MOVING COLORADO
VISION FOR THE FUTURE

2035 Statewide Transportation Plan

Transportation Safety

TECHNICAL REPORT

March 2008

DEPARTMENT OF TRANSPORTATION

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Purpose

The purpose of this technical report is to provide an overview of the major transportation safety programs in Colorado

Colorado Department of Transportation's Safety and Traffic Engineering Branch

The State of Colorado Department of Transportation's Safety and Traffic Engineering (STE) Branch provides financial and program assistance across the state through safety:

- Education
- Enforcement
- Engineering

STE does this work by gathering and analyzing statistics, working with other safety stakeholders, conducting research and consulting subject matter experts, and maximizing assets for greatest benefit. Problems are identified based on analysis of data; partners are identified for project development; funding is sought; and completed projects are evaluated for long-term effectiveness.

STE Safety Programs are divided into Engineering Programs and Education and Enforcement Programs. Engineering programs include:

Roadway Traffic Safety Projects

Federal Hazard Elimination Program – if warranted, projects include guardrails, median barriers, relocating intersections, lighting, shoulder widening, rumble strips, turn lanes, access improvements, roundabouts, signal upgrades, curve corrections, rock scaling, curve flattening, signs, flashing beacons, curb and sidewalks, ramp improvements, channelization, pedestrian improvements, geometry changes, or other projects that increase safety

Hot Spot Program – provide funding for Region priority locations that need immediate attention to alleviate a potential or existing accident problem

Traffic Signals Program – provide funding for regional traffic signals from a priority waiting list of warranted locations or locations that need additional or replacement equipment to enhance safety and operations

Safety Resurfacing Program – provides safety improvements while resurfacing through the Safety Assessment Process

Safety Education and Enforcement Programs – CDOT's Office of Transportation Safety, as the designated state highway safety agency (24-42-101 and 43-1-103 CRS) is responsible for the planning, coordinating and administering of the State's highway safety program authorized by the Federal Highway Safety Act 23 USC 402. Safety Education and Enforcement programs include:

Impaired Driving Programs:

- **Alcohol and Drug Countermeasures** – including training, equipment, and support for law enforcement officers, sobriety checkpoints, increased DUI

patrols based on alcohol related crashes, fatalities statistics, school presentations, and community partnerships

- **Police Traffic Services and Enforcement** – rank specific highway locations by risk and provide intensified enforcement
- **Young Drivers** – youth education and training of liquor retailers
- **Motorcycle Safety** – funds motorcycle instruction and training sites

Occupant Protection Programs

- **Seat Belts** – education and public awareness programs focused at both general public and target groups, including commercial motor carriers and pickup truck safety
- **Pedestrians** – safety education
- **Bicycles** – safety education and helmet use
- **Safe Communities**

Other programs include the Access Management Program, the Rockfall Program to reduce rockfall along state highway corridors and the Rail Crossing Protection Program to reduce rail crossing accidents.

STE Customers

- Traffic engineers
- Law Enforcement Agencies
- Federal, State, and Local Government Agencies
- Health Organizations
- Consultants
- Insurance Companies
- Private Citizens
- Media

Traffic Records Program

- Colorado's Motor Vehicle Division accident records system is now being standardized to enhance capabilities for electronic transfer of reports to CDOT, and internal and external user access, along with ability to download selected data in desired format.
- Colorado State Patrol officers now enter the Uniform Summons & Complaint or Penalty assessment directly into mobile data computers for electronic transfer to Department of Revenue, Motor Vehicles, and the state Judiciary Department.
- Crash and hospital data are being linked, and the linkages being analyzed to identify specific issues for the elderly driver, teenage driver, and others, along with variations in pre-hospital time, and identifying the high-risk individual. The impact of the graduated driver licensing law is also being evaluated.

- Findings of such analyses are being used to identify candidates for targeted highway safety programs, provide support for project implementation, and evaluate the effects of subsequent projects

Statewide Traffic Records Advisory Committee (STRAC)

STE also facilitates the STRAC. In response to federal requirements, the STRAC was created to assist in developing action items through the collaboration of all of Colorado's partners to include:

- Priority programs
- Priority funding
- Collaboration between and within coalitions; and
- Integrated efforts toward the state safety goals.

