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**GUIDELINES FOR
DEVELOPMENT OF A
GUARDRAIL MAINTENANCE
AND REPAIR ACTION PLAN**

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Document Objective

This synthesis and action plan was developed through consultation with engineering professionals and other public officials representing the interests of cities, counties and the State of Minnesota. It is based in part on a review and survey of practices both within the state and in other states. The purpose of this Guardrail Maintenance and Repair Action Plan is to provide a framework for governmental entities to develop guardrail maintenance and repair policies, procedures and plans.

- **This Action Plan is not intended to be a “model plan” or to create a new standard of care which any governmental entity must meet, nor does it assume that any suggested action or procedure can or should be adopted everywhere.**

Instead, this Action Plan should be used as a reference source or guide for governmental entities to develop their own policies and procedures for guardrail maintenance and repair. This Action Plan recognizes that governmental entities at all levels must exercise discretion and weigh political, social, safety, economic and other public policy considerations in the development, adoption, implementation or modification of any policy or action plan.

- **This Action Plan is not intended to take away or diminish the discretion exercised by governmental entities when deciding how best to address their guardrail maintenance and repair concerns.**

Instead, this Action Plan is intended to encourage governmental entities to share information, to work cooperatively with each other, to think innovatively, and to develop guardrail maintenance and repair policies and procedures that make good public policy sense. Given the disparity of resources, and the different geographic, climactic, topographic and other conditions with which governmental entities in Minnesota must contend, development of guardrail maintenance and repair policies and procedures will require different approaches by different governmental entities. This Action Plan recognizes that development of guardrail maintenance and repair policies and procedures is most effective when those policies and procedures are developed by the governmental entity that must implement them.

We appreciate the assistance of the following people who served on the task force responsible for developing this Guardrail Maintenance and Repair Action Plan:

Roger Gustafson, Carver County
Jack Hennen, League of Minnesota Cities
Glenn Korfhage, Minnesota Department of Transportation
Brad Larson, Scott County
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History

In 1993, the Local Road Research Board (LRRB) published *Research Implementation Series Number 14, Guardrails, End Treatments and Transitions*, which summarized the accepted guardrail types, end treatments and transition systems used in Minnesota. The document was written to serve as a quick reference to illustrate what is available, along with the suggested use of each type of device. In its appendix, the Mn/DOT standard plates and plans for each were listed. Lastly, but very importantly, the document emphasized that every agency should have a documented repair action plan for their guardrail systems. Realizing the importance of this, the LRRB has developed the following guide to assist agencies in developing a Guardrail Maintenance and Repair Action Plan of their own.

Legal Environment

Minnesota Court of Appeals and Supreme Court decisions have consistently demonstrated the importance of developing written policies that balance competing political, social and economic considerations. Governmental entities are immune from liability for “any claim based on the performance or failure to exercise or perform a discretionary function or duty whether or not the discretion is abused.” This statutory discretionary immunity is set forth in Minn. Stat. 466.03, subd. 6, (applicable to local governmental units) and Minn. Stat. 3.736, subd. 3(b), (applicable to the State of Minnesota.)

Discretionary immunity provides the most complete protection when it is based on a written policy that is developed and implemented after weighing competing policy considerations.

Discretionary immunity will not provide protection for a governmental entity if the policy is not known or not followed. Statutory discretionary immunity is intended to assure that courts do not second guess policy decisions entrusted to the legislative and executive branches of government.

To increase the statutory discretionary immunity protection afforded governmental entities, jurisdictions enacting and implementing a guardrail maintenance and repair action plan or policy should consider the following:

1. Any policy or plan should be developed or approved by the appropriate governing body or by those to whom that task has been explicitly delegated by the appropriate governing body.
2. Policy or plan development should include a balancing of political, social and economic considerations, including but not necessarily limited to availability of resources, public safety, workers’ safety, cost, effectiveness, and weather and climactic conditions.
3. Once a policy or plan is developed, all appropriate personnel should be informed of the policy and directed to follow it. Supervisors should be responsible for monitoring their employees’ activities to assure that the plan or policy is being followed.

