

## Internal Memo for Posting

**Date:** April 8, 2022

**From:** Derek Leuer, PE. Office of Traffic Engineering (OTE).

**RE:** FHWA Proven Safety Countermeasures & MnDOT Practices Regarding HSIP Eligibility

The Federal Highway Administration (FHWA) recently updated their listing of the “FHWA Proven Safety Countermeasures”. This memo is intended to briefly explain Minnesota’s current position on funding and eligibility of these items in regard to using Federal Funding with the Highway Safety Improvement Program (HSIP).

The Minnesota Department of Transportation currently administers the HSIP program in a competitive solicitation. Projects and project types submitted may be eligible for funding, but are not guaranteed to be funded to the limited amount of available funds and numerous submissions in every solicitation.

The current FHWA Proven Safety Countermeasures are located at the following website.

[Proven Safety Countermeasures | Federal Highway Administration - Safety | Federal Highway Administration \(dot.gov\)](#)

Below is a brief synopsis followed by a more detailed summary of each focus area and countermeasure and their respective eligibility in the HSIP program.

<b>Brief Synopsis</b>	
<b>Category/Description</b>	<b>MnDOT HSIP ELIGIBLE?</b>
<b>Speed Management</b>	
<b>Speed Safety Cameras</b>	Not currently
<b>Variable Speed Limits</b>	Not currently
<b>Appropriate Speed Limits for All Road Users</b>	Encouraged, not fundable
<b>Roadway Departure</b>	
<b>Wider Edge Lines</b>	Yes, with risk-rankings and/or crash history
<b>Enhanced Delineation for Horizontal Curves</b>	Yes, with risk-rankings and/or crash history
<b>Longitudinal Rumble Strips and Stripes on Two-Lane Roads</b>	Yes, with risk-rankings and/or crash history
<b>Safety Edge</b>	Yes, with risk-rankings and/or crash history
<b>Roadside Design Improvements at Curves</b>	Yes, with risk-rankings and/or crash history
<b>Median Barriers</b>	Yes, with risk-rankings and/or crash history

<b>Brief Synopsis</b>	
<b>Category/Description</b>	<b>MnDOT HSIP ELIGIBLE?</b>
<b>Intersections</b>	
<b>Backplates with Retroreflective Borders</b>	Yes, with risk-rankings and/or crash history
<b>Corridor Access Management</b>	Encouraged, not fundable.
<b>Dedicated Left- and Right-Turn Lanes at Intersections</b>	Yes, with higher risk rankings, safety planning and competitive costs
<b>Reduced Left-Turn Conflict Intersections</b>	Yes, with risk-rankings and/or crash history
<b>Roundabouts</b>	Yes, but typically with K+A Crash History, higher risk rankings, safety planning, and competitive costs
<b>Systemic Application of Multiple Low-Cost Countermeasures at Stop Controlled Intersections</b>	Yes, with risk-rankings and/or crash history
<b>Yellow Change Intervals</b>	Encouraged, not fundable.
<b>Pedestrian/Bicyclist</b>	
<b>Crosswalk Visibility Enhancements</b>	Yes, with risk-rankings and/or crash history
<b>Bicycle Lanes</b>	Yes, with risk-rankings and/or crash history
<b>Rectangular Rapid Flashing Beacons (RRFB)</b>	Yes, with risk-rankings and/or crash history
<b>Leading Pedestrian Interval</b>	Yes, with risk-rankings and/or crash history
<b>Medians and Pedestrian Refuge Islands in Urban and Suburban Areas</b>	Yes, with risk-rankings and/or crash history
<b>Pedestrian Hybrid Beacons</b>	Yes, but typically with K+A Crash History, higher risk rankings, safety planning, and competitive costs
<b>Road Diets (Roadway Reconfiguration)</b>	Yes, with risk-rankings and/or crash history
<b>Walkways</b>	Yes, but typically with K+A Crash History, higher risk rankings, safety planning, and competitive costs
<b>Crosscutting</b>	
<b>Pavement Friction Management</b>	Very Limited Application. History of other measures deployed, high risk rankings, competitive costs.
<b>Lighting</b>	Yes, with risk-rankings and/or crash history
<b>Local Road Safety Plans</b>	Yes, application process applies.
<b>Road Safety Audit</b>	Yes, for trunk highways. Not for local streets at this time.

