

# **Maintaining Iowa's Secondary Road Environment**

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

**March, 1989**

**Highway Division**



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Maintaining Iowa's  
Secondary Road Environment

BY

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ABSTRACT

The Iowa counties have been successful in maintaining a good roadway environment on our 90,000 mile secondary road system. However, county highway personnel must remain vigilant in detecting, discovering and correcting potential problems if our roads are to remain so.

This presentation was developed for those county personnel who work and travel on secondary roads. The presentation discusses things county personnel can look for during their daily operations which could possibly create a potential problem. If these situations are uncovered and corrected in a timely manner, our secondary road system will be maintained in an appropriate manner.

ACKNOWLEDGEMENT

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1. Blank \*
2. Car Traveling on a Secondary Road \*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.
3. Children Getting on School Bus
4. Car Traveling on Secondary Road \*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 lessen the potential for accidents. If our highways are to continue to provide a good roadway environment, these efforts need to be continued.
5. Paving Train
6. Driver's Education Car
7. Sheriff's Car
8. "Maintaining Iowa's Secondary Road Environment" \*This presentation was developed to help county highway department personnel in their effort to maintain and improve the roadway environment. \*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
9. Standard Spec. Reg.
10. Guide Safety Features for .....

prepared by the National Highway Institute of the Federal Highway Administration.

11. Vehicle on Mud Road

\*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

12. Modern County Road

13. 18 ft. Wide County  
PCC Road

14. IA Laws Pertaining to  
Transportation

majority of citizens regarding the value of a good roadway environment. The public has demonstrated little willingness to support substantial increases in funding for these 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 highway, secondary road, or street to new, changed or altered design standards" (Section 25A.14 of the Iowa Code).

15. Asphalt Overlay  
Project

\*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.

16. Road  
Roadside  
Signing  
Maintenance

Despite having a limited amount of money, there are still many things we can do in day to day operations which can help maintain a good roadway environment. \*This presentation will cover several topics, each of which has an impact on that environment.

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

17. Tire-Road Surface Contact

\*Most drivers do not continually think about the part the road surface plays in control of their vehicle. However, the contact between a vehicle's tires and the road surface is important. Since this contact occurs all the time, it may be taken for granted by drivers.

18. Gravel Road

19. Fertilizer Spreader

20. Title "Maintaining  
....."

\*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.

21. Gravel Road With Crown

\*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.

22. Water in Potholes

\*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.

23. Water in Sec. Ditch  
Along Windrow

24. Repairing Pothole  
With Shovel

\*Although not always practical, in certain situations 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.

25. Water in Potholes

26. Cross Section Profiles

\*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.

27. Potholes in  
Bituminous Surface

\*The hard surfaced 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 are discovered, employees should inform their immediate supervisor so remedial action can be taken.

28. Pavement, Shoulder & Ditch

\*The shoulder is another part of the road surface which plays a role in the roadway environment. Problems may occur when shoulders are not constructed or maintained properly.

29. Shoulder Functions

\*Shoulders serve several functions. The most important one is to stabilize the roadbed. However, shoulders also may provide a refuge for stopped vehicles, provide an "escape route" to avoid a collision with another vehicle and provide a recovery area when a driver drifts or strays off the road.

30. Granular Shoulder

\*It is common practice to have a shoulder slope equal to or greater than the slope of the road. A shoulder should be maintained in accordance with the applicable policy in order to best serve these functions.

31. Rut on Hill

\*Shoulders on steep hills or curves deserve different attention. Heavy rains may cause unacceptable edge ruts to form by eroding the soil or

32. Edge Rut on Curve

rock on hills. \*On curves, vehicles occasionally stray onto the shoulder area causing increased wear. Some

33. Washout on Granular Surfaced Road

shoulder problems may require more than routine maintenance. \*Inform your immediate supervisor when there is an unacceptable edge rut or shoulder

washout. It may need to be marked or signed until maintenance can be accomplished.

34. Hay on Road

\*Other areas of concern are debris, windrows of aggregate and loose aggregate on pavements and paved

35. Muffler on Road

bridges. \*Rocks or earth slides, fallen branches, articles dropped off vehicles, trash, or dead animals on high- ways can be obstacles to drivers.

