

Report No.	Report Date	No. Pages	Type Report: Final	Project No. : 9227-063-940
VTRC 91-R14	March 1991	35	Period Covered: N/A	Contract No.: N/A
Title and Subtitle An Action Plan for Risk Management in the Virginia Department of Transportation				Key Words Risk Management Tort Liability Information System Implementation Plan
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Supplementary Notes				
Abstract				
<p>In part 3 of a three-phase effort, the Virginia Transportation Research Council was requested by the Virginia Department of Transportation (VDOT) to develop a comprehensive risk management system to confront the threat of tort liability caused by transportation system defects. The first two phases of the project involved research into risk management and identification of areas within VDOT that required improved risk management. During the current phase, an action plan for risk management was developed with input from the Risk Management Task Force to accomplish three goals: (1) reduce the risks to human safety caused by transportation system defects, (2) reduce the risk of financial loss due to the tort liability of VDOT, and (3) prepare for unavoidable liability. The recommendations included the formation of a Risk Management Group and an Office of Risk Management as well as the designation of the Operations Center in the Maintenance Division as the central command post for VDOT's emergency response efforts. The recommendations also included establishing additional cooperation between VDOT and existing state agencies to accomplish risk management objectives and developing training procedures and formal work response criteria for VDOT employees. Finally, the establishment of comprehensive systems for inventory, maintenance, and documentation was recommended to increase the flow of information on and response to roadway defects. The report concludes that implementation of this action plan would decrease tort liability by increasing road safety and the availability of information on transportation system defects.</p>				

FINAL REPORT

**AN ACTION PLAN FOR RISK MANAGEMENT
IN THE VIRGINIA DEPARTMENT OF TRANSPORTATION**

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(The opinions, findings, and conclusions expressed in this
report are those of the authors and not necessarily
those of the sponsoring agencies.)

Virginia Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the
Virginia Department of Transportation and
the University of Virginia)

Charlottesville, Virginia

April 1991
VTRC 91-R14

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ABSTRACT

In part 3 of a three-phase effort, the Virginia Transportation Research Council was requested by the Virginia Department of Transportation (VDOT) to develop a comprehensive risk management system to confront the threat of tort liability caused by transportation system defects. The first two phases of the project involved research into risk management and identification of areas within VDOT that required improved risk management. During the current phase, an action plan for risk management was developed with input from the Risk Management Task Force to accomplish three goals: (1) reduce the risks to human safety caused by transportation system defects, (2) reduce the risk of financial loss due to the tort liability of VDOT, and (3) prepare for unavoidable liability. The recommendations included the formation of a Risk Management Group and an Office of Risk Management as well as the designation of the Operations Center in the Maintenance Division as the central command post for VDOT's emergency response efforts. The recommendations also included establishing additional cooperation between VDOT and existing state agencies to accomplish risk management objectives and developing training procedures and formal work response criteria for VDOT employees. Finally, the establishment of comprehensive systems for inventory, maintenance, and documentation was recommended to increase the flow of information on and response to roadway defects. The report concludes that implementation of this action plan would decrease tort liability by increasing road safety and the availability of information on transportation system defects.

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INTRODUCTION

In recent years, people who have suffered injuries and property damage on Virginia's highways have increasingly turned to the Commonwealth for compensation, alleging that the Virginia Department of Transportation (VDOT) is responsible for their loss. For the purposes of tort liability, VDOT is concerned with only certain kinds of defects. If VDOT is held liable in a tort claim, it means that the court deemed that it did not act with reasonable care. There are several situations in which VDOT may be found not to have exercised reasonable care. For example, since VDOT is responsible for the actions of its employees, the court may find that VDOT failed to exercise reasonable care if an employee's error results in a defect that causes personal injury or property damage. VDOT also has a duty to respond to defects that it knows of or legally should know of within a reasonable amount of time and in a reasonable manner, whether VDOT caused them or not; not to do so may constitute a failure to exercise reasonable care. The amount of time required for a response depends on the circumstances, and a reasonable response could include a correction, a warning, or both. Finally, VDOT is required to prevent defects where it knows or should know that its actions will result in a defect. For example, if VDOT is aware that a road it is building will be defective when completed because of faulty specifications, it must correct the specifications and conform to them as corrected in order to ensure reasonable care.

In response to the growing threat of tort liability, the Virginia Transportation Research Council (VTRC), with the advice of members of the Risk Management Task Force composed of key personnel from VDOT and the Office of the Attorney General (OAG), prepared a report entitled "Assessment of Tort Liability Risk Management in the Virginia Department of Transportation," which was released in October 1988. The purpose of the report was to assess VDOT's exposure to the threat of tort liability and describe existing efforts for controlling the risks associated with liability.¹ The study found that VDOT and its employees are threatened by liability in five categories of activity: maintenance, design, construction, operations, and work zones. A few claims are not related to any of these categories; others relate to several. Although VDOT currently engages in a number of activities aimed at con-

trolling risk, the report disclosed that several deficiencies exist in these efforts, mainly involving coordination, communication, and follow-up by VDOT.

Commissioner Pethel responded immediately to the report by ordering the development and systematic implementation of a comprehensive risk management program. The Commissioner directed that VDOT's risk management system address tort liability in three ways. First, by making the roadways safer, the number of claims can be held to a minimum. Second, by improving VDOT's ability to defend tort claims and by quickly settling claims that VDOT will inevitably lose, the number of claims paid and the amounts awarded for the claims can be minimized. Third, by accurately forecasting the amounts that VDOT will pay for future claims and by setting aside money to pay such claims, the risk management program will prepare VDOT for unavoidable tort liability.

To accomplish the Commissioner's directives, the Risk Management Task Force, in cooperation with the VTRC research staff, met over a period of months to devise an action plan to implement a comprehensive system of risk management in VDOT. Drawing on the results of research as well as the personal experience and expertise of the task force members in the transportation field, the combined group developed proposals for an effective risk management system that optimally utilizes current VDOT structures and personnel while enhancing communication within VDOT and with other state agencies. This action plan is the embodiment of these proposals.

PURPOSE AND OBJECTIVES

The purpose of the Risk Management Task Force is to implement an improved risk management program in compliance with the Commissioner's directive. In connection with this mission, the task force will facilitate the adoption of an effective, comprehensive, agencywide program of risk management that will accomplish the Commissioner's three main goals: (1) reducing risks to human safety posed by defects in the transportation system, (2) reducing the risk of financial loss due to the tort liability of VDOT, and (3) preparing for unavoidable liability.

RISK MANAGEMENT SYSTEM

Figure 1 demonstrates how various activities would interact to form VDOT's risk management system. The system is composed of a continuous cycle of activities. Each activity interacts with others to attain the three goals established for risk management and facilitate the transfer of information regarding defects in the transportation system. Although each of the identified activities already takes place in VDOT to a certain extent, they are not part of a systematic approach to achieve the goals of risk management. Figure 2 lists the various VDOT personnel