The STRAC:

- Has representation from all levels of public and private sector traffic safety stakeholders, as well as the wide range of disciplines that have need for traffic safety information. This committee recommends policy on traffic records;
- Provides a mechanism to ensure support for the administration and continuance of the coordinating committee as well as technical guidelines;
- Is a comprehensive committee formed as part of a federally sponsored effort to collect, organize, analyze, and utilize all types of information relating to traffic accidents on Colorado roadways;
- Uses the traffic records to develop engineering, education, and/or enforcement solutions and funding to improve roadway safety.

STRAC Executive Management is composed of the following five major state agencies and the Judicial Branch:

- **The Colorado Department of Revenue:** Custodian of accident report records and data received from all law enforcement agencies throughout the state. The accident report contains almost 200 data elements that include information on the drivers and individuals involved, any injuries and fatalities, property damage, vehicle information, location and time of the accident, weather conditions, roadway characteristics and any traffic violations cited. This data, combined with the driving record data of the drivers, forms the foundation of the State Traffic Data Integration and Analysis System.
- **Colorado State Patrol (CSP):** The lead law enforcement agency to develop the Accident Report, procedures and systems to gather crash data. Law enforcement, typically the first on the scene, controls the crash site and gathers the Accident Report data.
- **Colorado Judicial Branch**: Adjudicates crash citations.
- **Colorado Department of Public Health and Environment (CDPHE):** Coordinates activities of the Emergency Medical and Trauma Services system related to roadway crashes.

- **Colorado Department of Human Services (CDHS):** Provides treatment to those cited for substance abuse or driving under the influence related to the crash citations.

The Committee includes representatives of these organizations, along with the Federal Highway Administration (FHWA), National Highway Transportation Safety Association (NHTSA), counties, and metro police department representatives, and Metropolitan Planning Organizations.

STRAC Responsibilities:

- Adopt requirements for file structure and data integration;
- Assess capabilities and resources;
- Establish goals for improving the traffic records system
- Evaluate comprehensive system;
- Develop cooperation and support from stakeholders;
- Ensure that high quality and timely data will be available for all users.

2006 STRAC Accomplishments

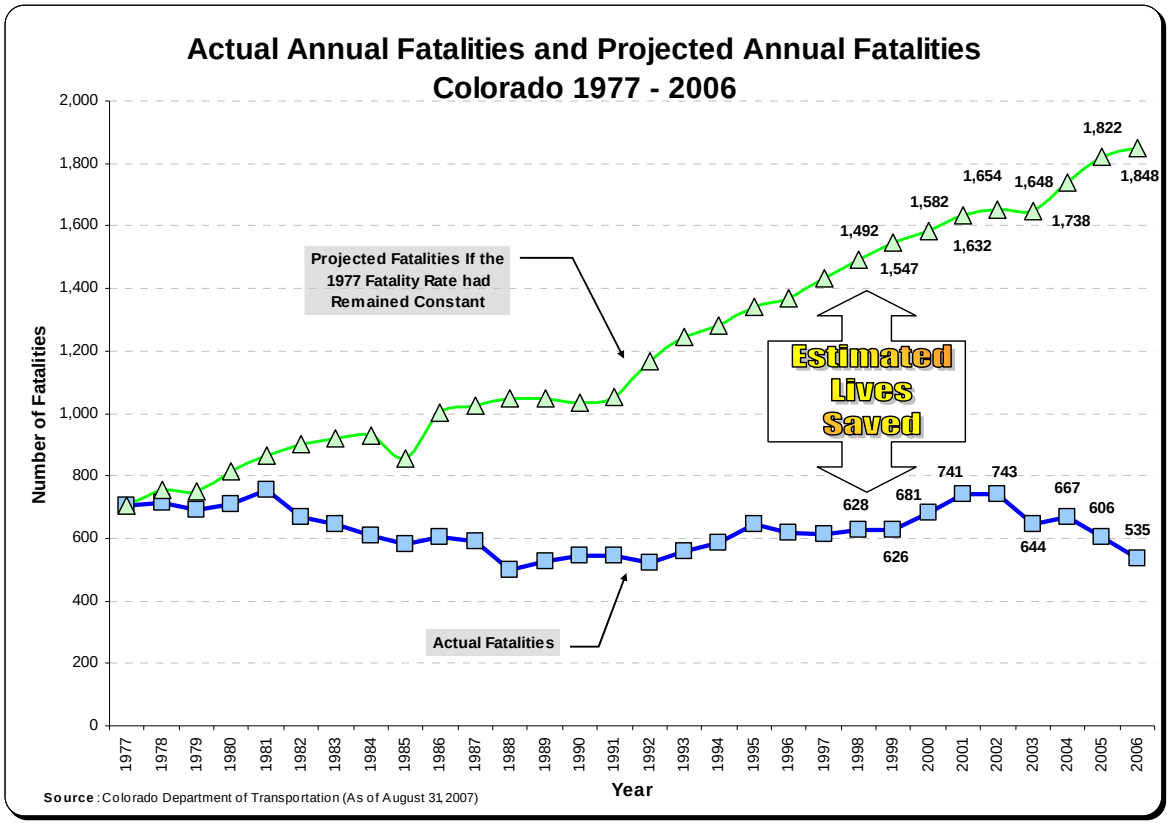
- Revised the Accident Report to ensure greater consistency with various agencies and improve data collection with related instructions and an implementation plan.
- Reformatted the organization of STRAC and added formal subcommittees.
- Developed a strategic plan with short-, medium-, and long-term goals consistent with the 2004 Traffic Records Assessment.
- Obtained funding for the various Traffic Records systems enhancements.
- Used state funds to develop the first phase of a CSP program to establish an internal data warehouse. In the first phase, crash information data will
- CDOT and the STRAC membership evaluated the projects proposed to improve traffic information.

