

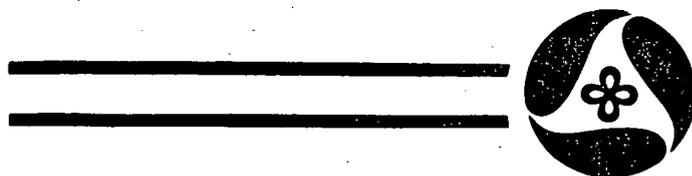
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# **TRAINING AIDS TO REDUCE POTENTIAL COUNTY LIABILITY**

**Final Report  
Iowa Highway Research Board  
Project HR-289**

**October 1987**

**Highway Division**



**Iowa Department  
of Transportation**

1.

Iowans who travel secondary roads regard these roads as a very important part of their lives. These highways provide a means of transporting products to market and children to school. They are also links to nearby cities and towns.

2.

Nearly 3.8 billion vehicle miles of travel occur each year on Iowa's nearly 90,000 mile secondary road system. Accidents do happen. However, improvements in highways, in vehicles, in driver education, in legislation, and in enforcement have combined to make driving in Iowa very safe. If our highways are to remain safe, these efforts need to be continued.

This presentation was developed to help county highway department personnel in their effort to maintain and improve highway safety. The presentation is not a standard, specification or regulation. Most of the information contained in this report can be found in the "Safety Features for Local Roads and Streets" manual prepared by the Na-

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tional Highway Institute of the Federal Highway Administration.

At the time the federal aid highway system was established in Iowa in 1917, the intercounty road system had 6000 miles, the county system had 10,000 miles, and the township road system had 88,000 miles. The current 90,000 mile secondary system, for the most part, has evolved from these early roadways. These roads were originally developed for horse drawn traffic. As the type of traffic changed, the standards for design, construction and maintenance changed. Law changes in the 1960's, which permitted the courts to hear claims for damages against the counties and state, have made highway administrators acutely aware of the problem of changing roadway uses and standards. It would take large sums of money to bring all of Iowa's highways up to current standards. It appears reasonable to conclude, however, that current levels of highway expenditures reflect the viewpoint of a majority

4.

of citizens regarding the value of highway safety. The public has demonstrated little willingness to support substantial increases in funding for safety measures. This is also reflected in recent legislation which reads "A claim under this chapter shall not be allowed for failure to upgrade, improve or alter any aspect of an existing public improvement or other public facility to new, changed or altered design standards" (Section 25A.14 of the Iowa Code).

This does not mean counties shouldn't make any improvements to existing roads. It does, however, allow the counties to spend the available money where it will provide the maximum benefit.

Despite having a limited amount of money, there are still many things we can do in day to day operations which can help maintain highway safety. This presentation will cover several topics, each of which has an impact on the safety of our highways.

The road, roadside, signing and maintenance are all factors of concern to county highway departments.

5.

Most drivers do not think about the part the road surface plays in safety. However, the contact between a vehicle's tires and the road surface is important. Since this contact occurs all the time, it is taken for granted by drivers.

Over 75% of the county road system is granular surfaced roads. Traffic and weather continually affect these surfaces. The presentation, "Maintaining Granular Surfaced Roads", developed by the Iowa DOT for secondary roads, details many of the maintenance techniques used to keep these surfaces in good condition.

The simplest way to slow down the development of pot-holes, washboarding, and rough surfaces in general is by maintaining a proper crown to allow water to drain to the ditches.

Granular surfaced roads with poor crowns trap water, causing the crust to become saturated and break up. Likewise, windrows of material at the outer edge of the road surface form secondary ditches which inhibit surface drainage and hasten deterioration of the surface.

6.

For certain conditions it may be best to stop and repair holes, rutted areas and poor surface drainage conditions with a shovel. Reshaping is occasionally needed to remove pot-holes and washboard areas to restore the crown.

Maintenance of the superelevation of curves is also helpful in partially offsetting centrifugal forces of a vehicle rounding a curve. Superelevation is where the outside edge of the curve is higher than the inside edge.

The paved roadway system is much more resistant to deterioration caused by traffic and weather. However, when pot-holes, dips, bumps and rough surfaces do develop, they are more difficult to correct. When these types of conditions develop it is best to inform the foreman.

The shoulder is another part of the road surface that plays a role in highway safety. While this is most noticeable when there are no shoulders, problems may also occur when shoulders are not constructed or maintained properly.