36. Logs on Shoulder

\*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.

37. Maintainer Forming Windrow  
in Middle of Road

\*Windrows of aggregate are an unavoidable result of smoothing the road surface to permit efficient travel.

38. Motor Grader Putting  
Windrow in Middle of  
Road

Windrows created during reshaping will generally be larger than storage

windrows. \*Keep in mind that traffic will be using the road during blading.

39. Motor Grader Putting  
Windrow Along Edge of  
Road

Try to position the windrow toward the center so vehicles can travel in their lane with as little encroachment on the

shoulder as practicable. \*Storage windrows during dry periods are neces-

sary to store loose aggregate. These windrows are usually left on the shoul-

der out of the traveled portion of the road. The height and size of these

windrows should be kept as small as is practical so that safety and drainage

are maintained.

40. Wide Right-of-Way

\*It is generally preferable to build roadways with wide, flat areas on each side to better serve the various

41. Narrow Right-of-Way

functions previously stated. \*However, in reality most local roads have lim-

ited rights-of-way which make wide, flat slopes impossible. Steeper

roadside slopes must be used and

ditches must be built closer to the roadway.

42. Cross Section From CL  
Through Ditch

\*The principal parts of the roadside and ditch areas are shown here. Slopes next to shoulders should be as flat as practical to better serve those functions.

43. Clear Zone of a Granular Surfaced Road

\*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.

44. Interstate Highway

\*Obviously, the clear zone desired is larger for interstate roads than for county roads.

45. Stop Ahead Sign

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.

- 46. Railroad Overpass
- 47. Bridge Rail/Object Marker

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.

- 48. Culvert Pipe Not Close to Roadway

Drainage structures within the right-of-way are a necessity, but they may also represent a potential obstacle. \*The potential problems of drainage structures is reduced as the ends are placed farther from the roadway.

- 49. Culvert With Protective Cover

\*When a structure end must be placed close to the roadway, it is desirable that it be designed so vehicles can cross it safely or are prevented from reaching it.

- 50. Sketch of Side Road Culvert Location

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

- 51. Eroded Foreslope

\*Ruts or gullies in the foreslope caused by erosion should be filled as quickly as practicable after they are discovered.

52. Pole in R.O.W.

\*Many of the objects that are found on county roads are not under the direct control of the local highway

53. Trees in R.O.W.

agency. \*This includes existing utility poles, trees left by ROW agreements with property owners and drainage

54. Mail Box Mounted on Tractor

ditches. \*Such things as odd shaped or oversized mail box posts, equipment, hay bales and vehicles are generally

55. Building Debris in R.O.W.

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.

56. Brush Covering Sign

\*Obstacles of a different type are weeds and brush. Weeds can obscure vision at intersections and driveways, cover important signs, and hide other

57. Brush Covering Sign

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 3½ feet above the

road. When you travel roads often and the brush grows slowly there is a tendency to overlook the gradual change.

58. Brush Covering Sign

\*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 helpful to inform drivers of their responsibilities, to warn them of conditions and to help guide them to their destinations.

59. MUTCD Manual

\*The Manual of Uniform Traffic Control Devices, often referred to as the MUTCD, sets guidelines for the design, application and placement of traffic control devices on all roads. Four addenda 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

60. Traffic Control Devices Handbook

MUTCD. \*A companion document "The Traffic Control Devices Handbook" contains

supplemental information which may be helpful in applying the MUTCD to real world situations.

61. Importance of Uniformity

\*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.

62. Types of Signs

\*Signs are divided into three major groups:

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

Warning signs advise drivers of special locations, maneuvers or activities. They also advise drivers of upcoming regulatory signs.

Guide signs give information about routes, directions, destinations, points of interest and services.

63. Centerline and Edge Marking

\*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, indicates the path to be followed.

64. Object Marker

\*Object markers are an example of "negative" delineation indicating areas to be avoided. \*Delineation and markings are helpful in improving a driver's ability to drive at night because they provide guidance to drivers when visibility is limited to normal headlight range.

