if the target light on the lead vehicle goes out of sight, the trail vehicle parks at the base of the hill. The lead vehicle **shall** back up to reveal a full silhouette of the rear of the car (from the bottom of the bumper up). Once the trail vehicle sees the full silhouette of the lead vehicle, the trail vehicle **shall** back up to establish the sight distance between the 2 vehicles before marking the roadway (see Figure 2).

**Figure 2. Crest Vertical Curve**

- For sag vertical curves, if the target on the lead vehicle goes out, the lead vehicle **shall** stop at the base of the hill or in the sag. The trail vehicle **shall** pull forward until they see a full silhouette of the lead vehicle. Once the trail vehicle sees the full silhouette of the lead vehicle, the lead vehicle **shall** pull forward to establish the sight distance between the 2 vehicles before marking the roadway (see Figure 3).

**Figure 3. Sag Vertical Curve**

- If the no passing zone is less than 500 feet in length, the zone **shall** be extended to 500 feet by lengthening the zone at its beginning in each traffic direction.
- The correctness of no-passing zones leading into and out of the project limits **shall** be checked. Ensure that the minimum distance between zones and the sight distance are checked.

### MARKING MATERIAL

The beginning and end of all no-passing zones **shall** be marked on the roadway with T's and dots. T's and X's **shall** be 12" X 12" and 2" stroke. Dots **shall** be 3" - 4" in diameter. Use white spray paint (for asphalt) and black spray paint (for concrete) that will be readily visible after one year of application.

### RECORDING OF NO PASSING ZONES

Use [DT2124](#) to record the No Passing Zones. Include the following data on the No Passing Zone Log Sheets:

- Log all starts and ends in miles to the nearest 1/100<sup>th</sup> of a mile.
- The beginning and ending of both no-passing zone line in the cardinal direction.
- The sight distance and speed criteria for each zone.
- The location of landmarks (intersecting U.S., State and County trunk highways, bypass lanes, truck climbing lanes, passing lanes, county boundary lines, railroad crossings, and starts and ends of bridges).

### NO-PASSING BARRIER LINE CRITERIA

1. No-passing barrier lines, 500 feet in length, **shall** be marked on an undivided STH approach in the following intersection situations:
  - The STH traffic is controlled by a stop sign.
  - The intersection with the STH is controlled by a signal.
  - The intersection with the STH is controlled by a roundabout.
  - At a T-intersection with a standard bypass lane that allows vehicles proceeding straight to pass to the right of a left turning vehicle without leaving the paved portion of the highway as per [SDD 15C8-b](#), a 500-foot barrier line **shall** be installed prior to the start of the bypass taper.
2. A no-passing barrier line **shall** be marked in the following non-intersection situations:
  - In advance of a divided highway illustrated on [SDD 15C21](#).
  - In advance of a painted median island illustrated [SDD 15C18](#).
  - Bridges having a width less than 24 feet shown on [SDD 15C6](#).
  - Railroad grade crossings shown on [SDD 15C9](#).
  - Passing/Truck Climbing Lanes illustrated on the [SDD 15C8-c](#) and [SDD 15C8-d](#), A bypass lane for an intersection is **not** considered a passing lane under this guideline.
  - Any stretch of undivided 4 lane roadways **shall** have the opposing lanes designated by a double yellow barrier line for its entire length and start the barrier lines of 500 feet before the approaches to this section.

### SPECIAL NO PASSING BARRIER LINES

The specific characteristics and factors leading to the increase or decrease of the No-Passing Zone sight distance from the DOT 55 MPH standard of 0.21 mile, *should* be documented in the Region. If there is a justified special zone, the traffic engineer **shall** give the crew locating no passing zones specific directions as to where barrier lines are to be placed. Special zones *may* include:

- Any intersection justified by an engineering study, appropriate reasons include a crash history related to passing maneuvers or demonstrated operational problems. illustrated on the [SDD 15C8-13b](#)
- In low speed urban areas, double yellow barrier lines *may* be placed when justified by an engineering study. Criteria for the engineering study include curb and gutter, reduced speed, parking allowed, poor stopping sight distance, closely spaced driveways or intersections, and high pedestrian volumes. The double yellow lines *should* be installed from the start of the curb and gutter to the end of curb and gutter through the urban area. When urban double yellow lines are used, 500-foot barrier lines **shall** be placed on the approaches to this special layout, unless a longer no-passing zone takes precedence.
- At a T-intersection that allows vehicles proceeding ahead to legally pass to the right of a left turning vehicle without leaving the paved portion of the roadway, a 500-foot barrier line prior to the start of the bypass taper will be optional based on engineering judgment.



## SIGNING

A No-Passing Zone pennant sign (W14-3) **shall** be installed as required in [TEOpS 2-3-38](#), supplementing zones established under this guideline. This sign **shall** be placed no more than 50 feet from the start of the no-passing barrier line unless it's impossible due to location on a bridge deck or other exception.

### 3-2-3 Special Marking

April 2023

#### GENERAL

Special pavement markings consist of arrows, symbols, words, stop lines, crosswalks, diagonals, and aerial/vascar enforcement markings. These markings *may* be used to supplement signing. When used, they **shall** conform to the requirements in Section [3B](#) of the WISMUTCD and the following guidelines.

#### POLICY

Most special markings **shall** be white and reflective.

#### Arrows

In general, arrows are used to supplement signing. There are 3 main types of arrows that WisDOT uses:

1. *Lane Control Arrows*
  - To supplement signing for complicated lane assignments and turn lanes. For mandatory turn lanes, the installation of arrows are required, per [SDD 15C8 sheet b](#)
2. *Wrong Way Arrows (Type 4)*
  - On any freeway off-ramp with high crash rates or unusual or poor geometrics.
  - Intersections or ramps with demonstrated problems of wrong way driving.
3. *Lane Drop Arrows (Type 5)*
  - On any lane drop with high crash rates.

Use [SDD 15C7 sheet c and d](#) for the size and shapes of these markings.

#### Words

Words currently allowed by WisDOT can be found on [SDD 15C7 sheets a and b](#). All words *should* be used at a site with a documented safety problem and discussed with the regional traffic engineer.

- The word, "ONLY", *may* only be used with singular Type 1 or Type 2 lane use arrows. The word, "ONLY", **shall not** be used in a two-way left turn lane.
- The word, "SCHOOL", either single or dual lane marking, **shall** only be used when one of the following criteria applies:
  - In advance of a marked crosswalk, which is typically monitored by a school crossing guard.
  - At a mid-block or uncontrolled intersection. The requestor **shall** be responsible for maintenance of the "SCHOOL" marking in combination with the crosswalk marking. This **shall** be documented on the application/permit form, DT2136 and the crosswalks policy under the "Type of Crosswalk Marking, Other". The required detail **shall** comply with [SDD 15C7](#).
  - *Should not* be installed in a parking lane.
- "BIKE LANE" **shall** only be used with a signed bike lane.
- "YIELD" *may* only be used at roundabouts where there is a documented safety issue.
- The word, "OK", **shall not** be used on any state maintained highways.

#### Symbols

Symbols **shall** conform to the [SDD15C7 sheet a](#) and **shall** only be used when the following criteria applies:

- At a site with a documented safety problem.
- Supplement to regulatory signage.
- At the discretion of the regional traffic engineer.

### **Chevron/Diagonal Markings**

Chevron/Diagonal markings provide added emphasis to the neutral area where driving is discouraged. Chevron markings *may* be applied at gores., refer to the [FDM SDD 15C 31 sheet a and b](#). Yellow diagonal markings *may* be used in medians, refer to [SDD 15C18](#) and [SDD 15C21](#).

### **Stop Lines**

Stop lines indicate where vehicles are required to stop at intersections. Stop lines are not required at all intersections, but *may* be desired if:

- An approach to a signalized intersection where detection is installed and stopping at a certain point *may* enhance the operation.
- Intersection approaches with unusual geometrics such as large skew angles or non-symmetric approaches.
- Complex multilane approaches.
- An approach to an intersection with the STOP sign installed well in advance of the desired stopping point because of curb radii.
- In advance of a marked or unmarked crosswalk with significant pedestrian volumes.

For placement of stop lines refer to [SDD 15C33](#). If the stop lines are required by the department, the Department will maintain the markings. All other stop lines and crosswalks *may* be marked by contract at the request of the municipality with the understanding that the local agency assumes responsibility for the maintenance.

### **Crosswalks**

Crosswalks mark the path at which pedestrians *should* cross the roadway by delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops. As a secondary purpose, crosswalk markings *may* also serve to alert drivers of a pedestrian crossing point without signal or stop control. At non-intersection locations, crosswalk markings legally establish the crosswalk.