## Speed Management

### Speed Safety Cameras

Minnesota Law does not currently permit Speed/Safety Cameras for enforcing speed limits. The Minnesota Strategic Highway Safety Plan does have this item called out for exploration, and a current action team is meeting on a regular basis to explore this issue further and to seek legislative approval to implement Speed Safety Cameras.

[Speed Safety Cameras - Safety | Federal Highway Administration \(dot.gov\)](#)

### Variable Speed Limits

Minnesota Law does not permit enforceable variable speed limits. Advisory Speed Limits can be made variable. This was attempted on I-35 south of Minneapolis with limited effectiveness. Neither the Minnesota Department of Transportation nor Department of Public Safety have any plans to pursue advisory speed limits.

[Variable Speed Limits - Safety | Federal Highway Administration \(dot.gov\)](#)

### Appropriate Speed Limits for All Road Users

MnDOT has actively pursued matching speed limits to the appropriate roadway conditions. MnDOT has encouraged leveraging street design in urban areas to better manage speeds and effectively reduce speeds with such features as narrower lanes, roundabouts, raised medians, and curb extensions. Effective geometric changes along with active enforcement are likely the most effective methods for reducing actual driver speeds. Lowering speed limits with no other actions has shown no impact on actual driver speeds or crash outcomes.

Minnesota Law was modified in 2019 to allow cities to set speed limits on their own city-owned streets. The speed limit should be set to be consistent with state and national guidance.

[Appropriate Speed Limits for All Road Users - Safety | Federal Highway Administration \(dot.gov\)](#)

## Roadway Departure

### Wider Edge Lines

MnDOT is supportive of wider edge lines as an effective, low cost, widely deployable countermeasure that can directly reduce road departure crashes. MnDOT has recently standardized 6" edge lines on all Trunk Highways after 2022 as part of regular roadway construction and maintenance. Using HSIP funding is eligible to increase the deployment, but this will likely be phased out over the next few years. Identified high risk routes will be the emphasis for funding with HSIP on Trunk Highways.

Counties will still be eligible and encouraged to apply for HSIP funding on high-risk routes as identified in the County Road Safety Plan(CRSP). Wider markings are a blanket term, and counties will need to determine which materials are best suited for their roadways.

[Wider Edge Lines - Safety | Federal Highway Administration \(dot.gov\)](#)

### Enhanced Delineation for Horizontal Curves

MnDOT is supportive of Enhanced Delineation for Horizontal Curves on the State and County Roadway Systems. Chevrons are a highly effective and low-cost countermeasure for reducing one of the most common severe crash types at one of the most common locations of occurrence. MnDOT continues to install chevrons and delineators on curves as part of regular sign maintenance and installation.

Roadway owners are eligible for chevrons and delineators using HSIP. Safety Plans and prioritization should be used when applying for funding. The County Road Safety Plans have heavily emphasized the importance and eligibility of chevrons on horizontal curves.

[Enhanced Delineation for Horizontal Curves - Safety | Federal Highway Administration \(dot.gov\)](#)

### Longitudinal Rumble Strips and Stripes on Two-Lane Roads

Rumble Strips and Stripes, both centerline and edge line, have long been promoted by MnDOT as an effective, low cost, and widely deployable countermeasure. Rumble Strips and Stripes are now a standard construction item on all rural trunk highways owned by MnDOT (with a few exceptions).

Rumble Strips and Stripes are eligible with HSIP dollars both for districts and counties. The County Road Safety Plans place a heavy emphasis on rumble strips and stripes and deployment on high-risk rural roads. Rumble Strips and Stripes (along with Sinusoidal Rumble Strips) will continue to be promoted by MnDOT.

[Longitudinal Rumble Strips and Stripes on Two-Lane Roads - Safety | Federal Highway Administration \(dot.gov\)](#)

## Safety Edge

Safety Edge is a standard addition to all paving projects on MnDOT Trunk Highways as part of pavement construction and maintenance projects. These have been standardized and detailed as part of the Facility Design Guide and Traffic Engineering Manual.

