


38th Annual Local Roads Conference Low Volume Road Safety





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Why is addressing traffic safety important?

- Nationwide:
 - 42,795 fatalities per year
 - 117 fatalities per day
 - 5 fatalities per hour
- Ten States:
 - 3,709 fatalities per year
 - 10 fatalities per day
 - 2 fatalities every 5 hours

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Safety on Local Roads - Crash Facts

Minnesota Fatalities by Road Design

| | Fatalities | Percent |
|-------------------|------------|---------|
| Interstate | 34 | 7 |
| State Highway | 179 | 36 |
| County Highway | 174 | 36 |
| Local Street/Road | 101 | 21 |
| Total | 488 | 100 |

57%

https://dps.mn.gov/divisions/ots/reports-statistics/Documents/CFmod_2021_Doc.pdf




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Proven Low-Cost Safety Countermeasures

- Enhanced Delineation for Horizontal Curves
 - Chevrons
 - Curve Warning Signs
 - Pavement Markings
- Wider Edge Lines
- Safety Edge
- Low Cost Countermeasures at STOP Controlled Intersections
 - Double Side Signing
 - Pavement Marking STOP Bar
 - LED Enhanced STOP Sign
 - Intersection Conflict Warning System

[Proven Safety Countermeasures | FHWA \(dot.gov\)](#)



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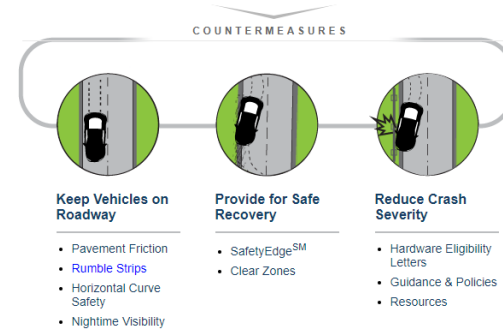
Clear Zones and Recovery Areas

- Driveway Headwalls
- Mailboxes
- Vegetation/Trees



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Lane Departure Crash Countermeasures



Source: FHWA



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Lane Departure Strategies (focus on curves)

- Signs
- Chevrons
- Delineators
- Pavement Markings
- Rumble Strips
- Safety Edge



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Where to Install?

- 50% severe departure crashes on County Roads on Curves.
- Review of over 10,000 curves in Minnesota revealed:
 - No Dead-Mans Curves
 - Radius between 500 and 1,200 feet
 - ADT between 500 and 1500
 - Crest before the curve, Intersection and visual trap



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Shoulder Drop-Offs

Drivers over-correct and steer into oncoming traffic when shoulders fall off

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The Safety Edge

- Decrease highway fatalities and serious injuries.
- Provides an additional level of consolidation on the edge decreasing edge raveling and contributing to longer pavement life.

<https://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/pdf/brochure.pdf>

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Other Typical Segment Countermeasures

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Typical Segment Countermeasures

| Safety Strategy | Crash Reduction Factor* | Cost |
|--------------------------------------|--|-------------------------------|
| Segments | | |
| Clear Zone Maintenance | 35% to 40% | \$50,000 - \$500,000 per mile |
| Enhance Edgeline | 10% to 45% all rural severe crashes | \$2,000 per mile |
| Shoulder Rumble Strip | 20% run-off-road crashes | \$5,850 per mile |
| 2-Foot Shoulder Paving & Safety Edge | 20% to 30% run-off-road crashes (with shoulder rumble) | \$54,000 per mile |
| Centerline Rumble | 40% head-on/sideswipe crashes | \$3,600 per mile |

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Typical Intersection Risk Factors

Proactive Methods

- Skewed approaches
- On/near curve
- Volume
- Proximity to railroad crossing
- Commercial development in quadrant

Reactive Methods

- Proximity to last stop sign
- Intersection related crashes



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Intersection Safety

- Keep Sight Distance Clear of signs, parked vehicles, and vegetation that block visibility.
- Rule of Thumb – 10 seconds of intersection sight distance.