The Department policy for installation of crosswalks is as follows:

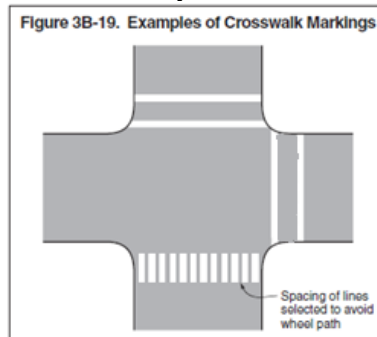
- Crosswalk markings *should* be installed at signalized intersections where pedestrian signal indications are present and at locations where there is a signed school crossing.
- Crosswalk markings *should not* be installed at non-intersection, mid-block locations or urban locations where posted speed limits are 45 MPH or more, unless traffic controls (all-way stop, signal, roundabout) or crossing enhancements (curb bump outs, median divider island, etc.) are present.
- Non-intersection crosswalk markings **shall not** be permitted at rural locations with a posted speed limit of 45 MPH or more. Exceptions *may* include trail crossings where advance warning signs are present.
- A permit for crosswalk markings *should not* be approved if a sidewalk or trail approach and/or ADA-compliant curb ramps (where there is curb) do not currently exist or are planned outside the roadway limits on both sides of the crosswalk approach. Per approval of the Region Traffic Engineer, the local government *may* be permitted to maintain existing crosswalk markings without sidewalk and/or ADA-compliant curb ramps as long as the local unit of government agrees to become compliant with the next highway project (regardless of sidewalk or curb work) or local sidewalk project.
- A permit for crosswalk markings **shall not** be approved unless parking is prohibited within 15 feet of the near limits of the crosswalk, as referenced in Wisconsin State Statute 346.53(5).

### **Crosswalk Type Selection**

There are 2 types of crosswalks that WisDOT allows as shown in Figure 3B-19 of the WISMUTCD

- Two 6" Transverse Lines at all intersections
  - Preferred method due to:
    - Reduced maintenance cost

- Less marking area to become slippery and cause problems
  - Reserve ladder bar for the areas with safety issues
- 24" Ladder Pattern
  - Midblock crossings
  - Multi-lane roundabouts where there is a high presence of pedestrians during peak hours or a demonstrated operational or safety issue. Consult the Region Traffic Engineer and Bike/Ped Coordinator for concurrence.
  - High pedestrian volumes
  - Locations with identified safety issues or risks



Crosswalk markings *should* be placed as nearly perpendicular as possible to the direction of travel on the roadway. The following form needs to be completed to permit a municipality to install and maintain a crosswalk DT2136. A signed copy of the permit **shall** be sent to the local unit of government and a copy **shall** be filed in the Region office. Block pattern crosswalks are paid for by linear feet of each block.

### **Special Marking Treatments for Crosswalks**

FHWA has published an official WISMUTCD Ruling, dated August 15, 2013 that allows subdued-colored aesthetic pavement treatments between legally marked transverse crosswalk lines. However, the following criteria **shall** apply:

- The colored pavement treatment **shall not** be made of retroreflective material.
- Transverse crosswalk lines **shall** delineate the edges of the crosswalk and **shall** be 2-6" white transverse lines.
- Examples of acceptable aesthetic pavement treatments include brick lattice patterns, paving bricks, paving stones, cobbles or other types of paving. All treatments cannot impede wheelchair pedestrians.
- Examples of acceptable colors for aesthetic pavement treatments are red, rust, brown, burgundy, clay, tan or similar earth tone equivalents.

### **Funding**

Funding for new crosswalk markings, replacement of existing crosswalk markings or new and replacement colored pavement treatments, is entirely the responsibility of the local government permittee except as follows:

- As part of a highway improvement (new or altered pavement surface) project:
  - Funding of the initial installation and/or colored pavement treatments *may* be included in the project cost without local participation or as outlined in [FDM Section 11-3](#).
  - Routine maintenance of the crosswalk markings between successive improvement projects **shall** be entirely the responsibility of the permittee.
- At signalized intersections with pedestrian signals and at roundabouts:
  - Regions have discretion to maintain the crosswalk marking where sidewalks and ADA compliant ramps are present.

If the local unit of government desires any marking beyond the standard transverse 6" wide lines, the extra cost and maintenance of the marking or colored pavement is borne by the local unit of government.

### **Aerial Enforcement and Vascar Enforcement Bars**

Aerial and Vascar Enforcement Bars are transverse markings placed on the roadway to assist law enforcement agencies in the enforcement of speed regulations. These markings are a series of two to five bars with a center-to-center spacing of 660 ft. and **shall** conform to the [SDD15C14](#).

- Aerial –These lines are utilized by airplane to determine vehicle speeds from the air.



- VASCAR (Visual Average Speed Computer and Recorder) – These lines are utilized at ground locations for speed monitoring and verification of distance traveled.

Wisconsin State Patrol is the authority on these markings in cooperation with the Division of Transportation System Development to determine the quantity and locations of these markings for the use on state trunk system. Wisconsin State Patrol will notify the Regional traffic office for new locations that are needed or those that need to be remarked. Actual marking of the lines will be done by the Special Marking Contractor as the work schedule permits. A representative of State Patrol **shall** mark the locations of the lines with a small paint stripe prior to placing markings. A car can be provided by State Patrol for Traffic Control during the marking process, if the project engineer deems it necessary.

### **Parking on State Highways**

Parking on State Highways is not encouraged due to the impacts on traffic flow, safety, highway operations, and maintenance. Parking on State Highways is only allowed when a municipality agrees to establish **and** maintain the parking lanes.

This policy is consistent with provisions of [Section 86.32\(4\)](#) of the Wisconsin State Statutes for connecting highways, section 3B.19 of the Wisconsin MUTCD, MUTCD Part 8, and FDM Chapter 17. The Region, after Regional Traffic Engineer review, *may* issue a permit or sign an agreement with local municipalities to allow the marking of parking spaces on the state highway. Installation and marking of parking spaces *may* appear in contracts for state highway work after a project agreement with local cost participation is finalized. Parking space **shall** follow SDD 15C36.

### **Parking Restrictions**

Yellow curb markings *may* be installed on state highways to restrict parking. Yellow curb markings **shall** be accompanied by No Parking Signs or covered in State Statute 346. WisDOT will not pay for or maintain these markings.

### **Corrugated Median**

Corrugated medians are used to delineate the raised section of a median. If the raised part of the median is separating opposing directions of traffic it *should* be painted in a set of double yellow solid lines on both sides of the median and the raised part of the median *may* be painted in yellow. If the raised part of the median is separating traffic in the same direction of traffic a double set of white solid lines **shall** be used and the raised part of the median *may* be painted in white.

### **Railroad markings**

Railroad markings **shall** follow SDD 15c9 and include the RR, X and 3 stop bars. The RR is set before the X to reduce the amount of wear on the marking from traffic. Railroad insurance is required if you are painting any part of the railroad marking.

### **Outfall markings**

Outfall markings are white 8" x 8" Epoxy squares. Follow SDD 8d15 for placement.

## **3-2-4 Island Marking**

**March 2019**

### **PURPOSE**

This policy explains the concept of how islands **shall** be marked consistent with WISMUTCD Section [3B.23](#)

### **POLICY**

Channelizing lines **shall** be placed upstream and adjacent to islands. The color of the pavement marking adjacent to the island **shall** be indicative of the function of the island.

- If an island separates traffic flowing in the same direction, such as a right or left turn island, the pavement markings along the island *may* be left unmarked. If marked it **shall** be white.
- If an island separates opposing traffic, such as a median island, the pavement markings **shall** be yellow.

Channelizing lines *may* be extended to address a demonstrated problem.

Refer to [SDD 15C18 and 15C27](#) for details on how to mark a Turn Lane Island, Median, and Corrugated Median

**3-2-11 Raised Pavement Markers****March 2017****PURPOSE**

Raised pavement markers are used to either supplement or substitute longitudinal pavement markings. These retroreflective units are either placed on top of or embedded into the pavement. Section [3B.11 to 3B.14](#) of the WISMUTCD covers the installation of raised pavement markers, and Section [6F.79](#) covers temporary raised pavement markers. This policy will clarify application of raised pavement markers on WisDOT maintained roadways.

**POLICY**

The color of the raised pavement markers **shall** match the color of the line that they supplement or substitute.

Plowable raised pavement markers **shall not** be used on state-maintained roadways. Existing plowable raised pavement markers **shall not** be covered over during a resurface project and **shall** be removed, prior to resurfacing the roadway.

Temporary Raised Pavement Markers, Type I (Pucks)

Temporary Raised Pavement Markers Type I *may* be used in construction zones to supplement pavement marking through shifting tapers. If used in shifting tapers within construction zones, temporary raised pavement markers **shall** remain in place until the traffic staging changes. They **shall** be placed every 50 feet.

Temporary Raised Pavement Markers, Type II (Tabs)

Temporary Raised Pavement Markers Type II **shall** be used to substitute pavement markings which are completely covered. Permanent markings **shall** be installed within 14 days of the marking being obliterated.

On undivided roadways, W8-12 “NO CENTER LINE” signs **shall** be used to warn motorists of a roadway without any centerline until temporary or permanent markings are installed. These signs **shall** be placed at the beginning of the project, at two-mile intervals throughout the project, and at locations where traffic enters the project area from intersections with state trunk and county trunk highways.

On undivided roadways, prior to the existing marking being obliterated, the locations of the existing pavement markings, including no passing zones, **shall** be documented. In addition, prior to the existing marking being obliterated, the R4-1 DO NOT PASS sign **shall** be installed at the beginning of the no passing zones. Additional R4-1 DO NOT PASS signs **shall** be installed within any no-passing zone that continues beyond an intersection with a state or county trunk highway or that exceeds one mile in length. The R4-2 PASS WITH CARE sign **shall** be installed at the downstream end of the no passing zones. Once the permanent pavement marking has been re-established, the R4-1 and R4-2 signs **shall** be removed.

If the above signs are in place for less than seven continuous days and nights, rollup signs and stands *may* be used in lieu of post mounted signs.

Same-day pavement marking *may* be used in lieu of using Temporary Raised Pavement Markers, Type II.

