Road Safety for Everyone

Module 1: Course Introduction
Welcome

Course Instructor

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Course Objectives

• Explain the need for making roads safer.
• Separate safety myths from reality.
• Demonstrate how to “read the road.”
• Describe practical and low-cost countermeasures to improve safety, both on existing roads and during project development.
• Identify ways to plan, implement, and fund low-cost safety measures.
Module 2: The Need for Road Safety
Learning Outcomes

• Identify safety issues unique to local and rural roadways.

• Identify common challenges to improving road safety.

• Explain why road agencies and others should continually strive to improve road safety.
Rural and Local Road Safety
In Ohio:

- Nearly 84% of center line miles are on county and local roads.
- Only 39% of the vehicle miles travelled occur on county and local roads.

Source: Ohio Department of Transportation
BACKGROUND

Ohio Fatalities by Year & Location 2001-2009

More than 64% of Ohio fatalities occur on rural roads.

Source: US DOT Highway Statistics 2009
What are Potential Safety Issues?
What are Potential Safety Issues?

**Safety Issues:**
- Narrow roadway
- Pavement markings
- Poor stopping sight distance
- Steep side slopes
- Gravel and stones on the roadway
What are Potential Safety Issues?

Safety Issues:
• Water on roadway
• No shoulder/edgeline
What are Potential Safety Issues?

Safety Issues:
- Bleeding pavement
- Lack of delineation
What are Potential Safety Issues?

Safety Issues:
• Trees in clear zone
• Limited sight distance
• Lack of signs and delineation
What are Potential Safety Issues?

Safety Issues:
• Fixed objects in clear zone
• Unrecoverable steep side slopes
What are Potential Safety Issues?

Safety Issue:
• Bridge structure is a fixed object
What are Potential Safety Issues?

Safety Issue:
- Pavement edge drop-off
What are Potential Safety Issues?

Safety Issues:
• Faded pavement markings
• Concrete fixed object
What are Potential Safety Issues?

Safety Issue:
- Deteriorated sign retroreflectivity
What are Potential Safety Issues?

Safety Issue:
- Fence blocks sidewalk path
**Challenges to Road Safety**

<table>
<thead>
<tr>
<th>Limited…</th>
<th>In addition to…</th>
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<tbody>
<tr>
<td>• Budgets</td>
<td>• Lack of coordination between agencies</td>
</tr>
<tr>
<td>• Staffing</td>
<td>• Competing priorities</td>
</tr>
<tr>
<td>• Time</td>
<td>• Politics</td>
</tr>
<tr>
<td>• Crash data</td>
<td>• Staff turnover</td>
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<tr>
<td>• Traffic and road information</td>
<td>• Empowerment</td>
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<tr>
<td>• Understanding or awareness of safety issues</td>
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<td>• Training</td>
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Ways to Overcome Some Challenges

• Develop safety awareness
• Identify what to look for
• Identify simple, low cost ways to improve road safety
• Incorporate safety into the “Big Picture”
Questions?
Module 3: Road Safety

Myth vs. Reality
Myth vs. Reality

Myth: Safety costs a lot

Reality: Can do a lot for little to no cost
Example
Myth vs. Reality

Myth:
I can’t do safety because first I have to repave (or replace my signs)

Reality:
Safety can be incorporated into all activities
Consider

- Is blanket replacement of signs the best use of funds or are there high-crash locations without signs that would benefit from sign installation?

- Is safety one of the criteria for determining when roads/streets need to be repaved?

- How will higher travel speeds brought about by resurfacing affect safety for motorists and pedestrians?
**Myth vs. Reality**

**Myth:**
Crashes are the driver’s fault and there’s nothing I can do about it.

**Reality:**
Crashes have multiple causes (driver, roadway and vehicle)
Crash Causes

Roadway 34%

Driver 93%

Vehicle 12%

Accommodate Drivers

- Drivers need certain information to make decisions.
- They need time to receive and process that information and arrive at those decisions.
- They sometimes make incorrect decisions.
- Road system should accommodate drivers, not the other way around.
Myth vs. Reality

**Myth:**

Wider is always safer

**Reality:**

Wider roads and intersections could have unintended consequences
Myth vs. Reality

Myth: Crash reports are completed by police officers only for insurance companies.

Reality: Crash reports are used in making roads safer.
What are other myths about road safety have you encountered at work?