Intersections – Sight Distance

Highlights

- Intersection sight distance refers to the length of the gap along the major roadway sufficient to allow a cross street vehicle to clear safely before crossing the major traffic system.
- A reasonable intersection sight distance allows the adequate driver perception reaction time (2.5 seconds) and other sufficient time to clear the major street, as to leave onto the major street and accelerate to the operating speed without causing approaching vehicles to reduce speed by more than 20 mph.
- The actual length of the recommended intersection distance is a function of the major street operating speed. However, the desired rate of gap versus time is 7 seconds @ 10 mph to 10 seconds at speeds of 60 mph and above.
- When dealing with HADDO's trunk highways, refer to Section 5.2.2.10 of the Road Design Manual for additional guidance regarding intersection sight distance.
- It is important to note that intersection sight distance is always greater than stopping sight distance for all roads at 50% or 60%.
- The 10 second "Rule of Thumb" – 10 seconds of intersection sight distance – is a good estimate, regardless of conditions.
- Removal of vegetation and on-street parking are cost effective safety improvements for intersections.

<https://www.dot.state.mn.us/trafficeng/safety/reportspubl.html>

SRF Safety Fundamentals Handbook, 2012 C-29

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Low-Cost Intersection Counter Measures

- Double Side Signing
- Pavement Marking STOP Bar
- LED Enhanced STOP Sign
 - 10-25% reduction
- Intersection Conflict Warning System
 - 17-27% reduction

[LRRB Intersection Safety Technologies Guidebook](#)

| | Passive LED STOP Sign | Active LED STOP Sign Controlled by Detector | Major Road Daily System Controlled by Detector | Minor Road Daily System Controlled by Detector | Major & Minor Road Warning Signal Controller |
|-----------------------|-----------------------|---|--|--|--|
| Controller | None | Controlled by Detector | Controlled by Detector | Controlled by Detector | Signal Controller |
| Signs | STOP or LED STOP | STOP or LED STOP | TRAFFIC ADVANCING on mainline | TRAFFIC ADVANCING on major road | TRAFFIC ADVANCING on minor road |
| Detection | No | Yes | Detect Minor Road Vehicles | Detect Major Road Vehicles | Detect all approaches |
| Malfunction Detection | No | No | Yes | Yes | Yes |
| Event Logging | No | No | Yes | Yes | Yes |
| System Cost | \$2,000 | \$20,000 | \$50,000 | \$50,000 | \$100,000-\$175,000 |



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Required and Effective Signs Signs Required in Minnesota

| | | |
|------------|--|---|
| Regulatory | | <ul style="list-style-type: none"> • Speed Limits IF a speed zone (other than a statutory limit) has been established. • ONEWAY & DO NOT ENTER where applicable. • The ALL-WAY STOP plaque at All-Way Stops. • STOP or YIELD IF at a passive railroad crossing • Prohibition signs where applicable |
| Warning | | <ul style="list-style-type: none"> • Rail Road Advance Warning and No Train Horn (if quiet zone established) • Clearance IF clearance is less than 14'-6" (12" above the statutory minimum clearance height) • Advance Traffic Control IF there is limited sight distance. • Horizontal Alignment IF more than 1,000 AADT • Minimum Maintenance |
| Guide | | <ul style="list-style-type: none"> • Route Numbers on ALL numbered highways • Junction Assembly • Advance Route Turn Assembly |



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Sign Effectiveness

Research has found:

- Pedestrian warning signs with marked crosswalks at uncontrolled intersections resulted in greater numbers of pedestrian crashes.
- STOP signs are rarely safety devices, especially at very low volume intersections.
- Overuse of STOP signs at intersections where there is rarely any cross traffic has resulted in overall compliance rates less than 20%.

| | Signs that ARE proven to be effective | Signs that have not been tested for effectiveness | Signs that appear to be ineffective | Signs that are proven ineffective |
|------------|---------------------------------------|---|--------------------------------------|-----------------------------------|
| Regulatory | | LEFT LANE MUST TURN LEFT SLOWER TRAFFIC KEEP RIGHT | SPEED LIMIT 50 STOP | |
| Warning | Left turn arrow, Right turn arrow | Slippery road, Bicycle, Pedestrian | Caution children at play, Pedestrian | Pedestrian |
| Guide | | | E Main St, WRIGHT 44 COUNTY | |



