

4. Safety Strategies

4.1 Background

Following the identification of the Safety Emphasis Areas, a short list of potential safety improvement strategies was assembled and a prioritization exercise was conducted at a Safety Workshop, in order to produce a list of Olmsted County's highest priority safety strategies. The culmination of the safety planning process occurs with the development of highway safety projects that involve the application of the highest priority strategies at specific locations on Olmsted County's highway system that were identified as being at-risk based on a combination of crash, traffic volume and roadway characteristics.

The source of the initial list of potential safety strategies is the National Cooperative Highway Research Program (NCHRP) 500 Series Reports – Guidance for Implementation of AASHTO's Strategic Highway Safety Plan. This series of guides was developed to assist state and local highway agencies reduce the number of crashes in targeted safety emphasis areas. The guides basically correspond to the emphasis areas outlined in AASHTO's Strategic Highway Safety Plan and each guide contains a "best practices" list of strategies with value added information including; relative implementation costs and the expected safety effectiveness – Proven (widely deployed and subject to a rigorous statistical testing), Tried (widely deployed but either lacking the statistical testing or with inconclusive results) and Experimental (too narrowly deployed to provide statistically significant results).

The following sections document the development of Olmsted County's short list of high priority safety strategies that was assembled for each of the County's identified safety emphasis areas. The strategies are assigned to two basic categories – Infrastructure and Driver Behavior. The development process began with a review of the NCHRP 500 series reports, followed with a an initial screening of the strategies performed by County staff and culminated with a prioritization exercise with the County's Safety Partners at a Safety Strategies Workshop.

4.2 Infrastructure Based Strategies

4.2.1 Road Departure Crashes

From 2002 through 2006, there was an average of 89 road departure crashes per year on Olmsted County's system of rural highways. These road departure crashes accounted for nearly 44% of all fatal crashes on the County's system and 21% of severe crashes (fatal + A-injury crashes) in rural areas during the five year period. The majority of these fatal road departure crashes occurred during good weather conditions (93%) and on dry pavements (75%). Other characteristics of these fatal crashes that are worth noting include:

- Crashes on weekends are over represented (43% actual vs. 28% expected).
- Crashes during periods of darkness are over represented (64% actual vs. 11% expected) and 35% of the crashes occurred between midnight and 3 AM.

- 70% of the involved drivers were male and 67% of these were under 30 years of age.

One final characteristic stands out – 38% of all road departure crashes occur in horizontal curves, even though curves only account for around 10% of the mileage of the County's highway system.

The initial list of strategies for reducing road departure crashes was based on information contained in Volume 6 of the NCHRP 500 series reports and contains thirteen items that are focused on achieving three primary objectives:

- Keep vehicles from encroaching on the roadside – 8 strategies involving improvements to the road edge. The guidance suggests that these (generally) low cost signs, markings and design features should be the highest priority for deployment because if you keep vehicles on the road, whatever is beyond the edge becomes a secondary issue.
- Minimize the likelihood of crashing into an object or overturning if the vehicle travels off the shoulder – 3 strategies that improve the clear zone – that area that extends from the road edge to the edge of the right-of-way. The guidance suggests that these (generally) higher cost efforts to remove obstacles and make slopes and ditches more traversable should be a lower priority because of the greater challenges associated with implementation, including; the much higher construction costs, possible need for acquiring new right-of-way and the potential need for environmental clearances and/or permits.
- Reduce the severity of crashes – 2 strategies that address upgrading highway hardware. Upgrading guardrails and impact attenuators is considered to be a relatively low priority activity because it involves having to invest a moderate amount of money at a few locations that are only rarely struck during road departure crashes (at the national level striking a guardrail is involved in 3% of the road departure crashes and there were no instances of hitting a guardrail noted in the data set for Olmsted County).

This initial list of strategies was then reviewed by County staff and five were eliminated from further consideration because they were considered to be either too expensive (regrading slopes and ditches could cost several hundred thousand dollars per mile and require the acquisition of additional right-of-way) or involved experimental strategies that had no history of application in Minnesota (mid-lane rumble stripes and delineating roadside objects with reflective tape). This screening effort resulted in the list of eight high priority road departure strategies identified in **Figure 4.1**.