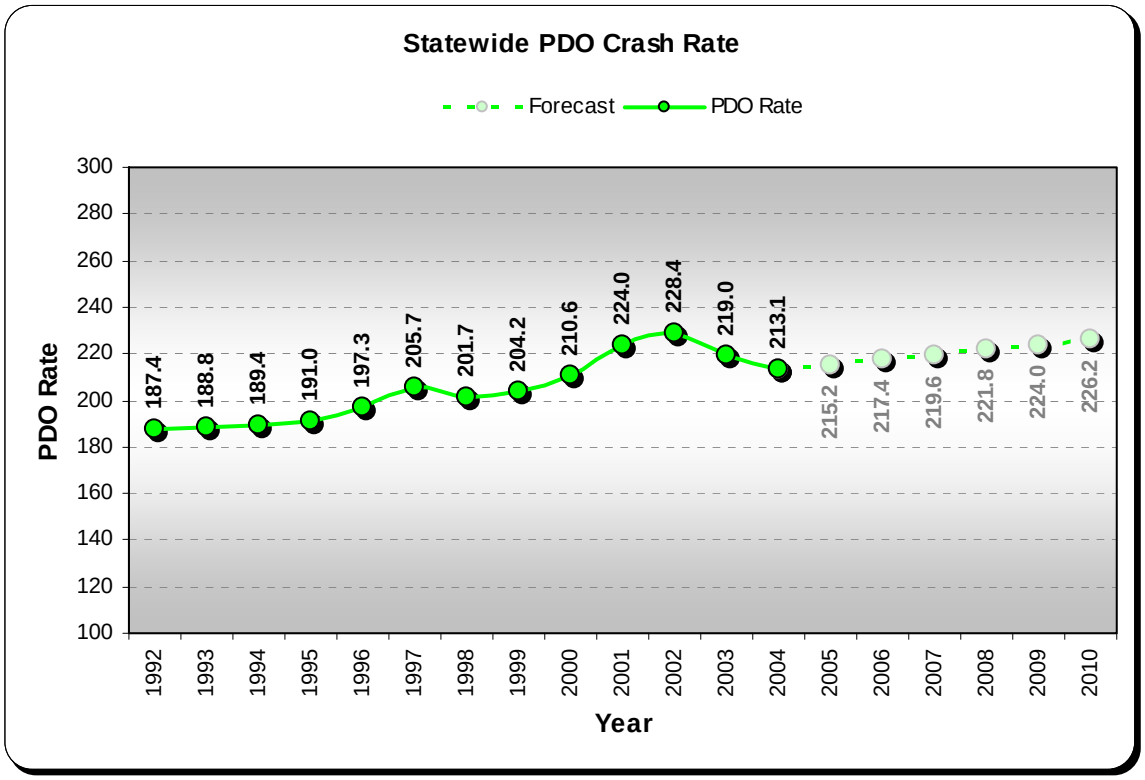
STE collects data on an annual basis from computerized crash data gathered and maintained by the Branch's Accident Records Group, compiled from Accident Reports completed at the crash scene by the Colorado State Patrol. Crash data is divided into three major categories: Property Damage Only (PDO), Injury, and Fatalities. The data is compiled and compared to the Functional Classification of the roadway segment, vehicle miles traveled, and average annual daily traffic for that segment, and a crash *rate* for that segment of corridor is determined. This rate does not reflect the range of causes for a crash, including driver behavioral issues, such as inattentive driving and drunk driving.