Shoulders serve several functions, including: providing a safe refuge for

7.

stopped vehicles, providing an "escape route" to avoid a collision with another vehicle and providing a recovery area when a driver drifts or strays off the road.

It is common practice to have a shoulder slope equal to or greater than the slope of the road. A shoulder that has cracks, depressions and uneven settlement is not very useful. Drivers may tend to shy away from such a shoulder .

Shoulders on steep hills or curves deserve special attention. Heavy rains may cause edge ruts to form by eroding the soil or rock on hills. On curves, vehicles occasionally stray onto the shoulder area causing increased wear. Shoulder problems will generally require more than routine maintenance. Inform the foreman when there is an edge rut or shoulder washout. It may need to be marked or signed until maintenance can be accomplished.

Other areas of concern are debris, windrows of aggregate and loose aggregate on pavements and paved bridges.

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Rocks or earth slides, fallen branches, articles dropped off vehicles, trash, or dead animals on highways can be obstacles to drivers. When these types of things are spotted or reported, they should be removed. If left on the highway they may cause an inattentive motorist to panic and swerve into the other lane. Also, when debris is hit it can be thrown into the path of other vehicles. Windrows of aggregate are an unavoidable result of smoothing the road surface to permit safe and efficient travel. Windrows created during reshaping will generally be larger than storage windrows. Keep in mind that traffic will be using the road during blading. Try to position the windrow toward the center so vehicles can travel in their lane with as little encroachment on the shoulder as possible. Storage windrows during dry periods are necessary to store loose aggregate. These windrows are generally smaller and are usually left on

9.

the shoulder out of the traveled portion of the road.

Ideally, roadways would be built with wide, flat areas on each side so that out of control vehicles would have room to stop. However, in reality most local roads have limited rights-of-way which make wide, flat slopes impossible. Steeper roadside slopes must be used and ditches must be built closer to the roadway.

The principle parts of the roadside and ditch areas are shown here. Slopes next to shoulders should be as flat as practical. Drivers who inadvertently leave the traveled way can often recover control of their vehicles easier on a relatively flat foreslope.

The concept of a clear zone has evolved for design of highways. The clear zone is the distance between the edge of the traveled lane and the nearest object of substance. The amount of clear zone required is based on the type of roadway and the traffic speed. Obviously, the clear zone desired is larger for interstate roads than for county roads.

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The official wording is  
....."It is desirable to provide a roadside clear of objects or conditions for a distance consistent with the speed, traffic volume, and geometric conditions of the site." The practical width of this clear zone is variable, particularly for local roads.

A clear zone of 10 feet is generally acceptable. Such things as railroad overpasses, culvert headwalls and bridge end-rails built according to earlier standards may leave a smaller clear zone. Obviously, upgrading these items is programmed based on a priority system. Generally object markers are used to alert motorists of these items.

Drainage structures within the right-of-way are a necessity, but they may also represent a potential obstacle. The potential impact hazard of drainage structures is reduced as the ends are placed farther from the roadway. When a structure end must be placed close to the roadway, it should normally be designed so vehicles

11.

can cross it safely or are prevented from reaching it.

Culverts under a side road or driveway should normally be placed as far from the through roadway as possible.

Ruts or gullies in the foreslope caused by erosion should be filled as quickly as time permits.

Many of the objects that are found on county roads are not under the direct control of the local highway agency. This includes existing utility poles, trees left by ROW agreements with property owners and drainage ditches. Such things as odd shaped or oversized mail box posts, equipment, hay bales and vehicles are generally handled by the county attorney if requested by the engineer.

Corrective action is best taken in a timely manner. Allowing one violation to exist tends to lead to others. When these types of violations are observed, you should notify the engineer.

12.

Obstacles of a different type are weeds and brush. Weeds can obscure vision at intersections and driveways, cover important signs, and hide other obstacles. Many times your view of the road is from a motor grader or truck cab several feet in the air. The height of the eyes of a driver of a car is considered to be  $3\frac{1}{2}$  feet above the road. When you travel roads often and the brush grows slowly there is a tendency to overlook the gradual change.

If you notice a sign which is obstructed by weeds or hanging branches, take appropriate action to correct the situation.

Signs, markings and delineation are the basic tools available for giving messages to drivers. These messages are necessary to inform drivers of their responsibilities, to warn them of conditions and to help guide them to their destinations.