4. The policy or plan should be periodically reviewed and, if necessary, revised to reflect current political, social and economic considerations.
5. If appropriate, the policy should be formally adopted or ratified by the governing body responsible for implementing the policy.

In addition to statutory discretionary immunity, claims against governmental entities and other possible defendants may be barred by applicable statute of limitations for improvement to real property. In a recent lawsuit, the Minnesota Court of Appeals found that a county's failure to add sloping guardrails to the corners of a bridge that was designed and constructed in 1939 without guardrails was barred by the improvement to real property statute of limitations and, therefore, the county was not liable. All jurisdictions enacting guardrail maintenance and repair action plans or policies should consult with their attorney to assure that their plan or policy is consistent with current law.

Why is a Maintenance and Repair Action Plan necessary?

Guardrails are designed to reduce the severity of accidents occurring when vehicles collide with roadside hazards. The question of whether guardrails are safety features or roadside hazards was addressed in a 1994 study conducted by Michie and Bronstad, which concluded that properly located highway guardrails are a safety feature, with a 94 percent success rate of preventing more serious accidents. However, in the 6 percent of cases where the guardrail system was considered hazardous, half of the incidents were due to improper installation and/or inadequate repair.

Writing and adopting a policy to guide in the maintenance and repair of guardrail systems can protect the agency and help agency employees understand their duties and expectations. If adopted by the governing agency's legislative body, policies that balance competing needs, such as roadway safety, maintenance staff safety, and fiscal constraints can offer some protection to communities against liability for accidents. It is important to show that the agency has a written policy in place which outlines the standard procedures used in assessing and addressing the situation.

Standards and Specifications

When guardrail installation and repair are needed, there are two major concerns: public safety and repair crew safety. Any action plan to implement guardrail installation and repair should be made with both concerns as a top priority.

An installation and repair action plan is required by any agency with responsibility defined by Section 6A-4, Part VI of the *Manual on Uniform Traffic Control Devices for Streets and Highways* by the Federal Highway Administration (1978) as:

- (1) State highway department, county, and municipal forces performing construction and maintenance operations on roads and streets;

- (2) Contractors employed in road or street construction or maintenance under contract to any government authority; and
- (3) All others, including employees of public utility companies, performing any work on highways or so closely adjacent as to create hazards for the public or for themselves.

The manual also clearly states some major fundamental principles related to safety in Section 6A-5 as:

- (1) Traffic movement should be inhibited as little as practical. Construction time should be minimized to reduce potential hazard exposures.
- (2) The maintenance of roadside safety requires constant attention during construction zone life because of the increase in potential hazard. Unencumbered roadside recovery areas should be as wide as practical; channelization of traffic by marking, signing, posts, barricades, and other lightweight devices that will yield when hit by errant vehicles; Storage of equipment, materials, and debris should be away from the impact.

Components of a Guardrail Action Plan

A quality safety program and high quality data is needed to evaluate and improve the safety of a highway system. A documented guardrail action plan that outlines standard practices for maintenance and repair should be part of that safety program. The plan should also allow decision-making by all levels of maintenance staff, empowering them to take action when needed. The main goal of the action plan is to have a process in place that leads to increased public safety

Elements to consider when developing a detailed work plan for guardrail maintenance and repair include:

- Inspection frequency and standards
- Criteria for determining repair or maintenance needs
- Method by which guardrail repair is prioritized against other maintenance responsibilities
- Financial and budgetary constraints
- Reasonable response times
- Correct repair and maintenance procedures
- Established interim action pending repair
- Personnel responsible for each duty
- Training needs and plan
- Work zone safety
- Weather and climatic conditions
- Supplies and equipment needs
- Record-keeping requirements

Inspection frequency and standards

Criteria should be developed that outlines a schedule and procedure for the inspection of all guardrails. Attached to this report are sample forms that will aid in standardizing a procedure

and evaluation. During assessment, any required repairs should be noted, along with estimated time, materials and crew to conduct the repairs. A routine inspection schedule will assist in managing this task, but standard inspections after all incidents or accidents are also important.