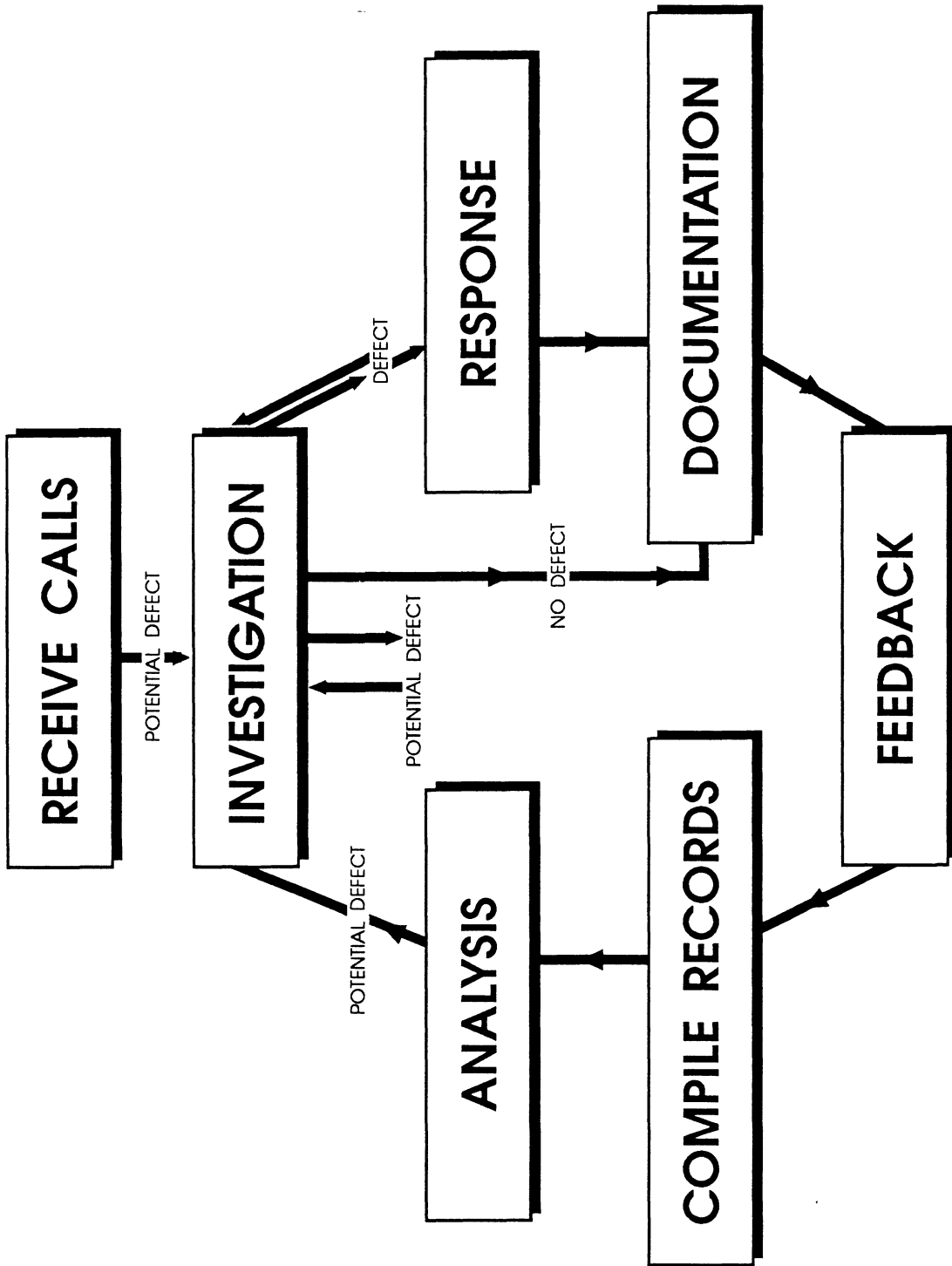


Figure 1. Activities Involved in VDOT's Risk Management System.

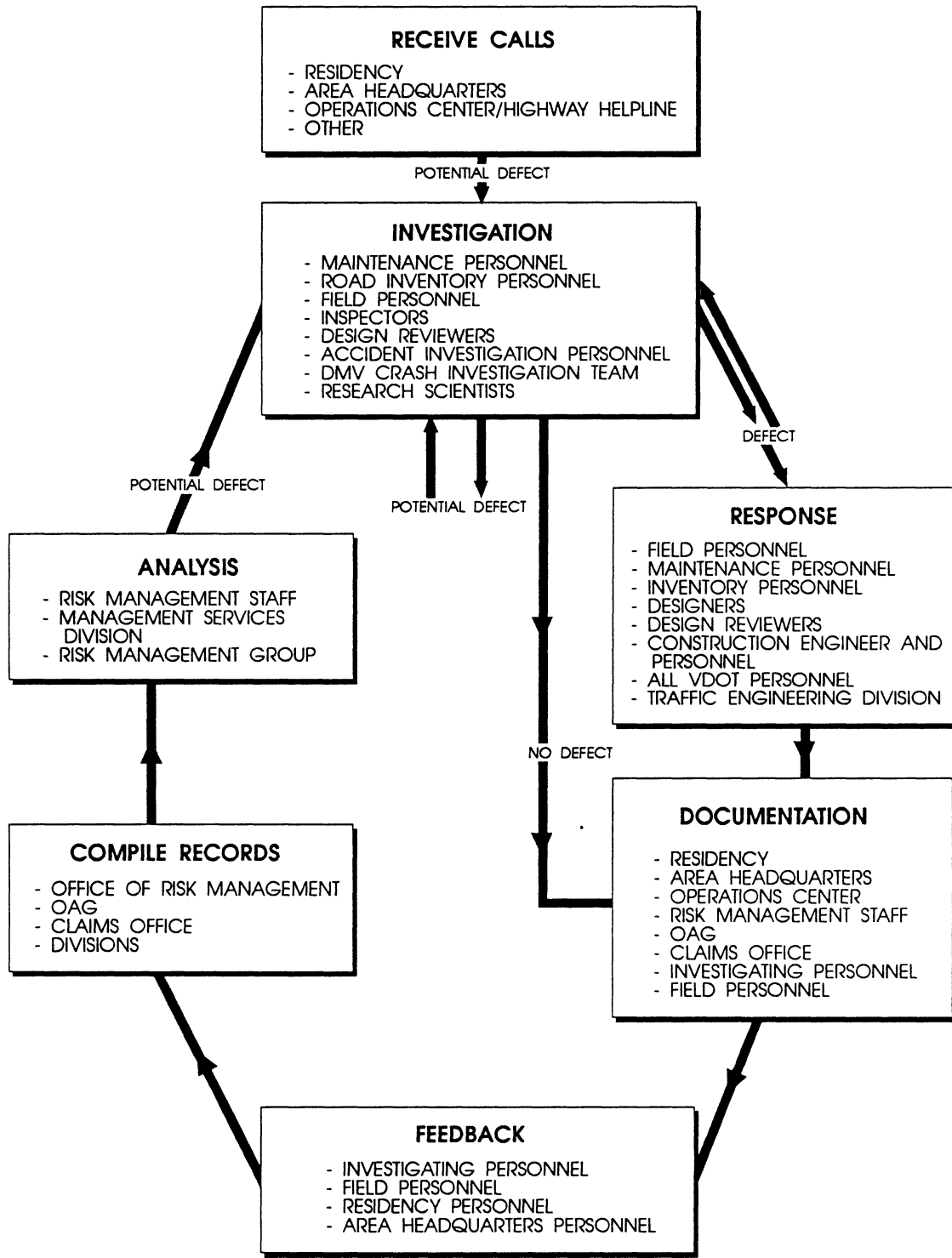


Figure 2. Personnel Who Perform Activities in VDOT's Risk Management System.

who will perform these activities in the risk management system.² The cyclical nature of the system can be demonstrated by the relationship between investigation and analysis. When analysis³ indicates that there may be a defect⁴ in the transportation system, someone investigates⁵ to determine whether the defect exists. Records developed from investigation and response are later analyzed to identify other potential defects, which, in turn, must be investigated. Two activities indicated in Figure 1 do not always occur under the present system: (1) VDOT should receive reports⁶ from various sources that indicate potential defects in the transportation system, and (2) these reports should trigger the investigation activities that analysis might otherwise trigger.