How have you overcome those myths?
Low Cost Local Road Safety Solutions

http://docs.mvrpc.org/safety/Low_Cost_Local_Roadway_Safety_Solutions.pdf
Resources

http://safety.fhwa.dot.gov/local_rural/training/fhwasa07018/
http://safety.fhwa.dot.gov/local_rural/training/fhwasa09024/
Resources

www.highwaysafetymanual.org/
www.dot.state.oh.us/Divisions/HighwayOps/Traffic/publications2/TEM/
www.dot.state.oh.us/Divisions/HighwayOps/Traffic/publications2/OhioMUTCD/
Questions?
Module 4: Reading the Road

How You Can Help Improve Safety in Your Community
“Extra Eyes for Safety”
Looking for indications that road users may be having problems travelling a section of roadway.
What Indication Do You See?

Yaw Marks
What Indication Do You See?

**Scar on tree**
What Indication Do You See?

Water on road
What Indication Do You See?

Object Marker
What Indication Do You See?

Damaged guardrail

Clear Creek
What Indication Do You See?

Pedestrians in roadway
What Indication Do You See?

Tracks on gravel shoulder
What Indication Do You See?
Questions?
Module 5: Making Roads Safer

A Process for Reducing Crashes
Steps in Crash Reduction Process

1. Identify the site
2. Determine crash pattern
3. Visit the site
4. Identify contributing factors
5. Assess and select countermeasures
6. Implement countermeasures
Obtain Crash Data

Crash Report Data includes:

- Time/date of crash
- Pavement or surface conditions
- Weather conditions
- Other contributing factors
GCAT (GIS Crash Analysis Tool) uses GIS (Geographic Information Systems) to produce data that is spatially located (valid latitude/longitude). The purpose of GCAT is to provide a convenient highway safety crash analysis tool for ODOT, MPOs and county engineers.
Pin Map - Crash Locations and Crash Types

- Right-angle
- Rear-end
- Run-off-road
- Left turn
- Pedestrian
- Head-on
Create Collision Diagram

Collision Diagram

Legend:
- Injury
- Fatality
- Road Condition, Date, Time

1. Wet, 08/06, 7 PM
2. Dry, 05/07, 8 AM
3. Dry, 07/07, 6 PM
4. Icy, 01/08, 7 AM
5. Dry, 06/08, 12 PM

- Angle
Collision Diagram Symbols

- Rear-end
- Head-on
- Left/Right Rear-end
- Sideswipe Same Direction
- Sideswipe Opposite Direction
- Angle
- Left-turn Head-on
- Left/Right Turn
- Left/Right Crossing
- Single Vehicle
- Fixed Object
Steps in Crash Reduction Process

1. Identify the site
2. Determine crash pattern
3. Visit the site
4. Identify contributing factors
5. Assess and select countermeasures
6. Implement countermeasures
Visit the site

- Observe traffic under conditions of interest
- Gather basic traffic data (volumes and speeds)
RSA = formal safety performance examination of an existing or future road by an independent audit team.

“RSAs are a proven way to review just how safe our local roads are and can be a valuable tool for local government road professionals in making their roads safer.”

Tony Giancola
Executive Director, NACE
safety.fhwa.dot.gov/rsa/
Prepare a Condition Diagram

Condition Diagram
Steps in Crash Reduction Process

1. Identify the site
2. Determine crash pattern
3. Visit the site
4. Identify contributing factors
5. Assess and select countermeasures
6. Implement countermeasures
9 Proven Countermeasures

- Safety Edge
- Road Safety Audits
- Rumble Strips/Stripes
- Median Barriers
- Roundabouts

- Left/Right Turn Lanes
- Yellow Change Intervals
- Medians and Pedestrian Refuge Areas
- Walkways
Countermeasures to Consider

• Edgelines and delineation

• Rumble strips

Centerline Rumble Strips Help Keep Drivers in Their Lane

Centerline Rumble Strip
I-75 in northern Michigan

Comparison of painted edgeline in Rain

Normal Edgeline

Rumble Edgeline
Effectiveness

- Center line rumble strips on rural two-lane roads: 44% reduction of head-on/fatal and injury crashes.
- Center line rumble strips on urban two-lane roads: 64% reduction of head-on/fatal and injury crashes.
- Shoulder rumble strips on rural two-lane roads: 36% reduction of run-off-road fatal and injury crashes.
Warning Signs for a Curve

Notes:
1. See Table 2C-4 for advance placement distance guidelines
2. See Table 2C-5 for the selection of horizontal alignment signs
3. See Table 2C-6 for spacing of W1-8 signs
4. A 25-mph advisory speed is shown for illustrative purposes only
Enhanced Delineation and Friction for Horizontal Curves

Roadway with 4-in edge line

Roadway with 8-in edge line
Background

• Horizontal curves are a change in roadway alignment creating a more demanding environment for driver, vehicle, and pavement.
• Challenges of safe navigation of horizontal curves are compounded with nighttime driving environment or inclement weather.
• 28% of all fatal crashes occur on horizontal curves. Three times as many crashes occur on curves as on tangent sections.
• Early driver perception and appropriate reaction to changes in roadway greatly improve safety of the curve
• Inconsistent use of warning signs is an important factor contributing to high incidence of crashes on curves.
• MUTCD was recently revised to attempt to provide a more uniform application.
Effectiveness Values for Curve Treatments

• Chevron signs and curve warning signs can yield a 38-43% percent reduction in all fatal and injury crashes.