Narrow Shoulder Paving with installation of Safety Edge, Rumble Strips, and Wider Edgelines is an eligible project type for HSIP. County Road Safety Plans have recommended this strategy at the highest risk routes. Due to the higher cost of this strategy, MnDOT has limited the amount of eligible roadway miles for each county. However, MnDOT continues to be supportive of this strategy, especially during regular construction and maintenance projects when the project cost is close to incidental.

[SafetyEdge - Safety | Federal Highway Administration \(dot.gov\)](#)

## Roadside Design Improvements at Curves

Applying clear zones, embankment flattening and widening shoulders are all considered best practices. Due to the higher cost and resource needs, MnDOT typically tries to accomplish these items with planned construction and maintenance projects. While eligible for HSIP funding, the higher cost typically limits the number of sites that can be improved. MnDOT Districts should prioritize these horizontal curves based on risk assessments or crash history (or both).

The County Road Safety Plans can serve as a prioritization tool, but counties should be aware of the greater resources needed (especially engineering design and project development needs). The limited amount of HSIP funding will also greatly reduce the number of fundable sites, thus leaving only the highest risk sites within a given county.

A typical funded project of this type might include such items as clear zone establishment, embankment improvements, chevrons, and an added 2' of shoulder paving including safety edge, rumble strips, and an enhanced 6" edge line.

[Roadside Design Improvements at Curves - Safety | Federal Highway Administration \(dot.gov\)](#)

## Median Barriers

MnDOT remains firmly committed to the planning, installation, and maintenance of barrier on divided highways. Cable barrier remains an HSIP eligible item. Districts should be using a prioritized ranking to ensure the corridors with the best potential benefits continue to be funded.

Counties and cities have very limited opportunities to even deploy median barriers. HSIP funding would likely be eligible assuming a county/city demonstrated the need and a prioritization for funding.

[Median Barriers - Safety | Federal Highway Administration \(dot.gov\)](#)

## Intersections

### Backplates with Retroreflective Borders

Reflective backplates have just recently begun to be deployed in Minnesota. MnDOT completed a large deployment in 2019 at nearly 100 intersections. MnDOT Office of Traffic Engineering (OTE) is currently working to make this countermeasure a routine consideration at more sites during signal installation and maintenance updates.

MnDOT considers reflective backplates an eligible HSIP project element, considering the road owner has prioritized sites or used a Safety Plan to select higher risk sites.

[Backplates with Retroreflective Borders - Safety | Federal Highway Administration \(dot.gov\)](#)

### Corridor Access Management

Access management continues to be one of the best and most effective methods for reducing crashes, improving operations, and providing vital access for land and economic development. However, access management is highly resource intensive on the agency pursuing the management and can come with significant political needs and will. Corridor Access Management should be considered a primary function of the overall agency and should work beyond the functional traffic engineering and/or traffic safety units. If new corridors are being considered, expanded, or constructed, access management should be a primary consideration during the development to preserve the function and needs of the corridor into the future.

On existing corridors, once an access management plan is completed, the cost of implementation can range from low cost to high cost.

HSIP can provide a limited role in access management. HSIP funds could be used to consolidate or improve access points. Past projects have included using funds to remove access points or to consolidate access points. As an example, a popular use in the past has been to combine 3 or more small farm field entrances into one larger entrance.

Due to the limited funding of HSIP, it cannot be relied upon as an extensive funding source for access management within an agency. However, with a robust corridor management plan, HSIP could be a funding source to complete portions of the plan over time, especially those components that meet the intent and spirit of the HSIP program.

[Corridor Access Management - Safety | Federal Highway Administration \(dot.gov\)](#)

### Dedicated Left- and Right-Turn Lanes at Intersections

MnDOT supports the use of right and left turn lanes when conditions are met, and the installation has the potential to reduce severe crashes. Due to the greater cost and potential right-of-way impacts, the need for additional turn lanes is not always feasible or necessary.

HSIP funding of turn lanes is usually limited. Right turn lanes are usually not funded due to the low occurrence of severe crashes associated with right turning vehicles. Left turn lanes can be funded when crash history and/or risk assessments indicate the left turn lane can mitigate severe crashes.

The County Road Safety Plans Round 2 identify locations where left turns lanes may be beneficial. These sites should be investigated further before submission for funding to ensure the treatment is geometrically feasible and mitigates the potential crash types. The addition of left or right turn lanes on stop or signal controlled approaches are typically not eligible with HSIP funds.