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Vegetation Trimming



https://safety.fhwa.dot.gov/local_rural/training/fhwasa07018/

Clear Distance Guidance to See Sign

| Speed Limit (mph) | Critical Signs (feet) | Noncritical Signs (feet) |
|-------------------|-----------------------|--------------------------|
| 30 | 250 | 150 |
| 40 | 350 | 200 |
| 50 | 450 | 250 |
| 60 | 600 | 300 |

Figure Source: FHWA Vegetation Control for Safety (p. 14)



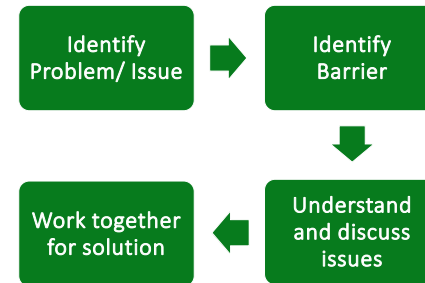
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Safety Culture – Observation of Safety Concern

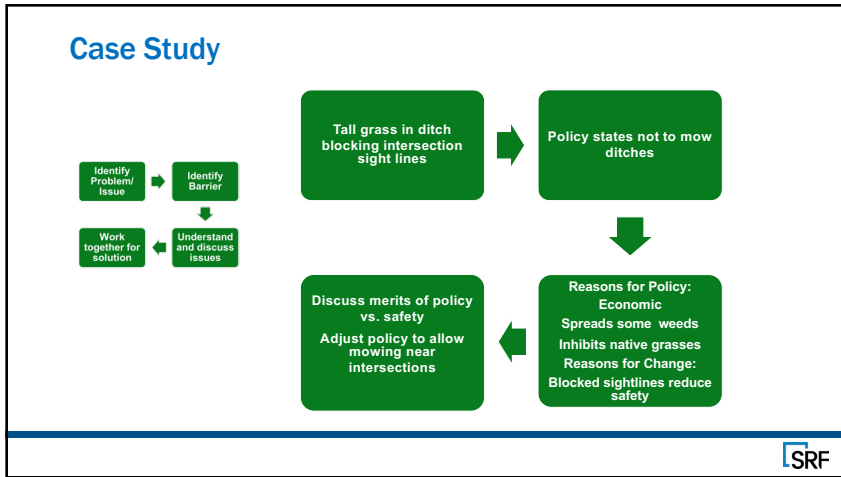


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How to Implement Policy/Procedure Change



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Systematic Approach to Address Safety

- Development of Roadway Safety Plan
- Prioritized list of suggested safety projects

The goal of a road safety plan is to reduce fatal and serious injury crashes by providing staff with a list of prioritized locations that have safety issues and guidance on specific safety strategies to implement.

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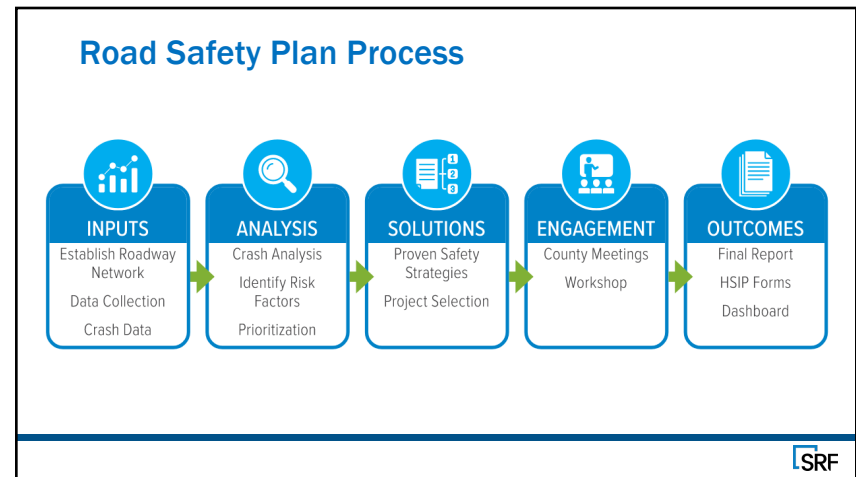
Local Road Safety Plan