The standard application of Temporary Raised Pavement Markers, Type II **shall** be installed as shown on Standard Detail Drawing [15C34](#).



# Traffic Engineering, Operations & Safety Manual

## Chapter 3 Markings

### Section 4 Maintenance

#### 3-4-1 Maintenance of Markings

April 2022

##### PURPOSE

The purpose of this policy is to provide guidance for the maintenance responsibility of pavement markings on state maintained roadways as to what markings the State will maintain and what the local municipality will maintain.

##### POLICY

The State **will** maintain:

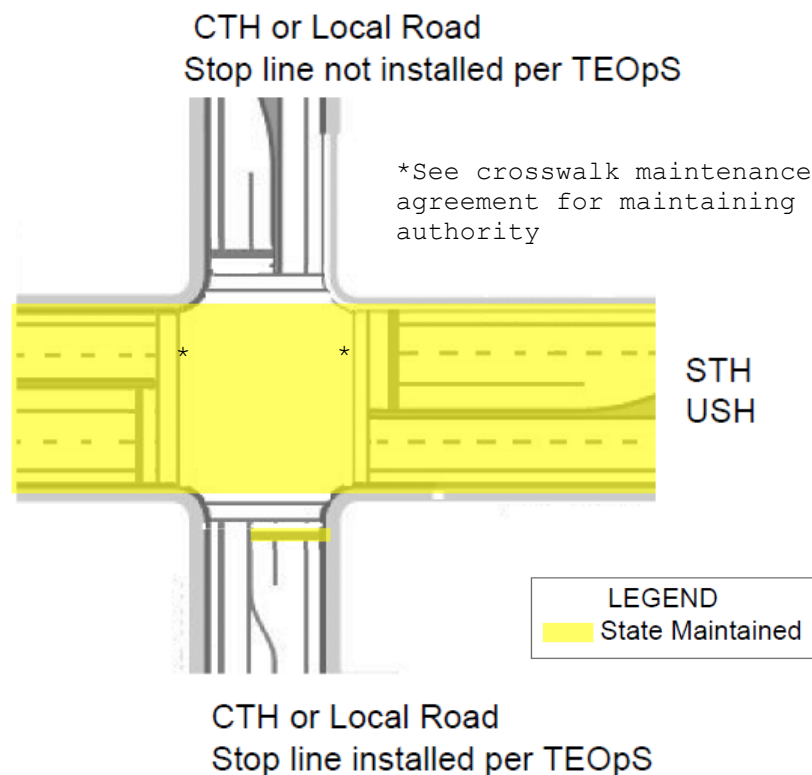
- All markings on STH, USH, or IH except for permitted markings.
- All markings within a roundabout including island gores.
- Stop lines if they meet the requirements in [TEOpS 3-2-3](#).
- Rest areas and weigh stations.

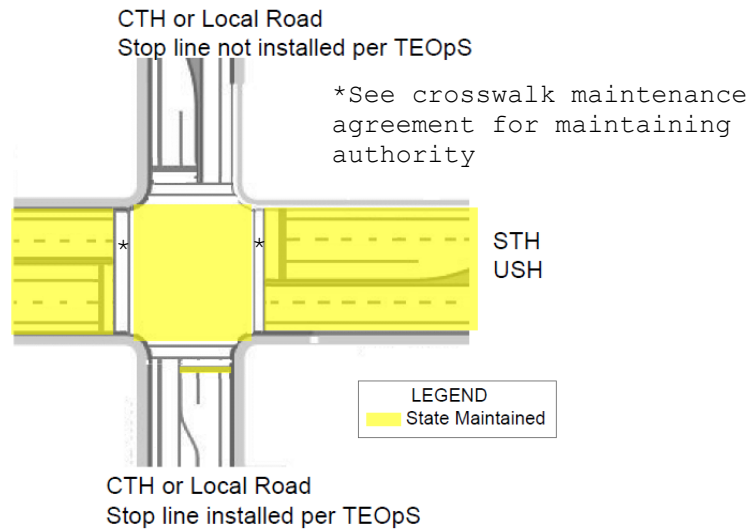
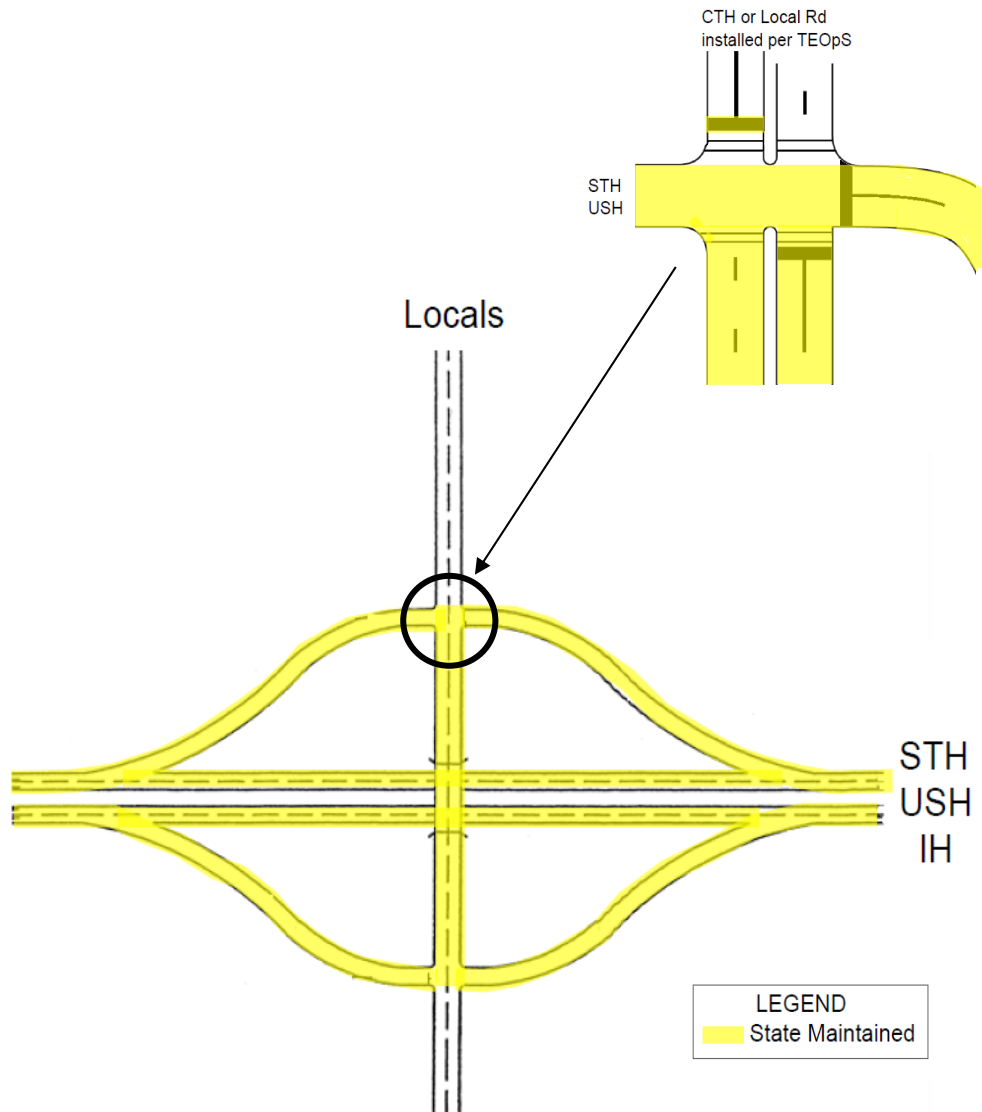
The State **will not** maintain:

- Edge lines/centerlines on local roads and connecting highways, including non-state approaches to a roundabout.
- Crosswalks and special markings on local roads and connecting highways.
- Permitted markings on state highways.
- Shared use path markings and bike lane symbols.

