ASKING THE RIGHT QUESTIONS

SAFER

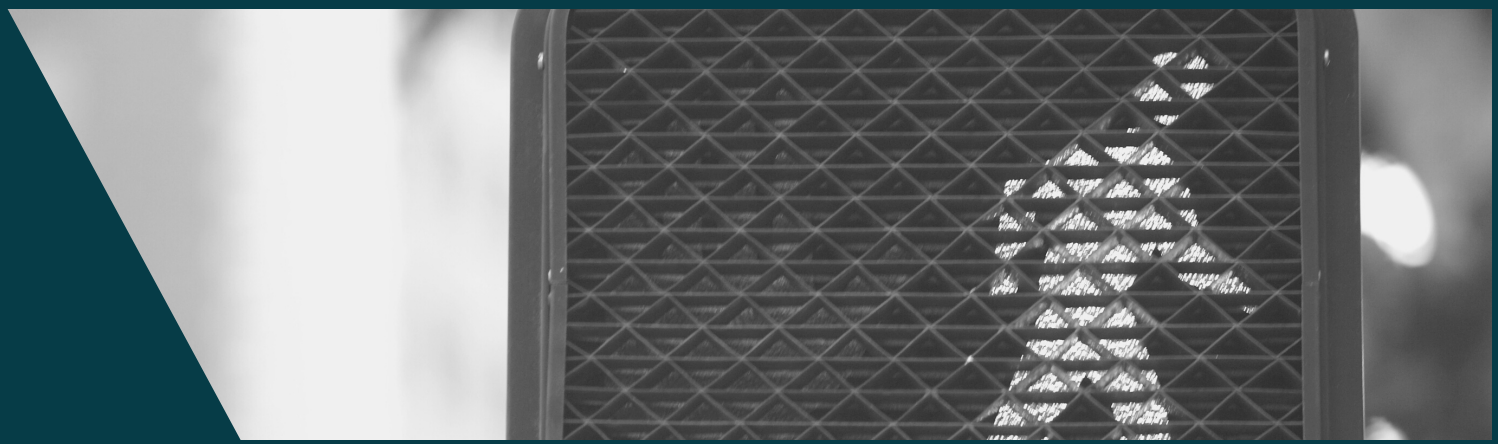
THE SAFE SYSTEM APPROACH

INSTRUCTIONS

The goal is to incorporate safety measures in all projects. The intent of this tool is to facilitate a discussion of safety in all MoDOT projects. Project Managers with the core team should use this document to consider baseline safety improvements for projects. Crash history and customer areas of concern should be part of the discussion, as well as considerations for potential future crashes. This is not an all-inclusive list, and further safety analysis may be required. If other safety improvements not specified on the form have been considered, these items can be added to the form. Comments can be added to note core team discussions and decisions.

VULNERABLE ROADWAY USERS

- Are there opportunities to enhance crossings based on the number of lanes crossed, AADT and speeds?
  - Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations
    - Table 1. Application of Pedestrian Crash Countermeasures by Roadway Features
- Are there trail crossing locations that could be improved?
- Is the speed of the roadway conducive of VRUs along the roadway?
- Are there traffic calming measures that could be implemented?
  - Narrow lanes, road diets, roundabouts, etc.
- Is there sufficient crossing movement times for VRUs?
  - Leading pedestrian intervals or extend crossing intervals
- Can we separate the vehicle traffic and the VRUs?
  - Barriers, grade separate, etc.
- Is there an overall bike/ped plan for the community that this project can accommodate?
- Consider improvements near transit stations - Is the transit station located in an optimal location?
- Are there high generators of bike/ped traffic that require additional improvements?
  - Bus stops, land use (shopping centers, schools, apartment complexes, low/no vehicle households, tourist areas), nearby bike/ped trails, etc.
- Are there alcohol establishments nearby that may merit additional improvements?
  - Enhanced crosswalk visibility
- Are there improvements identified on the MoDOT ADA transition plan? Can these go beyond ADA to incorporate pedestrian safety?
- Are ITS solutions incorporated at mid-block and signalized intersections?
  - Audible pedestrian signal, countdown timers, pedestrian detectors, Rectangular Rapid Flashing Beacon (RRFB), pedestrian push buttons, etc.
- Are there gaps within the VRU infrastructure that can be made continuous?
- Are unique road users in the area? For example: horse/buggy, farming, schools, older roadway users, etc.
- Does the location allow for complete street concepts?
- Are there elements of the roadway that block the pedestrian from view (on-street parking, shrubbery, etc.)?
- Does the local municipality have a complete streets ordinance or policy that should be considered?



