

Impacts of Environmental, Health, and Safety Regulations on Highway Maintenance

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Transportation agencies throughout the United States face dilemmas due to the ever-increasing number of environmental, health, and safety regulations being issued at the federal, state, and local levels. These regulations are often issued without complete familiarity with or comprehension of their effects on highway maintenance resources and activities. As a result, compliance with the new regulations has serious impacts on agencies' activities and allocation of resources. Compliance with environmental regulations reportedly cost state highway agencies an estimated \$99 billion in 1990, and this figure is expected to rise significantly in coming years. Technical, operational, and economic impacts of these regulations on 17 key areas of maintenance, including herbicide use, road deicing, fuel and asphalt storage, wetland areas, storm water runoff, bridge painting, and roadside litter, are identified. Some highway departments have used innovative methods to help budget resources for transportation maintenance operations; make essential alterations regarding personnel, equipment, and operating procedures; and respond to needs in areas such as inter- and intradepartmental communications, staffing, and training. Legislative decision makers must understand the implications of their actions with regard to environmental regulations.

Regulatory compliance is forcing personnel to change long-standing maintenance practices and spend more money to implement new maintenance methods and equipment. One noted researcher has estimated that the total cost for departments to comply with environmental regulations in 1990 was \$99 billion, compared with \$41 billion in 1977. He estimated that

the amount would rise to approximately \$167 billion by 2000. The federal acts requiring regulations pertaining to environmental compliance with identification of administering agencies, is given in Table 1.

The aim of this study, conducted during 1991 and 1992 for the Transportation Research Board, was to identify and highlight the technical, operational, and economic impacts of environmental, health, and safety regulations on highway maintenance programs and to provide information for transportation agencies and legislative personnel on the cost consequences of regulatory compliance. It is hoped that this information will provide greater insight for making appropriate decisions regarding highway maintenance operations.

Information was acquired through questionnaires submitted by maintenance personnel throughout the country, by studying various maintenance programs and the specific problems they face, and by conducting interviews with maintenance personnel. Through these efforts, the research team identified 17 crucial areas of concern to highway maintenance personnel:

1. Herbicides,
2. Deicing,
3. Wetlands,
4. 404 permits,
5. Structural painting,
6. Fuel storage,
7. Roadside litter,
8. Storm water runoff,
9. Hazardous waste,
10. Hazardous substance spills,

TABLE 1 Federal Regulations and Administering Agencies

Act or Executive Order	Acronym	Administering Agency
Archaeological Resources Protection Act	ARPA	National Park Service
Clean Air Act	CAA	Environmental Protection Agency
Coastal Barrier Resource Act	CBRA	National Oceanic and Atmospheric Administration
Comprehensive Environmental Response, Compensation, and Liability Act	CERCLA	Environmental Protection Agency
Clean Water Act	CWA	Environmental Protection Agency
Clean Water Act, Sec. 402(p), Storm Water	CWA 402(p)	Environmental Protection Agency
Coastal Zone Management Act	CZMA	Army Corps of Engineers (Department of Defense)
Executive Order 11988, Flood Plain Management	EO 11988	Not applicable
Executive Order 11990, Protection of Wetlands	EO 11990	Not applicable
Endangered Species Act	ESA	Fish and Wildlife Service (Department of the Interior)
Federal Food, Drug and Cosmetic Act	FFDCA	Food and Drug Administration
Federal Insecticide, Fungicide and Rodenticide Act	FIFRA	Environmental Protection Agency
Farmland Protection Policy Act	FPPA	Farmers Home Administration (Department of Agriculture)
Fish and Wildlife Coordination Act	FWCA	Fish and Wildlife Service (Department of the Interior)
Federal Water Pollution Control Act	FWPCA	Environmental Protection Agency
Hazardous Materials Transportation Act	HTMA	Office of Hazardous Materials Transportation (Department of Transportation)
Land and Water Conservation Fund Act	LWCFA	Bureau of Land Management (Department of the Interior)
National Environmental Policy Act	NEPA	Environmental Protection Agency
National Historic Preservation Act	NHPA	National Park Service
Occupational Safety and Health Act	OSHA	Occupational Safety and Health Administration
Preservation of Historical and Archaeological Data Act	PHADA	National Park Service
Resource Conservation and Recovery Act	RCRA	Environmental Protection Agency
Superfund Amendments and Reauthorization Act	SARA	Environmental Protection Agency
Safe Drinking Water Act	SDWA	Environmental Protection Agency
Solid Waste Disposal Act	SWDA	Environmental Protection Agency
Toxic Substance Control Act	TSCA	Environmental Protection Agency
Wild and Scenic Rivers Act	WSRA	National Park Service

11. Nonhazardous materials disposal,
12. Wastewater disposal,
13. Asphalt storage and use,
14. Traffic painting,
15. Air quality,
16. Water quality, and
17. Erosion control.