• Chevron signs on curves can yield a 16% reduction in non-intersection fatal and injury crashes.

• Fluorescent curve signs or upgrading existing curve signs to fluorescent sheeting can yield a 25% reduction in non-intersection fatal and injury crashes.
Effectiveness Values (cont’d)

• Providing static combination horizontal alignment/advisory speed signs can generate a 13% reduction in injury crashes.

• Refinishing pavement with microsurfacing treatment can yield a 43% reduction in all fatal and serious injury crash
Before Installation of Chevrons
After Installation of Chevrons
Countermeasures to Consider

• Barrier/guardrail
Reflectors on W-Beam Guardrail
Countermeasures to Consider

• The Safety Edge

Source: FHWA

http://safety.fhwa.dot.gov/policy/memo071008/
Safety Edge

Conventional Paving  Paving with Safety Edge
Benefits of A Safety Edge

- Immediate and long term mitigation of drop-off
- Provides strong, durable transition for all vehicles
- Even at high speeds, vehicles can return to paved road smoothly and easily
Benefits of A Safety Edge (cont’d)

- Reduces tort liability exposure
- Cost less than 1% of material costs
- Increased pavement edged durability since provides an additional level of consolidation on the edge
Countermeasures to Consider

- Left-turn lanes
Background

- Red-light running is one of the most common causes of intersection crashes.
- Yellow interval duration is a significant factor affecting the frequency of red-light running.
- Increasing yellow time to meet the needs of traffic can dramatically reduce red light running.
- Longer yellow interval durations consistent with the ITE Proposed Recommended Practice using 85th percentile approach speeds are associated with fewer red-light violations.
Background (cont’d)

• Length of yellow change interval should be increased at any intersection where the existing yellow change interval time is less than the time needed for a motorist traveling at the prevailing speed of traffic to reach the intersection and stop comfortably before the signal turns red.
Countermeasures to Consider

- Sidewalks
- Walkways
Types of Pedestrian Walkways

- Pedestrian Walkway (Walkway): A continuous way designated for peds and separated from motor vehicle traffic by a space or barrier.

- Shared Use Path (Multi-use Trail): A bikeway or pedestrian walkway physically separated from motorized vehicular traffic by an open space or barrier—either within a highway right-of-way or within an independent right-of-way. May also be used by, skaters, wheelchair users, joggers, and other nonmotorized users.

- Sidewalks: Walkways that are paved and separated from the street, generally by curb and gutter.

- Roadway Shoulder: In rural or suburban areas where sidewalks and pathways are not feasible, gravel or paved highway shoulders provide an area for pedestrians to walk next to the roadway.
Safety Benefit of Sidewalks/Shoulders

• Presence of sidewalk or pathway on both sides of street corresponds to about 88% reduction in “walking along road” ped crashes.

• Providing paved, widened shoulders (min. of 4 ft) on roadways that do not have sidewalks corresponds to about 71% reduction in “walking along the road” ped crashes.

• “Walking along road” ped crashes typically are around 7.5% of all pedestrian crashes (with about 37% of the 7.5% being fatal and serious injury crashes).
Countermeasures to Consider

Pedestrian Refuges
Effectiveness

• Demonstrated reductions in pedestrian crashes:
  – Marked crosswalks - 46%
  – Unmarked crosswalks - 39%

• Considered for curbed sections of multi-lane roadways in urban and suburban areas:
  – Significant number of pedestrians
  – High traffic volumes
  – Intermediate or high travel speeds
**Countermeasures to Consider**

**Maintenance Strategies**

- Patching Potholes
- Cleaning Drainage Structures
- Blading Ditches
- Trimming Vegetation
Steps in Crash Reduction Process

1. Identify the site
2. Determine crash pattern
3. Visit the site
4. Identify contributing factors
5. Assess and select countermeasures
6. Implement countermeasures
Example 1 - Identify Site & Obtain Crash Data

3 Years Crash Data

- 4 Run-off-road
  - 1 overturned
  - 1 went into creek
  - 2 struck utility pole