Response⁷ is necessary only when investigation identifies an actual defect in the transportation system. Response is unnecessary if investigation shows that the suspected defect did not, in fact, exist. The results of investigation and response are then documented⁸ for future reference. Feedback,⁹ on the other hand, is necessary for monitoring of the system and follow-up. It also allows VDOT employees to see the results of their efforts. Once feedback has taken place, records developed through the system are compiled¹⁰ in a form suitable for analysis, and the cycle begins again.

The activities of follow-up, guidance, monitoring, and safety training affect each step of the risk management system. VDOT's risk management system will work only if all necessary activities are performed by the appropriate personnel in a timely manner and with the proper attitude and awareness.

- *Follow-up* at each level will guarantee that risk management functions are performed.
- *Guidance* from management will ensure that the basic functions are assigned to the appropriate personnel.
- *Monitoring* at each level will ensure that the system moves at an acceptable pace.
- *Safety training* for all personnel will ensure that risk management functions are performed with the attitude of providing a safe transportation system and with an awareness of how all activities interrelate with each other and with the risk management goals and objectives.

A major finding of the study on risk management assessment is that a lack of follow-up exists in VDOT. VDOT generally assumes that individual employees effectively respond to defects. The proposed risk management system incorporates monitoring and follow-up whenever possible for two reasons. First, building follow-up into the system will eliminate the possibility that a risk might "fall through the cracks." Second, monitoring the performance of the risk management system and its components will facilitate refinement of the system. Thus, monitoring and follow-up will not only promote effective operation of the present risk management system but will also contribute to a better system in the future.

Relationship to Goals and Objectives

The activities that comprise the risk management system should relate to the system's goals and objectives in the following manner.

Goal 1: *Reducing Risks to Human Safety.* The objectives are to discover, correct, prevent, and warn the public about defects in the transportation system. *Investigation* is aimed at discovering defects. *Analysis* and *report receiving* focus investigation by indicating the location of defects. *Response* functions are initiated to prevent, correct, and/or warn the public about defects as required by the circumstances. *Feedback* ensures that the response is properly conducted.

Goal 2: *Reducing Risk of Financial Loss Due to Tort Liability.* The objectives are to strengthen VDOT's defense against tort claims and quickly settle legitimate claims before they go to court. Cases decided by the court increase the risk of financial loss in two ways: litigation is more expensive than settlement in some cases, and a court judgment may exceed the amount for which a case can be settled. *Investigation* allows VDOT to recognize and settle valid claims by identifying defects that VDOT caused, knew about, or should have known about. *Analysis* permits VDOT to determine the likelihood of a court awarding damages by identifying trends in past lawsuits. *Documenting* the investigation of and response to defects strengthens VDOT's legal position by providing evidence that no defect exists, that VDOT did not cause the defect, that VDOT did something about the defect within a reasonable time after it was discovered, or that VDOT responded to a higher-priority defect instead of the defect that is the basis for the claim. *Compiling records* from documented evidence simplifies the OAG's task of obtaining the information required for a good defense.

Goal 3: *Preparing for Unavoidable Tort Liability.* The objectives are to forecast the amount of future liability payments accurately and to ensure that sufficient money is set aside to pay the sum. *Analysis* allows VDOT to review past claims and suits in order to predict its future liability. *Feedback* ensures that the units performing the analysis convey the results to those who control the state's tort liability fund so that the fund can be adjusted accordingly.

RECOMMENDATIONS

The following recommendations represent the combined efforts of the Risk Management Task Force and the VTRC research staff. Together they comprise a comprehensive action plan for implementing a system of risk management in VDOT.

Recommendation 1. VDOT should set out its risk management objectives in detail. At times, actions that are appropriate from a risk management perspective could conflict with other departmental objectives. A clear statement of objec-

tives by top management would provide guidance for the VDOT personnel charged with implementing the risk management program and would also prevent confusion regarding the precise allocation of responsibilities.

Recommendation 2. A risk management group (RMG) should be established in VDOT consisting of the Assistant Chief Engineer; a district administrator; a resident engineer; a maintenance superintendent; the Claims Manager; personnel from the Location and Design, Construction, Bridge, Traffic Engineering, and Employee Safety and Health Divisions; and an attorney from the OAG's Finance and Transportation Section. The Assistant Chief Engineer would serve as chairperson of the RMG. The RMG would report directly to the Chief Engineer and would provide recommendations that would be used by the Chief Engineer in formulating policy on risk management issues.

Moreover, it was the opinion of the Risk Management Task Force that a full-time risk manager position should be created within the RMG, along with any staff required for the performance of the risk manager's duties. The task force suggested establishment of a risk manager and staff (collectively referred to as the Office of Risk Management) in the belief that management by committee could not effectively execute the duties assigned to the Office of Risk Management. The Office of Risk Management would perform administrative and notification activities for the RMG and publish a *Risk Management Bulletin* and the Chief Engineer's risk management policy recommendations. The Office of Risk Management would also conduct analysis for the RMG with input from the various divisions on matters in their specific area. For example, the Bridge Division would provide input for the analysis of bridge defects.

The primary functions of the Office of Risk Management would involve analyzing information in order to identify components of the risk management system that require change by the RMG (see Recommendation 18) and locate potential defects in the transportation system. The information sources would include the claims process, the quarterly report of citizen complaints generated by the districts, accident investigation reports, routine maintenance records, Highway Helpline logs, and any other sources the Office of Risk Management deemed appropriate. The Office of Risk Management should also solicit conclusions regarding roadway safety from the Operations Center, the various divisions, and the VTRC. The results of this analysis and fact analysis of claims and suits performed by the OAG and the Claims Manager should be compiled along with any recommendations made by the Office of Risk Management for appraisal by the RMG in formulating recommendations to the Chief Engineer.

Using the collected information, the Office of Risk Management would issue quarterly risk management bulletins. The risk management bulletins would be submitted to the Chief Engineer or his or her designee for approval, then distributed to all division administrators, district administrators, and resident engineers. The bulletins would list potential defects associated with the transportation system in the following categories: complaints, crashes, claims/suits, routine maintenance, and miscellaneous. When VDOT personnel receive risk management bulletins that

note potential defects located in their area, they would investigate the potential defects. The RMG would monitor the response to the bulletins.

The risk management bulletins, in conjunction with the RMG and the Office of Risk Management, would further the Commissioner's policy of increased decentralization. Paradoxically, the goals of a risk management program are sometimes at odds with the goals of decentralization. Although VDOT is composed of numerous decision makers throughout the Commonwealth, it is presumed by the legal system to be a single entity. For example, when the Resident Engineer in Leesburg learns that a particular practice may cause injury or damage, the Resident Engineer in Abingdon will be legally presumed to have that same knowledge. In addition, when the Central Office adopts a policy, it is important that field personnel understand and follow the policy.

The RMG and the Office of Risk Management would reconcile risk management concerns with VDOT's decentralized structure by facilitating communication among the various divisions and an understanding of individual roles in the risk management effort. The risk management bulletins would provide decision makers with equivalent information. By ensuring that various decision makers communicate with each other and operate with equivalent information, the RMG and the Office of Risk Management would allow decentralized decision making without increasing the risk of tort liability. Moreover, because it would receive information from sources throughout the Commonwealth, the Office of Risk Management would be in a position to detect trends that individual divisions would miss.

Part of the RMG's monitoring function would involve coordinating the use of the expected value/critical rate reports generated in the Central Office by the Traffic Engineering Division. If VDOT fails to correct the defects identified through these methods, the reports could be used in tort suits against it. Plaintiffs would be able to use the reports as evidence that VDOT had notice of the defect and was negligent in responding to the notice. At the present time, the Traffic Engineering Division distributes the reports and performs some follow-up. However, often, VDOT relies on the districts without providing any centralized follow-up.