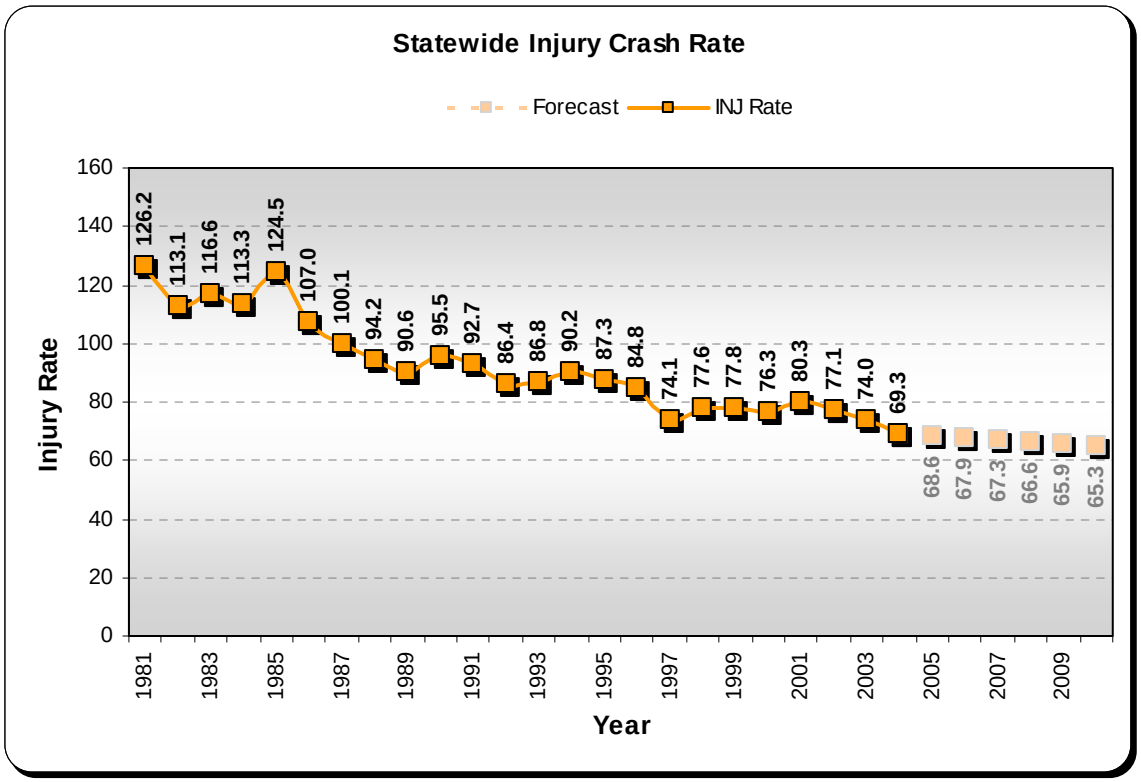
Colorado's population and vehicle miles traveled (VMT) have been increasing over the last decade; however the fatal and injury crash rates on the state highway system have decreased. In 2006, the fatal crash rate was reported at 1.00 accidents per 100 million VMT.

Actual Annual Fatalities

The number of fatalities has decreased to 535 in 2006, compared to 681 in 2000. One of CDOT's high priorities is to reduce fatalities (individual deaths per crash) per 100 million vehicle miles traveled from 1.83 in 1995 to 1.00 by 2010. This rate may decrease with the passage of a Primary Seat Belt law. CDOT anticipates this forecast to remain steady through 2035.