[Dedicated Left- and Right-Turn Lanes at Intersections - Safety | Federal Highway Administration \(dot.gov\)](#)

### Reduced Left-Turn Conflict Intersections

Reduced Left-Turn Conflict Intersections, also known as Reduced Conflict Intersections (RCI), Restricted Crossing U-Turns (RCUT), J-Turns, and other derivatives (Median U-Turns,  $\frac{3}{4}$  Intersections), have been shown to be highly effective and cost effective in Minnesota. MnDOT has and will continue to fund RCI's and the various derivatives with HSIP, both on the District and Local level, into the foreseeable future. Districts and Counties should use systemic risk analysis (safety plans) and/or crash histories in their justification for seeking HSIP funding. Due to the higher cost of these treatments, the number that can be built every year with HSIP is limited, but these are considered a highly effective solution.

[Reduced Left-Turn Conflict Intersections - Safety | Federal Highway Administration \(dot.gov\)](#)

### Roundabouts

Roundabouts are shown to be highly effective at reducing severe crashes, especially right-angle related crashes. Roundabouts have also proven to be effective at reducing pedestrian and bicycle related crashes. In addition to these benefits, roundabouts are effective at reducing vehicle operating speeds and can be used as an effective speed management solution.

Roundabouts generally have a high cost associated with them as they typically require a complete reconstruction of an existing intersection, along with greater right-of-way needs and modifications of the approach legs.

Due to the higher cost of roundabouts, the number of roundabouts being built with HSIP is limited. Agencies seeking HSIP funding for roundabouts should be prepared to show significant severe crash history, and that the roundabout will mitigate those crash types. Due to the high costs, a benefit/cost ratio should be at 1.0 or greater.

Intersections without severe crash history should have significant planning and a high-risk assessment, along with prioritization to show the need for the agency. The benefit/cost ratio should prove that the roundabout will mitigate the existing and future crash problems in a cost effective manner.

[Roundabouts - Safety | Federal Highway Administration \(dot.gov\)](#)

## Systemic Application of Multiple Low-Cost Countermeasures at Stop Controlled Intersections

MnDOT supports the application of these strategies for both trunk highway and local road applications. The deployment can vary widely, but this overall application is generally supported with HSIP. The largest factors when reviewing applications for funding selection are typically to ensure sites selected are higher risk intersections, the overall project cost, and ensuring the project isn't a maintenance related funding need.

Typically, District and County Safety plans can suggest numerous sites that may collectively benefit from these types of systemic treatments. While the impacts at each site may be small overall, when combined they can have greater benefits for lower costs than individual sites with high costs. As an example, for the same price, you can treat 200 locations with a 10% reduction across those sites, versus 1 site with a 90% reduction).

Project components can include, but are not limited to post-gating stop signs, larger stop signs, post-mounted delineators, junction identification and junction ahead signing, stop ahead signing, stop bars, chicanes, and other signing or striping improvements.

[Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections - Safety | Federal Highway Administration \(dot.gov\)](#)

## Yellow Change Intervals (also Flashing Yellow Arrow)

MnDOT follows ITE and National guidance for yellow change intervals and all-red phasing for traffic signals. MnDOT has not funded traffic signal timing studies or programming with HSIP.

Flashing Yellow Arrow programming or installing appropriate signal heads is typically not funded with HSIP.

[Yellow Change Intervals - Safety | Federal Highway Administration \(dot.gov\)](#)



## [Pedestrian/Bicyclist](#)

### [Crosswalk Visibility Enhancements](#)

The use of crosswalk visibility enhancements can assist in reducing pedestrian crash potential. The use of the treatments listed on this page, especially when used in combination with other treatments, can greatly reduce the frequency of crashes with vulnerable road users.

Most of these treatments are typically built with more substantial improvements such as reconstruction or pavement preservation projects.

MnDOT is supportive of using HSIP funds to build these types of improvements. Similar to other countermeasures, a prioritized and systemic analysis should help to identify locations where these improvements would be the most beneficial. Counties and Cities may also be eligible for funding and will need to demonstrate priorities.