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
15.1 A -- Keep vehicles from encroaching on the roadside	15.1 A1 -- Install shoulder rumble strips	Low	Tried	Short
	15.1 A2 -- Install edgelines "profile marking", edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders	Low	Experimental	Short
	15.1 A3 -- Install centerline rumble strips	Low	Experimental	Short
	15.1 A4 -- Provide enhanced shoulder or delineation and marking for sharp curves	Low	Tried / Proven / Experimental	Short
	15.1 A6 -- Provide enhanced pavement markings	Low	Tried	Short
	15.1 A8 -- Apply shoulder treatments *Eliminate shoulder drop-offs *Shoulder wedge *Widen and/or pave shoulders	Low	Experimental/ Proven	Medium
15.1 B -- Minimize the likelihood of crashing into an object or overturning if the vehicle travels off the shoulder	15.1 B2 -- Remove/relocate objects in hazardous locations	Moderate to High	Proven	Medium
15.1 C -- Reduce the severity of the crash	15.1 C1 -- Improve design of roadside hardware	Moderate to High	Tried	Medium

Figure 4.1 Road Departure Safety Strategies

Source: NCHRP 500 Series

4.2.2 Intersections

Almost 50% of the crashes on Olmsted County's system are intersection related, approximately 640 crashes per year. These intersection related crashes account for about 30% of fatalities on the County system and 40% of severe crashes. The majority of these crashes occur during good weather (91%) and on dry pavements (85%). Key characteristics associated with severe intersection crashes include:

- 67% of the crashes occur in urban areas and these are evenly distributed between signalized and unsignalized intersections.
- The remaining 33% of the intersection crashes occur at rural, STOP controlled intersections.
- The predominant crash type at intersections is a right angle crash – 59% at urban unsignalized, 36% at urban signalized and 35% at rural unsignalized locations.
- Crashes on week days are over represented.
- Crashes during the afternoon hours are over represented.
- Approximately 60% of the involved drivers are male and both very young and middle aged drivers are over represented.

The initial list of 28 strategies for reducing crashes at signalized intersections and 49 strategies for unsignalized intersections was based on information contained in Volume 12 and Volume 5, respectively, of the NCHRP 500 series reports. These strategies address

signal operations and visibility, intersection geometry, enhancing enforcement, managing access in the vicinity of the intersection, improved signs and markings, street lighting and the application of new technologies. This initial list was reviewed with County staff and approximately one-half of the strategies were eliminated from further consideration. Examples of the strategies that were not carried forward include:

- Strategies that were not associated with reducing the predominant crash type - auxiliary turn lanes were not carried forward because they are intended to reduce rear end crashes.
- Strategies that are intended to address conditions that are not common in Olmsted County - 85% of intersection crashes occur on dry pavements, so strategies intended to improve pavement skid resistance were not carried forward.
- Strategies that have not proven to reduce crashes in Minnesota – installing transverse rumble strips on the minor approaches to STOP controlled intersections was not carried forward because research has never been able to demonstrate a crash reduction and because research has shown that the primary factor contributing to angle crashes at STOP controlled intersections is gap recognition as opposed to intersection recognition.

This screening effort resulted in the identification of 10 priority strategies for signalized intersections (**Figure 4.2**) and 28 strategies for unsignalized intersections (**Figure 4.3**).

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
17.2 A -- Reduce frequency and severity of intersection conflicts through traffic control and operational improvements	17.2 A1 -- Employ multiphase signal operation	Low	Tried / Proven	Short
	17.2 A2 -- Optimize clearance intervals	Low	Proven	Short
	17.2 A4 -- Employ signal coordination along a corridor or route	Moderate	Proven	Medium
	17.2 A6 -- Improve operation of pedestrian and bicycle facilities at signalized intersections	Low	Tried / Proven	Short
	17.2 A7 -- Remove unwarranted signal	Low	Proven	Short
17.2 B -- Reduce frequency and severity of intersection conflicts through geometric improvements	17.2 B3 -- Improve geometry of pedestrian and bicycle facilities	Low	Tried / Proven	Short
17.2 D -- Improve driver awareness of intersections and signal control	17.2 D2 -- Improve visibility of signals and signs at intersections	Low	Tried	Short
17.2 E -- Improve driver compliance with traffic control devices	17.2 E2 -- Supplement conventional enforcement of red-light running with confirmation lights	Low	Tried	Short
17.2 F -- Improve access management near signalized intersections	17.2 F1 -- Restrict access to properties using driveway closures or turn restrictions	Low	Tried	Medium
17.2 G -- Improve safety through other infrastructure treatments	17.2 G3 -- Coordinate closely spaced signals near at-grade railroad crossings	Moderate	Tried	Long