Statewide PDO Crash Rate
Forecast
PDO Rate
PDO Rate
Year
187.4
188.8
189.4
191.0
197.3
205.7
201.7
204.2
210.6
224.0
228.4
219.0
213.1
215.2
217.4
219.6
221.8
224.0
226.2


Statewide Injury Crash Rate
Forecast
INJ Rate
Injury Rate
Year
126.2
113.1
116.6
113.3
124.5
107.0
100.1
94.2
90.6
95.5
92.7
86.4
86.8
90.2
87.3
84.8
74.1
77.6
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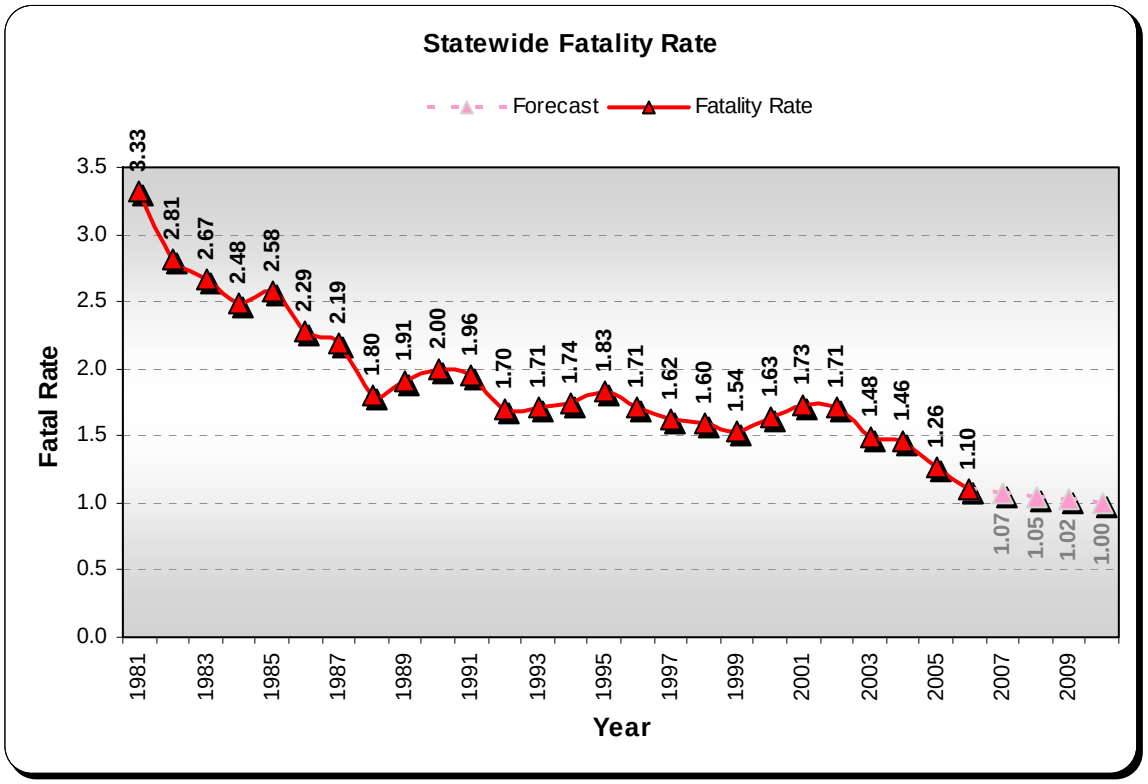
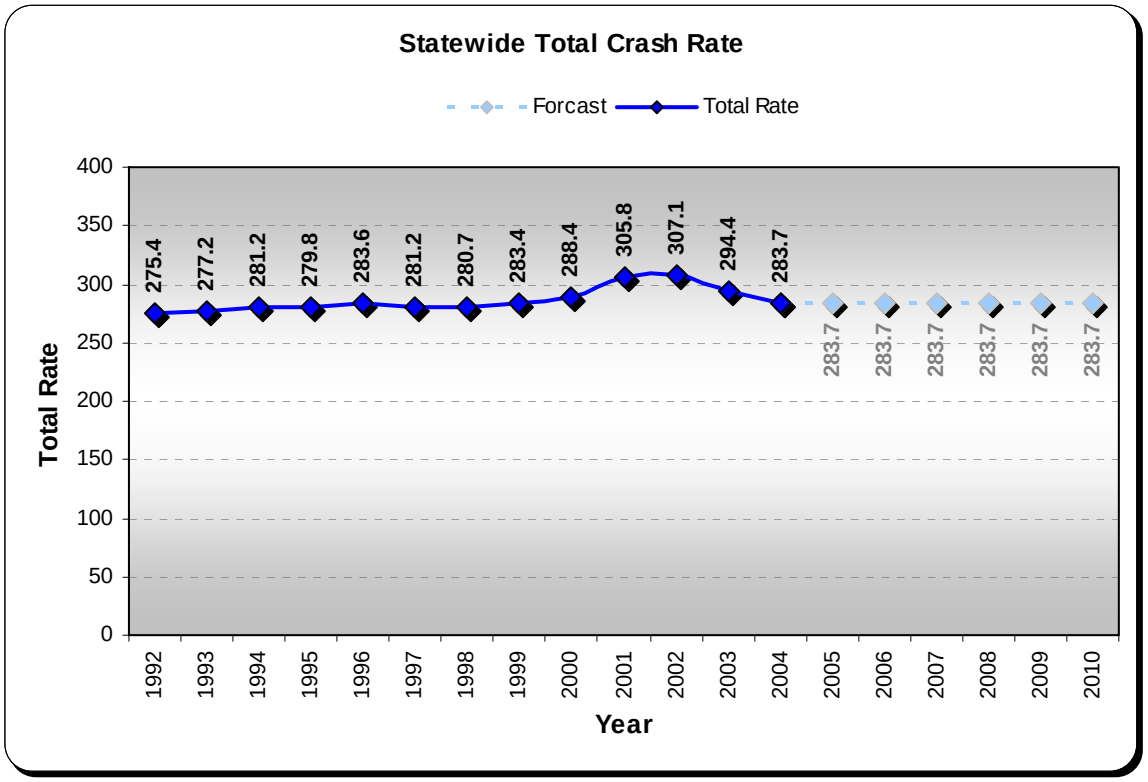


