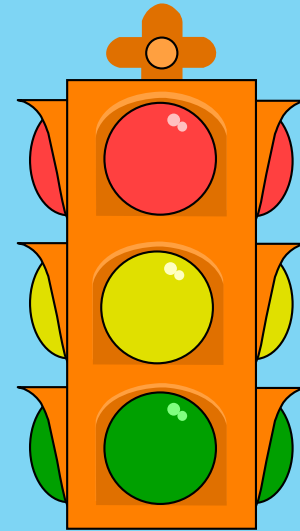


SDDOT SAFETY PROGRAM



Who Am I ???

CLIFF REUER

TRAFFIC & SAFETY ENGINEER

**SOUTH DAKOTA DEPARTMENT OF
TRANSPORTATION**

OFFICE OF PROJECT DEVELOPMENT

605-773-5361



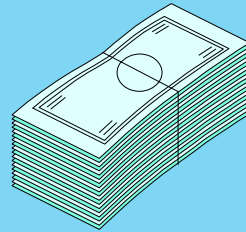
SAFETY PROGRAM

- Federal Section 402 Funds
 - ◆ Traffic Engineer for Local Governments
 - ◆ Reimbursement Program - 90% Materials
 - ◆ Cities, Counties, Townships, BIA, & Tribal
 - ◆ Spot Signing & Safety Improvements
 - ◆ Complete Sign Improvements Projects



SAFETY PROGRAM

- Roadway Safety Improvement (RSI) Program
 - ◆ Federal Hazard Elimination Funds
 - ◆ \$8.0 Million per Federal Fiscal Year
 - ◆ 90 % Federally Funded
 - ◆ 10 % Funding By Entity Having Jurisdiction



Roadway Safety Improvement (RSI) Project - Origination

- Location Must Have Accident History

- ◆ 5 Accidents in 3 year period



- Plot Map Search From Accident Records Data Base

- Locations Submitted From Class 1 Cities

- ◆ 5000 > Pop. - 14 In South Dakota

Roadway Safety Improvement (RSI) Project - Origination (Con't)

- Locations Submitted From 4 DOT Regions
 - ◆ May Also Have Other Locations For Review
- Locations Submitted From Highway Patrol



Selecting RSI Sites

- Analyze Accident Summary
- Look For Accident Pattern
- Draw Collision Diagram
- Calculate Accident Rate
- Determine Benefit/Cost (B/C) Ratio

I-190/West Blvd & SD44/Omaha

I-190/West Blvd & SD 44/Omaha

Date Range: 01/01/2004 Thru 12/31/2006

Accident Nbrs: 600276, 600285, 600286, 600788, 600824, 602752, 602772, 602780, 602785, 603247, 603351, 604003, 604399, 604733, 605118, 607567, 607887, 607892, 608044, 608065, 608080, 608083, 608084, 610443, 610881, 611179, 611181, 611101, 613568, 613586, 613587, 614166, 614184, 615487

Accident Summary

Driver Contributing Circumstances

Speed-Over Limit		Speed-Over Safe	2	Failure to Yield	36	Run Off Road	Distracted	9
Follow Too Close	29	Improper Passing		Wrong Side Road		Swerving/Avoiding		
Turn/Lane Change	4	Improper Signal		Improper Back/Park		Overcorrection		
Fell Asleep		Traffic Signal	4	Other	10	Cellular/Electronic		

Surface Condition

Weather

Relation To Intersection

Dry	68	Clear	54	Blowing Sand/Soil		Non-Intersection	6	Driveway	4
Wet	5	Rain		Severe Crosswinds		4 Way Intersection	42	Rail Crossing	
Ice / Frost		Cloudy	19	Snow / Sleet	3	T Intersection		Cross Over	
Snow / Slush	3	Other		Fog / Smoke		Y Intersection		Other	
Other				Blowing Snow		5 Way Intersection	1	Alley	
Sand/Dirt/Gravel	0			Unknown	0	Intersection Relat	23	Bike path	
Unknown	0					Interchange		Unknown	0
Wild Animal	0					Wild Animal	0		

Road Alignment

Driver Alcohol / Drugs

Vehicle Type

Straight Level	54	Unknown	0	Alcohol	4	Car	77	Van/Bus	1
Straight Grade	3	Wild Animal	0	Drugs		Sport Utility Vehicle	37	Motorhome	1
Straight Crest	2			Both		Pickup	28	Single Unit Truck	1
Curve Level	14					Mini Van	12	Farm Machinery	
Curve Grade	3					Cargo Van		Heavy Equipment	
Curve Crest						Truck / Semi		Other	
						Motorcycle	2		