SAFETY ASSESSMENT FOR EVERY ROADWAY (SAFER)

ACCESS MANAGEMENT

- What is the primary focus of the corridor (through traffic, business district, both, etc.)?
- Are there any opportunities to consolidate or narrow accesses?
- Are there unused driveways that can be removed?
- Is there opportunity to change access to reduce severe crash risks?
  - ¾ access or right-in/right-out (reducing conflict points)
  - Does the access accommodate VRUs?
- If an interchange is involved, will the functional area of the interchange be compromised? If so, will further design considerations need to be addressed to preserve safety through the corridor?
  - Consider the impact of closely spaced outer roads/accesses

ROADWAY ALIGNMENT

- Do the curves meet MoDOT standards?
  - Super-elevation/crown/transitions/radius
- Do the driveways/intersections have poor sight distance?
  - Vertical/horizontal alignments
- Do we have adequate intersection sight distance triangles for the side roads?
- Are there any skewed driveways/intersections?

ROADWAY VISIBILITY

- Are there any unlit, raised, non-mountable islands/medians?
- Does the lighting change significantly along the corridor?
  - Avoid rapidly changing lighting environments
- Are there unlit or improperly lit crosswalks?
- Is there sub-standard/insufficient signing (retro reflectivity / sign location) along roadway?
  - Is advance warning of curves, intersections, signals and crossings needed?
- Is there an opportunity to reduce exposure to maintenance staff by using a more durable stripe?
- Is roadside delineation in need of replacement?
- Can the visibility of pavement markings be improved for wet conditions?
- Is there a need for increased signal visibility (reflective back-plates)?
  - High speeds/approaching intersections, first signal at unsuspected signals
- Is there an opportunity to improve driver compliance through enhanced visibility for signs?
- Are intersection pavement markings in need of replacement?
- Is there sufficient lighting to accommodate pedestrian facilities, if needed?

ROADWAY SURFACE

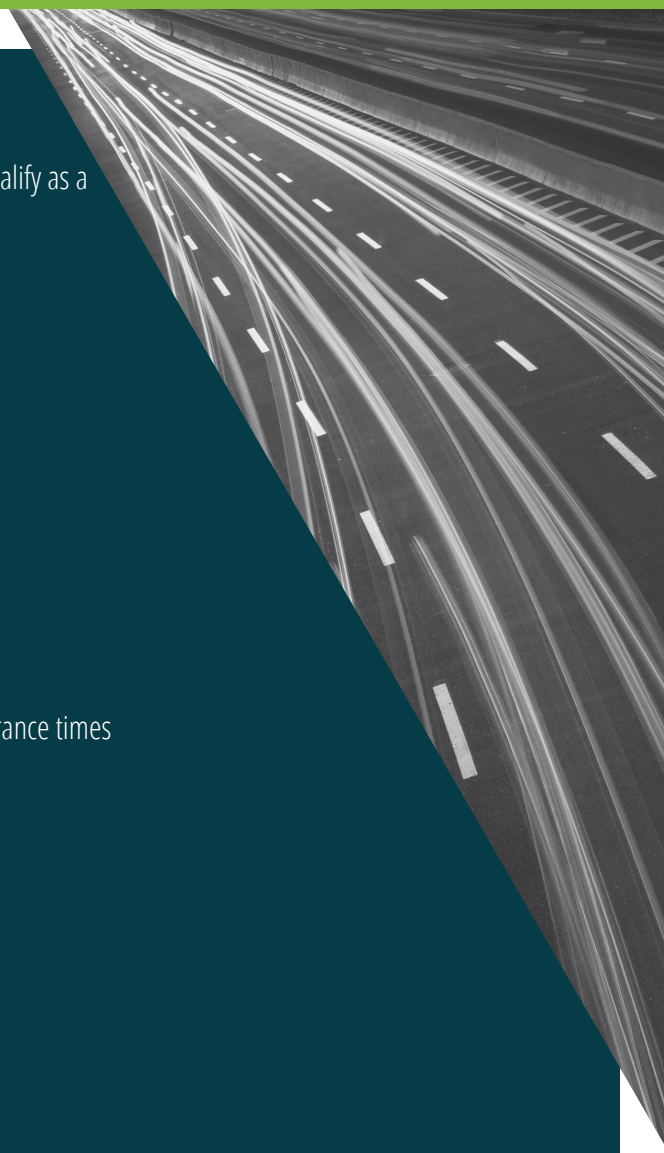
- What is the friction need for the corridor/curves? (HFST)
- Are we making the safest use of the roadway cross section? (lane width vs. shoulders)
- Consider adding centerline and edge line rumble strips.
- Are there signs of off tracking at intersections or through curves?
- Are there rutting issues or water-pooling/hydroplaning or other drainage issues?