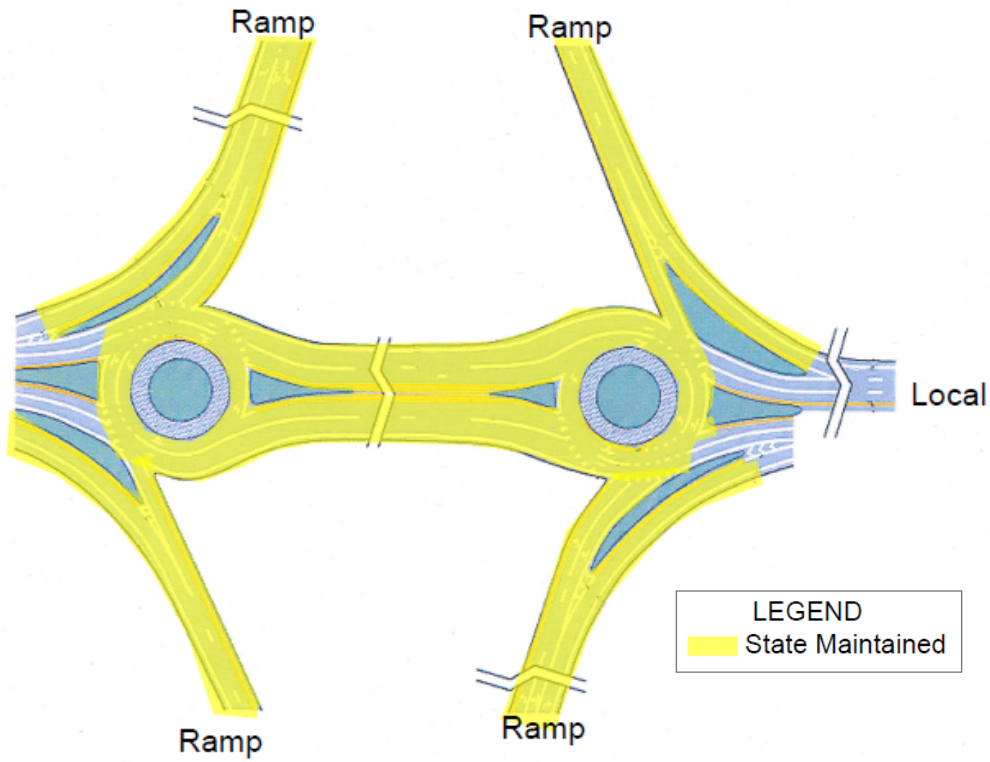
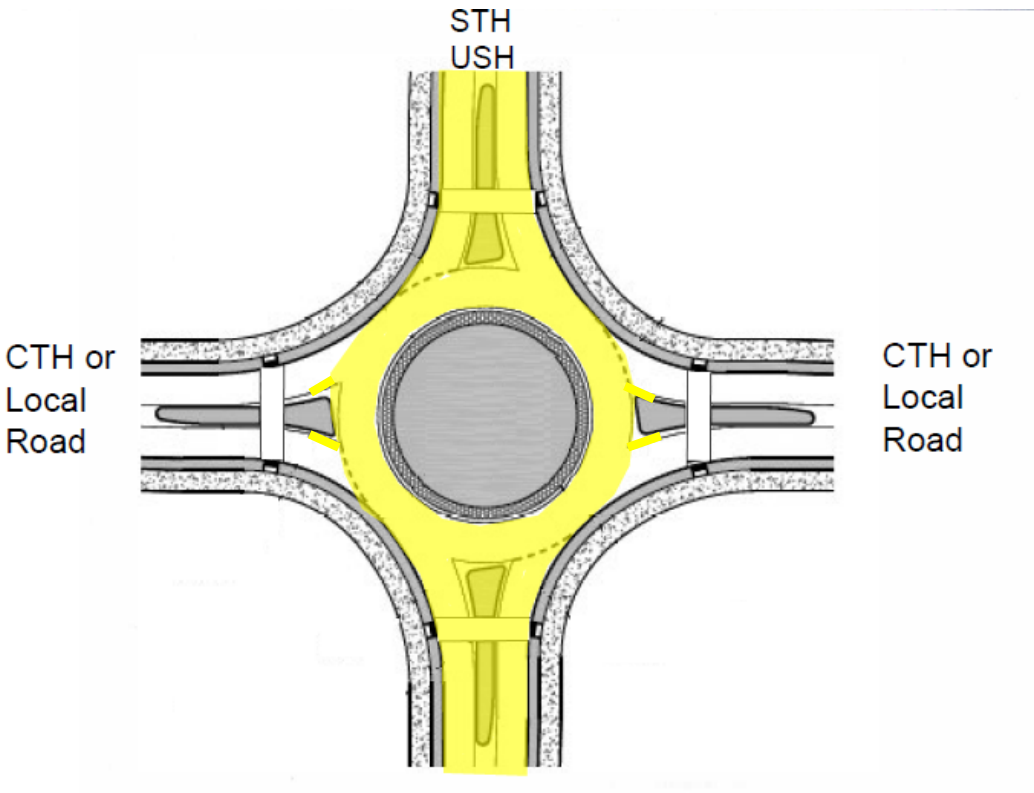
Some examples are shown below.

##### Signalized Intersections



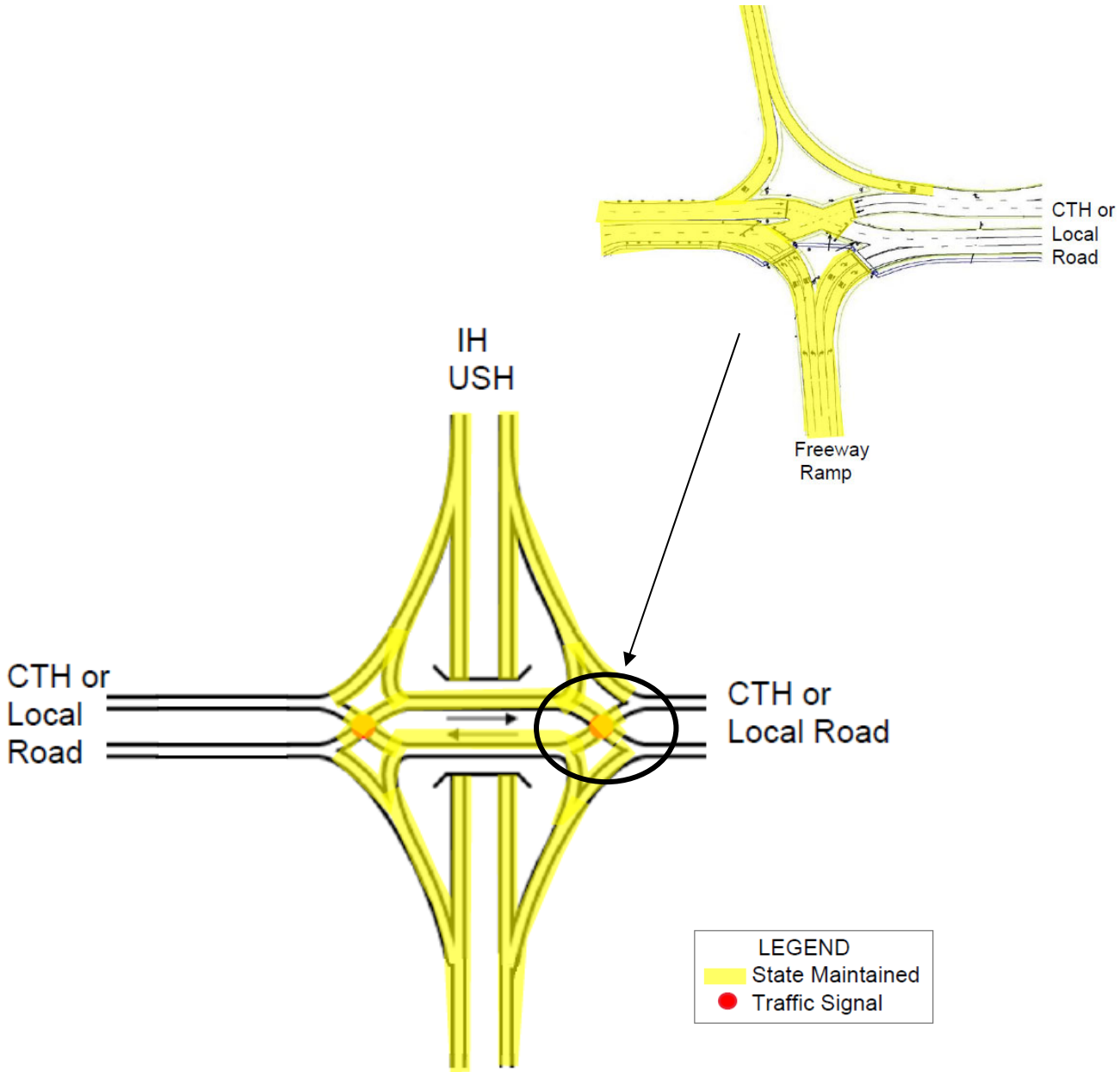
**Non-Signalized Intersections****Interchange Ramps**

**Roundabouts**





Diverging Diamond Interchange





#### 3-10-1 Pavement Marking Material Selection Policy

April 2024

##### PURPOSE

Uniformity in the application of pavement markings materials on state highways is very important because it will provide for consistency of motorist expectations, which can enhance traffic safety. Consistency of application will result in the most efficient usage of dollars (both for projects and maintenance) for pavement markings. In turn, this will lead to a sustainable pavement marking program that will provide effective pavement markings to address the needs of motorists at the most economical cost.

This policy provides direction on what types of pavement marking materials are used on the different types of roadways.

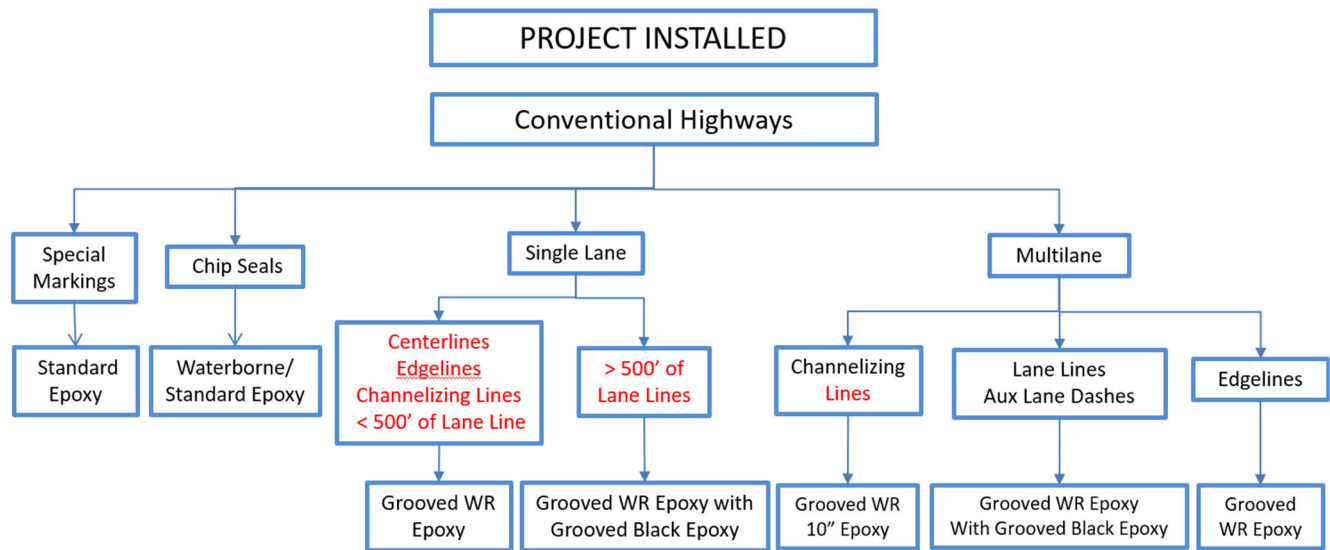
It is recognized that there *may* be times where unique situations could necessitate a deviation from this policy. Unique locations or non-standard markings **shall** be discussed with the Regional Traffic Signing and Marking Engineer prior to including such markings in contract plans.