Criteria for determining repair or maintenance needs

An agency may be responsible for the maintenance and repair of many types of guardrails; some very old and no longer meeting “standards” as defined by a standard plate or plan. Regardless of the guardrail type, when it no longer serves its intended purpose, it is in need of repair.

Requirements for standard maintenance should be outlined, and criteria established so that all staff have the same understanding of when repairs are needed. Examples of evaluation forms are included in the appendix and on the attached disk.

Method by which guardrail repair is prioritized against other maintenance responsibilities

Financial and budgetary constraints

Reasonable response times

Established interim action pending repair

Agencies are responsible for many maintenance activities, and guardrail maintenance is just one of them. Prioritizing staff’s duties is an important element of maintenance operations, and budgetary constraints are an important factor in that prioritization. After the guardrails have been inspected and required maintenance or repair identified, the work can be prioritized and staff time budgeted. The process by which this prioritization is done is a critical element of the Guardrail Maintenance and Repair Action Plan.

Additional elements affected by staffing and budgetary constraints should be considered and identified. These include appropriate response and repair time, and whether all repairs are to be completed during one working day. Some repairs may be extensive and unable to be completed in a short amount of time, and a policy should include provisions for the condition that those unfinished repairs are to be left in.

Personnel responsible for each duty

Training needs and plan

The policy should also outline who is responsible for the following actions as related to guardrail maintenance and repair:

- inspection
- evaluation
- scheduling
- assigning crews
- traffic control
- repair
- record keeping

As safety terminals and guardrail design become more complicated, an agency should consider training and education of their staff in development of an action plan. They may decide to assign one staff member to keep informed of all changes and keep updates of new guidelines in a central

location. They may also assign one staff member to direct all repairs, and be responsible for final inspection and acceptance. Certification and training by guardrail manufacturers may also be identified as standard practice. Regardless of the method by which the agency selects to address these issues, training of staff is an important element of the plan.

Work zone safety

Weather and climatic conditions

Protection of both the roadway users and working crew is crucial to an action plan. A detailed plan will reduce time required to conduct repairs as a result of an efficient operation, and increase the quality of repair jobs. The plan should address needed crew numbers, traffic control methods and devices, and implementation steps. The plan should also outline those conditions under which it is not safe to conduct repairs, and criteria for assessing unsafe conditions. The *Manual on Uniform Traffic Control Devices for Streets and Highways* outlines requirements for traffic control during maintenance operations, and should be included or referenced in the action plan.

Supplies and equipment needs

Although it may not be possible to maintain a full inventory of parts and equipment needed for guardrail repairs, a policy should indicate the procedure for obtaining them, and give authority to obtain needed supplies and equipment to those assigned to do the repairs.

Record-keeping requirements

The policy should also outline requirements for keeping records of assessments, incidents, repairs made, and routine maintenance. Records should be kept on standardized forms, and filed in a manner and location that makes them easily accessible.

Sample Action Plans

An action plan of W-beam guardrail repair and maintenance has been documented by the Iowa State University Technology Transfer Center (1990). This comprehensive guide covers site review, response time, parts and materials, equipment and tools, manpower, repair sequence, traffic control and repair records. The guide can be used as a framework and modified to set up the action plan for other types of safety hardware such as a three-cable guardrail, concrete barrier, and transition as popularly used in Minnesota and listed by Worel (1993).

For local roads and streets, guardrail installation was presented by the FHWA in a report entitled "Improving Guardrail Installations on Local Roads and Streets," (1986) with an emphasis on technical aspects. Key technical considerations and requirements were summarized to ensure proper installation. The most often used guardrail systems were discussed in three major categories: standard, terminal, and transition section.