Time	12	1	2	3	4	5	6	7	8	9	10	11	Total
AM			1			2	1	7	3	2	5	6	27
PM	4	2	5	7	11	10	3	2	1	1	2	1	49

Accident Severity - Injury Totals

Lighting Conditions

Fatality	Injury2	Injury3	Injury4	No Injury	Light	Dawn	Dusk	Not lighted	Lighted	Other
0	3	14	35	118	58		1	2	15	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
13	5	5	8	6	4	3	6	5	8	6	7	76

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8	18	16	12	8	8	6

Property Damage Estimate

\$289,966.00

Type of Accidents

I-190/West Blvd & SD 44/Omaha

Date Range: 01/01/2004 Thru 12/31/2006

Accident Nbrs: 600276, 600285, 600286, 600788, 600824, 602752, 602772, 602780, 602785, 603247, 603351, 604003, 604399, 604733, 605118, 607567, 607887, 607897, 608944, 608965, 609860, 609883, 609884, 610443, 610881, 611179, 611181, 611191, 613568, 613586, 613587, 614166, 614184, 615487

Accident Type	01/01/2004 12/31/2004				01/01/2005 12/31/2005				10/10/2006 12/31/2006				Totals			
	F	I	P	T	F	I	P	T	F	I	P	T	F	I	P	T
Angle-Intersec		6	6	12		2	2	4		0	0	0		8	9	17
Rear End		4	4	8		8	3	11		3	6	9		28	22	50
Head-on		1	0	1		1	0	1		0	0	0		2	0	2
Fxd Obj in Rd		0	0	0		0	0	0		0	0	0		0	0	0
Fxd Obj off Rd		0	0	0		0	0	0		0	0	0		0	0	0
Overturn on rd		0	0	0		0	0	0		0	0	0		0	0	0
Overturn off rd		0	0	0		0	0	0		0	0	0		0	0	0
SSW overtake		0	2	2		0	0	0		0	1	1		0	3	3
SSW opp dir		0	0	0		0	0	0		0	0	0		0	0	0
Angle-no intersec		0	0	0		0	0	0		0	0	0		0	0	0
Bicycle		0	0	0		0	0	0		0	0	0		0	0	0
Pedestrian		0	0	0		0	0	0		0	0	0		0	0	0
Animal		0	0	0		0	0	0		0	0	0		0	0	0
Parked Veh		0	0	0		0	0	0		0	0	0		0	0	0
Other		0	1	1		0	1	1		0	1	1		1	3	4
Totals		11	13	24		11	6	17		3	8	11		39	37	76

Left Turn Accidents (at least one vehicle turned left)

