State DOT
Road Safety Audit Programs

Thomas M. Welch, P.E.
State Transportation Safety Engineer
Office of Traffic and Safety
Iowa Department of Transportation
515 239-1267
tom.welch@dot.iowa.gov

Arizona
Roads and Streets Conference
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WORLD HEALTH ORGANIZATION

1.2 million people will die as a result of road crashes this year –
more than 3200 deaths each day

ROAD SAFETY IS NO ACCIDENT
Iowa’s Highway Safety Management

Governor

Department of Transportation

Office of Traffic and Safety

Safety Management System & Statewide Traffic Records Committee

Cities, Counties, Other State Agencies, Universities & Private Sector Groups

Department of Public Safety

Governor’s Traffic Safety Bureau (GTSB)
Iowa’s Highway Safety Management

Office of Traffic and Safety

State Safety Engineer 9 Staff

State Traffic Engineer 13 Staff
Iowa DOT Safety Programs

Statewide Programs
- Federal Hazard Elimination Program
- Highway Safety Management System (SMS)
- Data-Driven Highway Safety Program
- Safety Conscious Planning
- 3R Roadway Safety Audits

Local Assistance Programs
- State Traffic Safety Improvement Programs (TSIP)
- Traffic Engineering Assistance Program (TEAP)
- Safety Data Products
  - Crash Data Analysis Tools
  - Iowa Traffic Safety Data Services (ITSDS)
- Traffic & Safety Engineering Forum
- Small town signing program
In 2004, AASHTO’s TIG selected RSAs as focus technology

Tom Welch and Terecia Wilson Co-Chairs

Team includes AASHTO, NACE, LTAP, FHWA, Universities

RSA Brochure

Video

Regional Peer Exchange Workshops
What is a Road Safety Audit?

A road safety audit is a formal examination of an existing or future road or traffic project, or any project which interacts with road users, in which an independent, qualified examiner reports on the project’s crash potential and safety performance.
Road Safety Audits are

A

PROACTIVE SAFETY

TOOL
Road Safety Audits Are Not:

- Praise or Critique of Design Work or Personnel
- Crash Investigation Only (Reactive)
- Provide Alternative Designs
- High-Cost or Resource-Intensive
- Replace Engineering, Fiscal Decision-Making
In the Beginning

1994 FHWA Safety Management Scanning Tour
- Australia
- New Zealand
FAQs

1997 in St. Louis

- 13 DOTs attended
- Many concerns raised
Training Courses

2000 FHWA

2001 NHI Courses
Has an RSA Program
- Rhode Island

Considering an RSA Program
- New Jersey

RSA Only on Existing Roads
- Maryland

Has Informal RSA Program
- NO RSA Program but has some RSA activity
- NO RSA Program
- NO Response / Unknown
TRADITIONAL RSA PROGRAMS
When Can RSA’s Be Used?

**Traditional:**
- Planning & Land Use Development - *Best*
- Preliminary Design, Detailed Design
- Construction
- Operations, Maintenance

**NonTraditional:**
- Rehabilitation
Why is SC doing RSAs?

[Bar chart showing a decrease in RSAs from 1992 to 2001.]

- 1992: 807
- 1993: 845
- 1994: 847
- 1995: 882
- 1996: 930
- 1997: 903
- 1998: 1,001
- 1999: 1,064
- 2000: 1,063
- 2001: 1,060

Down 0.4% since 1999
Why is SC doing RSAs?

- Proactive approach to highway safety.
- Widely used in other countries, highly effective.
- Possible even with limited resources.
- Supports Strategic Plan Goal of improving safety.
Projects

• The first year will feature 4 existing roads, 2 new projects, and 5 under construction.
“We view RSAs as a proactive, low cost approach to improve safety. The RSA helped our engineering team develop a number of solutions incorporating measures that were not originally included in the projects. The very first audit conducted saved SCDOT thousands of dollars by correcting a design problem.”