Therefore, the RMG should monitor the districts' response to hazards identified through critical rate/expected value reports and should ensure that the districts document the corrective measures taken or that they document the reasons for not acting. By working with the districts and the Traffic Engineering Division, the RMG would allow VDOT to maximize the benefits of expected value/critical rate analysis and would ensure that VDOT thoroughly documents the process in the event a tort claim arises. Eventually, the expected value/critical rate reports would be incorporated into the risk management bulletins.

The functions of the RMG would provide a centralized unit to oversee VDOT's risk management efforts, whereas the functions of the Office of Risk Management would improve communications within VDOT and between VDOT and other agencies, primarily the OAG. Many of the problems noted in the initial risk management report and in an earlier VTRC report (*Improving Communications Within the*

VDOT [VTRC Report No. 87-R12]) involve barriers to effective communication. A major problem noted in the communications report is that many VDOT employees are overloaded with data but starved for information relating to the effective use of the data. Although employees are constantly receiving data in the form of memoranda, telephone calls, bulletins, and announcements, many employees feel that they lack the information they need to do their job well. Further, many employees do not understand how their job relates to the jobs of their coworkers in a risk management system. The Office of Risk Management would ensure that information is collected and presented to employees in a form that would better assist them in the performance of their job and that would clarify their role in the risk management system. The RMG, on the other hand, would ensure that such information is effectively utilized.

An additional communication problem noted in both the risk management report and the communications report is that mechanisms for effectively communicating across the chain of command do not exist. The normal process involves information flowing up and down the chain of command. The chain of command tends to hinder the effective exchange of information between parties who do not have a superior-subordinate relationship. The Office of Risk Management and the RMG would address this problem by facilitating communications horizontally as well as vertically.

The third communication problem to be addressed by the Office of Risk Management and the RMG would be the improvement of communications between the OAG and VDOT. An effective communication link between the agencies would provide VDOT personnel with the benefit of the lessons learned by the OAG's attorneys in the course of defending tort suits. This link would assist VDOT in avoiding future tort liability and would also provide VDOT and its employees with valuable information about minimizing their exposure when tort liability threatens.

Recommendation 3. An Operations Center in the Maintenance Division should serve as the central command post for VDOT's emergency response efforts. The Operations Center would also operate the Alert! System (the system for notifying field personnel of emergency conditions) and the Highway Helpline (the mechanism by which the public notifies VDOT of roadway defects).

There has been considerable discussion in VDOT about the desirability of establishing a focal point for activity and decision making when natural, manmade, or civil defense emergencies require concentrated, coordinated response. It was the opinion of the task force that an Operations Center with clear authority to act in an emergency situation could respond more expeditiously than the RMG. However, the Operations Center would inform the Chief Engineer of the response it makes in a particular situation and would gather information from the Highway Helpline and Alert! System for analysis by the Office of Risk Management (see Figure 3).¹¹

The Operations Center would be notified of emergency conditions by the Highway Helpline, VDOT's weather forecasting service, VDOT field personnel, and VDOT personnel performing accident, complaint, and claims analysis. The Opera-

RISK MANAGEMENT ORGANIZATION

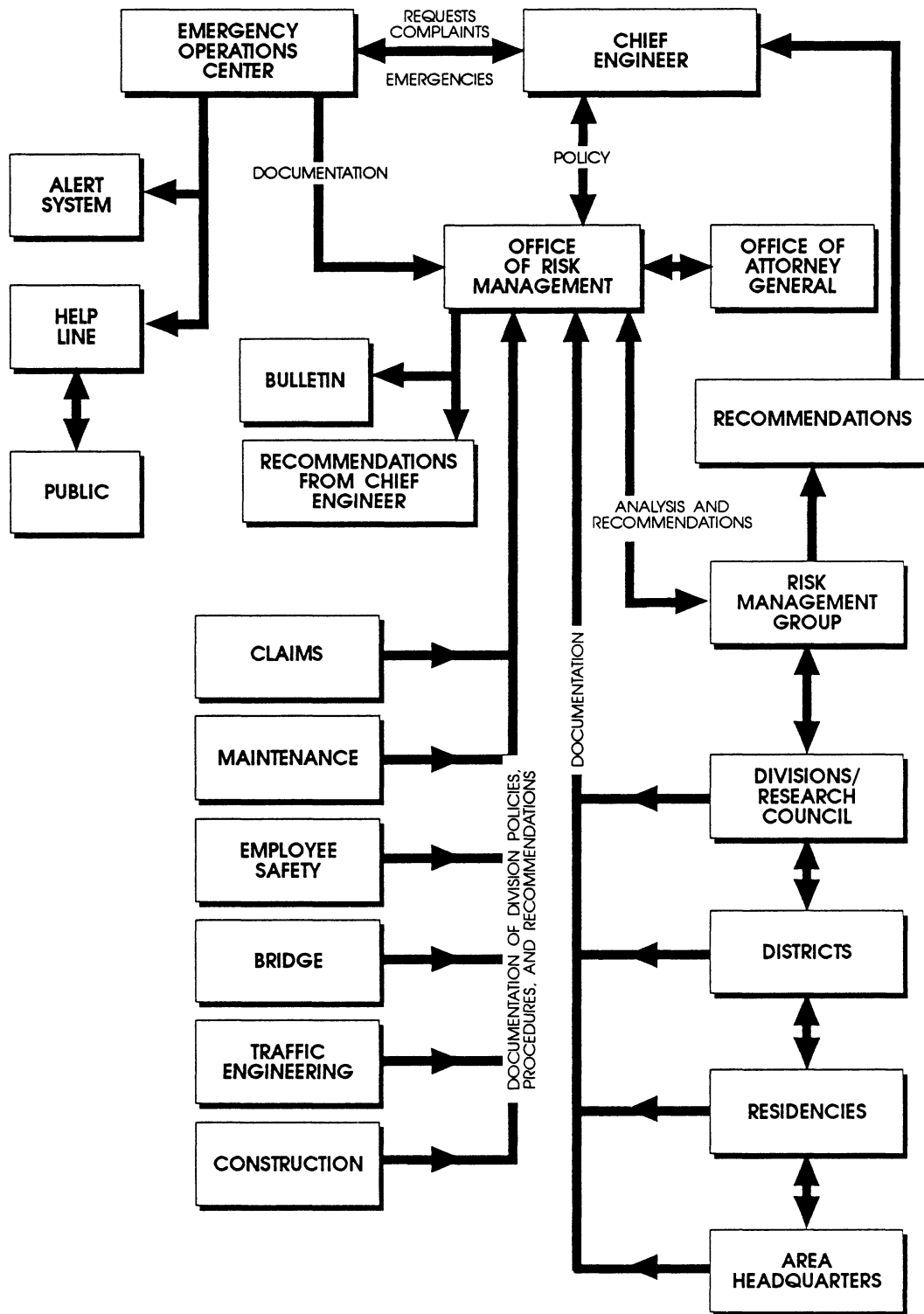


Figure 3. Flow Chart of the Risk Management System.

tions Center would also coordinate the Snow Emergency System. The main function of the Operations Center would be to optimize the allocation of personnel and equipment involved in response to emergencies. The Operations Center would notify field personnel of emergency conditions through the Alert! System. The Alert! System would operate as follows.