[Crosswalk Visibility Enhancements - Safety | Federal Highway Administration \(dot.gov\)](#)

### [Bicycle Lanes](#)

Protected bicycle lanes and separated shared-use facilities are highly effective at separating bicyclists and other vulnerable road users from the motoring traffic. MnDOT has not used HSIP to fund bicycle lanes to date, nor have we received any requests to use HSIP funding for this purpose. While Bicycle Lanes could be potentially funded with HSIP, agencies would need to show the demonstrated need, prioritized ranking for corridors/streets, which method of bicycle lanes they would deploy, and some measure of cost effectiveness. Given many of the other improvements that would maximize bicycle lane safety, HSIP may not be the best or most ample funding source to pursue bicycle lanes.

Bicycle lanes could be viable with other HSIP eligible projects, especially road diets/reconfigurations where the bike lane becomes an integral part of the redistribution of pavement width.

[Bicycle Lanes - Safety | Federal Highway Administration \(dot.gov\)](#)

### [Rectangular Rapid Flashing Beacons \(RRFB\)](#)

RRFB's are showing to reduce risk and decrease crashes for pedestrians. HSIP funds may be used for RRFBs at locations that have been shown to have multiple risk factors and gone thru a prioritization exercise. Please refer to the FHWA STEP chart for preferred site selection criteria.

RRFB's are typically most effective when combined with other pedestrian countermeasures. The combination of curb extensions and median refuge islands can be highly effective with an RRFB installation. Often these other countermeasures may be sufficient and an RRFB will not be needed.

[Rectangular Rapid Flashing Beacons \(RRFB\) - Safety | Federal Highway Administration \(dot.gov\)](#)

## [Leading Pedestrian Interval](#)

MnDOT is supportive of the Leading Pedestrian Interval (LPI). One of the primary challenges with implementing an LPI is that many older signals do not have the pedestrian indication signal head, and/or countdown timers. Signals may need to have modern controllers and the ability to have pedestrian phasing. MnDOT has invested substantially in installing more pedestrian indication countdown timers on existing signals. HSIP can be a funding source to install these devices and the components to accomplish successful LPI implementation.

MnDOT has not funded an LPI directly to date. To be eligible for the federal HSIP funding, an agency would need to hire a consultant to program and install the changes directly. HSIP cannot be used to pay for internal staff time and resources to accomplish this task, per federal funding rules.

OTE would consider funding a combined Countdown Timer and Signal Timing modification project. An agency would likely need to show the prioritized needs and the intersections selected (or corridor) is a higher risk facility that would likely benefit from such a treatment.

[Leading Pedestrian Interval - Safety | Federal Highway Administration \(dot.gov\)](#)

## [Medians and Pedestrian Refuge Islands in Urban and Suburban Areas](#)

Refuge islands are shown to be a highly effective treatment for reducing pedestrian crashes and potentially for mitigating and managing vehicle speeds along a corridor. HSIP funding can be used to construct these median refuge islands. Typical challenges with refuge islands in urban areas are that many other associated needs can also become identified with the project. This can include sidewalk improvements, ADA improvements, drainage, utilities, and other traffic control measures. Due to these other needs, a simple refuge island may come in at a much greater cost than the derived benefits. These needs can impact the competitiveness of the project proposal. Based on these factors, MnDOT has shifted to promoting refuge islands during planning, design, and construction/pavement preservation projects.

For stand-alone HSIP projects, refuge islands would likely be beneficial at locations that have similar characteristics of those identified for RRFB locations.

[Medians and Pedestrian Refuge Islands in Urban and Suburban Areas - Safety | Federal Highway Administration \(dot.gov\)](#)

## Pedestrian Hybrid Beacons

MnDOT has not funded any Pedestrian Hybrid Beacons (PHB, but sometimes referred to as a HAWK) to date. Due to the higher costs associated with this project type, the HSIP program likely has limited opportunities to fund these systems. Most likely, OTE would prefer to see other treatments developed and implemented before proposing a PHB. Site characteristics should be similar to those considered with an overhead RRFB. Higher vehicle speeds (greater than posted at 35 MPH) may be a warrant to propose a Pedestrian Hybrid Beacon rather than an RRFB. The Federal Manual of Uniform Traffic Control Devices (MUTCD) has recommended warrants for placing a PHB. These should be reviewed and understood before any funding request.