-Terecia Wilson
Director of Safety, South Carolina DOT
The MaineDOT Approach

Focus on Planning & Scoping Activities
- Maximum Life Cycle Safety Benefits
- Minimal Life Cycle Cost
- Reduced Need for Follow-Up Safety Projects

Minimal Administration & Resources

Selective RSAs in Subsequent Phases

Rte. 136, Freeport
MaineDOT RSA Findings -Driver Expectations-

- Consistency in Road Geometry
- Driver Information Signs
- Speed Control, Speed Limits
- Railroad & Other Crossings
- User Mix (Bike, Ped, Large Vehicles, Other)

Litchfield
MaineDOT RSA Findings
-Geometrics-

- Lane & Shoulder Widths, Types
- Access Control, Entrance & Egress
- Lane Changes, Turning Movements
- Parking
- Lighting, Sun Glare
NON-TRADITIONAL RSA PROGRAMS
Maine
Example
Report

Woolwich Route 1
Road Safety Audit Report
September 23, 2005

Prepared by
Duane Brunell, Safety Office, MaineDOT

Route 1 Woolwich
Crashes (2002-2004)

Study Area
Number of Crashes

Route 1 Woolwich

Woolwich

Bath

Cumberland Farms

Foca Market

Taste of Maine

Dery Queen

Wiscasset

Route 1, Woolwich Road Safety Audit
MaineDOT

September 23, 2005
Typical Iowa “New Construction”
From 1R to 3R

- We were resurfacing the roads and nothing else.
- 3 inch overlay every 20 years would cost $100,000,000 a year so that was our program goal.
- Safety and incidental items slowed this down.

Prior to 2000
3R Project Annual Cost Breakdown

FY 2001: 92%
FY 2000: 89%
FY 1999: 94%

- Rehab
- Misc
- Safety
Safety Program Focus:

Low cost improvements to improve safety on all roadways in the next 20 years
November 5-6, 2002

3R Safety Workshop

Roadway Resurfacing Safety Workshops

Sponsored by the Office of Traffic and Safety

Iowa Department of Transportation
SAFETY REVIEW CHECKLIST

FOR PROJECT REVIEW

( It is assumed that the accident history has already been reviewed for ‘hot spots’ and substandard geometrics etc have been identified )

SAFETY RELATED ITEMS ( Done with project or later ) Not all inclusive

NOTE: This is not an all or nothing proposition — i.e.,
A) If fixed objects cannot be moved to the chart clear zone — can they be moved a part of the distance — 6’ from the back of curb is better than in the back of curb
B) If it is cost prohibitive to correct all the substandard cross slopes can those on the outside of curves or where a vertical face exists be corrected
C) If all the poles / trees cannot be moved / eliminated are there some that can be taken care of — unused or single line drop poles are usually easy to eliminate, move or combine
D) Special attention should be paid to those areas that a review of the accident history has highlighted as hot spots

1) Clear Zone
   a) May need to remove / protect objects beyond clear zone
   b) Removal of vegetation that has been allowed to grow in the foreslopes or at the toe of a traversable foreslope etc.
   c) Move poles to inside from outside of curves
   d) Move / remove poles / trees
   e) Fill large gullies in foreslopes or at toe of slope

2) Access
   a) Correct / relocate drives / entrances with poor sight distance
   b) Catch ones that could create a problem with future development

3) Curves
   a) Add / correct superelevation
   b) Pave outside / inside of shoulder
   c) Flatten outside foreslope
   d) Add delineators, chevron, RPM’s
   e) Bell bank for advisory speed
   f) Add advance warning signs — check for correct sign for advisory speed

6 Page Worksheet
31 Review Categories
3R Roadway Safety Audits
3R Safety Audits

- By Districts
- Recently Completed 3R Projects
- Proposed 3R Projects
- Crash Analysis
- Prepare Audit Report
- Annual Report to Chief Engineer
3R Safety Audit Review Team

- Safety
  - DOT
  - FHWA
- Design
- Maintenance
- Construction
- Older driver
- Local enforcement input
US 69 Fatal and Injury Crashes
Warren County (Clarke County to Iowa 349)
(1996-2000)

*As recorded in the crash record.*
Warren County

US 69 Crashes by Accident Type (1995-1999)

Accident Type:
- Overturned
- Non-collision Other
- Collision w/ Vehicle
- Parked vehicle
- Animal
- Fixed Object
- US 69 proposed 3R section
- Primary Roads
- Roads

Map showing various streets and accident markers.
Warren County

Warren County


Roadway Geometrics
- Straight, Level (18)
- Straight, Up/Downgrade (24)
- Curve, Level (7)
- Curve, Up/Downgrade (9)
- Intersection, Level (7)
- Intersection, Up/Downgrade (1)
- US 69 proposed 3R section
- Primary Roads
- Roads

4
0
4
8
Miles

 compass directions
Warren County

US 69 Crashes by Injury Severity
(1995-1999)
Safety Improvements
Incorporated Into 3R Projects

4’ Paved Shoulders with milled rumble strips
Safety Improvements Incorporated Into 3R Projects