When notified of an emergency condition or a potential defect through one of the sources or through analysis of data, the Operations Center would immediately notify the appropriate department personnel to respond. Field personnel would be notified by the telefaxing of an emergency notification form (see Figure 4). The form would include the following: message number, date, person(s) notified, situation, specific problem, location, proposed solution, instructions if no solution, specific action required, time frame for response, and any additional information deemed necessary. The form would also show a level of priority. Highest-priority forms would have the heading "ALERT! Priority 1." The Priority 1 form would be used only in an emergency. A form indicating a lower level of priority would be used where appropriate. For example, a Priority 2 form would require that the recipient attend to the problem as soon as possible. A Priority 3 form would leave the timing of the response to the discretion of the field personnel. All forms would indicate to field personnel the procedure for contacting the Operations Center if further instructions are required.

A copy of each notification form would be kept at the Operations Center. A telefaxed notification form would be followed by a hard copy. A form for field personnel to complete that would include the original message number, results of investigation, response action taken, and time taken to complete the response would accompany the hard copy. The response form would be returned promptly to the Operations Center for filing. The form would be kept so that VDOT could later demonstrate that it responded quickly and reasonably to the condition in the event a lawsuit arises. If a response form is not received promptly, the Operations Center would contact the personnel notified of the emergency in order to find out what response action was taken. That information would then be documented at the Operations Center, and information on the Alert! System would be forwarded to the Office of Risk Management for analysis.

Recommendation 4. Training procedures should be established to further employee understanding of the risk management objectives, the importance of the objectives, and the relation of their activities to the achievement of the objectives. Employees must also be made aware of how to use the system and how they can help improve it. A VTRC pamphlet entitled "What You Should Know About Risk Management in the VDOT" has been distributed to all VDOT employees in accordance with this recommendation. In addition, the Technology Transfer Center sponsors a course entitled "Mitigating Highway Tort Liability" that is appropriate for achieving the goals of this recommendation. Specific elements should be extracted from the course in order to develop a new short course for field personnel to help them understand how risk management concepts affect their daily work activities.



ALERT! SYSTEM

PRIORITY 1	
	MESSAGE NO.: _____ DATE: _____
TO:	
SITUATION:	
PROBLEM:	
LOCATION:	
SOLUTION:	
INSTRUCTIONS:	
ACTION REQUIRED:	
TIME FRAME:	
ADDITIONAL CONSIDERATIONS:	
	_____ SIGNATURE

Figure 4. Alert! System Notice Form.

Recommendation 5. VDOT should increase public and employee awareness of the Highway Helpline, the proper reasons for calling it, and the importance of reporting defects in the transportation system. VDOT's Office of Public Affairs has been active in this area and should be consulted regarding ongoing information campaigns to accomplish these objectives.

Recommendation 6. Training procedures should be established to instruct employees on the importance of responding to problems identified through the Alert! System and the risk management bulletins. Employees should know that notification through the Alert! System and risk management bulletins gives actual notice of defects and that failure to respond or failure to document responses may result in liability. Examples of available training materials are the pamphlet "What You Should Know About Risk Management in the VDOT" and the Federal Highway Administration's video "The Best Defense . . . Is a Good Road."

Recommendation 7. The RMG should serve as the central coordinator for implementing improvements in VDOT's risk management policies and procedures. VDOT must establish channels that allow employees to communicate their safety concerns to people who can evaluate and act on them. Currently, there is an Employee Suggestion Program (ESP) to implement employees' ideas for improvements in policies and procedures aimed at cost savings. A parallel to the ESP could serve as a channel for employees' safety and efficiency concerns. Because the success of the risk management program depends on positive input from all levels, a program for safety improvement suggestions is essential to VDOT's risk management efforts.

Further, employees must know about the channels of communication and how to overcome perceived barriers to communication. For example, if a safety inspector recognizes that a particular specification change would improve work zone safety, the inspector should know whom to contact to implement the improvement. However, barriers to effective communication may arise since the inspector and the specification writer are in different divisions. The RMG should coordinate and publicize the channels of communication as well as work with the various divisions to ensure communication and implementation of employees' good suggestions.

Recommendation 8. The Office of Risk Management should be given primary responsibility to collect data on roadway-related complaints that are received through channels other than the Highway Helpline.¹² District personnel should be consulted about development of the process.

Recommendation 9. Procedures should be established to improve communications with the OAG during the preparation of standards, specifications, guidelines, and special provisions of road contracts to ensure that they are drafted in such a way as to minimize VDOT's exposure to liability.

Recommendation 10. Channels should be developed to enable VDOT field personnel to communicate directly with the OAG in order to provide them with a direct link to someone who can answer questions when tort liability is a possible outcome of a situation with which they are faced. The OAG can instruct field personnel on the proper questions to ask when potential tort liability arises and on how

tort liability can be identified early. Early identification of possible tort liability expedites gathering and documenting the information required by the OAG and the Claims Manager to evaluate a claim's legitimacy quickly. It also avoids redundant information gathering in the event a suit is filed.

Recommendation 11. Formal criteria should be established so that VDOT field personnel know what accidents to investigate, what information to gather, and which employees are responsible for the investigations. The OAG should work with the RMG to establish such criteria within current personnel constraints.

Recommendation 12. Every effort should be made to ensure that the information contained in the Highway Traffic Records Information System (HTRIS) is available and in a form the risk management staff would find useful (see Recommendation 17). Monitoring the usefulness of HTRIS in risk management analysis should be a top priority of the RMG and Management Services Division (see Recommendation 18).

Recommendation 13. A comprehensive inventory system for roadway facilities should be established in each district. Implementation could be accomplished in stages, starting with certain types of facilities, e.g., bridges and signs. The purpose of the inventories would be to identify facilities that are not in conformance with standards or that need replacing because of age or wear. Inventory records would be continuously updated as defects are corrected and new devices installed. Where defects are noted, the public would be warned of the hazard until it could be repaired. The inventory would also aid the implementation of a comprehensive routine maintenance system and identification of facilities similar to those found to be defective in other areas of the state.

Recommendation 14. Records developed from district inventory systems should be used to schedule routine maintenance activities. The Office of Risk Management would monitor the monthly reports sent by the districts to the Maintenance Division as part of the maintenance management system. The Office of Risk Management would compare these reports to the complaints, claims, and accidents that occurred in each district. The RMG could then determine whether a district's routine maintenance activities are being scheduled in such a way as to minimize complaints, claims, and accidents. If budgetary or personnel constraints are associated with a high rate of accidents, complaints, or claims, then the RMG would consult with the Maintenance Division regarding increased allocation.

When maintenance personnel note a defect other than the one on which they are working to correct, they would report the defect to their supervisor. The defect and the response to it would be documented in the same manner as a complaint-related defect.

Recommendation 15. VDOT and the OAG should work together to ensure that risk management bulletins, information documented at the Operations Center, expected value/critical rate analysis results, and data concerning complaints and claims are distributed to only appropriate personnel. If a problem is documented in this information, a plaintiff's attorney could use the information to show actual

notice of the defect, creating a severe threat of liability for VDOT. Although VDOT should not deny access to these documents upon receipt of a proper, formal request by a claimant, they should not be generally available for public review. A plaintiff injured in such a situation would have a right to compensation. But this right would not include access to risk management documents outside appropriate legal channels for the purpose of obtaining court awarded damages exceeding a claimant's actual loss.

Recommendation 16. The *VDOT Directory of Transportation Services* should be made more comprehensive. VDOT should distribute the comprehensive version to all personnel involved in the prevention of, discovery of, and response to defects in the transportation system. Distribution of the directory would facilitate communication by ensuring that employees know the appropriate personnel to contact when they encounter a problem or have a question.