Included with this guide is a disk containing a guide for development of a guardrail safety and maintenance plan. Each disk contains two versions of the plan, one in Word, and one in WordPerfect. Also included are sample forms for inspection and evaluation. A printout of the disk contents is included in the appendices.

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SAMPLE

County/City of _____
GUARDRAIL MAINTENANCE AND REPAIR ACTION PLAN

I. PURPOSE AND NEED FOR POLICY

The County/City of _____, being a growing County/City, needs to annually review and adopt a policy regarding efficient and timely maintenance and repair of guardrails in order to best provide for safe travel for the greatest number of persons. This policy outlines the responsibility within the County/City Highway Department in order to accomplish this goal.

II. POLICY

Each year the County/City Highway Department prepares a map of the County/City showing the County/City road system. This map clearly delineates thoroughfare and local residential streets.

Within each of the following areas, the County/City has classified roadways based on the function, relative traffic volume, and importance to the welfare of the community. Guardrails located on those roadways classified as priority "A" streets will be inspected and repaired first. These are higher volume roadways which connect major sections of the county/city and provide access for emergency fire, police and medical services. The second priority roadways (priority "B") are those roadways providing access to schools and commercial businesses. The third priority roadways (priority "C") are low volume roadways. See Exhibit A.

III. PROCEDURES

The local Police Departments assist Maintenance Division Supervisors in monitoring guardrail conditions and notify Maintenance Division personnel of those sections of guardrail needing attention, and those recently involved in an accident. Maintenance Division personnel are notified in accordance with the County/City Highway Department Schedule for Emergency Calls.

The Maintenance Division, with the assistance of the local Police Department, monitors guardrail conditions and is responsible for making the decision to call out assign personnel to conduct repairs.

IV. RESPONSIBILITY

The Maintenance Division monitors the guardrail conditions to determine the timing and amount of equipment and personnel necessary to conduct the repair or maintenance needed.

The County/City Engineer has the responsibility of determining when guardrails are to be repaired, in accordance with priorities as established by the agency. The County/City Engineer

shall retain the latitude to adjust sequencing or assignments based on weather conditions, equipment availability and/or other conditions warranting changes.

V. HOW GUARDRAILS WILL BE REPAIRED

Repairs and maintenance operations shall be conducted in a manner so as to minimize traffic obstructions.

VI. SUSPENSION OF OPERATIONS

Generally, operations shall continue until the guardrail repair is completed, and the guardrail is able to serve its intended purpose.

VII. COMPLAINTS AND CONCERNS

Complaints and concerns regarding guardrail maintenance or damage shall be taken during normal working hours and handled in accordance with the County/City's complaint procedures. Complaints involving safety issues or problems requiring immediate attention shall be handled on a priority basis. Response time should not exceed twenty-four (24) hours for any complaint. It should be understood that complaint responses are to ensure that the provisions of this policy have been fulfilled and that all residents of the County/City have been treated uniformly. It is the County/City's intention to log all complaints and upgrade this policy as necessary in consideration of the constraints of our resources.

EXHIBIT A
GUARDRAIL REPAIR AND INSPECTION PRIORITIES

PRIORITY "A"

Roadways with greatest priority, based on traffic, roadway use, roadway type, etc.

PRIORITY "B"

Roadways providing access to schools and commercial businesses.

