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Traffic Safety and Compliancy, Enforcement and Education

In This Issue…

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Overview

Engineering, enforcement, and education are often thought of as the three E's associated with reducing crashes. The transportation profession has been organized around these three E's since the early days of the National Safety Council in 1925, when the rise of the automobile began to dominate city planning and infrastructure investment. Traffic safety programs have been built around these three disciplines for more than half a century.

The first E, engineering, is often thought of as the first means to correct a problem. As an example, when a crash problem is observed at a location, engineering solutions are often implemented first. This is primarily due to the fact that departments of transportation and/or public works are typically responsible for roadway maintenance and improvements. Not implementing engineering solutions at a problem location, may result in the misperception that the department is not taking action to correct the problem. To avoid this misperception, these agencies often apply engineering principles or implement proven countermeasures to upgrade the roadway design at a problem location in hopes of correcting the issue. Addressing certain deficiencies that can contribute to a location's crash rate has the potential to increase safety at that location. Examples may include changing the intersection traffic control, adjusting the speed limit, adding signage to provide better information to motorists, upgrading pedestrian accommodations; and, even improvements of larger scope such as realignment or adding capacity. However, though these types of improvements often improve safety, they do not always address all crashes that occur at a location.

The remaining two E's, enforcement and education, are also means to address problems, such as crashes. These methods are geared toward changing driver behavior, versus implementing changes to the roadway itself. These methods will be the focus of this bulletin.

Enforcement

Enforcement is a key aspect of reducing crashes and compliancy of traffic laws. There are different areas of enforcement, including enforcement of crash areas, speed enforcement, DUI enforcement, and automated enforcement. The presence of police and law enforcement can be a significant deterrent simply due to the fact that many drivers do not wish to pay a traffic fine or have points associated with their driving record.

Frequent enforcement of areas with a high number of crashes occurring or areas where speeding or other traffic violations commonly occur can be very effective. If drivers expect an enforcement presence, they tend to drive slower and obey the traffic regulations. Even with infrequent enforcement, drivers may become accustomed to the presence of law enforcement and obey traffic regulations.

Enforcement on military bases must follow state vehicle codes. Some states have restrictions on what techniques are allowed for speed enforcement. States having differing crosswalk laws, specifically Stop or Yield to pedestrians in crosswalks.

The National Institute of Justice published the *Effect of High-Visibility Enforcement on Motor Vehicle Crashes* in 2020 summarizing a case study from Nashville, TN involving a crash prone location, and focused on the effectiveness of enforcement in reducing crashes at the location. The location averaged 12 crashes per week; and, the study included a team of police officers enforcing the roadway for a two-hour period in the afternoon, two days per week, for one week per month. They looked for drivers demonstrating behaviors that were thought to be contributing to crashes, particularly distracted driving. After three months of the enforcement plan, the crash rate decreased from 12 to 8 crashes per week on average. The same study also noticed an uptrend in crashes in the 3rd week without enforcement at that location. Therefore, the study concluded that the optimal enforcement in the target area was two days a week for two hours each day, every three weeks.

The same study was later expanded to seven sites throughout the city of Nashville and utilized a similar frequency of enforcement. After 6 weeks, a reduction of 22 percent in the number of overall crashes was observed. One site had a 50 percent reduction in the number of crashes, while others experienced reductions between 10 and 20 percent. Crashes increased at one location which was prone to congestion. Considering, it was determined that congestion was the main contributor to the occurrence of crashes versus being correctable through enforcement. Based on the overall reduction in the crash rate, the City of Nashville plans to continue this style of enforcement in hopes of continuing to reduce crashes.

As it relates to military installations, it can be difficult to provide staffing for patrol at specific crash locations due to insufficient manpower to cover all policing responsibilities on an installation. Nonetheless, as evidenced by the Nashville study, a small amount of periodic enforcement is beneficial to reducing crashes. It is recommended that installations monitor crash locations that can benefit from enforcement.

