

| INTERSECTION CRASH REDUCTION FACTORS | | |
|--|--------------------|--|
| Proposed Improvement | % Reduction | Associated Crash Types |
| Signal Timing / Hardware Enhancements | | |
| All-Red Clearance Interval - Add per ITE recommendations | 10% | All Crash Types |
| Rural Box Span Signal - Upgrade from Stop Control | 75% | Angle |
| | 40% | All other Crashes |
| Urban Box Span Signal - Upgrade from Stop Control | 65% | Angle |
| | 20% | All other Crashes |
| Box Span Signal - Upgrade from Diagonal Span | 10% | All Crashes |
| Left-Turn Signal Phase - Add | 30% | Left-Turn |
| Signal Head Size - Increase to 12 " | 10% | All Crash Types |
| Signal Optimization & Timing Updates | 10% | All Crash Types |
| Yellow-Change Interval - Increase | 10% | All Crash Types |
| Pedestrian / Bicycle Enhancements | | |
| Bump Out / Curb Extension - Remove Parking / Install | 30% | All Crashes |
| Bicycle Lanes - Install per standards | 25% | Bicycle Crashes |
| Intersection Lighting - Install | 30% | Pedestrian Fatal and A-Injuries |
| | 20% | Other Crashes |
| Ped. Countdown Signals - Install w/o existing signal | 30% | Pedestrian, Bicycle |
| Ped. Countdown Signals - Upgrade from existing signal | 25% | Pedestrian, Bicycle |
| Sidewalk for Pedestrians - Construct | 85% | Pedestrian Crashes |
| Intersection Geometric Enhancements | | |
| Bump Out / Curb Extension - Remove Parking / Install | 30% | All Crashes |
| Center Left-Turn Lane - Construct | 80% | Rear-End, Left-Turn |
| | 50% | Head-On Left-Turn |
| | 20% | Head-On, Angle, Other |
| | 15% | Non Left-Turn Rear-End |
| Intersection Improvements (Realignment, Sight-Distance Improvements, Radii Improvements, Etc.) | 30% | Angle |
| | 15% | Rear-End |
| | 10% | Head-On, Sideswipe, Pedestrian, Bicycle, Left-Turn Related |
| Offset Left-Turn Lanes | 10% | Head-On Crashes |
| Right-Turn Lane - Construct | 65% | Rear-End Right-Turn |
| | 20% | Non Right-Turn Rear-End, Sideswipe Same Direction |
| Roundabout - Refer to Roundabout TOR | 76% K&A | Contact Jim D'Lamater (517) 335-2224 for Roundabout TOR form |
| | 39% Minor Crh | |
| General Intersection Enhancements | | |
| All-Way Stop Control Operation at Intersection - Provide | 60% | All Crash Types |
| Flashing Traffic Signals - Install/Upgrade | 20% | All Crash Types |
| Intersection Lighting - Install | 30% | Pedestrian Fatal and A-Injuries |
| | 20% | Other Crashes |
| Reflective Sheeting on Sign Posts (lollipops) | 15% | All Crashes |
| Ground Mounted Flashing Beacons (Red) - Install** | 30% | All Crashes On Install Approach |
| Ground Mounted Flashing Beacons(Amber) - Install** | 20% | All Crashes On Install Approach |
| Signing and Pavement Markings - Improve/Upgrade | 30% | Angle, Rear-End |
| | 10% | Head-On, Pedestrian |

* "Other" includes and other crash which might be mitigate by the addition of a center left-turn lane in the judgment of the crash analyst

** applies with overhead flashing beacon removal

REFERENCES:

The references listed below are the sources recognized by MDOT for obtaining crash reduction factors. If you have a situation that none of these sources can provide a crash reduction factor for, please contact Jim D'Lamater 517.335.2224.

- 1) MDOT Safety Programs Unit - Crash Reduction Factors (As recommended by K. Kunde. P.E.); October, 1986
- 2) Selection Process for Local High Safety Projects, - Transportation Research Record 847: 1982
- 3) UKTRP - 85-6, University of Kentucky; March, 1985
- 4) Desktop Reference for Crash Reduction Factor, Federal Highway Administration. 2007
- 5) NCHRP Report 617: Accident Modification Factors for Traffic Engineering and ITS Improvements, TRB 2008
- 6) Crash Modification Factor Clearinghouse, <http://www.cmfclearinghouse.org/index.cfm>, 2008

| SEGMENT CRASH REDUCTION FACTORS | | |
|--|--------------------|--|
| Proposed Improvement | % Reduction | Associated Crash Types |
| Geometric Enhancements | | |
| Center Left-Turn Lane - Construct | 80% | Rear-End, Left-Turn |
| | 50% | Head-On Left-Turn |
| | 20% | Head-On, Angle, Other |
| | 15% | Non Left-Turn Rear-End |
| Horizontal Curve Flattening | 30% | Head-On, Fixed-Object, Overturn |
| Increase Lane Width - Per foot | 10% | All Crash Types |
| Shoulders - Widen to Standard Width | 5% per ft. ** | All Crash Types |
| Superelevation Modification | 20% | Head-On, Fixed-Object, Overturn |
| Vertical Curve Modification | 20% | Head-On, Sideswipe |
| | 10% | Fixed-Object, Overturn |
| Operational Enhancements | | |
| Access Management - Improve | 15% | Drive-way Related |
| Centerline Rumble Strips - Install | 55% | Sideswipe Opposite, Head-On, Run-Off the Road Left Crashes |
| Lighting - Install on segment | 20% | Night Crashes |
| Pavement Surface - Improve | 20% | Wet Crashes |
| Pedestrian Refuge - Install | 50% | Pedestrian Crashes |
| Should Rumble Strips | 20% | Run-Off the Road Right Crashes |
| Signing/Delineation on Horizontal Curves - Install | 20% | Head-On, Sideswipe, Fixed-Object, Overturn |
| Roadside Enhancements | | |
| Fixed Objects From Clearzone (Trees, Culverts, Etc.) - Remove | 75% | Fixed-Object |
| Guardrail - Install | 55% | Fatalities and "A" Injuries |
| Sidewalk for Pedestrians - Construct | 85% | Pedestrian Crashes |
| Slope Flattening | 15% | Fixed-Object, Overturn |

* "Other" includes and other crash which might be mitigate by the addition of a center left-turn lane in the judgment of the crash analyst

** 5% per foot widened each side (i.e. 3 foot shoulder on each side = 15% reduction)

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- 6) Crash Modification Factor Clearinghouse, <http://www.cmfclearinghouse.org/index.cfm>, 2008

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