“Rumble Stripes”
Curves

- Super elevation: add or correct
- Pave shoulders: outside & inside
- Flatten outside slope
- Remove objects outside curve
- Delineate, chevron, RPM’s, ball bank advisory
Safety Dikes (escape ramps)

- Opposite all “T” intersections
- Free of fixed objects
Daylight: Intersections, Drives

- Vegetation: crops, bushes
- Cut or fill problem
- Signs & poles
Turn Lanes

- Check warrants & crash history
- Offset left turn lanes
Turn Lanes

- Offset Right Turn Lanes
Signals

- Back plates
- Add mast arms
- Add far right side
- Head for each lane
- Replace < 12 inch
- Combination poles
- Detector location & operation
- Mill/patch affect detectors
- Pedestrian signal/buttons
Rumble Strips

- At stop signs
- Replace if present
- On paved shoulder
- Re-cut if not effective
- Will project cover
Improved Signing
Cattle Passes

- Fill in if not in use (check for deer use)
- Guardrail
- Delineate
Safety Improvements Incorporated Into 3R Projects

Reduce Impact Severity
Safety Improvements
Incorporated Into 3R Projects

Extend Culverts
Culverts

- Consider drop inlets
Culverts

- Lengthen
- Grate
- Place guardrail
Guardrail

- Upgrade all terminals
- Mounting height
- Pave to face of rail
- Remove fixed objects in front of or within deflection area
Safety Improvements Incorporated Into 3R Projects
Remove Driveways With Vertical Walls
Safety Improvements
Incorporated Into 3R Projects

Flatten Transverse Slopes
Remove Roadside Trees
Mailboxes

- Severe obstacles
- Replace with breakaway posts and well-fastened box
Safety Improvements Incorporated Into 3R Projects

Improve Curve Signing
4-lane Undivided to 3-lane Conversions

BEFORE

Used in 18 Iowa Sites

AFTER
Rip Rap

- Back slope: any size?
- Fore slope and toe: maximum 4 inch
- Do not create a wall
Milled Center-line Rumble Strip
Return on Investment?

Iowa Highway Fatalities
Five Year Average

- 1995 - 1999  480
- 2000 - 2004  420
Expected Fatality Rates (Weighted by Distribution of VMT) Compared to Actual Fatality Rates

Puerto Rico 1.26
Virgin Islands 0.76

0.65 0.46 0.39 0.57 0.54 0.52 0.46 0.39 0.33 0.30 0.29 0.25 0.29 0.18 0.17 0.17 0.17 0.15 0.10 0.08 0.07 0.02 0.02 0.10 0.12 0.17 0.19 0.19 0.21 0.23 0.23 0.23 0.29 0.29 0.30 0.34 0.41 0.44

(1.30) to zero
zero to 0.83

Charles (Tony) Aiken, FHWA, 2004 Traffic Records Forum
DESIGNING TO “STANDARD” MAY NOT BE GOOD ENOUGH

- Standards may not address everything
- Combination of elements may not “fit”
  - i.e.: downhill to a left-hand curve
Meets Clear Zone and Design Standards
Enhance Edge Rut
Maintenance Standards
Do RSAs expose agencies to more legal liability?

- Agencies should seek legal advice.
- Agencies can be taken to court with or without a road safety audit.
- RSAs can be part of a safety management system.
Do RSAs expose agencies to more legal liability?

“[RSAs] demonstrate a proactive approach to identifying and mitigating safety concerns.”

“Our attorneys say that once safety issues are identified, and if we have financial limitations on how much and how fast we can correct the issues, then the audit will help them in defense of liability.”
Liability Issues

- Safety Audits will help create a safer road environment
- Audits should not be discouraged by legal system
- Benefits outweigh the costs
Will an RSA drive up costs?

The audit team provides suggestions only.

The road agency or designer remains responsible for design decisions.
Will an RSA drive up costs?

Audit suggestions:
- can focus on low-cost safety improvements,
- can be pre-screened with the road agency and designer,
- must be consistent with the design stage.
Keys to Success

- Top-Down Support
- Adapt to Fit Local Needs
- Institutionalize the Process
- Focus on What is Doable
- Train Key Players, OJT for Team Members
- Utilize Multi-Discipline Approach
- Note Life Cycle Savings Far Outweigh Costs

Rte. 137, Freedom
“The Road Safety Audit process is valuable from a perspective of identifying deficiencies, developing mitigative strategies, improving public relations, and enhancing our agency’s credibility.”

Bernie Arseneau,
Director, Office of Traffic, Security, and Operations, Minnesota DOT