Enforcement can be targeted to specific locations where problems occur. The nature of the enforcement can be speed enforcement, stop sign running, crosswalk enforcement, parking enforcement, seat belt usage or any other common violation. Note that enforcement must adhere to state laws, even on military installations. Unique considerations specific to state laws include:

- At Fort Campbell, the Kentucky-Tennessee state line runs through the cantonment area of the installation. Fort Campbell military police must follow the state law applicable to the location where the violation occurs.
- In Pennsylvania, state law allows state police to use radar for speed enforcement but prohibits its use for local police. This prohibition also applies to military police and would require installation police in Pennsylvania to also use other means for speed enforcement.
- Several states have different laws regarding Stop versus Yield to pedestrians in crosswalks, seat belt usage as a primary violation, or the minimum speed limit that can be enforced. It is important to know and follow the applicable state law for enforcement.

DUI Enforcement

Driving under the Influence (DUI) is a special area of consideration. Drunk driving can have very severe consequences. In the year 2019, 10,142 traffic fatalities in the USA were attributable to alcohol. With 36,096 traffic fatalities occurring that year in the United States, that represents 28 percent of all traffic fatalities. On average, that the combination of speeding, alcohol and/or non-usage of seat belts were involved in 61 percent of traffic fatalities. A very pronounced effect of drunk driving is observed for young drivers, nighttime driving, and weekend driving. Enforcement of drunk driving is likely to reduce the driver's propensity to being involved in a crash.

Following are 20 cues which police officers may use to detect nighttime drunk drivers. The cues were developed

from interviews with a variety of law enforcement specialists in DUI detection; from a detailed analysis of more than 1,000 DUI arrest reports from different geographical regions; and from a field study in which cues observed in more than 600 patrol stops were correlated with driver Blood Alcohol Content (BAC) levels. These cues represent the most systematically developed method available for visually predicting whether a vehicle operated at night is being driven by an alcohol-intoxicated driver or a sober driver.

The number given after each visual cue is the probability that a driver exhibiting that cue has a BAC equal to or greater than 0.10 percent. For example, the 65 for the first cue (turning with wide radius) implies that 65 out of 100 drivers who turn with a wide radius at night has a BAC equal to or greater than 0.10 percent.

- ☑ Turning with a wide radius, 65%
- ☑ Straddling center or lane marker, 65%
- ☑ Appearing to be drunk, 60%
- ☑ Almost striking object or vehicle, 60%
- ☑ Weaving, 60%
- ☑ Driving on other than designated roadway, 55%
- ☑ Swerving, 55%
- ☑ Slow speed (more than 10 mph below limit), 50%
- ☑ Stopping (without cause) in traffic lane, 50%
- ☑ Following too closely, 50%
- ☑ Drifting, 50%
- ☑ Tires on center or lane marker, 45%
- ☑ Braking erratically, 45%
- ☑ Driving into opposing or crossing traffic, 45%
- ☑ Signaling inconsistent with driving actions, 40%
- ☑ Slow response to traffic signals, 40%
- ☑ Stopping inappropriately (other than in lane), 35%
- ☑ Turning abruptly or illegally, 35%
- ☑ Accelerating or decelerating rapidly, 30%
- ☑ Headlights off, 30%

Automated Enforcement

With increases in technology, automated enforcement has become a very common method of enforcement, provided state law allows it. Automated enforcement typically uses cameras in combination with detection methods tied to a database of license plate information to enforce certain traffic regulations. Automated enforcement typically includes speed enforcement and traffic signal red light running enforcement. Speed enforcement could occur in work zones, school zones, or roadways in general.

Red light running systems can watch for vehicles that pass over the stop line at a traffic signal after the red interval starts. Red-light-running crashes caused approximately 139,000 injuries and 846 fatalities in 2018, according to the Insurance Institute for Highway Safety (IIHS). Automated enforcement is restricted in certain states, so if automated enforcement is used, be sure to follow state code. Some states limit automated enforcement to work zones or school zones, while others allow it to be used more freely. Some states require certain conditions for traffic signal red light running, such as ensuring that yellow and all-red times are calculated per current engineering methodologies, or that if used, all four approaches to an intersection must be enforced.

Automated enforcement does not always mean enforcement without manpower. With automated enforcement, typically a ticket is sent to the owner of a vehicle based on its license plate. However, some states require that all potential violations be reviewed manually by a police officer before the tickets are sent out. Some states, including Maryland and Pennsylvania, allow automated speed enforcement in work zones; but the cameras used for enforcement must be mounted on manned vehicles. In these cases, the locations do not have automated enforcement 24-7, it is only when the manned vehicle is present.