Figure 4.2 Signalized Intersections Safety Strategies

Source: NCHRP 500 Series

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
17.1 A -- Improve management of access near unsignalized intersections	17.1 A1 -- Implement driveway closure/relocations	Moderate	Tried	Medium
	17.1 A2 -- Implement driveway turn restrictions	Low	Tried	Short
17.1 B -- Reduce the frequency and severity of intersection conflicts through geometric design improvements	17.1 B4 -- Provide bypass lanes on shoulders at T-intersections	Low	Tried	Short
	17.1 B11 -- Restrict or eliminate turning maneuvers by signing	Low	Tried	Short
	17.1 B12 -- Restrict or eliminate turning maneuvers by providing channelization or closing median openings	Low	Tried	Short
	17.1 B13 -- Close or relocate "high-risk" intersections	High	Tried	Long
	17.1 B14 -- Convert four-legged intersections to two T-intersections	High	Tried	Medium
	17.1 B16 -- Realign intersection approaches to reduce or eliminate intersection skew	High	Proven	Medium
	17.1 B17 -- Use indirect left-turn treatments to minimize conflicts at divided highway intersections	Moderate	Tried	Medium
17.1 C -- Improve sight distance at unsignalized intersections	17.1 C1 -- Clear sight triangle on stop- or yield-controlled approaches to intersections	Low	Tried	Short
	17.1 C4 -- Eliminate parking that restricts sight distance	Low	Tried	Short
17.1 D -- Improve availability of gaps in traffic and assist drivers in judging gap sizes at unsignalized intersections	17.1 D1 -- Provide an automated real-time system to inform drivers of suitability of available gaps for making turning and crossing maneuvers	Moderate	Experimental	Medium
17.1 E -- Improve driver awareness of intersections as viewed from the intersection approach	17.1 E1 -- Improve visibility of intersections by providing enhanced signing and delineation	Low	Tried	Short
	17.1 E2 -- Improve visibility of intersections by providing lighting	Moderate to High	Proven	Medium
	17.1 E4 -- Provide a stop bar (or provide a wider stop bar) on minor-road approaches	Low	Tried	Short
	17.1 E5 -- Install larger regulatory and warning signs at intersections	Low	Tried	Short
	17.1 E9 -- Provide pavement markings with supplementary messages, such as STOP AHEAD	Low	Tried	Short
17.1 F -- Choose appropriate intersection traffic control to minimize crash frequency and severity	17.1 F2 -- Provide all-way stop control at appropriate intersections	Low	Proven	Short
	17.1 F3 -- Provide roundabouts at appropriate locations	High	Proven	Long
17.1 G -- Improve driver compliance with traffic control devices and traffic laws at intersections	17.1 G1 -- Provide targeted enforcement to reduce stop sign violations	Moderate	Tried	Short
	17.1 G2 -- Provide targeted public information and education on safety problems at specific intersections	Low	Tried	Short
	17.1 H1 -- Provide dynamic speed feedback signs	Moderate	Proven	Short
17.1 H -- Reduce operating speeds on specific intersection approaches	17.1 H2 -- Provide traffic calming on intersection approaches through a combination of geometrics and traffic control devices	Moderate	Proven	Medium
	17.1 H3 -- Post appropriate speed limit on intersection approaches	Low	Tried	Short
17.1 I -- Guide motorists more effectively through complex intersections	17.1 I1 -- Provide turn path markings	Low	Tried	Short
	17.1 I2 -- Provide a double yellow centerline on the median opening of a divided highway at intersections	Low	Tried	Short
	17.1 I3 -- Provide lane assignment signing or marking at complex intersections	Low	Tried	Short

Figure 4.3 Unsignalized Safety Strategies

Source: NCHRP 500 Series

4.3 Driver Behavior Based Strategies

4.3.1 Seat Belt Usage

Not using a seat belt is one of the key factors contributing to fatal crashes in Olmsted County. Crash data for the years 2002 – 2006 shows that 30% of the fatal crashes involved unbelted occupants and information provided by the County Sheriff indicates that in 2008, 78% of fatal crashes involved an unbelted occupant. In response to these statistics, a list of

seven strategies was assembled that is based on both the NCHRP 500 series reports and from a safe communities program in Wright County. These strategies focus on two areas – increasing the use of occupant restraints and educating parents about the proper use of child and infant restraints. The priority seat belt usage strategies are documented in **Figure 4.4**.