ISSUES OF CONCERN

The following is a brief overview of some critical problems from the list just cited and methods currently used to address these problems.

Herbicides

Right-of-way vegetation management programs help ensure the safety and continual operation of public highway transport by offering sound, economical maintenance practices for controlling and managing right-of-way vegetation. Methods used to control vegetation include biological (animals, birds, insects, and competing plants), physical (cultivating, trimming, and mowing), and chemical applications. The latter method is widely considered the most effective, economical method of vegetation control; however, growing public concerns and regulatory restrictions have prevented or seriously limited the use of some herbicides.

Herbicide use has been affected most by water quality and health standards, which have caused departments to

modify how they apply chemicals; and by hazardous materials regulations, which have limited the ways departments of transportation (DOTs) can dispose of herbicides. These and other regulations have forced states to initiate changes in personnel, equipment, materials, and work methods. Foremost among these changes are the training for handling materials, and the special clothing that departments must now provide to their workers. These new provisions are costly to the DOTs: Pennsylvania annually spends approximately \$100 to \$150 per person for certification and update training. In New Jersey, annual costs of clothing and training are \$5,000 to \$6,000 per person; California spends \$1,000 per year to train each pesticide applicator; and Vermont spends \$4,500 per person annually for clothing and training. Influence from environmental groups has also contributed to reduced herbicide use and has helped shape public opinion.

Tests on areas where chemicals have not been used for 2 years have shown that they are impossible to maintain by physical methods only. Maintenance costs in these areas have increased by 400 percent, and vegetation is still not adequately controlled. A study by the University of Florida found that mowing as often as once every 2 weeks would be required to maintain proper weed control in certain areas of that state; the Florida DOT presently mows its rights-of-way five to seven times a year. Improper weed control could endanger the traveling public and workers who perform the mowing, but increasing the number of mowings per year would drastically increase departmental costs. Other DOTs have experienced similar problems. In conclusion, it would be practically infeasible to maintain the same quality of service with mowing as is now possible with herbicide control.

In Iowa, both herbicide application and mowing have been affected by a new regulation that requires the department not to spray noxious weeds if it is practical to mow instead. The regulation has resulted in an increase of \$250,000 in mowing costs. In Oregon, regulations prohibiting the use of pesticides on lands controlled by the U.S. Forest Service and the Bureau of Land Management (approximately 50 percent of Oregon is federally owned land) have resulted in difficult maintenance procedures and soaring labor, equipment, materials, and disposal costs. In Maryland, Occupational Safety and Health Administration standards for noise and chemical exposure and personal protective equipment have affected vegetation control procedures and resulted in additional costs.

The debate among federal lawmakers, lobbying organizations, and environmentalists over the fate of pesticide use is having profound effects elsewhere. Manufacturers, distributors, retailers, and applicators all must deal with new laws and regulations on agricultural chemicals. The National AgriChemical Retailers Association has estimated that distributors will annually spend \$77,000 each

over the next 10 years to comply with environmental rules, up from \$23,000 in 1990.

Deicing Chemicals

Approximately \$1.5 billion is spent each year on highway snow and ice removal programs in the United States. Apart from plowing, the most important element of these programs is chemical deicing, which represents about one-third of winter maintenance expenditures. Chemical deicing helps ensure public mobility and safety by quickly and efficiently reducing hazardous road conditions. Sodium chloride (salt) for snow and ice control is the primary agent used by highway departments to chemically deice roads and bridges. If improperly applied, salt can have adverse side effects, including motor vehicle damage, structural and roadside (soil and plant) degradation, and infiltration of water tables. Financial assessments indicate that total nationwide costs for salt-related mitigation far exceed (by approximately 14 times) the national cost of salt purchase and application.