One advantage of automated enforcement is that there is in most cases an enforcement presence at all times or as allowed per regulations, regardless of police manpower available to provide the enforcement. The fines are often lower than the corresponding fine if the violation was a result of manual enforcement. Most states do not add points to a driver's record if they receive a violation by automated enforcement, where they often would receive points with a similar violation through manual enforcement.

Automated red light enforcement has demonstrated safety benefits. A Texas study found that red light-related crashes dropped by 25 percent, and right-angle crashes (the most severe type) dropped by 32 percent where red light enforcement was used. The reductions were seen across the board on all types of roadways, including: business/primary roads, farm-to-market roads, interstate access roads, state highways and U.S. highways. In addition to assessing the cameras' effectiveness according to roadway type, researchers also compared crash frequencies at different intervals before and after cameras were installed. The examination showed a 23 percent drop from one year before to one year after cameras were put into use. The two- and three-year comparisons reflected reductions of 27 percent and 21 percent, respectively.

Critics of automated enforcement often cite lack of due process in administration of the violation. Since the owner of the vehicle automatically receives the violation, there is no proof if another driver commits the violation versus the owner. The constitutionality of automated enforcement laws has been challenged in many jurisdictions. For example, Missouri's Supreme Court ruled in 2015 that red-light and speed cameras were unconstitutional.

Other criticism is based on the argument that automated enforcement is installed to maximize revenue through fines with minimal effort on the part of law enforcement. Earlier red light enforcement systems were criticized after being found using insufficient yellow and all-red interval timings, resulting in more violations, which strengthened this argument.

Some jurisdictions have found that after adding automated enforcement, the system is not economically sustainable on its own. Compliance with the traffic control that is being enforced is so good that the system does not generate enough revenue to cover its maintenance costs. Crash rates decrease as a result of increased compliance, thereby accomplishing the safety goal. If planning to use automated enforcement, consider a dedicated maintenance budget so that the system revenue is not needed to cover its operation and maintenance costs.

Education

Providing information to motorists is very critical in accomplishing the driving task. Information can have the form of signing and markings along the roadway. It can also be in the form of education. It is common for young drivers to take a driver education course to learn basics of driving, but there is additional awareness that can even benefit drivers with years of driving experience. This can be areas of driving that appear to be forgotten as a result of lack of compliance, or it can be in the form of new information as a result of changes to state law or new types of roadway facilities. The education aspect of driver behavior is very critical.

Driver education can be of multiple forms, i.e., billboards, TV and radio ad campaigns, public meetings, handouts, stands at shopping centers, dynamic message boards, or online and social media. Crosswalks and vehicular/pedestrian conflicts are a common problem on military installations. Some installations have provided flyers through their installation email system reminding both civilian and military staff on watching out for pedestrians and the responsibility pedestrians have to watch for vehicles.

It is commonplace to run ad campaigns geared at reminding drivers what they may have forgotten. For example, Share the Road is common in areas where bicycles use roadways. School bus related messages are often sent when school starts in the fall to remind drivers of the need to stop for school buses stopped when picking up or dropping off children. Ad campaigns are often run reminding people to use seat belts or watch for motorcycles. These are often traffic regulations that do not change, but periodic reminders are thought of as appropriate.