F	I	P	T	F	I	P	T	F	I	P	T	F	I	P	T
	5	6	11		2	3	5			1	1			10	

Accident Summary Details

01/07/2004 - 12/29/2006

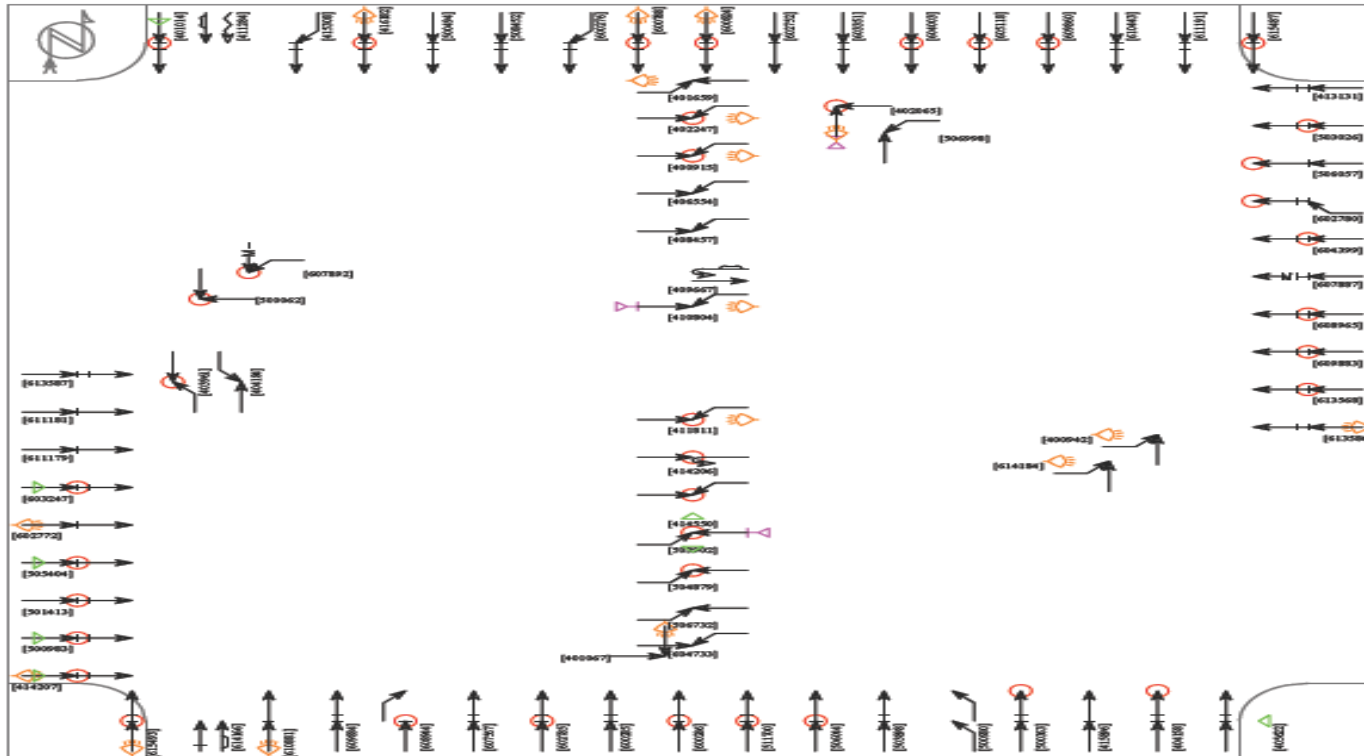
Accident Numbers: 600276, 600285, 600286, 600788, 600824, 602752, 602772, 602780, 602785, 603247, 603351, 604003, 604399, 604733, 605118, 607567, 607887, 608944, 608965, 609860, 609883, 609884, 610881, 611179, 611181, 611191, 613568, 613586, 614166, 615487, 615493, 500062, 500494, 500980