- 1 Sideswipe Opposite

- 1 Head-on

Collision Diagram
Visit the Site & Identify Contributing Factors

Example 1 - Southbound View from Upstream of Curve
Visit the Site & Identify Contributing Factors

Example 1 - Southbound View of Curve
Visit the Site & Identify Contributing Factors

Example 1 - Northbound View of Curve
Visit the Site & Identify Contributing Factors

Example 1 - Evidence of Vehicle Running Off Road on Outside of Curve
Example 1 - Create Condition Diagram

• Posted Speed Limit = 35 mph
• Turf Shoulders of Variable Width
• 6% Superelevation
• Radius = 110’
Example 1 - Discussion

- What type of crash patterns do you see?
- What are the contributing factors
- What would be appropriate countermeasures?
Example 2 - Identify Site & Obtain Crash Data

3 Years of Crash Data

- 4 Angle
- 2 overtaking left
- 2 run-off-road
- 1 Rear-end

Collision Diagram
Visit the Site & Identify Contributing Factors

Example 2 - Northbound View
Visit the Site & Identify Contributing Factors

Example 2 - Northbound View
Visit the Site & Identify Contributing Factors

Example 2 - Eastbound Approach
Example 2 - Create Condition Diagram

- Two-way STOP control
- Posted Speed Limit = 55 mph on both roads
- Gravel Shoulders of Variable Width

Condition Diagram
• What type of crash patterns do you see?
• What are the contributing factors
• What would be appropriate countermeasures?
Example 3 - Identify Site & Obtain Crash Data

3 Years of Crash Data

- 7 Run-off-road
  - 3 overturned
  - 2 struck stone wall
  - 2 struck a tree

- 2 Head-on

Collision Diagram
Visit the Site & Identify Contributing Factors

Example 3 - Two-Lane Segment
Visit the Site & Identify Contributing Factors

Example 3 - Roadside Safety Issues
Example 3 - Maintenance
Example 3 - Create Condition Diagram

- Posted Speed Limit = 45 mph
- Gravel Shoulders of Variable Width
- Steep Sideslopes
- Many Horizontal curves
• What type of crash patterns do you see?
• What are the contributing factors
• What would be appropriate countermeasures?
Resources

Questions?
Module 7: Planning and Paying for Safety Improvements

How to do More with Less
Learning Outcomes

• Describe ways to implement practical safety solutions during both maintenance and project development.

• Identify potential sources of funding.
Integrate Safety into Projects

- Project Development
- New Developments
- Capital Projects
- Ongoing Routine Maintenance Activities
Engage safety experts in project development to identify low-cost safety improvements
Incorporating Safety into New Developments
Incorporating Safety into New Developments

Consider:

- Access management
- Traffic control improvement
- Additional turn lanes
- Right-in/Right-out
Incorporating Safety into Capital Projects

Install/upgrade traffic control devices:

- Rumble strips
- Delineation
- Pavement markings
- Signs
- Signals
Incorporating Safety into Capital Projects

- Identify targeted safety improvements for capital projects
- Not feasible to implement system-wide upgrade program
- Road Safety Audits (RSA) can identify safety issues and low-cost countermeasures
Remove, relocate, or shield roadside hazards including:

- Outdated barriers/guardrails
- Outdated culvert treatments
- Abrupt pavement drop-offs
- Trees and utility poles
- Non-breakaway supports
Incorporating Safety into Capital Projects

Improve access management:
• Access consolidation
• Access reconfiguration
• Lighting
• ADA Requirements
Incorporating Safety into Capital Projects

Make selective geometric improvements:

• Cross-section improvements
• Sight distance or sight line improvements
Integrate Safety into Maintenance

- Maintenance may be the only regular road improvement activity
- “Piggybacking” safety improvements on a maintenance project may represent only a small additional cost

[Diagram showing overlapping circles labeled “System Preservation” and “Safety Improvement” with a section labeled “Shared Base Costs”]

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Incorporating Safety into Ongoing Maintenance

Upgrade traffic control devices during maintenance:

- signs
- signals
- pavement markings
Incorporating Safety into Ongoing Maintenance

Upgrade traffic control devices during maintenance:

- signs
- signals
- pavement markings
Incorporating Safety into Ongoing Maintenance

- Drainage
- Vegetation control
- Pavement surface condition
Funding Sources

- Highway Safety Improvement Program (HSIP)
- High Risk Rural Roads
- STP Funds
- CMAQ
- Transportation Enhancement Fund
- Safe Routes to School
- State Funds
- Local Funds

Visit: safety.fhwa.dot.gov/hsip/
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Questions?