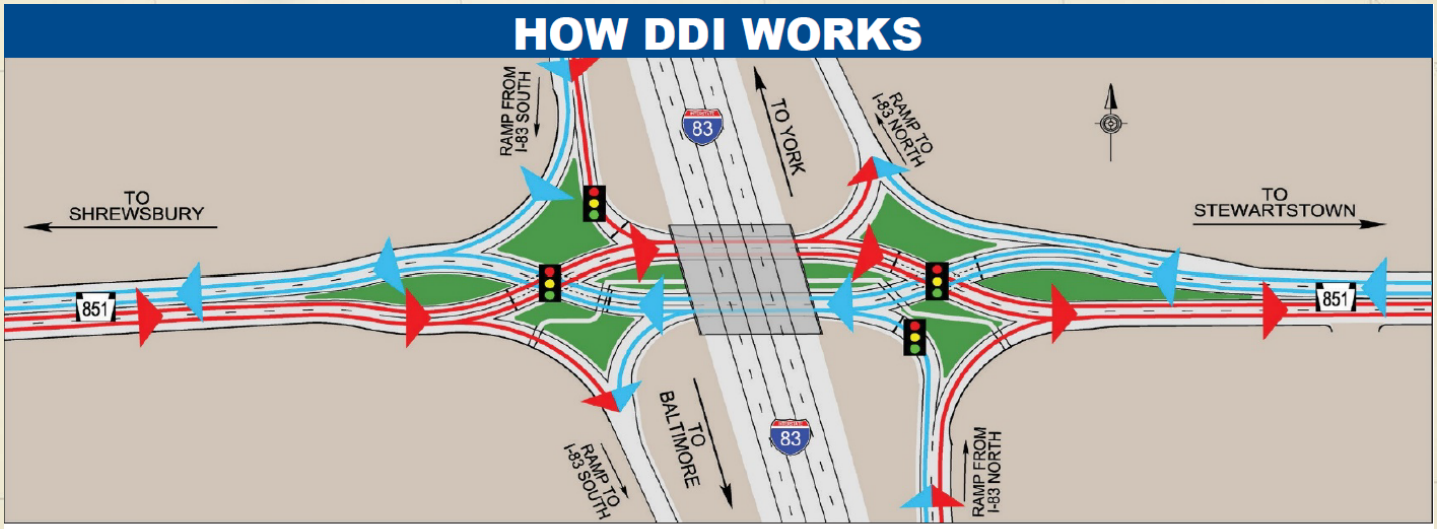
Public relations campaigns are often used for new traffic laws. Examples can include child car seat requirements, or laws concerning removing snow from the vehicle prior to operating it.

Driver education is also frequently used for innovative traffic engineering features new to an area. Examples can include roundabouts and interchange treatments, such as diverging diamond interchanges (DDIs). Drivers are often opposed to new features like these because of unfamiliarity. Especially when a feature is the first of its kind in an area, people may be resistant to it and doubtful of its effectiveness. Educational campaigns are used, including public meetings, stands set up in shopping malls, mailings, and media campaigns. These increase the driver's awareness of the feature, so when it opens to traffic, drivers have a general knowledge of it. This knowledge can result in much better awareness and community acceptance of the feature. Favorable results such as these have been noted quite often.

An example of educational material from the Pennsylvania Department of Transportation (DOT), developed for a diverging diamond interchange, is shown below. The graphic was developed to provide basic information on how the interchange was to operate. As the first in the area, it was considered extremely important to provide this information to local drivers.

Similarly, many DOTs have information on how to use roundabouts, since they are being used more frequently as an intersection treatment. Educational information from the Washington DOT is shown also on the following page.

Diverging Diamond Interchange Educational Graphic (Source: PennDOT)



A diverging diamond interchange (DDI) is unique from a standard diamond interchange in that the side road traffic Route 851 crosses to the left side of the road at a signalized intersection prior to the bridge. This allows direct left turns from the off-ramps to Route 851 and allows for a direct left turn on to the on-ramps to I-83. The side road (Route 851) traffic crosses back to the right side of the road at a signal beyond the bridge.

The DDI configuration has an operational advantage over the standard diamond in that it has only 2 phases per signal cycle versus 3 phases. This allows the DDI to provide more green time to traffic, alleviating congestion. Additionally, because of the direct left turns, there are fewer conflict points than a standard diamond, which reduces the crash rate and crash severity.

As of April 2018, 96 diverging diamond interchanges (DDIs) have been opened to traffic in the United States. PennDOT constructed its first DDI on I-70 at US 19 near Washington, PA. The I-83 Exit 4 Project is anticipated to be the second DDI to be constructed in Pennsylvania.

Roundabout Educational Graphic (Source: Washington DOT))

How to drive a roundabout

Roundabouts are designed to make intersections safer and more efficient for drivers, pedestrians and cyclists. There are two types of roundabouts: Single-lane roundabouts and multi-lane roundabouts.