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
8.1 A- Maximize use of occupant restraints by all vehicle occupants	8.1 A1- Conduct highly publicized enforcement campaigns to maximize restraint use.	Moderate-High	Proven	Medium
	8.1 A2- Provide enhanced public education to population groups with lower than average restraint use rates.	Low	Proven	Short
	8.1 A3- Encourage the enactment of local laws that will permit standard enforcement of restraint laws.	Low	Tried	Medium
	8.1 A4- Support Legislation to change seat belt usage from a secondary to a primary offense.	Low	Proven	Medium
8.1 B- Insure that restraints, especially child and infant restraints, are properly used	8.1 B1- Provide community locations for instruction in proper child restraint use, including both public safety agencies and health care providers, that are almost always available.	Low	Tried	Short
	8.1 B2- Conduct high-profile “child restraint inspection” events at multiple community locations.	Low	Proven	Short
	8.1 B3- Train law enforcement personnel to check for proper child restraint use in all motorist encounters.	Moderate	Tried	Short

Figure 4.4 Seat Belt Usage Safety Strategies

Source: NCHRP 500 Series and Safe Communities of Wright County

It should be noted that while Olmsted County was going through the safety planning process, Minnesota was a secondary state relative to the enforcement of seat belt usage – a driver could only be issued a citation for not wearing a seat belt if they were stopped for another violation. This status as a secondary state lead to the inclusion of a strategy to support legislation to change enforcement of seat belt usage from a secondary to a primary offense. In May, 2009 the Legislature passed into law a statute that makes Minnesota a primary state and that law went into effect in August, 2009.

4.3.2 Impaired/Aggressive/Young Drivers

Drivers under the age of 21 years were involved in more that one-third of fatal crashes in Olmsted County and aggressive and impaired driving were factors that contributed to 25% and 15% of fatal crashes, respectively. The priority list of fourteen strategies was developed that focus on two areas – enforcement and education. The enforcement related strategies include support for more effective techniques and for legislation that would allow the use of two proven effective strategies that are currently prohibited in Minnesota – the use of sobriety checkpoints (that are allowed in 38 states) and the use of ignition interlocks as a condition for license reinstatement following a DWI. The education related strategies are primarily focused on helping young drivers and a public information campaign to deter aggressive driving. The priority Impaired, Aggressive and Young Driver strategies are documented in **Figure 4.5**.

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
More Effective Traffic Enforcement Laws	Support legislation to allow sobriety checkpoints (38 states allow)	Low	Proven	Medium
	Enhance DWI detection through special DWI patrols and related traffic enforcement	Low	Tried	Short
	Publicize and Enforce Zero Tolerance Laws for Drivers Under Age 21	Moderate	Proven	Short
	Targeted enforcement to deter aggressive driving in specific population, including those with a history of such behavior and at specific locations	Low	Tried	Short
Ensuring Safer Bicycle Travel	Seek increased County adoption of policies to better accommodate bicyclists on public roads, and encourage legislatures to fund bicycle facilities	Low	Tried	Short
	Increase bicycle helmet usage	Low	Proven	Short
	Provide separate trails for bicycling	Moderate	Tried	Medium
	Provide wide paved shoulders along designated bicycle routes	Moderate	Tried	Medium
Deter aggressive driving	Reduce nonrecurring delays and provide better information about these delays	Moderate-High	Experimental	
Prosecute, Impose Sanctions on, and Treat DWI Offenders	Suspend driver's license administratively upon arrest	Low	Proven	Medium
	Establish stronger penalties for BAC test refusal than for test failure	Low	Tried	Long
	Eliminate diversion programs and plea bargains to non-alcohol offenses	Moderate	Tried	Long
	Incarcerate offenders	Moderate-High	Proven	Long
	Support legislation to require ignition interlocks as a condition for license reinstatement	Low	Proven	Medium
Public Outreach and Awareness Campaigns	Engage parents through outreach programs designed to educate parents about driving tips for their teens	Low	Tried	Medium
	Develop parent-teen driver's education presentations and handbook aimed at educating individuals on the risk of teen driving	Moderate	Tried	Medium
	Create a seat belt challenge among high schools to encourage teens to buckle up	Low	Tried	Short
	Develop and implement a public education/information program on bicycle safety targeting all age groups of bicyclists and drivers	Moderate	Tried	Short
	Conduct educational and public information campaigns against aggressive driving	Moderate	Tried	Short

Figure 4.5 Impaired/Aggressive/Young Driver/Bicycle Safety Strategies
Source: NCHRP 500 Series and Safe Communities of Wright County

4.3.3 Bicycles

The analysis of Olmsted County's crash records data base found that bicycle related crashes are relatively infrequent, they account for approximately 4% of severe crashes (about 2/year). However, this frequency exceeds the statewide average (1%) and recent information indicates that bicycle related crashes are one of only two safety emphasis areas to see an increase over the past several years (the other emphasis area with an increase in crashes is motorcycles). As a result, a priority list of four bicycle safety strategies was assembled (**Figure 4.5**).