Recommendation 17. The Office of Risk Management should aid the General Services Department's Office of Risk Management in forecasting VDOT's exposure to liability. VDOT accounts for a significant portion of the state's liability payments. In order to ensure that the state's self-insurance fund contains enough money to pay future claims, VDOT's future payments must be accurately forecast. The risk management staff would be in the best position to accomplish that task.

Recommendation 18. The RMG and the Management Services Division should cooperate to evaluate and improve the effectiveness of the risk management system. The mission of the Management Services Division is to encourage, enhance, and support organizational and operational effectiveness and efficiency. It is uniquely equipped to identify problem areas in the operating system and develop measures aimed at improving the system. The RMG is uniquely situated to provide the Management Services Division with the information necessary for such an evaluation. The RMG would meet periodically to discuss the strengths and weaknesses of the system and formulate any adjustments necessary to its maintenance.

NOTES

1. In this action plan, the term *risk* refers to a defect in the transportation system that could result in tort liability for VDOT. VDOT is not expected to eliminate all defects from the roadway immediately; rather, VDOT should seek an optimum allocation of resources in its risk management activities. By responding to defects in a reasonable fashion and documenting the response, VDOT would minimize its exposure to tort liability and improve roadway safety in the process. Indeed, VDOT is concerned with reducing risks to human safety. Were VDOT's sole concern reducing the risk of financial loss, it would not adopt a system of extensive documentation designed to reveal errors.

However, nondisclosure of errors is not advisable for four reasons. First, other transportation authorities have had positive results with systems aimed at uncovering errors. Second, the practice of not revealing errors is at odds with VDOT's duty and mission to the citizens of Virginia. Third, errors cannot be kept from the public and the courts without also keeping the information necessary to correct them from VDOT personnel. Fourth, by uncovering and correcting defects in the transportation system, VDOT would reduce financial loss due to tort liability in the long run.

By maintaining the safest transportation system possible and documenting its safety, VDOT would reduce to a minimum the number of tort claims winnable by plaintiffs. In effect, a risk management system would allow VDOT to say to a court: "We have decided to take on real risks to human safety. Here is how we determine what those risks are. Here is how we determine which work must be done first. Here is what we did." The courts would be favorably impressed with such a system, precisely because it would increase the safety of the roadways under VDOT's jurisdiction.

2. Figure 1 depicts the flow of information relating to the discovery of and response to defects in the transportation system, and Figure 2 depicts the complex interrelationships among the many VDOT employees involved in risk management activities. The chart does not depict the systemwide analysis that VDOT's risk management system would require in order to continue effective operation. Someone would have to assess the system's overall performance periodically, and the system would also have to be able to adapt to new ideas and developments.
3. The Office of Risk Management, with input from the various divisions, would analyze records of report receiving, information gathering by field personnel, response, and claims to identify problems with specific locations and types of facilities or procedures.

Another type of analysis would involve the performance of the system and its components in attaining risk management goals and objectives. This type of

analysis would seek to ensure that activities were properly tailored to achieve the goals and objectives of risk management. Some of this analysis would be performed by individual monitors. For example, when a supervisor evaluates the job performance of one of his or her employees, he or she is analyzing a particular component of the system.

The risk management system must include mechanisms to ensure that the system as a whole is operating correctly. The Management Services Division is uniquely equipped to locate the source of any problems if the system were not achieving its goals. The RMG and Management Services Division must cooperate to identify problems with the system and formulate solutions that would allow the system to achieve the goals of risk management.

4. The term *defect* refers to a problem with a particular VDOT facility, design, employee, policy, or procedure that poses a risk of injury to persons or property. Defects may be the result of errors by VDOT employees. Defects may also occur when outside forces alter the roadway. A defect may be caused by one or more other defects, or a defect may also cause several related defects. *Potential defect* refers to a suggested problem that has not been verified by investigation.
5. Investigative activities would be ultimately aimed at determining the existence or nonexistence of defects. When investigation determines the existence of a defect, VDOT would respond to the defect. If investigation determines that no defect exists, the response stage would be bypassed. However, investigation could involve many steps before all defects associated with a particular problem in the transportation system are discovered. For example, if a residency is notified of an alleged problem, the resident engineer's first responsibility would be to determine that a problem actually exists. Likewise, if an accident, a complaint, or a claims analysis reveals that a certain type of facility might be subject to deterioration, the risk management staff would notify the residencies containing such facilities so that the residency personnel could verify whether those facilities actually have the defect. Once a defect is discovered, investigation would look for other defects that might have caused the discovered defect. For example, if a particular roadway is subject to flooding, the defect causing the flooding might be a drain pipe that was too small. The defect that caused the drain to be too small might be a faulty specification. The defect causing the improper specification might be a breakdown in the design review process. In order to discover all of these defects, investigation would repeat the following process: (1) discover defect, (2) search for potential cause of defects, (3) determine the antecedent defects, (4) search for potential causes of those defects, and so on.

Investigation could reveal potential defects unrelated to the defects being investigated. Those potential defects must also be investigated to determine if they exist. Once verified, their causes must be discovered.

Investigation would be conducted by a variety of VDOT personnel. Routine maintenance is, in part, an investigative activity. Routine maintenance person-

nel investigate to determine whether the facilities have deteriorated to a defective condition. Inventory of roadway facilities is also investigative. Inventory personnel are sent to investigate the entire range of visible highway facility defects in their area. When they notice a missing or damaged facility, a defect has been discovered. Field personnel engaged in information gathering perform investigative tasks. For example, if a residency is notified of a downed stop sign, the resident engineer would have someone determine whether the sign is down. The person might gather other information that would determine why the sign is down. Like inventory personnel, inspectors also examine a wide range of potential defects. A bridge inspector looks for any defect to which analysis indicates a bridge might be subject. Design reviewers look for potential defects in a particular design. Analysis may give them clues about the types of defects to look for.

Accident investigation would examine a range of potential defects. Accident investigation would be performed by VDOT personnel if they feel an accident might have been caused by defects in the transportation system. Accident investigation is also performed by the Department of Motor Vehicles' Crash Investigation Team, which seeks to discover any potential defects associated with the crashes it investigates. VDOT personnel are responsible for determining whether the defects exist.

The claims process would be investigative in two ways. First, VDOT would investigate the causes of incidents involved in claims. Second, if a claim reaches a court and the court renders a verdict against VDOT, the existence of a defect is verified. If the court rules that there is a defect, then there is a defect. Ideally, VDOT's own investigation would discover the defect before such a verdict.

Research performed by VDOT could reveal potential defects or verify the existence of defects. By researching planned materials, facilities, innovations, and developments, VDOT could discover design defects before the designs are put into use and could ensure that its designs, facilities, and procedures are consistent with current standards. Research could also verify suspected safety problems associated with facilities and procedures already in use.

6. *Report receiving* specifically refers to the receipt by any VDOT office of reports regarding specific potential defects in the transportation system. Reports might come from citizens; contractors; VDOT personnel; other state agency personnel, such as the state police; and local government personnel, including the local police.

Ideally, reports would arrive at the appropriate office, such as the correct residency or area headquarters, or at the Operations Center/Highway Helpline (see Recommendation 3). Reports received by inappropriate offices would be directed to the Operations Center. Routine calls received by the Operations Center would be handled through normal Highway Helpline procedures. However,

if the call involves an emergency situation, the Operations Center would notify appropriate residencies through the Alert! System.

7. *Response* refers to preventing, correcting, and warning the public about defects. Field maintenance personnel often carry out response, but virtually any VDOT employee can be involved in response in the appropriate circumstances.