A PHB should also be built with other countermeasures to maximize the benefits. This would include advance signage, median refuge islands, and curb extensions.

[Pedestrian Hybrid Beacons - Safety | Federal Highway Administration \(dot.gov\)](#)

## Road Diets (Roadway Reconfiguration)

Road Diets or (roadway reconfigurations) can be a highly effective treatment to calm traffic, repurpose existing roadway width, improve operations, and improve safety for all users. MnDOT has been supportive of using HSIP funds to implement roadway reconfigurations. However, they can vary widely in cost from being a simple re-stripe, all the way to a complete reconstruction. As projects costs go up, this may impact the benefits and desirability to use HSIP funding for this project type. MnDOT encourages agencies to review roadway configurations with other pavement improvements. During pavement preservation or reconstruction, the cost of converting the roadway may be incidental, or even less costly than putting back the existing pavement width. Roadway reconfigurations can be controversial and may require extensive public outreach for the public to understand the benefits of the reconfiguration.

[Road Diets - Safety | Federal Highway Administration \(dot.gov\)](#)

## Walkways

Sidewalks and separated walkways are highly effective at separating pedestrians and other vulnerable road users from the motoring traffic. HSIP can be used for completing and constructing sidewalks. However, due to the higher cost and popular appeal of sidewalks, any funding requests should come with extensive planning completed and the identification of the needs being tied directly to pedestrian safety.

The County Road Safety Plan Round 2 identified locations that would meet this requirement. These needs can be challenging to achieve. Other funding sources may be more viable for completing sidewalks.

MnDOT has worked extensively to identify needs and desired improvements that can be funded during the regular construction/reconstruction/pavement preservation projects. Often due to the extensive construction needs to add sidewalks on existing roadways, the most feasible time to add sidewalks is during roadway reconstructions.

[Walkways - Safety | Federal Highway Administration \(dot.gov\)](#)

## Crosscutting

### Pavement Friction Management

Pavement Friction Management is a newer strategy that has not been widely deployed or funded within Minnesota. MnDOT has funded a few smaller projects with HSIP as test cases to evaluate performance, both for safety and durability. While funding constraints are currently restrictive, the most recently funded projects have been on high-risk, rural horizontal curves. These locations also had other improvements identified and funded similar to the roadside design improvements on horizontal curves. Other applications may be considered or funded in the future.

[Pavement Friction Management - Safety | Federal Highway Administration \(dot.gov\)](#)

### Lighting

Lighting has been shown to be an effective, low cost, and widely deployable strategy. Lighting is eligible for funding through HSIP. Typically, the funding application needs to include a systemic analysis and prioritization. District and County Safety Plans have identified numerous locations for each agency that would be beneficial for lighting. Most agencies have found that maintenance and power costs tend to be a greater concern long term than the initial upfront investment.

[Lighting - Safety | Federal Highway Administration \(dot.gov\)](#)

### Local Road Safety Plans

Local Road Safety Plans have become one of the cornerstones of Minnesota's safety program. Local Road Safety Plans can help local road agencies better understand the crash types most commonly impacting their system, while also identifying locations, project types, and funding needs for the agency. Minnesota has completed road safety plans for all 87 counties, 8 Districts, and has begun updating plans on over 30 county safety plans. MnDOT fully intends to continue to support local road safety planning moving into the future. These plans have been using HSIP and related federal safety funds as the primary funding mechanism. Currently, MnDOT has counties contribute up to 20% of the cost of their updated plan.

[Local Road Safety Plans - Safety | Federal Highway Administration \(dot.gov\)](#)

### Road Safety Audit

Road Safety Audits can be a great tool for identifying and recommending future improvements to roadways and corridors. They can vary greatly in complexity and cost. MnDOT has historically leveraged HSIP funds for Road Safety Audits. However, due to the needed resources and attention, typically road safety audits are reserved for the most pressing of needs and high crash corridors. MnDOT has typically funded and supported about 1 road safety audit per year for the last decade. MnDOT has not made HSIP funding available to local roadway agencies for road safety audits.

[Road Safety Audit - Safety | Federal Highway Administration \(dot.gov\)](#)