400915	01/07/2004	5:34:00PM	Four-way intersection	190 S	0.00 +	0.00
401014	01/22/2004	2:02:00PM	Non-junction		0.00 +	0.00
401067	02/02/2004	5:50:00AM	Four-way intersection	190 S	0.00 +	0.00
401659	02/09/2004	5:38:00AM	Four-way intersection	190 N	0.00 +	0.00
402065	02/15/2004	2:13:00AM	Four-way intersection	190 N	0.00 +	0.00
402247	02/24/2004	10:01:00PM	Four-way intersection	190 S	0.00 +	0.00
403961	04/02/2004	1:26:00PM	Four-way intersection	190 S	0.00 +	0.00
404158	04/14/2004	3:10:00PM	Four-way intersection	190 N	0.00 +	0.01
404184	04/11/2004	3:50:00PM	Four-way intersection	190 N	0.00 +	0.01
405622	05/24/2004	4:52:00PM	Four-way intersection	190 N	0.00 +	0.01
406554	06/07/2004	8:40:00AM	Four-way intersection	190 S	0.00 +	0.00
408457	07/25/2004	2:50:00PM	Four-way intersection	190 S	0.00 +	0.00
409667	08/22/2004	2:48:00PM	Four-way intersection	190 N	0.00 +	0.00
410804	09/14/2004	11:12:00PM	Four-way intersection	190 N	0.00 +	0.00
411284	09/25/2004	4:25:00PM	Intersection related	190 S	0.00 +	0.01
411811	10/11/2004	8:21:00PM	Four-way intersection	190 S	0.00 +	0.00
413131	10/30/2004	10:29:00AM	Four-way intersection	190 S	0.00 +	0.01
414206	11/16/2004	12:42:00PM	Five-point, or more	190 N	0.00 +	0.00
414207	11/17/2004	10:17:00PM	Intersection related	044 E	44.88 +	0.00
414550	11/21/2004	10:39:00AM	Four-way intersection	190 S	0.00 +	0.00
415308	12/02/2004	7:44:00AM	Intersection related	190 S	0.00 +	0.01
415896	12/14/2004	9:57:00AM	Four-way intersection	190 N	0.00 +	0.00
416182	12/21/2004	7:18:00PM	Four-way intersection	190 S	0.00 +	0.00
500062	01/04/2005	11:04:00AM	Four-way intersection	190 S	0.00 +	0.01
500494	01/13/2005	8:51:00AM	Intersection related	190 S	0.00 +	0.02
500980	01/24/2005	8:09:00AM	Four-way intersection	190 N	0.00 +	0.00
500983	01/25/2005	7:58:00AM	Intersection related	044 E	44.88 +	0.00
501413	02/07/2005	4:24:00PM	Intersection related	044 E	44.88 +	0.00
503898	04/14/2005	4:03:00PM	Intersection related		0.00 +	0.00
503902	04/16/2005	7:06:00AM	Four-way intersection	190 N	0.00 +	0.01
504879	05/16/2005	10:20:00AM	Four-way intersection	190 S	0.00 +	0.00
505404	05/29/2005	11:43:00AM	Intersection related	044 E	44.88 +	0.00
506732	06/27/2005	6:45:00AM	Four-way intersection	190 N	0.00 +	0.01
508452	08/08/2005	12:12:00PM	Intersection related	190 S	0.00 +	0.01
511700	10/19/2005	5:02:00PM	Intersection related		0.00 +	0.00
600276	01/08/2006	1:36:00PM	Intersection related	190 S	0.00 +	0.01
600285	01/11/2006	11:04:00AM	Intersection related		0.00 +	0.00
600286	01/11/2006	7:53:00AM	Four-way intersection	016 W	69.19 +	0.01
600788	01/20/2006	5:51:00PM	Intersection related	190 S	0.00 +	0.01
600824	01/25/2006	5:17:00PM	Intersection related	190 S	0.00 +	0.01
602752	03/22/2006	12:36:00PM	Four-way intersection	190 S	0.00 +	0.00
602772	03/10/2006	7:42:00PM	Intersection related	044 E	44.88 +	0.00
602780	03/13/2006	4:36:00PM	Four-way intersection	190 N	0.00 +	0.01
602785	03/14/2006	12:22:00PM	Four-way intersection	190 N	0.00 +	0.01
603247	04/06/2006	2:57:00PM	Four-way intersection	044 E	44.88 +	0.00
603351	04/08/2006	9:40:00AM	Four-way intersection	190 S	0.00 +	0.01

Collision Diagram

I190WestBlvd SD44Omaha

76 Crashes



- (0) crashes could not be placed in this schematic
- | | | | |
|--------------|------------------|--------------|------------------|
| ← Straight | ▭ Parked | ⊗ Pedestrian | □ Fixed objects: |
| ⊥ Stopped | ⤴ Erratic | ⊗ Bicycle | ▣ General |
| ↔ Unknown | ⤴ Out of control | ○ Injury | ▣ Signal |
| ↔ Backing | ↘ Right turn | ⊙ Fatality | ▣ Tree |
| ↔ Overtaking | ↙ Left turn | 🕒 Nighttime | ▣ Pole |
| ↔ Sideswipe | ↶ U-turn | 🕒 DUI | ▣ Curb |
| | | | ▣ Animal |
| | | | ▣ 3rd vehicle |
| | | | * Extra data |

Pf Programming, Inc. 02/17/2007

Accident Rate

$$R = \frac{2 (A) (1,000,000)}{(T) (V)}$$



R = Accident rate expressed in accidents per Million entering vehicles.

A= Number of accidents during days of study.

T= Time period in days.

V= Total average daily traffic entering and departing the intersection.

Accident Rate Info. 2004 - 2006

- $A = 76$ Accidents (3yrs)
- $T = 365 \text{ days/yr} \times 3 \text{ yrs} = 1095 \text{ days}$
- $V = \text{ADT Entering \& Leaving} - 101,080 \text{ ADT}$
 - I-190 = 18500 ADT
 - West Blvd = 25000 ADT
 - SD 44 – West of I-190 = 29000 ADT
 - SD 44 - East of I-190 = 28580 ADT