Any pavement marking material usage requests that are not on the Department's Approved Products List **shall** be reviewed and approved by the Bureau of Traffic Operations prior to usage. Any shortages of pavement marking materials or vendors requesting usage of new products **shall** be referred to the Bureau of Traffic Operations.

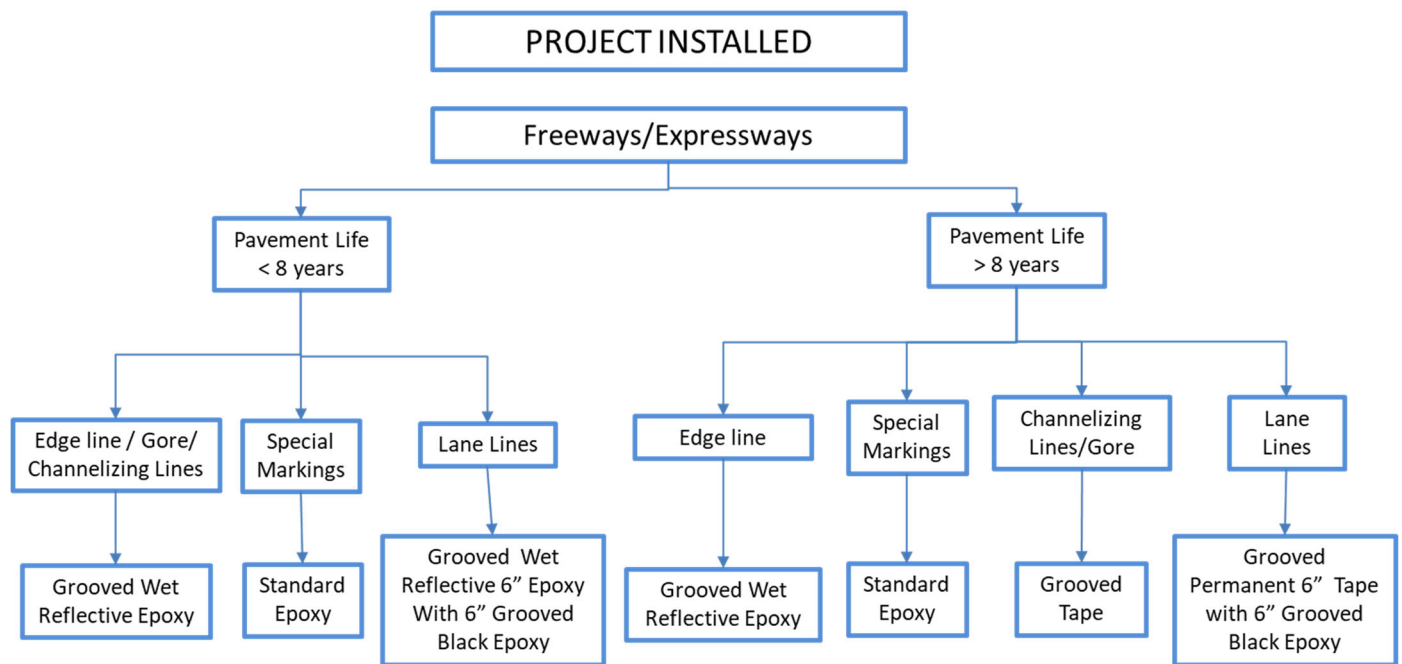
##### POLICY

The type of pavement marking material used on state highways is provided below in the flow charts. The flow charts are for project installed pavement markings and maintenance installed pavement markings. These charts **shall** be utilized when making the decision to select the proper pavement marking material for the roadway.

- When utilizing the flow charts, the following criteria **shall** be kept in mind: If a contrast epoxy product already exists, retrace only the white portion of the epoxy unless the black aggregate is visually missing.
- Grooved Wet Reflective Epoxy **shall** only be remarked in kind if an existing groove has maintained adequate depth.
- If preformed thermoplastic is present, remove preformed thermoplastic markings and replace with a product listed on the associated flow chart. Retracing preformed thermoplastic is **NOT** permitted.
- If tape is present and still bonding, retrace marking with a product listed on the flow chart product. However, if the tape product is failing, remove tape and replace with epoxy.



On local and connecting highway projects consult with maintaining authority for product selection.



On local and connecting highway projects consult with maintaining authority for product selection.

**3-10-2 Pavement Marking Replacement Criteria****April 2024****PURPOSE**

Over time the visual characteristics of pavement markings deteriorate as a result of age, traffic wear, snow plowing and ultraviolet radiation, resulting in reduced visibility. As a result, pavement markings have to be replaced as part of a routine pavement marking replacement. Often questions arise as to when pavement markings *should* be changed, who *should* replace the pavement marking, and what criteria *should* be used in determining replacement. Therefore, it is necessary to have clear, consistent guidelines for the replacement of pavement markings on state highways.

**FEDERAL HIGHWAYS MINIMUM PAVEMENT MARKING RETROREFLECTIVITY VALUES**

Section 3A.03 of the MUTCD requires all units of government to use an assessment or management method that is designed to maintain the retroreflectivity of longitudinal pavement markings at or above:

- 50 mcd/m<sup>2</sup>/lx on roadways with a speed limit greater than 35 mph
- 100 mcd/m<sup>2</sup>/lx on roadways with a speed limit greater than 70 mph

To maintain compliance with the minimum pavement marking retroreflectivity values in the MUTCD, WisDOT utilizes the following approved assessment and management methods:

1. Service Life Based on Historical Data. Age and product type is tracked, and markings are replaced when it reaches its historical data replacement life expectancy.
2. Measured Retroreflectivity. Retroreflectivity of durable markings is measured on an annual basis. Due to the timing of LETs markings will need to be scheduled for replacement a year before they will fall under the required retroreflectivity. Over time the service life based on historical data cycle *may* be revised based on data from the Measured Retroreflectivity.
3. Service Life Based on Monitored Markings. Replacement of pavement markings in the field is based on the performance of a sample of control markings. The data from the control markings can provide engineering support to the Service Life Based on Historical Data method. Over time the service life based on historical data cycle *may* be revised based on data from the Monitored Markings.

**DETAILED PAVEMENT MARKING REPLACEMENT POLICY****Service Life Based on Historical Data**

1. The Department's Traffic Operations Asset Management System (TOAMS) **shall** be used to track inventory data on pavement markings that include install date, product type, and painted footage.
2. In general, replace:
  - a. Waterborne every year
  - b. Epoxy every 3 Years
  - c. Black lag should be installed on epoxy retrace projects where lane lines are being retraced.
  - d. Wet reflective epoxy 5 years
    - b.i. Will only be replaced if the groove has sufficient depth to support another application of wet reflective epoxy, otherwise standard epoxy should be used.
  - ~~e. Tape every 10 Years~~
3. Markings needed for let projects **shall** be replaced using the flow chart in 3-10-1 and 6-6-78.
4. Waterborne pavement marking will be replaced by County Highway Departments, through Traffic Maintenance Agreements. WisDOT **shall** provide a pavement marking material contracts for the County Highway Departments to purchase from.
5. Durable pavement marking products will be replaced by LET Contracts.

**Measured Reflectivity**

1. Markings no longer meeting minimum retroreflectivity *should* be replaced.

2. Every year mobile and/or handheld retroreflectivity readings are taken on state-maintained highways.
3. Durable markings *should* be *scheduled* for replacement when the roadway reaches a retroreflective value of 140. Scheduled replacement is above the minimum retroreflectivity because the retroreflectivity readings are collected from May to September and those readings are used for the next years LET.

### **Service Life based on Monitored Markings**

Due to staffing issues, size of state, and limited window to collect retroreflective readings, Wisconsin will also use the monitored markings service life. Monitored service life will be used to verify the service life based on historical data and used to replace other markings at the same age, similar traffic volumes and location within the state.

\*While retroreflectivity is very important that is not the only performance indicator that will be looked at for replacement of markings.

### **SPECIAL MARKINGS**

Special markings are not covered under Section 3A.03 of the MUTCD. However, WisDOT still feels these markings are important. Arrows, words, symbols, stop lines, yield markings, dotted extensions, railroad crossings, crosswalks, and diagonals *should* be replaced on the same cycle as longline markings. Curb markings, island noses, corrugated median, and chevron gore markings *should* be replaced as needed.