65. Night Picture of Centerline and Edge Stripes

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

66. Requirements of Effective Traffic Control Devices

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

67. When Selecting Signs

\*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 warranted, 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 motorists who are unfamiliar with the road. Adequate time for driver response needs to be provided.

68. Table of Placement Distances

\*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. Consult the engineer whenever a question arises concerning the proper placement of warning signs.

69. Speed Limit Sign

\*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.

70. Guide Sign

\*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.

71. Route Marker

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.

72. Sign on Secondary Road

\*To provide some room for drivers to recover vehicles which are out of control, it is desirable that signs should not be placed 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.

73. Sign on Secondary Road

\*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.

74. Hidden Sign

\*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.

75. Vandalized Stop Sign

\*Also, vandalized signs should be replaced if it is determined the sign can no longer be interpreted plainly by motorists.

76. Multiple Signs

\*Where multiple signs are used, the most important information should be given priority. Regulatory and warning signs should be placed in the optimum position. They should not be blocked or obscured by other signs. Guide signs should be relocated to other positions.

77. Old Sign Still in Place After Correction

\*Sometimes signs remain in place after the conditions which warranted their installation have changed. They may be unnecessary. If so, they should be removed or relocated to reduce sign clutter and give more emphasis to the remaining signs.

78. Handful of Glass Beads

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

79. Night Shot of Paint Reflectivity

\*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.

80. Poor Paint Reflectivity

81. Chevrons Along a Curve

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 or chevrons may provide a better indication of the path ahead.

82. Delineator

\*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.

83. Chevron Detail

\*The chevron alignment sign consists of a black chevron symbol on a yellow rectangle. Several of these are placed in a series to mark the roadway path at sharp curves. Spacing of the signs should be such that the motorists always have two in view, until the change in alignment eliminates the need for the signs.

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

84. Type 1 Object Marker

\*

85. Type 2 Object Marker

\*

86. Type 3 Object Marker

\*

87. Type 3 Object Markers  
at a Bridge

\*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.

88. Type 2 Marker at  
Bridge

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

While you may not want to place delineators everywhere, they are very effective at curves and at obstacles.

89. Sign With Poor  
Retroreflectivity

\*Periodic inspections should be made during the day to check for the presence of the sign and at night to check for quality of sign reflectivity. 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.

90. County Secretary Logging a Call From the Public

\*With 700 to 1000 miles of roadway, one of the best ways to effectively maintain the signs is to encourage public calls, including from law enforcement, on defects. \*Also, department employees, in the course of their employment, should make notes of missing or damaged signs they notice and report such problems to the County Engineer or the person in charge of making repairs as soon as practicable.

91. County Personnel Inspecting Sign

92. Road Maintenance Work

\*A good roadway environment can be kept with proper construction and routine maintenance of the road and right-of-way. However, maintenance work often introduces a necessary problem on

93. "Road Construction Ahead" Sign

the roadway. To be sure a good roadway environment is maintained during this time, the county's established standard operating procedures must be followed as closely as practicable. \*Also, signing must conform to the MUTCD in the use of warning signs, unless good engineering judgment indicates otherwise.

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 in mind when making this decision.

94. Clearing Drainage Ditch

\*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.

95. County Worker Spraying Herbicide

96. Motor Grader Operator Smoothing Shoulder

\*Equipment operators must be aware of passing traffic while operating their vehicles on or near the roadway.

97. Snowplow Operating in Storm

\*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. Also, it is good practice to always use your vehicle's warning lights when working on or near the roadway.

98. County Personnel Marking Shoulder Washout

\*County personnel, in the course of their employment, can play an important role in detecting potential problems that may 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 which may be subject to maintenance under your policies. Report these to your immediate supervisor so that timely corrections can be made.

99. Cars Traveling on County Highway

\*Iowa's transportation agencies have been successful in designing, constructing, and maintaining roadways

which provide a good roadway environment. Occasionally, however, situations will arise which create potential problems. It is our duty to act in a timely and proper manner to correct these situations.

100. Credit Slide

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