There are a few key things to remember about driving roundabouts:

- Yield to drivers in the roundabout
- Stay in your lane; do not change lanes
- Do not stop in the roundabout
- Avoid driving next to oversize vehicles

Want to learn more? We have a five-part video available online.
You can also download our Rules of the Roundabout (pdf 1.7 mb) brochure in English and Spanish (pdf 1.7 mb).

Driving single-lane roundabouts

As you approach a roundabout, you will see a yellow "roundabout ahead" sign with an advisory speed limit for the roundabout.

Slow down as you approach the roundabout, and watch for pedestrians in the crosswalk.

Continue toward the roundabout and look to your left as you near the yield sign and dashed yield line at the entrance to the roundabout. Yield to traffic already in the roundabout.

Once you see a gap in traffic, enter the circle and proceed to your exit. If there is no traffic in the roundabout, you may enter without yielding.

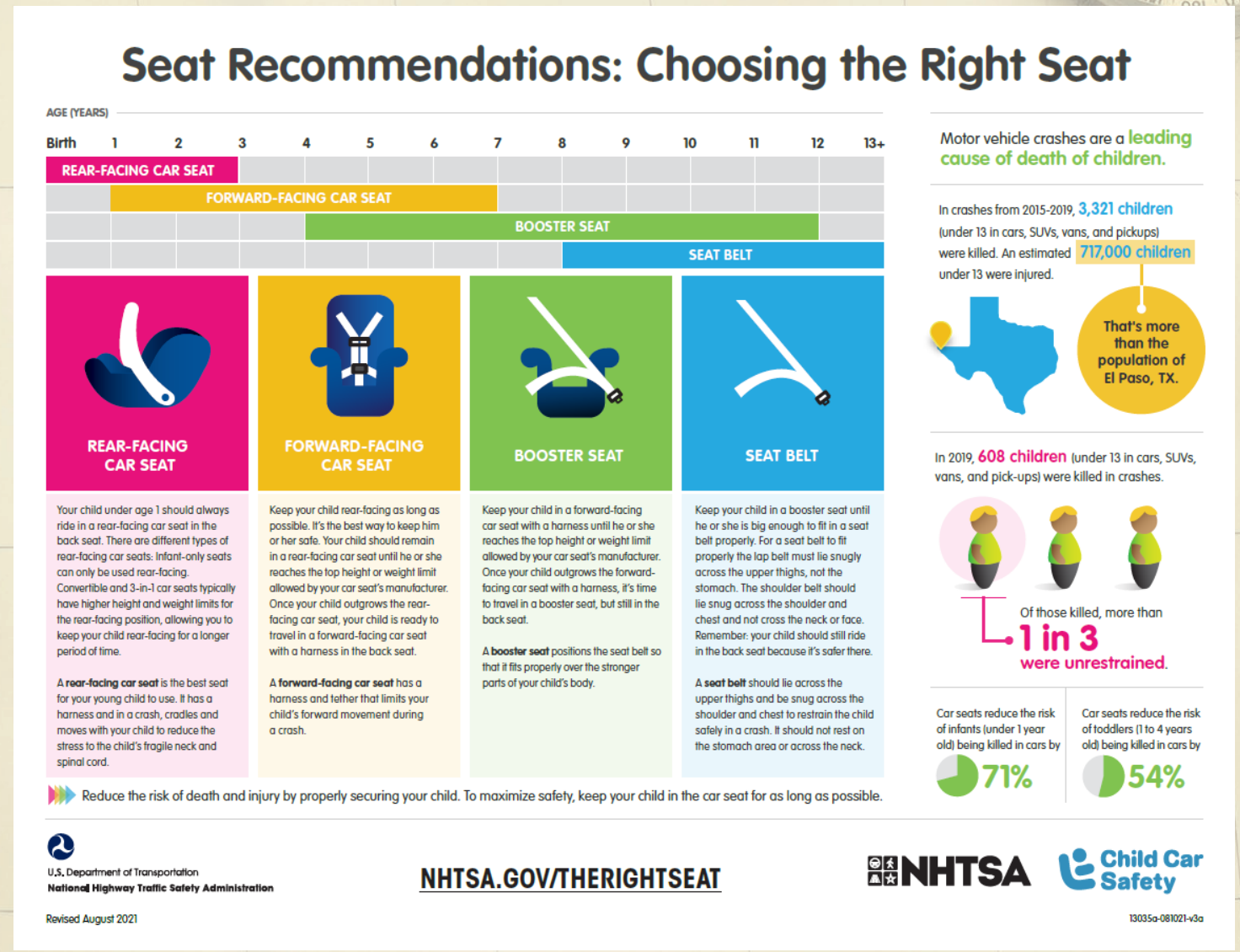
Another type of educational campaign includes education against drunk driving. Mothers Against Drunk Driving (MADD) has worked to change public perception of drunk driving through educational campaigns. MADD is generally given credit for changing American attitudes toward drinking and driving, underscoring that drunk driving is a serious issue that must be prevented. Crash trends mirrored their work; prior to the mid-1980s, there were approximately 25,000 drunk driving fatalities annually, and in 2019, there were 10,500. This reduction shows the effectiveness of this educational campaign.