# Traffic Engineering, Operations, & Safety Manual

## Chapter 3 Marking

### Section 25 Field Crew Guidance

#### 3-25-1 Field Crew Guidance and Contacts

April 2023

#### PURPOSE

This subject was developed to provide guidance to improvement project inspectors as well as Department and County field and maintenance crews for the installation, service and maintenance of all types of highway signs and pavement markings on the State Highway network. The goal for this manual is to install signs and pavement markings to provide a safe, understandable and efficient system of guidance to the motoring public.

These guidelines are intended to provide a framework of policies and practices for the systematic reporting and handling of pavement marking installation and replacement or sign repair activities done by others under the direction of the Wisconsin Department of Transportation through its Regions. It is inherent these guidelines that the basic thrust be to promote safety of the motorist, safety for the improvement and maintenance crews and standardization of practices toward uniform application and appearance statewide.

Improvement project crews and maintenance crews will perform their operations in accordance with the Wisconsin Manual on Uniform Traffic Control Devices, Traffic Guidelines Manual and other Department policies as referenced within.

The Department recognizes these guidelines *may* require adjustments and revision as they are implemented.

#### INSTALLING MARKINGS

Pavement marking **shall** be in accordance with the WMUTCD, Facilities Development Manual and the Wisconsin Standard Specification Manual.

##### Types of Roadway Markings

Skip line is a broken or dashed line. The standard is a 12.5' line with a 37.5' gap.

Dash is a painted portion of a skip line. Typically a 3' line with 9' gap.

Cat track is a painted line for guidance. Typically a 2' line with a 6' gap.

Channelizing line is double the thickness of a standard line. Typically 8".

##### County Maintenance

Counties will be given segments of roadways that need to be painted. The scheduling of pavement marking operations will be left to the county. Counties will then be able to schedule their crews to what fits their needs, but the work **shall** be completed in a timely manner. WisDOT is requiring all marking to be placed at or above manufacture specifications. Each stripping crew is responsible for completing the Pavement Marking Daily Report. These reports **shall** be sent to the Regional Pavement Marking Coordinator or representative at the end of every week. State actual time spent not painting at the bottom of the report (drive time, weather delay, maintenance, etc.)

##### Improvement/Refurbishment Projects

Install per Spec 646, 647, and 649.

#### FIELD OPERATIONS

Paint and Beads **shall** be purchased off of the Statewide Bid for all State work. It **shall** be the responsibility of the County to order all paint and beads, unless other arrangements have been made with the Region. Return all empty paint totes to the provider. For application standards see the appropriate section below.

##### No Passing Zones

- No Passing Zone "T" is a mark on the roadway, which indicates the beginning and ending points of a barrier line.
- No Passing Zone "X" on the end of a line indicates that it needs to be extended or removed.
- No Passing Zone Dot indicates the center of the roadway.

Figure 1. New Marking

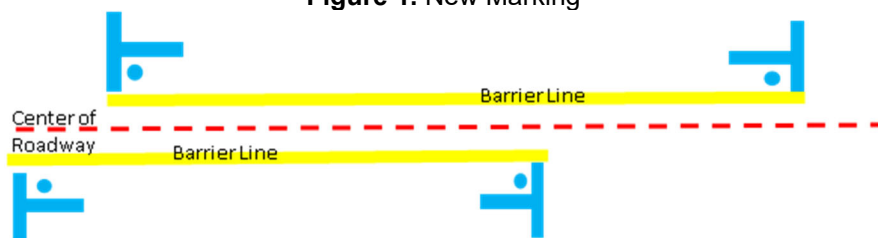


Figure 2. Existing Marking Extension

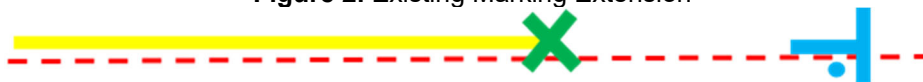


Figure 3. Existing Marking Removal



## **Waterborne Paint**

### **General**

Store waterborne paint in a dry area that will not freeze. Do not store paint for more than 12 months. Keep in mind the weather will drastically change the dry time of this product. Humidity and cooler weather are the biggest factors. Please let the Marking Coordinators know of any and all issues with the paint.

### **Types of Spraying**

There are 2 ways to spray paint:

- Conventional: Air jets with a pressure (60 psi to 140 psi) at the tip of the paint gun that breaks up the paint. The tip defines the size of the line.
- Airless: The pressure created by the pump forces paint out through an orifice in the tip of the gun. The angle and size of tip affect the size of the line.

### **Temperature**

Refer to manufacture specifications for the temperature the paint *should* be applied at. Typically the ambient temperature *should* be above 50°F.

### **Beads**

Wisconsin is currently using the AASTHO Type I bead gradation with 80% rounds. These can also be purchased off of the State Contract.

### **Application**

Product	Mil thickness	Gallons per Mile	Feet per Gallon	Lbs Beads per Gallon
Paint	16	26.4	200	10

## **Epoxy**

### **General**

Epoxy is a two part system. Epoxy has a longer life expectancy and can be applied at lower temperatures; however, it takes longer to dry than waterborne paint. Epoxy has a life expectancy of 3-5 years. Humidity and cooler weather are the biggest factors. Please let the Marking Coordinators know of any issues.

### **Mixing**

Since epoxy is a two part system the resin has to be mixed with a hardener. Typically it is 2 parts resin to 1 part hardener.

### **Temperature**

Refer to manufacture specification for the temperature the epoxy *should* be applied at. Typically the ambient

temperature *should* be above 35°F

### Beads

Wisconsin is currently using the AASTHO Type I bead gradation with 80% rounds. See table above for how many pounds of beads per gallon are required.

### Application

Product	Pavement Type	Mil Thickness	Gallons per Mile	Feet per Gallon	Beads per Gallon
Epoxy	SMA/ Seal Coat/ Epoxy Overlays	25	41.1	129	25
Epoxy	All Others not stated above	20	32.8	161	22.5

### Reflective Glass Beads

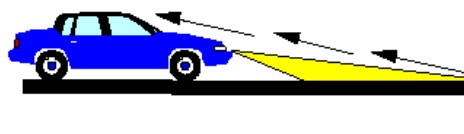
#### General

Beads are added to lines to increase the visibility of the lines at night. The beads help reflect light from a vehicle back to the driver as shown in the picture to the right.

**Figure 1: No Beads**



**Figure 2: Beads added**



Optimum embedment of beads is 50-60%. Anything less than that *may* cause the beads to pop out and any more than that affects how much light the bead can reflect back to the driver.

#### Bead Calibration

Bead calibration is very important since to many beads is expensive and doesn't adhere to the paint, and not enough beads can result in low retros. Hold a container under the bead gun for 10 seconds. Measure beads in milliliters. Use the table below to measure the volume of beads in milliliters per 10 seconds for a 4" wide line drop rate.

**Bead Calibration Chart (AASHTO Type I to Type 4)**

	Lbs/100ft Bead Calibration Chart				
Speed	8 lbs/1000 ft <sup>2</sup>	10 lbs/1000 ft <sup>2</sup>	12 lbs/1000 ft <sup>2</sup>	22 lbs/1000 ft <sup>2</sup>	24 lbs/1000 ft <sup>2</sup>
10 mph	1620	2010	2400	4395	4800
9 mph	1440	1800	2160	3840	4320
8 mph	1275	1605	1920	3525	4320
7 mph	1125	1410	1680	3060	3330
6 mph	960	1200	1440	2640	2880
5 mph	795	990	1200	2190	2400
4mph	645	795	960	1740	1920
3 mph	480	600	720	1320	1440

Source: Ennis Flint Traffic Paint Guide Book

### Troubleshooting Tips

Below are the common problems that occur during painting.

**Table 1: Conventional Paint Application Troubleshooting**

PROBLEM	CAUSE	REMEDY
Excessive Thickness (overall)	<ul style="list-style-type: none"> <li>Paint tank or pump pressure too high</li> <li>Paint gun volume control open too wide (if present)</li> <li>Applicator speed too low</li> </ul>	<ul style="list-style-type: none"> <li>Reduce tank or pump pressure</li> <li>Adjust paint gun volume control</li> <li>Increase speed</li> </ul>
Excessive Thickness (middle of line)	<ul style="list-style-type: none"> <li>Paint tank or pump pressure too high</li> <li>Paint gun volume control open too wide (if present)</li> <li>Atomizing air pressure off or too low</li> <li>Material buildup in paint gun tip and/or shroud</li> </ul>	<ul style="list-style-type: none"> <li>Reduce tank or pump pressure</li> <li>Adjust paint gun volume control</li> <li>Increase atomizing air pressure</li> <li>Clean tip and/or shroud</li> </ul>
Excessive Thickness (along one side)	<ul style="list-style-type: none"> <li>Material buildup in paint gun tip and/or shroud</li> <li>Clogged hole(s) in paint gun atomizing tip</li> </ul>	<ul style="list-style-type: none"> <li>Clean paint tip and/or shroud</li> <li>Clear clogged hole(s) in paint gun atomizing tip</li> </ul>
Insufficient Thickness	<ul style="list-style-type: none"> <li>Paint tank or pump pressure too low</li> <li>Paint gun volume control not open enough (if present)</li> <li>Vehicle speed too high</li> <li>Atomizing pressure too low.</li> <li>Material buildup in paint gun tip and/or shroud</li> <li>Material buildup in paint filter(s) and/or plumbing</li> </ul>	<ul style="list-style-type: none"> <li>Increase tank or pump pressure</li> <li>Adjust paint gun volume control</li> <li>Increase applicator speed.</li> <li>Increase atomizing air pressure</li> <li>Clean paint gun tip and/or shroud</li> <li>Clean paint filter(s) and/or plumbing</li> </ul>