Timely, accurate, and reliable information is critical to making decisions and effectively managing transportation safety programs. Problem identification, efficient allocation of resources and the measurement of results all depend on the availability of data and information. One of the most important challenges facing safety stakeholders is using information to the greatest advantage. In order to develop effective transportation safety programs, comprehensive information on existing traffic safety problems is critical. Historically, agencies have looked at problems in terms of where crashes are occurring. While this approach continues to be essential in developing safety measures, more emphasis has been given to delivering traffic safety programs at the community level. Development and management of safety and traffic information systems in Colorado is essential for the development of a strategic plan. The history of crashes in Colorado is illustrated below.



Wildlife

Movement of wildlife is an ongoing safety problem for Colorado's transportation system. The Colorado State Patrol documented 24,747 Animal Vehicle Collisions (AVC) between 1993 and 2004. Of these, 22,488 were reported as Property Damage Only (PDO) while 2,241 were reported as injuries, and 18 as fatalities. Large animals such as deer and elk represent the vast majority of reported collisions.

The number of annual accidents has increased over time due to expanding road networks and land development, increasing traffic flows, and changes in the environment. Traffic volumes during commute times and wildlife activity sometimes peak simultaneously. In addition, dead animals on the highways or shoulders may also cause additional accidents due to drivers swerving or braking.

Bicycle and Pedestrian Accidents

Pedestrians and bicyclists and other alternatives transportation mode users must be included in the discussion of roadway safety to provide a complete picture. Although bicycle paths and trails are widespread throughout the state, areas without these facilities create unsafe situations between bicyclists and motorists. CDOT's goal is to reduce the number of bicycle and pedestrian related crashes and improved data collection. A new partnership program***, Safe Routes to School***, facilitates the planning, development, and implementation of projects that will improve safety in the vicinity of the school as well as provide pedestrian safety educational programs, and therefore, helps encourage children, including those with disabilities, to walk and bicycle to and from schools.

STE's Roadway Engineering Safety Program

The Roadway Engineering Safety program is designed to address the reduction of crash rates and severity.

The roadway engineering safety program focuses on the following elements and strategies:

- Pavement markings;
- Construction work zones;
- Railroad crossings;
- Roadside obstacles;
- School zones;
- Traffic flow;
- Signing;
- Parking.

Traffic safety engineering studies are offered to towns which request and are selected for a study based on crash history. Towns selected will agree to implement findings and report impact. Traffic safety engineering studies will address specific needs such as: signing, pavement markings, parking, traffic flow, school zones, railroad crossings, construction work zones, accident history, and roadside obstacles. Study recommendations are implemented. Two to three years later, updated crash data is compared to prior crash data to determine magnitude of reduction.

Assistance is also offered to local roadway personnel, including:

- Provide roadway safety education seminars for local personnel responsible for traffic engineering;
- Provide flagger training for local personnel through the Colorado Local Technical Assistance Program;
- Offer training classes to traffic safety professionals;
- Provide technical publications to the public; and
- Reward maintenance and construction personnel for contributing to roadway safety.