Priority List of Signalized Intersection Safety Strategies

Objectives	Strategies	Relative Cost	Effectiveness	Typical Timeframe	Voting	Rank
	17.2 A4 -- Employ signal coordination along a corridor or route	Moderate	Proven	Medium	12	5
17.2 E -- Improve driver compliance with traffic control devices	17.2 E2 -- Supplement conventional enforcement of red-light running with confirmation lights	Low	Tried	Short	17	2

Priority List of Unsignalized Intersection Safety Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Voting Results	Rank
17.1 B -- Reduce the frequency and severity of intersection conflicts through geometric design improvements	17.1 B12 -- Restrict or eliminate turning maneuvers by providing channelization or closing median openings	Low	Tried	Short	3	12
	17.1 B16 -- Realign intersection approaches to reduce or eliminate intersection skew	High	Proven	Medium	1	15
17.1 E -- Improve driver awareness of intersections as viewed from the intersection approach	17.1 E2 -- Improve visibility of intersections by providing lighting	Moderate to High	Proven	Medium	13	3
	17.1 E4 -- Provide a stop bar (or provide a wider stop bar) on minor-road approaches	Low	Tried	Short		
	17.1 E5 -- Install larger regulatory and warning signs at intersections and improve visibility of intersections by providing enhanced signing and delineation	Low	Tried	Short		
	17.1 E9 -- Provide pavement markings with supplementary messages, such as STOP AHEAD	Low	Tried	Short		
17.1 F -- Choose appropriate intersection traffic control to minimize crash frequency and severity	17.1 F3 -- Provide roundabouts at appropriate locations	High	Proven	Long	1	15
17.1 G -- Improve driver compliance with traffic control devices and traffic laws at intersections	17.1 G1 -- Provide targeted enforcement to reduce stop sign violations	Moderate	Tried	Short	2	14
	17.1 G2 -- Provide targeted public information and education on safety problems at specific intersections	Low	Tried	Short		
17.1 H -- Reduce operating speeds on specific intersection approaches	17.1 H1 -- Provide dynamic speed feedback signs	Moderate	Proven	Short	0	
	17.1 H2 -- Provide traffic calming on intersection approaches through a combination of geometrics and traffic control devices	Moderate	Proven	Medium	0	

Priority List of Road Departure Safety Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Voting Results	Rank		
15.1 A -- Keep vehicles from encroaching on the roadside	15.1 A1 -- Install shoulder rumble strips	Low	Tried	Short	19	1		
	15.1 A2 -- Install edgelines "profile marking", edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders	Low	Experimental	Short				
	15.1 A3 -- Install centerline rumble strips	Low	Experimental	Short			11	7
	15.1 A4 -- Provide enhanced shoulder or delineation and marking for sharp curves	Low	Tried / Proven / Experimental	Short			2	14
	15.1 A6 -- Provide enhanced pavement markings	Low	Tried	Short			3	12
	15.1 A8 -- Apply shoulder treatments *Eliminate shoulder drop-offs *Shoulder wedge *Widen and/or pave shoulders	Low	Experimental / Proven	Medium			7	8

Priority List of Seat Belt Usage Safety Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Voting Results	Rank
8.1 A- Maximize use of occupant restraints by all vehicle occupants	8.1 A4- Support Legislation to change seat belt usage from a secondary to a primary offense.	Low	Proven	Medium	12	5
8.1 B- Insure that restraints, especially child and infant restraints, are properly used	Support legislation to improve child passenger safety laws	Low	Proven	Medium	6	10