Wide Paint Line	<ul style="list-style-type: none"> <li>• Paint gun set too high</li> <li>• Worn or damaged paint gun tip and/or shroud</li> </ul>	<ul style="list-style-type: none"> <li>• Lower gun</li> <li>• Repair or replace tip and/or shroud</li> </ul>
Narrow Paint Line	<ul style="list-style-type: none"> <li>• Paint gun too low</li> <li>• Paint gun tip slot not at 90° angle to paint line</li> <li>• Clogged paint gun tip and/or shroud</li> <li>• Low air pressure in paint machine tire.</li> </ul>	<ul style="list-style-type: none"> <li>• Raise paint gun</li> <li>• Reposition paint gun tip</li> <li>• Clean paint gun tip and/or shroud</li> <li>• Inflate tire</li> </ul>
Uneven Paint Line (spotty)	<ul style="list-style-type: none"> <li>• Atomizing air pressure too low</li> <li>• Paint tank pressure too low</li> <li>• Old paint (viscosity too high)</li> <li>• Loose paint gun tip and/or shroud</li> <li>• Not enough heat for paint to flow evenly</li> <li>• No shroud</li> </ul>	<ul style="list-style-type: none"> <li>• Increase atomizing air pressure</li> <li>• Increase material tank pressure</li> <li>• Rotate material stock</li> <li>• Secure paint gun tip and/or shroud</li> <li>• Increase heat</li> <li>• Install shroud</li> </ul>

Source "MnDOT Pavement Marking Field Guide"

**Table 2: Epoxy Spray Application Troubleshooting**

PROBLEM	CAUSE	REMEDY
Heavy or Light centers	<ul style="list-style-type: none"> <li>• Inadequate fluid delivery</li> </ul>	<ul style="list-style-type: none"> <li>• Increase fluid pressure</li> <li>• Decrease tip size</li> </ul>
Surging pattern	<ul style="list-style-type: none"> <li>• Pulsating fluid delivery</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce demand</li> <li>• Remove restrictions in supply system</li> <li>• Check individual pump pressures for unequal pressure</li> <li>• Check supply hose for leaks</li> </ul>
"Lop-sided" millage	<ul style="list-style-type: none"> <li>• Worn tip sides</li> <li>• Clogged tip</li> </ul>	<ul style="list-style-type: none"> <li>• Replace tips</li> <li>• Clean tips</li> </ul>
Line too wide	<ul style="list-style-type: none"> <li>• Gun too high</li> <li>• Too wide a fan angle on tip</li> </ul>	<ul style="list-style-type: none"> <li>• Lower gun</li> <li>• Adjust tip size if necessary</li> </ul>
Line too narrow	<ul style="list-style-type: none"> <li>• Gun too low</li> <li>• Too narrow a fan angle on tip</li> </ul>	<ul style="list-style-type: none"> <li>• Change tip size</li> <li>• Decrease speed of application</li> <li>• Verify pressure settings</li> </ul>
Too much or too little hardener	<ul style="list-style-type: none"> <li>• Displacement pumps not properly synchronized</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust pumps</li> </ul>

Source "MnDOT Pavement Marking Field Guide"

**Table 3: Reflective Bead Application Troubleshooting**

PROBLEM	CAUSE	REMEDY
Beads on one side	<ul style="list-style-type: none"> <li>• Bead gun out of alignment</li> <li>• Clogged bead gun</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust alignment of gun cap</li> </ul>
Excessive bead use	<ul style="list-style-type: none"> <li>• Worn gun needle, seat and orifice</li> <li>• Excessive glass bead pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Rebuild gun</li> <li>• Decrease pressure</li> </ul>
Beads in middle of line	<ul style="list-style-type: none"> <li>• Bead tank pressure too low</li> <li>• Bead gun "off" and "on" control screw not adjusted</li> <li>• Bead gun cap out of alignment</li> <li>• Too big of a bead gun tip</li> </ul>	<ul style="list-style-type: none"> <li>• Increase pressure</li> <li>• Adjust control screw</li> <li>• Align cap deflector</li> <li>• Change to a smaller tip</li> </ul>
All beads buried	<ul style="list-style-type: none"> <li>• Bead gun too close to paint</li> <li>• Bead gun angle too shallow</li> <li>• Excessive paint millage</li> </ul>	<ul style="list-style-type: none"> <li>• Re-align bead gun</li> <li>• Adjust angle of bead gun</li> <li>• Check wet millage thickness</li> </ul>
All beads on top of line	<ul style="list-style-type: none"> <li>• Bead gun too far from paint gun</li> </ul>	<ul style="list-style-type: none"> <li>• Re-align bead gun</li> </ul>
Pulsed bead application	<ul style="list-style-type: none"> <li>• Bead tank pressure inadequate</li> </ul>	<ul style="list-style-type: none"> <li>• Raise tank pressure</li> <li>• Rebuild applicator to increase pressure</li> </ul>
Excessive amount of beads beside line	<ul style="list-style-type: none"> <li>• Too much overlap of bead pattern on line pattern</li> </ul>	<ul style="list-style-type: none"> <li>• Move bead gun closer to roadway</li> </ul>

Source "MnDOT Pavement Marking Field Guide"

## CONTACTS

DOT Contacts			
Region	Contact Person	Number	Email
Pavement Marking Staff 3609 Pierstorff St Madison, WI 53704	Jeannie Silver	608-246-5408	<a href="mailto:jeannie.silver@dot.wi.gov">jeannie.silver@dot.wi.gov</a>
SW Region- La Crosse 3550 Mormon Coulee Rd. La Crosse, WI 54601	Kory Keppel	608-785-9953	<a href="mailto:kory.keppel@dot.wi.gov">kory.keppel@dot.wi.gov</a>
SW Region- Madison 3601 Pierstorff St Madison, WI 53704	Jeff Holloway	608-246-3268	<a href="mailto:jeffrey.holloway@dot.wi.gov">jeffrey.holloway@dot.wi.gov</a>
SE Region- West Allis 935 S. 60th St. West Allis, WI 53214	Chuck Saldivar Bree Johns-Konkol	414-266-1164 414-266-1171	<a href="mailto:chuck.saldivar@dot.wi.gov">chuck.saldivar@dot.wi.gov</a> <a href="mailto:bree.johnskonkol@dot.wi.gov">bree.johnskonkol@dot.wi.gov</a>
NE Region- Green Bay 944 Vander Perren Way Green Bay, WI 54304	Steven Herlache	920-492-3512	<a href="mailto:steven.herlache@dot.wi.gov">steven.herlache@dot.wi.gov</a>
NC Region- Wis Rapids 2841 Industrial St Wis Rapids, WI 54495	Al Smith	715-421-8364	<a href="mailto:alan.smith@dot.wi.gov">alan.smith@dot.wi.gov</a>
NC Region- Rhinelander Hanson Lake Rd Rhinelander, WI 54501	Al Smith	715-421-8364	<a href="mailto:alan.smith@dot.wi.gov">alan.smith@dot.wi.gov</a>
NW Region- Spooner W7102 Green Valley Rd Spooner, WI 54801	Ken Jansky	715-225-9318	<a href="mailto:kenneth.jansky@dot.wi.gov">kenneth.jansky@dot.wi.gov</a>
NW Region- Eau Claire 5009 USH 53 South Eau Claire, WI 54701	Ken Jansky	715-225-9318	<a href="mailto:kenneth.jansky@dot.wi.gov">kenneth.jansky@dot.wi.gov</a>

**South West**

Adams	David Johnson	(608) 339-3355
Dane	Robert Peterson	(608) 575-5209
Dodge	Joe Lechner	(920) 210-1760
Iowa	Neil Wegner	(608) 574 2936
Vernon	Phil Hewitt	(608) 606-3777

**Southeast**

Milwaukee	Jake Reinke	(414) 587-5012
Ozaukee	Joe Thoennes	(262) 770-8732
Racine	Mike Kirshling	(262) 770-9690
Walworth	Dave Gross	(262) 949-7835
Washington	Tim Herman	(262) 483-3081
Waukesha	B Kerr	(262) 442-9161

**Northeast**

Brown	Andy Sell	(920) 609-4020
Calumet	Chad Scheinoho	(920) 929-3491
Fond du Lac	John Hoffman	(920) 929-3491
Kewaunee	Ron Schleis	(920) 255-1026
Marinette	Joe Baranek	(715) 923-6874
Sheboygan	Dustin Hammel	(920) 459-9182

**North Central**

Adams	Joshua Oleson	(608) 547-0644
Iron	Kasey Krall	(715) 561-4965
Langlade	Brian Lowry	(715) 853-4742
Portage	David Johnson	(715) 247-4821
Shawano	Brian Lowry	(715) 526-9182
Waushara	George Nigh	(920) 787-3327

**Northwest**

Taylor	Lonnie Ulrich	(715) 965-3141
Trempealeau	Tanner Kidd	(715) 538-3035
Washburn	Fred Gruenhagen	(715) 205-9960



**3-25-2 Field Crew Safety and Training****May 2017****PERSONAL SAFETY**

All Department of Transportation (DOT) personnel **and** any personnel working for the state are required to follow the safety policies stated in the DOT Transportation Administrative Manual (TAM). DOT, county, and contractor personnel **shall** wear:

- Eye Protection: (TAM SD 36)
  - Safety glasses with attached shields
- Foot Protection: Steel-toe boot or shoe (TAM SD30)
- Protective Headgear: (TAM SD 51)
  - Hard hat
- High Visibility Safety Apparel: (TAM SD 57)
  - Reflectorized Safety Vest at all times on or along the roadway
  - Reflectorized Safety Pants during nighttime hours.