Proactive Approach

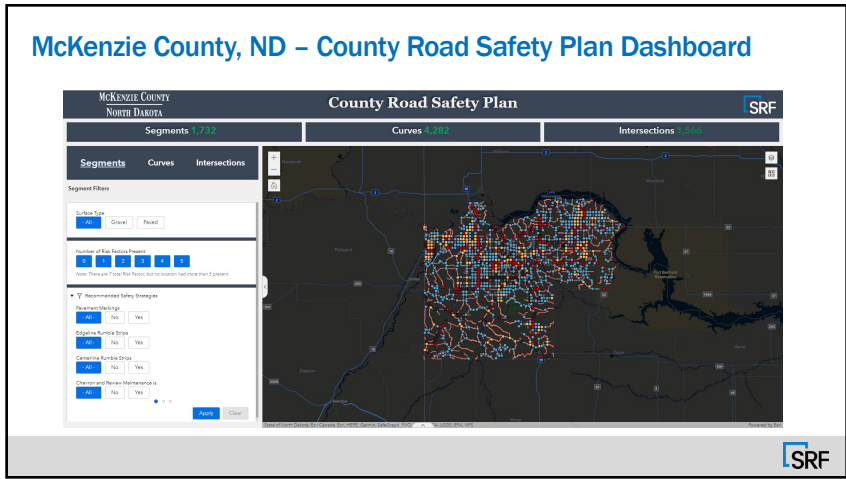
- Based on risk factors
- Systematic approach to identify effective safety countermeasures across a roadway system
- Position agency to compete for available safety funds
- Foster a culture of safety

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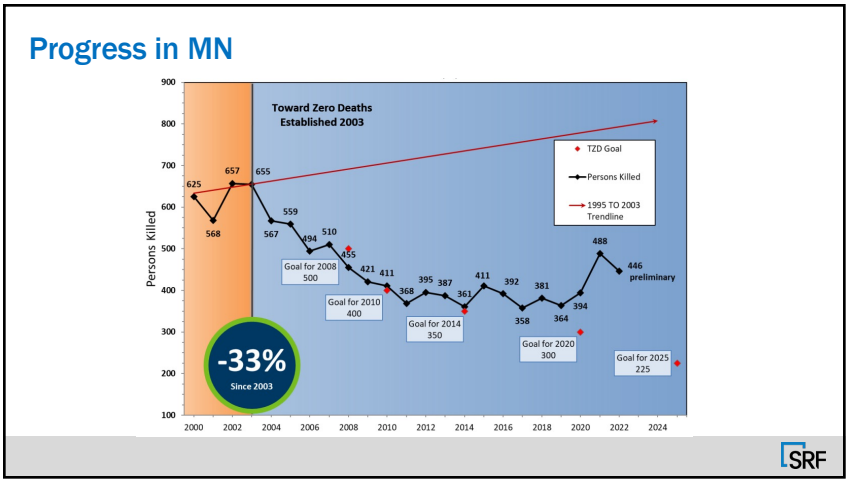
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Gravel Road Safety Strategies

- Surface Condition
- Strength to Address traffic loading
- Drainage
- Chevrons, Delineators, Advance Warning Signs for Curves
- Maintaining intersection sight corners
- Consolidate access points (field entrances)

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Activities on Unpaved Roads

- Grading
 - Light Grading
 - Surface Reshaping
- Pulling Ditches or Shoulders
- Resurfacing
- Culvert Installation and Maintenance Detour
- Reconstruction Detour

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Work Zone Signing on Low Volume Roads

ARE YOU KIDDING ME?



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Considerations – There is No Recipe

- Sight Distance and Traffic Speed
- Traffic Volume
- Environment
- Activity or Type of Work



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Plan the Work and Work the Plan

Responsibility rests with the public agency or official having jurisdiction.