Accident Rate

$$R = \frac{2 (76) (1,000,000)}{1095 (101,080)}$$

$$R = \frac{152,000,000}{110,682,600}$$

R = 1.37 Accidents Per Million Entering
Vehicles

Benefit Cost (B/C) Ratio

BENEFIT/COST ANALYSIS PROJECT NAME: I-190/West Bld & SD 44/Omaha

Variables		Constants	
Const. Improve. Cost	\$500,000	* Fatal Accident Cost	\$48,562
Annual O & M Before	750	* Injury Accident Cost	\$48,562
Annual O & M After	500		
Number Fatal Accidents	0		
Number of Injury Accds.	39	* Prop. Damage Acc. Cost	\$48,562
Number of Fatalities	0	Services Life	20
Number of Injuries	52	Salvage Value	0
Number Prop. Damage Acc's	37	Interest Rate	10%
Accdt. Reduct. Factr	0.45		

Capital Recovery	0.117	Present Worth Fctr	0.149
Sinking Fund	0.017	Present Worth Fctr Ser	8.514
EUAB	553606.80	PWOB	4713166.77
EUAC	58479.81	PWOC	497871.61
# B/C = EUAB/EUAC =	9.47	B/C = PWOB/PWOC =	9.47

This analysis is based on accident reports on file in the DOT Office of Accident Records for a three year period from January 1, 2004 through December 5, 2006

This analysis is based on adding additional left turn lane.

Cliff Reuer..... February 19, 2006

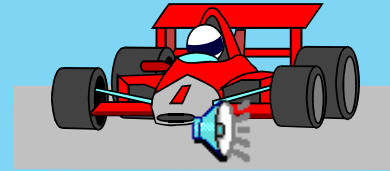
* RATES CALCULATED BY ROADWAY SYSTEM USING 3 YEAR ACCIDENT EXPERIENCE AND THE FOLLOWING FORMULA:

DEATHS * \$3,200,000 +inc-injuries*\$220,000+non-inc*\$45,500+possible*\$24,400+pdo*\$2,600
fatal accid + inc-injury accid + non-inc accid + possible injury accid + property damage only accid


RSI ON-SITE INSPECTION TEAM

■ Team Members

- ◆ Region Traffic Engineers
- ◆ Road Design Representative
- ◆ Traffic Design Engineer
- ◆ Federal Highway Administration (FHWA)
- ◆ City Representative
- ◆ Highway Patrol or Local Law Enforcement



RSI ON-SITE INSPECTION TEAM

- Reviews Defined Problem
- Discuss Probable Countermeasure
- Makes Recommendation
 - ◆ Action at DOT Region Level - Signs & Etc.
 - ◆ Program A Project in State Transportation Improvement Program (STIP) 
 - ◆ Consider Other Funding If Not Qualified For RSI Funds

ROADWAY SAFETY AUDIT (RSA)

- **A Road Safety Audit is an examination of a future roadway project, by an independent audit team, focusing solely on safety.**
- Process originated in Australia & New Zealand
- Introduced in US in Mid 1990's

ROADWAY SAFETY AUDIT REVIEW (RSAR)

- **A Road Safety Audit Review is an examination of an existing roadway, by an independent audit team, focusing solely on safety issues.**
- Proactive Processes
- “Think Safety”

Conducting the Audit/Review

- Is a Formal Process.
- Tailored to your issues.
- Both processes use an independent audit team approach.
- Team should consist of Traffic/Safety, Design, Construction, Maintenance, & Law Enforcement expertise
- If on Local Roads – Local entity should be represented

Conducting the Audit/Review

- Audit can include on site review.
- Audit Review is an on site review.
- Audit results reported to the designer.
- Audit Review reported to the owner.

Use of Crash Data

- The RSA & RSAR use crash data as background information.
- Funding through the federal program still tied to crashes.
- South Dakota has funding in State Transportation Improvement Program (STIP) to address RSAR findings.

Audit Considerations

- Design standards used correct?
- Need for accel & decel lanes?
- Review turning templates.
- Parking removal.
- Access management.
- Sight restrictions

Audit Review of Existing Roads

- Used to identify safety deficiencies of existing roads.
- Are safety needs of road users being met?
- Has the use of the roadway changed over time?
- Have standards changed?
- May be performed on a newly opened road.

Audit Review Considerations

- Steep inslopes.
- Edge drop off.
- Sight distance restrictions.
- Need for safety pipe ends.
- Obstacles in clear zone/right of way.
- Surface defects
- Signing and striping deficiencies

Audit Review Findings

- Divided into three categories
 - Immediate safety improvements that should be made – Vegetation, Delineation
 - Low cost improvements that could have a positive impact on safety – Signing, Clear the clear zone.
 - High cost improvements that should be considered when funds are available for a major rehabilitation – Construction, Re-construction.

THE END

- Questions