The Manual of Uniform Traffic Control Devices,  
often referred to as the MUTCD, sets

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standards for the design, application and placement of traffic control devices on all roads. Four addendums to the MUTCD have been produced to respond to the results of research studies. Each state must either adopt the MUTCD or a similar manual having U.S. DOT approval. The State of Iowa adopted the MUTCD. A companion document "The Traffic Control Devices Handbook" contains supplemental information which may be helpful in applying the MUTCD to real world situations.

The basic aim of the MUTCD is to establish uniformity in the appearance of and use of traffic control devices. Uniformity is important because it:

Enhances recognition and understanding of traffic control devices;

Promotes consistent interpretation by law enforcement agencies and the courts;

Helps the driver realize the message contained in the sign should be respected;

Reduces the costs of manufacturing and storing signs;

Reduces the risk of liability.

14.

Signs are divided into three major groups:

Regulatory signs inform drivers of the "Dos" and "Don'ts" that apply to each roadway.

Warning signs advise drivers of special locations, maneuvers or activities.

Guide signs give information about routes, directions, destinations, points of interest and services. Marking and delineation devices help drivers maintain their travel path, provide warning of upcoming changes, and assist in identifying special situations. "Positive" delineation, such as centerline marking, indicate the path to be followed.

Object markers are an example of "negative" delineation indicating areas to be avoided. Delineation and markings are helpful in improving the safety of driving at night because they provide guidance to drivers beyond the normal headlight range.

15.

The MUTCD lists five basic requirements for an effective traffic control device. The device must:

- Fulfill a need
- Command attention
- Convey a clear simple meaning
- Command respect of road users
- Give adequate time for proper response

The rules for the selection and use of signs are:

- Use standard signs
  - Keep messages simple
  - Place them in standard locations where they will be expected
  - Use signs only when necessary, particularly regulatory and warning signs.
- One of several concerns when installing a sign is its distance from the point where action is required.

Warning signs are primarily for the protection of motorists who are unfamiliar with the road. Adequate time for driver response needs to be provided.

16.

The 1983 revision to the MUTCD includes this table of placement distances for advanced placement of warning signs.

The table lists suggested minimum sign placement distances that may be used for three conditions:

Condition A is a high driver judgement condition which requires the driver to use extra time in making and executing a decision because of a complex driving situation, such as changing lanes, merging or passing.

Condition B is a condition in which the driver will likely be required to stop.

Condition C is a condition in which the driver will likely be required to decelerate to a specific speed.

The values contained in the table are for guidance purposes and should be applied with engineering judgement. The suggested minimum sign placement distances given in this table may not apply to the placement of temporary warning signs used at highway construction and maintenance sites. Con-

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sult the engineer whenever a question arises concerning the proper placement of warning signs.

Regulatory signs are normally placed where a required action or prohibition begins, and then at regular intervals to remind motorists the regulations still apply.

The legality of regulations has been questioned in the courts when the sign placement and the beginning of the restriction do not coincide.

Guide Signs are helpful when placed in advance of, and at, decision points where drivers must decide whether to continue straight or make a turn. Confirmation route markers just after the decision point are also very helpful to motorists who are unfamiliar with the area.

The distance between a sign and the roadway is very often a compromise between the nearness desired for easy readability and the separation from the edge of the pavement desired for safety.

To provide some room for drivers to recover vehicles which are out of

18.

control, signs should not be closer than six feet from the edge of the shoulder on rural roads. Where the shoulder is less than six feet, a spacing of 12 feet from the edge of the traveled way is desirable. The traveled way is considered to be 20 feet wide for granular surfaced roads.

The bottom of a sign in a rural district should be not less than 5 feet above the plane of the road. When a supplemental plate is used on a warning sign in a rural area, the minimum height to the bottom of the supplemental sign may be reduced to 4 feet.

Signs mounted on temporary supports in maintenance areas may be mounted at lower heights. However, in all cases, the bottom of the sign should be at least 1 foot above the roadway, and should not rest on the ground.

Some recent court decisions have gone so far as to say that the failure to be aware of a damaged or knocked down traffic control device will not protect against tort liability unless the agency can show it has an ongoing program to discover and correct defective devices.

19.

A detailed log should be kept of every sign. A good record system will contain information on the location of each sign.....the sign itself....and the post.

It is also a good idea to mark the date on the back of each panel as it is placed in the field.