PRIORITY "C"

Lower volume roadways

SAMPLE

IN PLACE GUARDRAIL EVALUATION FORM

CSAH _____ LOCATION _____ MILEPOINT _____

TYPE OF CONDITION _____ MUNICIPALITY _____ DATE INSPECTED _____

I. WARRANTS

Is guardrail warranted? YES _____ NO _____
(If yes, continue evaluation)

II. STANDARDS

Does guardrail meet the following standards?	(Check one)	
	<u>YES</u>	<u>NO</u>
A. Proper guardrail type used	_____	_____
B. Adequate distance available for deflection	_____	_____
C. Proper location behind curb	_____	_____
D. Proper post spacing	_____	_____
E. Completely protects hazard area	_____	_____
F. Rail height within ± 3 " of standard height	_____	_____

(If no for any of the above, complete the New Guardrail Evaluation Checklist)

III. MAINTENANCE

	<u>YES</u>	<u>NO</u>
A. Proper end treatment required	_____	_____
B. Guardrail attachment to bridge required	_____	_____
C. Guardrail hardware required	_____	_____
D. Rub rail required	_____	_____
E. Spacer blocks required	_____	_____
F. Guardrail damaged (describe below)	_____	_____

IV. REMARKS

SAMPLE

GUARD RAIL INVENTORY FORM

GUARDRAIL NUMBER (Route-Milepost) _____

SPEED LIMIT _____

SIDE OF ROAD (North, South, East, West) _____

TYPE (Plate Beam, Cable, etc.) _____

LENGTH (Feet) _____

POST SPACING (Feet) _____

SPACER BLOCKS (Yes or No) _____

END TREATMENT (Twist, Shovel, Buried, Bull Nose, etc.) _____

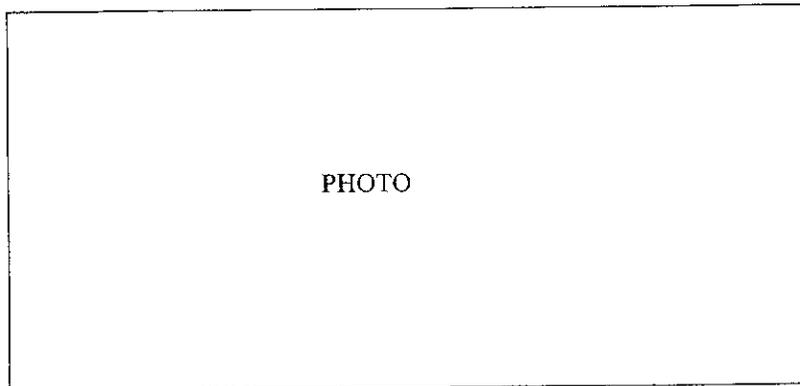
DISTANCE FROM EDGE OF PAVEMENT _____

YEAR INSTALLED _____

CONDITION _____

PURPOSE _____

REMARKS OR RECOMMENDATIONS _____



DATE TAKEN _____ LOOKING _____

By _____
Date _____

By _____
Date _____

By _____
Date _____

By _____
Date _____

SAMPLE

GUARDRAIL EVALUATION CHECKLIST (For inplace systems use supplemental sheet)

CSAH _____ LOCATION _____ MILEPOINT _____

TYPE OF CONDITION _____ MUNICIPALITY _____ DATE INSPECTED _____

I. SEVERITY INDEX NUMBER

A. Embankment Slope _____ Ht. _____ $N_E =$ _____

B. Obstacle Type _____ Distance _____

Clear Zone _____ Slope _____ $N_O =$ _____

II. ROADWAY CHARACTERISTICS

A. Shoulder Width (ft) _____ $A_1 =$ _____

PLAN VIEW

B. Horizontal Curvature (Degrees) _____

Location: Inside Outside $A_2 =$ _____

C. Profile Grade (Percent) _____ $A_3 =$ _____

D. Speed Zone (mph) _____ $A_4 =$ _____

E. ADT 2 lane 4 lane _____ $A_5 =$ _____

X SECTION

III. ACCIDENT EXPERIENCE

PRIORITY RATING

RE = _____

RO = _____

	YEAR	PD	PI	FAT	TOTALS
A.					
B.					
C.					
TOTALS					

IX. OBSERVER'S COMMENTS

TYPE OF GUARDRAIL RECOMMENDED _____

LENGTH _____

REMARKS _____