Integrated Safety Plan (ISP)

Colorado has had an ISP - developed to implement strategies which have been identified as most likely to reduce traffic crashes in Colorado – in place for several years. ISP's Mission Statement: Reduce the incidence and severity of motor vehicle crashes and the associated human and economic loss. ISP Objectives are:

- Reduce alcohol involvement
- Reduce aggressive driving
- Increase seat belts and child car seats usage
- Provide engineering improvements

STE updates the Integrated Safety Plan (ISP) during August of each year. The ISP is approved by the National Highway Traffic Safety Administration (NHTSA) and the TC. Based upon the ISP document, Safety funds are distributed to CDOT HQ to fund the Hazard Elimination (including High Risk Rural Roads), Rockfall Mitigation, and Railroad Crossing Programs, and

to the CDOT Regions, who use the ISP to direct funding to individual projects in Region-specific categories, such as Hot Spots, Signal, and Safety Surface Treatment.

Federal Hazard Elimination Program

Applications are requested from City and County transportation officials every three years. Any project selected for this federal funding must be included in, or added to, the Statewide Transportation Improvement Program (STIP), and, if in an urban area, in the appropriate Transportation Improvement Program (TIP) of the respective Metropolitan Planning Organization (MPO). Local governments within an MPO are advised to send a copy of their applications to their respective organization; for example: City of Denver to Denver Regional Council of Governments (DRCOG).

This program provides federal funds (90 percent Federal, 10 percent State/Local) for projects that improve the safety of high accident locations. If a project is not on a State Highway, the local entity will need to provide the 10 percent matching funds for the project. The major factors in evaluating applications are the accident history and the cost benefit.

Eligible projects are safety projects on a jurisdiction's street or highway system, as well as any other public road. Projects with costs for right-of-way, because of the lead time required for property acquisition, are not encouraged, but allowed. Only projects of $50,000 and over are funded, as cost effectiveness of the federal dollar diminishes below this amount. Projects can be combined to meet this $50,000 threshold.

The prioritization will only consider candidate projects that have a potential for accident reduction. Locations with potential for accident reduction are identified and evaluated through the calculation of the Weighted Hazard Index (WHI), or the observed cumulative Binomial Probability (BP) of an accident type or related accident characteristics. WHI is a statistic computed by considering accident frequency, accident severities (injuries and fatalities), traffic volume within the section, the length of the section, and a comparison with the accident history of similar highways. Resulting positive values of the WHI indicate highway sections and spots which have an accident frequency/severity history higher than the statewide average.

An observed cumulative Binomial Probability of 90 percent or greater suggests a presence of an accident pattern and a susceptibility to correction. CDOT will calculate the WHI or cumulative BP, and Benefit Cost Ratio (B/C). Candidate projects that have a potential for accident reduction will then be prioritized based on the B/C.

The Benefit/Cost (B/C) Ratio is the annual expected benefit divided by the estimated annual average project cost. In calculating the B/C, documented accident history is verified and/or provided by CDOT Safety and Traffic Engineering Branch. A minimum accident history of two years is required (three to five years is preferred). Property damage only, injury, and fatal accident are then expressed as the number of accidents per year.

Safety improvements desired on a state highway are coordinated with Regional CDOT traffic engineers. The application looks at both documented accident history (a 3-5 year timespan), plus average annual daily traffic (AADT) counts.

Strategic Plan for Improving Roadway Safety (SPIRS

Federal Legislation dated August 10, 2005 entitled: ***Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)*** requires states to develop a Strategic Highway Safety Plan.

This Legislation builds on the increased highway safety considerations initiated in the two previous authorization bills. SAFETEA‐LU identifies four key emphasis areas—education, enforcement, engineering, and emergency medical services (4Es)—and provides increased funding for highway safety programs. it requires each state to develop and implement a coordinated, integrated safety plan for reducing highway fatalities and serious injuries and establishing statewide goals and objectives.

A strategic plan is required to go beyond state highways and address all public roads. Plan development must be a data driven process, incorporating the four E's: Engineering, Education, Enforcement, and Emergency Medical Services.