Motorists may miss the messages of signs they cannot see plainly. The view of a sign may be blocked because of initial installation error, growth of vegetation or construction activities. Visual blockages should be corrected as soon as possible. Also, vandalized signs should be replaced if it is determined the sign can no longer be interpreted plainly by motorists.

Where multiple signs are used, the most important information should be given priority. Regulatory and warning signs should be placed in the optimum position and guide signs should be relocated to other positions.

Sometimes signs remain in place after the conditions which warranted their installation have changed. They may be unnecessary. If so, they should

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be removed or relocated to reduce sign clutter and give more emphasis to the remaining signs.

Pavement markings should also be maintained in order for them to be effective. An essential ingredient in good pavement markings are the glass beads which make these markings more visible at night.

The glass beads reflect light from a vehicle's headlights back to the eyes of the driver. Unfortunately, the glass beads which provide nighttime reflectance are often gone long before the paint is worn away. Thus, lines which are visible during the day may appear "dead" at night. One method of determining the effectiveness of line reflectivity is to drive the road at night. A line which reflects light poorly would indicate that maintenance should be done on it.

A problem with standard pavement markings, in some situations, is that they cannot be seen far enough in advance. At horizontal curves located beyond the crest of a hill, post mounted delineators may provide a better indication of the path ahead.

21.

These post-mounted delineators consist of disks or panels mounted on posts. The disks should be at least 3 inches in diameter with a surface that will direct light back to the driver. A delineator may be mounted on a plastic post which resists damage caused by impacts.

Object markers are used to identify obstructions within or next to the roadway. The three types of markers are shown here.

Obstacles within the roadway should normally be identified with type 1 or type 3 markers. The downward slope of the stripe on the type 3 marker indicates the side of the panel on which drivers should pass. Be sure these signs get placed correctly at obstacles

Type 2 or type 3 markers are used for objects close to the travelled way, such as bridge abutments.

The last delineation device on our list is a sign.

The chevron alignment sign consists of a black chevron symbol on a

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yellow rectangle. Several of these are placed in a series to mark the roadway path at sharp curves.

While you may not want to place delineators everywhere, they are very effective at curves and at obstacles. Periodic inspections should be made during the day to check for the presence of the sign and at night to check for visibility. Signs, markings and delineation devices do not last forever and must be expected to wear out and be replaced.

One or two people are generally made responsible for sign maintenance. With 700 to 1000 miles of roadway, one of the best ways to effectively maintain the signs is to ask for public calls on defects. Also, department employees should make notes of missing or damaged signs they notice and report such problems to the County Engineer or foreman in charge of making repairs. A log should be kept of all calls pertaining

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to roadway signing. Each should be investigated as soon as is practicable, giving priority to those calls which involve areas under construction or maintenance and to roadway sections carrying a high volume of traffic.

Roadway safety can be kept at a high level with proper construction and routine maintenance of the road and right-of-way. However, maintenance work often introduces a necessary hazard on the roadway. To be sure safety is maintained during this time, close attention should be paid to the county's established standard operating procedures. Also, signing must conform to The MUTCD in the use of warning signs.

During construction of a project all work should be confined to the construction limits or right-of-way.

Good judgement is needed in determining where to allow the contractor to keep his equipment during the night. Keep the motorist's safety in mind when making this decision.

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When performing maintenance work on the right-of-way, care is needed not to damage adjacent properties. When spraying herbicides on grasses and weeds avoid spraying farmers' crops or vegetation on private property. Also, when trimming trees, avoid damaging private property with falling branches.

Equipment operators must be aware of passing traffic while operating their vehicles on or near the roadway. Defensive driving is the best way to keep vehicle accidents to a minimum. By driving carefully, abiding by the posted speed limits and reducing speed in adverse conditions, accidents can be avoided. Do not hesitate to use your headlights to improve your visibility.

County personnel can play an important role in detecting potentially dangerous situations that will occur from time to time on the secondary road system. While driving in your county, note such things as erosion of the shoulder, shoulder dropoffs, potholes, ponding water, and rough surfaces.

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Report these to the maintenance supervisor so that timely corrections can be made.

Iowa's transportation agencies have been successful in designing, constructing, and maintaining roadways which provide safe travel. Occasionally, however, situations will arise which create potential hazards. It is our duty to the citizens that we serve to act in a timely and proper manner to correct these situations.