Defect prevention involves eliminating defects in design, construction, procedures, and policies before defective facilities are used by the public or VDOT employees; before facilities or equipment deteriorates into an unsafe condition; or before defective procedures and policies are implemented. It is also accomplished by correcting other defects and maintaining facilities before they deteriorate. For example, if design review indicates that the design of a facility or piece of equipment is defective, the person noting the defect would consult with the designer to see that the defect is corrected. If it is impossible to correct the defect, an alternative design would be found for the facility or equipment. Likewise, if inspection of a construction site indicates that the design or construction of a facility is defective, the inspector would consult with engineering and construction personnel to determine a means of correcting the defect. The inspector would also report the defect to his or her supervisor. VDOT should use all available means to correct a defective facility in the construction phase since the entire Department and all of its personnel would be charged with constructive knowledge of the defect if a VDOT employee knows that a facility under construction will be defective. This imputed knowledge is why response is an essential part of the risk management system. Further, if analysis and investigation determines that a facility will deteriorate to an unsafe condition after a certain period of time, the facility would have to be replaced or repaired before the period elapses. Also, if analysis and investigation determine that a prospective policy will decrease the safety of the transportation system, the policy or procedure would not be implemented until its hazardous aspects are eliminated.

Once the existence of a defect is determined, correcting all contributing defects as well as the original defect is essential. Investigation will determine the contributing defects. The interaction between investigation and response may be demonstrated by the following example. If a VDOT employee is operating a mower in an unsafe manner, the employee's supervisor must stop the operator and tell the operator what he or she is doing wrong. The supervisor must also inform the employee of how to avoid unsafe operation in the future. The employee would be responsible for safe future operation. The supervisor must also notify the person responsible for the employee's training. The trainer must discover the breakdown in training procedures that allowed the employee to operate his or her mower unsafely. The trainer must also correct the defective training procedure so that other employees are not trained in the same manner. Finally, the trainer must ensure that employees trained according to the defective procedure are retrained. By correcting the defective training procedure, similar instances of defective mower operation can be prevented. Re-

sponse to a given defect will be fully effective only if there is a response to all contributing defects discovered through investigation.

Once VDOT learns of the existence of a defect, field personnel would warn the public of the defect until it is corrected unless it is unreasonable to do so. For example, it is reasonable to warn the public about a road that floods often; it is unreasonable to warn the public about the undersized drain that causes the flooding. It is also unreasonable to warn the public about a defect in the design review process.

8. Documentation of report receiving, investigation, response, and analysis performed is essential to future analysis and investigation as well as to VDOT's defense in any lawsuits filed against it. When a report is received by a residency, an area headquarters, or the Operations Center, certain information about the report would be noted, including the location and type of defect alleged. Likewise, when analysis indicates a potential defect, the claims office, the OAG, or the Office of Risk Management would document the information, which would include the location and type of potential defect. In addition, investigating personnel would document the results of the investigation of an alleged defect, including the location and type of any defects discovered as well as any alleged defects found not to exist. The time the investigation is completed and the names of persons involved in the investigation would also be documented. Further, actions taken in response to defects would be documented. This documentation would take place mainly at residencies and area headquarters. The information would include the name of the person in charge, response taken, time taken to complete the response, and result of the response. If response action is delayed or not taken, the reasons for not doing so would be documented.

Some members of the task force raised a concern that effecting certain recommendations in this report would create a "paper trail" that would aid plaintiffs' attorneys in any suits against VDOT. These members asserted that thorough documentation of the time of and response to roadway defects when there is an untimely response, an ineffective response, or no response at all could damage VDOT's defense against a lawsuit. Although the potential that documentation could be used against VDOT exists, thorough documentation is necessary for two reasons. First, a proactive risk management system would confront tort liability more efficiently than a system that obscures circumstances and events. A system that obscures circumstances and events would force VDOT to rely on blind luck in the resolution of a particular claim. The proactive system, however, would provide the OAG's attorneys with thorough documentation in those cases where VDOT responds in a timely and effective manner. It would also enable VDOT to demonstrate that it was engaged in other "higher priority" activities under a reasonable system for setting priorities in situations where a particular defect does not receive an immediate response. Finally, thorough documentation would allow VDOT management to review its activities and change certain procedures and facilities to increase roadway safety in the

future. When VDOT can document that it made roadways safer, fewer claims will be successful.

Second, VDOT's risk management goals are different from those of private individuals and companies. VDOT is a state agency. State agencies are established to protect the health, safety, and welfare of the citizens of the state, and this duty includes securing compensation for people who are injured by the negligence of others. Indeed, this is the established purpose of state courts of law. VDOT should not obscure information to avoid liability since doing so would violate its duty to protect the state's citizens when it causes the claimant's injury by its own negligence. A system of thorough documentation would allow VDOT to identify legitimate claims and settle them to ensure that the plaintiffs in those claims are adequately compensated but not overcompensated.

Members of the task force raised an additional concern that documenting complaints and monitoring the response to them will overemphasize the importance of complaints. The members argued that VDOT should "plan its work and work its plan," and they felt that thorough documentation of the time of and response to complaints would disrupt that process. The concern is based on an assumption that if a particular activity is monitored or measured it will be given a higher priority than less-monitored activities because those engaged in the monitored activity feel that it is given more weight in the evaluation of their overall performance.

The complaint documentation process outlined in Recommendation 8 and note 12 would facilitate management's ability to measure the performance of maintenance personnel with respect to complaints. It is not intended that this measure of performance be weighed more greatly than performance in other areas, such as planned work. However, if documentation of the complaints process results in field personnel giving higher priority to complaints than planned work in the belief that complaints process performance is given more weight, it would suggest that inadequate monitoring of the progress of the planned work exists.

The key to achieving the goals of increased roadway safety and improved claim defense is to use available resources in the most efficient manner. One way to accomplish this is to perform the regular, planned activities in such a way as to minimize complaints. The system must also schedule responses to complaints at appropriate points in time. The system must then enable VDOT to demonstrate how it determined where and when to use its resources. Finally, the system must enable VDOT to show that the manner in which the determination was made was a reasonable one. The only way VDOT can demonstrate all this is to document all the activities and the priority-setting process.

9. If it is discovered that a potential defect does not exist, the investigating personnel would inform the person or unit that suggested the defect might exist.

For example, if a citizen contacts a residency about a potential roadway defect that field personnel discover does not exist, residency personnel would contact the caller to inform him or her that the problem was investigated and found not to exist. Likewise, if the Operations Center notifies a residency that a facility in the area might be subject to a defect but investigation shows that no defect exists, the residency would inform the Operations Center through an Alert! System response form or some other means. If response to a defect is delayed, the person assigned to respond would inform the individual or organization that reported the defect of the reasons for the delay.

Once the response to a defect is completed and documented, the person overseeing the response would send information concerning the investigation and the response back to the individual or organization that made the original report. The information would include the nature and location of the defect, investigation performed, response action taken, time of completion, and result.

10. Records containing documented information would be compiled at convenient locations in a manner that would facilitate analysis and investigation of the information. Records of report receiving, information gathering, roadway inventory, accident investigations, and responses to defects would be forwarded to the Office of Risk Management, and records of claims and suits would be compiled at the OAG and the Claims Manager's office. Records of inspection, design review, routine maintenance, and inventories would be kept at the Central Office divisions responsible for inspection and design activities, and records and documents produced by research would be retained by the VTRC or at the Central Office divisions responsible for various research activities.
11. Figure 3 demonstrates the relationship between existing VDOT entities and the risk management bodies proposed in this report. This system would not only promote the detection of defects through analysis but would also create the horizontal flow of information necessary to inform VDOT agencies of potential defects that must be corrected. Only a system of analysis and comprehensive response to potential defects identified through the risk management system would ensure that VDOT was not held liable for a defect the court deemed it should have known about.