- Design
- Placement
- Operation
- Uniformity



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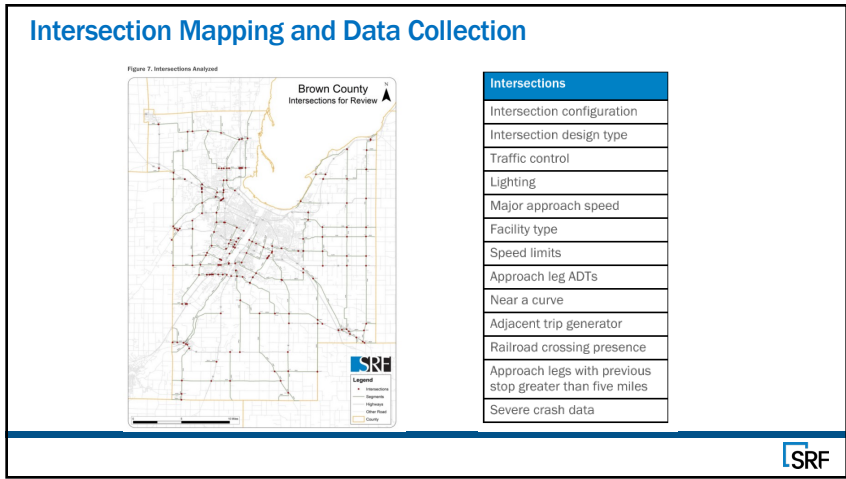
Questions and Discussion



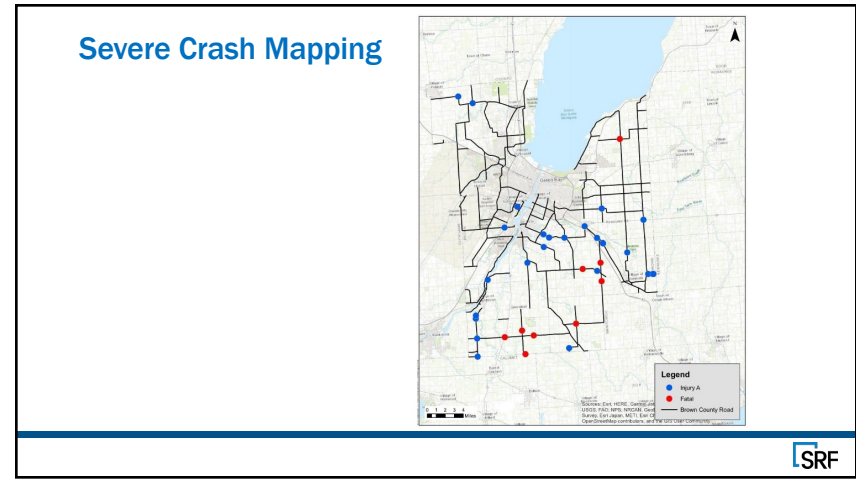
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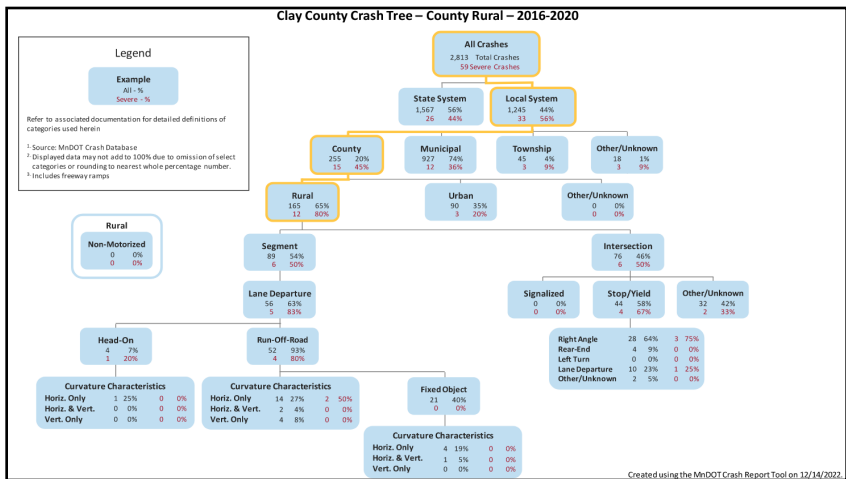
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