The purpose of the SPIRS is to reduce fatalities on all public roads and identify Colorado's key safety needs. SAFETEA-LU requires that the SPIRS maximize assets for greatest benefit by:

- Establishing common statewide safety goals;
- Strengthening existing partnerships;
- Share data, knowledge, and resources
- Avoid redundant activities
- Incorporate both behavioral and infrastructure strategies to reduce fatalities and injuries on all public roads

Development of the SPIRS In response to the enhanced federal requirements, the Colorado Department of Transportation (CDOT) developed and implemented a plan to better address the interactions between the components of highway safety—drivers, vehicles, roadways, and the environment. CDOT's planning document, Colorado Strategic Plan for Improving Roadway Safety (SPIRS), was adopted in 2006. This plan integrates safety stakeholders into one document that serve as a tool for future planning efforts across the state. The purpose of this technical report is to provide an overview of the major safety programs in Colorado and to provide a more current data since the adoption of SPIRS.

Working with safety advocates, law enforcement officials, the medical community, and its transportation partners, CDOT researched and monitored how human behavior, evolving technology, improved communications, targeted enforcement, public education, highway design, and the weather affect highway safety. With this information, CDOT has implemented programs focused on driver education, traffic law enforcement, and improved highway design and operation.

The SPIRS' format highlights several Focus Areas, that CDOT's data analyses have determined warrant special attention. STE began the development process for the new strategic plan by identifying and evaluation of Colorado's current safety activities, with a goal of determining the status of transportation safety in Colorado and developing a Vision of Safety in 5, 10, and 20 Years.

CDOT asked the MPOs to provide input by Focus Area, noting whether the same Focus Areas are priorities for them, or identifying other priorities. MPOs described their current safety planning efforts, including crash data collection and analysis, whether data is geocoded, identifying high accident areas, determining accident causes, how findings influence project prioritization and selection in their regions – including education, whether public outreach

includes law enforcement and emergency responders, and extends beyond that for the typical TIP project selection process.

Safety Investment Goals

Safety: Services, projects, and programs that reduce fatalities, injuries, and property damage for all users of the system.

The targets for the safety program are:

Reduce the total number of crashes per 100 million vehicles miles traveled (VMT) from a high of 307.1 in 2002 to 289.7 by the year 2010.

1. Reduce fatalities per 100 million VMT from a rate of 1.83 in 1995 to 1.00 in 2008 and maintain through year 2010.(Source: Strategic Plan for Roadway Safety)
2. Increase the statewide overall seat belt use rate from 55.5 percent in 1995 to 85 percent by the year 2010.
3. Reduce the percentage of alcohol related fatal crashes from 44.6 percent in 1995 to 29.5 percent by year 2008 and 29 percent by the year 2010. (Source: Safety Plan, 2006-2008).
4. Reduce the injury crash rate from 87.3 per 100 million VMT in 1995 to 67.5 by 2008 65.3 by the year 2010.
5. Reduce the number of motorcycle crashes per 100,000 1,000 motorcycle registrations from a high of 19.0 in 2002 to 15.0 by the year 2008 and maintain through 2010.(Source: Strategic Plan for Improving Roadway Safety)
6. Reduce the rate of involvement in alcohol related fatal crashes of underage drinking drivers from a high of 16.8 percent in 2004 to 12.9 percent in the year 2008 and maintain through 2010. (Source: Strategic Plan for Improving Roadway Safety)
7. Reduce the severity and economic loss of transportation related vehicle crashes by 20 percent from 2002 to 2010. (Source: Mar 15, 2006 TC Workshop)

Future Steps

SAFETEA-LU compliance seeks increasing coordination in safety planning between states and Metropolitan Planning Organizations (MPOs). In discussions, MPO representatives noted the need for more consistency in types, quality, and timeliness of data obtained, the need for better bike/ped crash data, along with ways to obtain data for all public roads. Some indicated a need to further efforts to observe, define, and map any patterns identified through crash data. As a result of these discussions, STE is stepping up communication with the MPOs on its Hazard Elimination, Hot Spots, and Rail Crossing Programs implementation. MPOs may play an expanding role as regional data providers, along with trend analyses. MPOs may move forward in coordinating these findings with MPO project selection processes, use them to assist in gap analyses, and include in public involvement processes. The new Implementation Strategy section of the plans might be an ideal location to address these, along with incorporating significant items into the Corridor Visions.

Conclusion

The goal of Colorado is to improve the safety of Colorado's transportation system for residents and visitors. Colorado's safety partners will continue to focus on methods and resources to reduce fatalities and serious injuries.