INTERSECTION/INTERCHANGE DESIGN

- Is this location feasible for an alternative design? (DDI, dog-bone, roundabouts, j-turns, etc.)
  - Utilize Intersection Control Evaluation (ICE) for alternative selection
- Are there opportunities to reduce conflict points?
- Are bicyclists and pedestrians (vulnerable roadway users) accommodated at the intersection?
- Are turn lanes warranted? If so, can offset turn lanes be incorporated?
- Could sight distance be improved?
  - Reduce angle of visibility for drivers
  - Trim back/clear vegetation
- Are there opportunities to reduce/minimize pedestrian crossing distances?
- Are there opportunities to improve skew?
- Do the thru lanes align with the appropriate receiving lane?
- Does the interchange/intersection design make drivers more prone to wrong way movements?

ROADSIDE

- Are there opportunities to upgrade crashworthy devices to MASH standards?
- Is guardrail length of need sufficient?
- Do bridge approach transitions need to be updated?
- Is there an elevated risk of vehicles crossing the median (AADT and median width)?
  - Consider adding guard cable
- Are there fixed objects within ROW/sight triangles?
  - Remove/shield fixed objects
- Are there edge drop-offs?
  - Safety edge
- Can side slopes be adjusted to be more recoverable?
- What is the risk of run-off-road crashes (high speeds, rural, narrow lanes)?
  - Add shoulders, rumbles, delineation, HFST



TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO)

- Is there a need for additional enforcement to address driver behavior? Does it qualify as a travel safe zone?
- Is there a need to provide warning systems to alert drivers of various conditions?
  - Queue, curve, intersection, size, speed and wrong way
- Is there an opportunity to improve traffic surveillance to assist incident response?
  - Add/replace CCTV cameras
- Is there an opportunity to improve messaging to drivers?
  - Add/replace dynamic message signs (DMS)
- Can the traffic signal operations be improved?
  - Should preemption be provided for emergency vehicles?
  - Determine if signalized left turning movements should be protected
  - Can signal timing be adjusted to reduce frequency of stops or enhance clearance times
  - Are the signal controllers and/or cabinets in need of replacement?
  - Implement Automated Traffic Signal Performance Measures (ATSPM)
- Can Smart Work Zone strategies be considered when constructing the project?
- Is the shoulder wide enough for emergency response and/or first responders?
- Is there a need for additional emergency response operators?
- Has maintenance or emergency response operators identified areas of concern?
- Is there a need for fences along the right of way to reduce pedestrian crossings?

OTHER CONSIDERATIONS

- Does the crash history along the corridor indicate trends that could be mitigated?
- Does the project area include any locations identified on the Traffic Safety Lists (locations with higher frequency of injury crashes)?
- Has maintenance identified areas of concern?
- Have we received customer safety concerns in the project area?
- Can we make future maintenance activities safer?
  - Tie-ons for bridge maintenance/inspections
  - Accessibility for overhead structures (DMS boards)
- Can existing at-grade railroad crossings be improved to improve advance safety?
- Can speed management strategies be implemented, such as setting proper speed limit, traffic calming effort, or other speed management countermeasures?
- Has an assessment of the of the corridor's safety performance been completed through an RSA, HSM analysis, risk factor analysis? If so, is there an opportunity to incorporate the findings along the corridor?

NOTES/COMMENTS