The Operations Center would receive information regarding potential defects through Highway Helpline calls and complaints. When a Highway Helpline call or any other source indicates that an emergency situation exists, the Operations Center would contact the appropriate VDOT agency or personnel to respond. Documentation of the response taken to the Alert! System notification would be forwarded to the Operations Center, which would monitor to ensure that a response is made. The Operations Center would also ensure that feedback on VDOT's response to defects identified through the Highway Helpline is given to the identified caller. Moreover, a channel of communication between the Chief Engineer and the Operations Center would permit emergency authorization when a situation requires immediate action. The Operations Center

would then send documentation of the Alert! System and the Highway Helpline to the Office of Risk Management for analysis.

The Office of Risk Management would also receive documentation for analysis from other sources. The divisions would document division policies and procedures and recommendations derived from analysis by the respective division and forward this information to the Office of Risk Management. Moreover, districts, residencies, and area headquarters would send documentation of report receiving, information gathering, roadway inventory, accident investigation, and responses to defects and citizen complaints to the Office of Risk Management. The analysis derived from this documentation would be combined with the OAG's fact analysis of claims by the Office of Risk Management and forwarded, along with recommendations made by the Office of Risk Management, to the RMG.

The RMG would consider the analysis and recommendations compiled by the Office of Risk Management in formulating recommendations for the Chief Engineer's consideration. A channel of communication should exist between the Office of Risk Management and the RMG to facilitate discussion of the analysis and recommendations. Using the RMG's recommendations, the Chief Engineer would formulate risk management policy that would, in turn, be communicated to the Office of Risk Management.

The Office of Risk Management would be responsible for publication of the Chief Engineer's recommendations and a *Risk Management Bulletin*. The RMG, on the other hand, would authorize further studies on risk management issues by the divisions, VTRC, districts, residencies, and area headquarters.

12. All districts, residencies, and area headquarters would use a "citizen work order" form much like that used by the Chesterfield Residency (Figure 5). At facilities with the necessary capacity, the complaints would be stored in computer files. When a complaint is received, the following information would be entered on a computer spreadsheet program:

- District/Residency/Area Headquarters
- Order Number
- Date/Time Received
- Name, Address, and Telephone Number of Source
- Location and Problem
- Nature of Problem
- Problem Code.

The person who logs the complaint would immediately print out two copies of the work order form, containing the required information. The form would

CHESTERFIELD RESIDENCY
CITIZEN WORK ORDER

Received By _____ Mo. Day Yr. Area _____

Name: _____

Address: _____

Phone: Home Business

Location of Work: _____
Street Subdivision

State Route Number _____ Closest Intersection _____

Type of Work:

Clean Roadside Ditch	_____	Pavement Repair	_____
Clean Outlet Ditch	_____	Shoulder Repair	_____
Cut Grass	_____	Stop Sign	_____
Cut Bush/Tree	_____	Other Signs	_____
Clean/Repair Entrance Pipe	_____	Sweep Street	_____
Clean/Repair X Drain	_____	Trash	_____
Dead Animal	_____	Other	_____

Explain: _____

Contacted By: _____ Date Contacted _____ Phoned _____ Visited _____

Work Required: _____

See Sketch on Back of Hard Copy _____

Date Work is Scheduled For _____
was Completed On _____ Mo. Day Yr.

Equipment Required:

Gradall	_____	Tiger Ditcher	_____	Grader	_____
Back Hoe	_____	Vac All	_____	Athey Loader	_____
Mow Trim	_____	Mower	_____	Handwork	_____
				Other	_____

Superintendent's Signature _____ Date _____

Figure 5. Citizen Work Order Form.

include spaces for other information to be filled in later. Both copies would be placed in a file for "new complaints," which the maintenance supervisor or area superintendent would review daily. Each district, residency, and area headquarters would maintain a separate list of emergency problems. When notified of an emergency problem, the person logging the complaint would give both printouts to the maintenance supervisor or area headquarters superintendent, instead of placing them in the "new complaints" file.

For each new complaint, including emergency complaints, the supervisor or superintendent would assign a priority, determine the specific work and equipment required to respond to the problem, and assign the response to a particular person: this information would be written on both copies of the work order form in the appropriate spaces. One copy of the form would be placed in a cabinet file labeled "pending responses." The other copy would go to the person responsible for dealing with the problem. The maintenance supervisor or area headquarters superintendent would review the pending files daily. If a form is in the file too long, he or she would contact the appropriate person to ensure that response action is underway or will be taken soon.

When a response is completed, the person completing the response would note the specific action taken in the space marked "response" on the work order form. If the action taken matches that found in the space marked "work required," the person completing the form would write "done" in the space marked "response." In either case, the date and time the action is completed would be noted at the bottom of the form. The completed copy would then be given to the person responsible for entering the new information on the computer, who would remove the copy in the "pending response" file and discard it. Then, the following information would be added to the original complaint in the program: person assigned to respond, response action taken, and date and time completed. The information from each work order would be stored on a floppy disk.

If a residency or an area headquarters does not have the capability to complete the process using a computer, the unit would use a preprinted form with a carbon copy. The same information regarding the complaint would be handwritten on the form when received, and the same steps would be used. However, when the form is completed, it would be sent to the appropriate residency or district where it could be entered on a spreadsheet program and stored on a separate floppy disk.

Each month, the residencies and area headquarters that store complaint information on a floppy disk would send a floppy disk to their district office. The district office would review the files to ensure that the residencies and area headquarters in the district are responding quickly and adequately to complaints.

Each month, the same units would also send floppy disks to the Office of Risk Management containing information identical with that sent to the districts.

The Office of Risk Management would be able to locate any given work order by district, residency, area, or key number. If the key number is unknown, the work order could be located using a combination of any of the following categories: district/residency/area, date received or completed, complainant's name, responder's name, and problem code.

The problem code is an integral part of the citizen work order information. It would enable the RMG to determine the problems that occur most frequently throughout the state or in a particular location. For each type of problem, there would be a problem code (see the Appendix). All problem codes relevant to a particular complaint would be entered in the space marked "problem code."

APPENDIX

**CITIZEN WORK ORDER
PROBLEM CODES**

Problem	Problem Code
Operations (Noncollision)	
Spraying	A1
Painting	A2
Blasting	A3
Grading	A4
Excavating	A5
Mowing	A6
Tree Cutting	A7
Drawbridge	A8
Ferry	A9
Snow Plow	A10
Other	A11
Collisions	
Truck	B1
Car	B2
Motorgrader	B3
Mower	B4
Snow Plow	B5
Other	B6
Improper Design or Construction/Lack of Equipment (Non-Work Zone)	
Signing	C1
Marking	C2
Signaling	C3
Guardrail/Barrier	C4
Gate	C5
Fixed Object Near Road	C6
Bridge	C7
Drainage	C8
Overpass	C9
Pavement Slick/Rough	C10
Median/Shoulder	C11
Sidewalk/Crosswalk	C12
Other	C13
Improper or No Warning (Work Zone)	
Flagging	D1
Flares	D2
Cones	D3
Signing	D4
Signaling	D5

Marking	D6
Barrier	D7
Other	D8

Deteriorated Road/Conditions

Objects/Debris in Road	E1
Pothole	E2
Loose Gravel	E3
Bad Patch	E4
Ice/Snow	E5
Dust	E6
Vegetation	E7
Blocked Drain	E8
Uneven Lanes/Low Shoulder	E9
Soft/Inadequate Shoulder	E10
Sidewalk	E11
Other	E12

Damaged/Defective/Missing Equipment

Light	F1
Guardrail	F2
Gate	F3
Sign	F4
Marking	F5
Manhole Cover	F6
Other	F7