Priority List of Impaired/Aggressive/Young Drivers and Bicyclist Safety Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Voting Results	Rank
Ensuring Safer Bicycle Travel	Increase bicycle helmet usage	Low	Proven	Short	4	11
	Support diversion programs to impaired driving offenses	Moderate	Tried	Long	0	
Prosecute, Impose Sanctions on, and Treat DWI Offenders	Support legislation to require ignition interlocks as a condition for license reinstatement	Low	Proven	Medium	0	
Public Outreach and Awareness Campaigns	Conduct educational and public information campaigns against aggressive driving	Moderate	Tried	Short	13	3
	Develop parent-teen driver's education presentations and handbook aimed at educating individuals on the risk of teen driving	Moderate	Tried	Medium		
	Continue seat belt challenges among high schools to encourage teens to buckle up	Low	Tried	Short		

Figure 4.6 Workshop Voting Results

4.4 Safety Strategies Workshop

A key element in Olmsted County's safety planning process included conducting a Safety Strategies Workshop. The Workshop was held on January 7th, 2009 at the 4H Building on the County Fair grounds and was attended by 50 Safety Partners representing:

- Olmsted County
 - Public Works
 - Law Enforcement
 - Planning
 - Public Health
 - Board of Commissioners
- Cities
 - Rochester Public Works, Law Enforcement and Elected Officials
 - Elected officials from Byron, Chatfield, Oronoco and Stewartville
- Mn/DOT
 - District 6 staff
 - Central Office staff representing State Aid to Local Government and Traffic Engineering
- Townships
- Mayo Clinic
- Bicycle Advocates
- Driving Educators



Figure 4.7 Edge Line Rumble StripE's

The two primary objectives of the Workshop included sharing the results of the data driven analytical process and to provide a forum to review and discuss the short list of safety strategies with the County's Safety Partners. During the Workshop, the Safety Partners also participated in an exercise that resulted in a further screening of the safety priorities – the highest ranked infrastructure and driver behavior based strategies are identified in **Figure 4.6** and can be summarized as follows:

- Infrastructure Strategies
 - Edge Line Rumble StripE's (a series of grooves at the road edge that includes the white edge line – **Figure 4.7**)
 - Red Light Confirmation Lights (**Figure 4.8**)
 - Improved Traffic Signs, Markings and Delineation (**Figure 4.9**)
 - Traffic Signal Coordination
 - Center Line Rumble Strips (**Figure 4.10**)
- Driver Behavior Strategies
 - Developing parent/teen driver education



Figure 4.8 Confirmation Light in Dakota County

campaign

- Support legislation changing seat belt enforcement to a primary offense (note – this legislation was passed and went into effect in August, 2009)

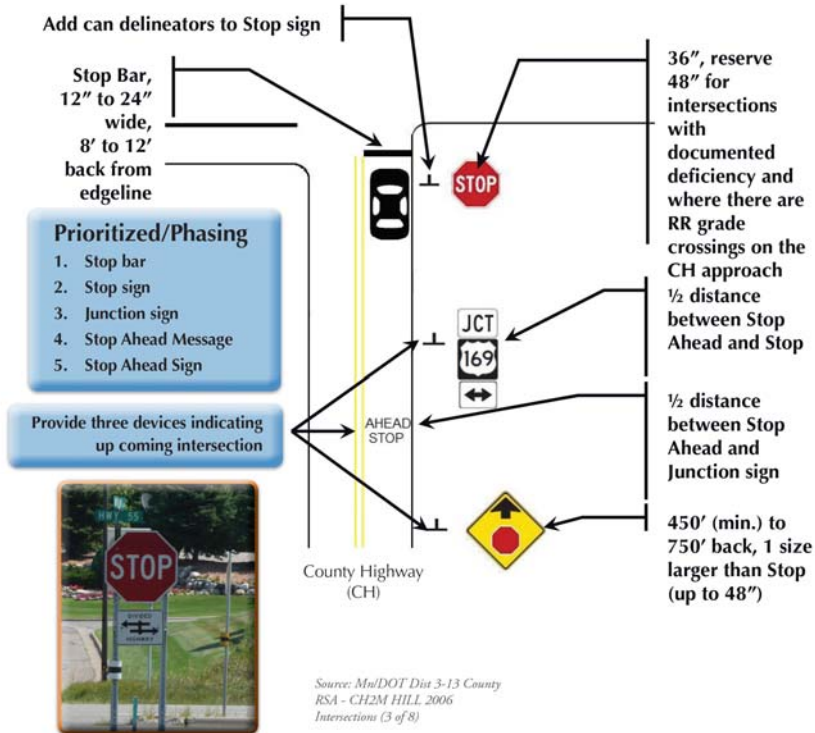


Figure 4.9 Improved Traffic Signs, Markings and Delineation



Figure 4.10 Centerline Rumble Strips