- ☑ Bicycle Safety
- ☑ Child Safety
- ☑ Child Car Safety
- ☑ Distracted Driving
- ☑ Drunk Driving
- ☑ Drug-Impaired Driving
- ☑ First Responder Safety
- ☑ Motorcycle Safety
- ☑ Law Enforcement Appreciation
- ☑ Older Drivers
- ☑ Pedestrian Safety
- ☑ Rail Grade Crossing
- ☑ School Bus Safety
- ☑ Seat Belts
- ☑ Speed Prevention
- ☑ Teen Safety

☑ Vehicle Safety

Training materials include handouts as well as videos intended to run as public service announcements on television or radio. An example of child car seat safety published by the U.S. Department of Transportation (USDOT) is shown below.

Training Material Example from USDOT



Many of these focus areas are common causes for crashes, where educational campaigns can have an effective benefit.

Another area of education is driver education, intended for new drivers. This is an effective method of training new drivers to be ready for driving. Driver education courses (generally, a mix of classroom and behind-the-wheel instruction, some of which may be at night) are often offered through state Departments of Motor Vehicles, high schools, or by private companies. They are required in most states for minors under 18 years of age who want to get a driver's license, and available in others to lower insurance rates when young drivers are added to policies.

Crash Reporting

Engineering, Enforcement, and Education are three primary methods of reducing crashes. Effective use of these practices, especially when resources are limited, cannot occur without knowing where the crash problems are, or what specific areas are crash prone. Maintaining crash records allows for crash location analysis to determine causes of crashes, and the best method for correcting them.

monetary damage (i.e., personal injury and property damage) with no specifics of the crash itself. Additionally, in many cases, crash data is not provided to the transportation or traffic engineers on base for safety improvement analyses. These practices put the installation at a disadvantage because detailed crash records are important to identify problem areas and for developing methods to increase installation roadway safety.

At a minimum, the following data should be included in a crash report:

- ☑ Location (or nearest intersection)
- ☑ Date and time
- ☑ Environmental conditions (weather, visibility, road surface condition)
- ☑ Severity (property damage only, injury, and/or fatality)
- ☑ Types of vehicles (truck, automobile, bicycle, etc.)
- ☑ Collision paths of vehicles (including vehicle direction before impact)
- ☑ Crash type (Angle, head-on, sideswipe, etc.)
- ☑ Possible cause

Crash data can be maintained in a database, which could start as a spreadsheet containing all of the fields noted above. Once several crashes occur, the data can be sorted in regard to trends.

It is important to note that helpful crash data is an analytical tool. No personal information is needed; the names and identities of those involved is irrelevant to performing the engineering analysis.

Why is accurate crash data so important? Sometimes deficiencies that may not be apparent can be identified through crash data. For example, a safety audit conducted during a week of dry weather may not reveal that a certain intersection approach becomes slick when wet, or that a roadway ponds with water because of poor drainage. Detailed crash records can provide insight to these problems.

When special funding is available for correcting crash locations, another benefit of maintaining good crash records is to justify the need to apply for additional funds. Crash reports, when available, should be collected and summarized in an orderly fashion. They are usually filed in the installation security or safety offices.

In the absence of engineering solutions, the educational and enforcement aspect of correcting crash problems can also be seen by using crash records to compare crash rates after these strategies are used.

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