Hazard Warning Information - Treated Wood Management (See Exhibit 5)

(Material Safety Data Sheets *should* be requested from the wood post vendor)

**EMPLOYEE RECOMMENDED TRAINING**

All agencies doing work for the DOT *should* make sure their employees are properly trained in the following areas:

1. Field Operations Awareness
2. Shop Tools
3. Major Equipment Operations
4. Utilities Locate. Call Diggers Hotline 811
5. Retraining
6. Vehicle Safety and Inspection

**WORK AREA TRAFFIC CONTROL**

All traffic control **shall** be in compliance with the WMUTCD and Departmental policies. See Standard detail drawings.

Vehicles used in highway signing operations **shall** be equipped with at least two (2) yellow, high intensity rotating beacons, clearly visible from the front, rear and both sides of the vehicle. These beacons **shall** be placed as high as possible on each vehicle. Vehicles **shall** have all warning lights operating when stopped or moving slowly along any highway. Warning lights **SHALL NOT** be displayed while the vehicle is traveling at highway speeds or when traveling between jobs.

When conditions are less than ideal, additional advance warning signs or devices *should* be added to the traffic control layouts. In some cases, the work *should* be deferred until the conditions are more favorable.

All lane closures on two lane roadways require flagging of traffic as well as advance signing and cone placement in the work area. Remember that all flaggers **shall** use stop/slow paddles.

An encroachment into a lane of traffic *may* require cones and/or flagging. The amount of encroachment, the volume and speed of passing vehicles will determine traffic control measures required. For example, a cone *may* be sufficient to mark the point where an outrigger makes contact with the pavement outside the overall width of the truck.

**PUBLIC SAFETY**

Workers **shall** park vehicles off the road as far as practical. Care *should* be taken to not block the vision of existing traffic control devices such as stop signs and signals. Work activities *should* be performed with an assumption the motorist does not know what the workers are going to do.

**UTILITIES**

Utility Locates. Diggers Hotline (811) **shall** be called and located before any work is performed. They *should* be given at least a 3 working day notice.

The following is a five-point plan for utility locates before digging in the highway right-of-way, which covers the routine steps required by Diggers Hotline:

1. Prepare a plan or work location sketch or drawing. Indicate a 25-foot radius around the stake or lath for "MARKING INSTRUCTIONS" for Diggers Hotline.

2. At each locate site, mark with a stake or by painting the pavement or shoulder of the highway. White or pink are the approved colors for ribbons, flags or paint when marking sign locations for utility locates.
3. Identify the exact location by measuring the distance from the nearest intersecting street or highway. Indicate which side of the highway the locate is on.
4. Contact Diggers Hotline to request the area to be located. Retain ticket number for a minimum of six years after work is completed.
5. Investigate the possibility of other utilities having services at the locate site.

Utility Damage Procedure. Damage prevention is the ultimate goal. As stated above it is essential to get clearance from utilities before doing any digging.

- ☐ BEFORE YOU DIG, CONFIRM UTILITIES HAVE BEEN LOCATED

**IF UTILITY DAMAGE OCCURS:**

- ☐ CALL THE UTILITY FROM A SAFE LOCATION AS SOON AS POSSIBLE.
- ☐ CLEAR AREA IF NECESSARY.
- ☐ EXTINGUISH ALL FIRE SOURCES; BE MINDFUL OF LOSS OF LIFE.
- ☐ NOTIFY EMERGENCY SERVICES (IF NECESSARY).
- ☐ NOTIFY SUPERVISOR.
- ☐ BE AVAILABLE ON OR NEAR THE SITE UNTIL REPAIR CREW ARRIVES.

**MAJOR EQUIPMENT OPERATIONS**

It is recommended that field operations that involve digger derricks or bucket trucks will NOT be performed with fewer than two crew persons on the job site.

HAVING A UTILITY LOCATE CLEARANCE DOESN'T NECESSARILY MEAN ALL DANGER HAS BEEN REMOVED.

Derrick operators must be aware of overhead lines to be certain the boom or its attachments remain the required distance away from the overhead lines.

**ACRONYMS & DESCRIPTIONS**

HMA - Hot Mix Asphalt

MSDS - Material Safety Data Sheets

PCC - Portland Cement Concrete

PMC - Pavement Marking Coordinator

TMA - Transportation Maintenance Agreement

Type H Sheeting - Prismatic High Intensity

Type F Sheeting - Prismatic High Intensity Fluorescent Sheeting

**3-25-3 Field Inspections****August 2022****PURPOSE**

This subject was provided to provide guidance to traffic operations staff on quality control of pavement markings on the state system. The goal is to provide safe and efficient ways to spot check the statewide pavement marking program.

These guidelines are intended to provide a framework for checking pavement markings across the state for improvement programs, ~~and~~ [regionwide LETS](#), ~~and BECK data collection~~.

**SAFETY**

All inspectors **shall** wear a high visibility safety vests during the day and high visibility safety vests and pants during nighttime hours. No out-of-vehicle inspections *should* be completed in inclement weather conditions. All vehicles **shall** be parked as far off the road as practical and be equip with lights on the top of the vehicle and hazards on when off the roadway. High ADT roadways 2 people is recommended to act as a spotter.

**INSPECTION**

Inspection will consist of durability or presence of the pavement marking as well as retroreflectivity of the pavement markings. The QA/QC form will be filled out including the date, inspection, route and segment collecting data on. The exact location of the reading *should* be:

- Easy to relocate (i.e., xx feet past intersection, house number, mile marker, etc.)
- Not at a high wear area (no turn lanes, driveways)

Readings must be taken on days when the roadway is dry, and temperatures are above 45F. ASTM E1710 (retro) and E1349 (color) will be followed.

**DATA COLLECTION PROCESS**

Step 1: Calibrate handheld meter in accordance with manufacturers' recommendations at the office.

Step 2: Record exact location following requirements above.

Step 3: All measurements **shall** be taken in the direction of travel. Centerline markings **shall** be taken in both directions.

Step 4: Take picture of each location.

Step 5: On all traffic lanes take 10 retroreflectivity readings every 25 feet or 2 readings per skip for 5 skips. Record findings.

Step 6: Record durability based on ASTM D913-15. Examples can be found [here](#).

Step 7: Repeat Steps 2-6 approximately 3 miles down the road. If the meters are placed back in the box, please recalibrate before collecting readings.

Step 8: Repeat Steps 2-6 approximately 3 miles down the road. If the meters are placed back in the box, please recalibrate before collecting readings.

Step 9: Visually inspect roadway at highway speed. For ~~BECK~~ [mobile retroreflectivity](#) routes only one county per route needs to be evaluated.

Step 10: Upload records to [\BoxDrv\Box\DTSD\DTSD-BTO\Traffic\Marking\RegionwideLETS](#)

**~~WHEN TO COLLECT READINGS – BECK~~**

~~Collect readings 1-3 weeks after crew has collected readings and before payment of invoices. BTO will collect retros on BECK routes. Readings will be collected on 5 routes per month per crew. Forms will be saved here: [\BoxDrv\Box\DTSD\DTSD-BTO\Traffic\Marking\RegionwideLETS](#)~~

**WHEN TO COLLECT READINGS - REGIONWIDE LETS**

Collect readings 2-3 weeks after crew has placed markings and before payment of invoices. Readings will be collected on 2 route per month per crew. Regions will be able to select which routes they want to collect data on. BTO can be asked to check color of the yellow marking if regions deem it necessary. Forms **shall** be saved as the project ID in this folder: [\BoxDrv\Box\DTSD\DTSD-BTO\Traffic\Marking\RegionwideLETS](#)

**WHEN TO COLLECT READINGS – COUNTY WORK**

Collect retro readings 2-3 weeks after crew has placed markings and before payment of invoices. Readings will be collected on 2 route per month per crew. Regions will be able to select which routes they want to collect data on. BTO can be asked to check color of the yellow marking if regions deem it necessary. If possible collect mil thickness of the markings on 2 routes per month. Forms **shall** be saved as the project ID in this folder: [\BoxDrv\Box\DTSD\DTSD-BTO\Traffic\Marking\RegionwideLETS](#)

**WHEN TO COLLECT READINGS – IMPROVEMENT PROJECTS**

Collect readings at least 2 weeks after crew has placed markings. Readings will be collected on 10 improvement projects per summer depending on weather and time of year. Temperatures must be higher than 45F. If possible, collect mil thickness of the markings. Regions will be able to select which projects they want to collect data on. Regions can also have a consultant collect this data using the regions or consultant's meters. Contractors' meters *should not* be used. BTO can be asked to check color of the yellow marking if regions deem it necessary. Forms **shall** be saved as the project ID in this folder: [\BoxDrv\Box\DTSD\DTSD-BTO\Traffic\Marking\RegionwideLETS](#)

**RECALIBRATION**

Recalibrations *should* be done every 5 years.