Not all states are required to clean up salt-contaminated sites, but those that are often spend millions of dollars each year on remediation cleanup and salt stockpile management, including facility renovation and construction. Most agencies have not found any environmentally acceptable product options for deicers or new methods of bulk storage. Some states collect discharge water from washing salt application trucks in detention basins or settling ponds, from which the salt can be reclaimed. Some agencies are constructing covered storage areas on impervious concrete loading pads, and some are considering reclamation and reuse of sand used on decks and bridges.

Several states have made significant expenditures in this area:

- Virginia spends approximately \$1 million annually on storage facilities and hundreds of thousands more to ensure chemical containment.
- Tennessee purchased five new salt separators at a cost of \$20,000 per unit to meet groundwater pollution laws.
- Colorado has built and renovated facilities for snow removal at a cost of \$120,000.
- North Carolina has built and renovated facilities to meet groundwater regulations at a cost \$1.65 million.
- Pennsylvania has built and renovated several facilities for ice and snow control and truck washing. Costs have ranged from \$20,000 to \$250,000 per building.
- Massachusetts spent \$2.5 million between 1983 and 1990 to investigate and remediate complaints of salt contamination of water supplies.

New chemicals are being tested as possible deicers, and one, calcium magnesium acetate, has shown promising

results. Its cost, however, is 25 times that of salt, thus making it an infeasible option for many agencies. Although alternatives to salt use are expensive, many communities are willing to consider those methods in light of the environmental effects of deicing salt.

Wetlands

The government's primary means of protecting wetlands is through the issuance of permits of proposed developments and alterations. This is carried out under the guidance of the U.S. Army Corps of Engineers and the Environmental Protection Agency (EPA). A permit from the Corps of Engineers is required for an individual or group to excavate, locate a structure, or discharge dredged or fill material in U.S. waters. Several federal agencies may be involved in the permitting process, depending on the nature and location of the activity.

The wetland permitting process can add delays and expense to construction and maintenance activities. Permits can take 60 to 90 days to be issued, and both time delays and costs may significantly increase if mitigation is involved. DOT operations may also be affected by regulations designed to protect endangered plant and animal species and historical sites. Permits can be denied by a reviewing agency, which could mean having to choose an alternative method of maintenance; other permits are issued under the condition that the state reestablish wetland areas and their natural components in a safe, ecologically sound environment. These changes usually mean huge expenditures and delays for the affected highway departments.

Section 404 of the Clean Water Act excludes "normal" maintenance activities as nonregulated actions. The Corps of Engineers in most states recognizes this exclusion, although some local offices in the West do not.

Personnel from many highway departments have indicated that an exemption, as in a minimum acreage of wetland use for highway purposes, would help resolve many permitting problems. They have also suggested that more general and nationwide permits would help alleviate some permitting costs and problems.

Many states are facing difficulties in establishing and maintaining wetlands. Florida must carefully control certain invader weed populations while maintaining wetlands on a 2:1 or more replacement basis. North Carolina has a federal mandate to establish a hardwood "bank" and reestablish wetlands near many maintenance and construction projects. Oregon has experienced a \$150,000 rise in biennial costs to manage wetland mitigation sites in accordance with federal regulations and permits. In all, the 37 states examined in this study have spent approximately \$100 million on wetland mitigation.

Many government representatives and private landowners believe that federal agencies should delegate their authority to issue wetland permits to the state agencies; the reasoning is that this would make the permitting process more efficient.

Erosion Control

Regulations pertaining to soil erosion and sedimentation are designed to avert environmental damage to rivers, lakes, and reservoirs. Preventing this damage can also mean avoiding expensive maintenance such as dredging and soil restoration. Nonetheless, agencies are incurring major expenses in this area due to mounting regulations.

In California, the situation is sometimes confusing. Nine state agencies are involved in defining and establishing regulations. Certain agencies are more involved in different parts of the state (which widely vary in geographic formation) and have various priorities. Each concern must be addressed uniquely, so flexibility on the part of the California DOT is necessary in confronting these issues.

The problem is also a costly one: it costs \$12 million to dredge a Contra Costa County reservoir, \$25 million over 10 years for sediment cleanup in Alameda County, and \$30 million annually to remove sediment from San Francisco Bay area lakes and reservoirs (not counting the bay itself).

In North Carolina, sediment control accounts for 10 percent of that department's construction budget on secondary roads. Erosion regulations have been greatly reinforced by the state's Department of Environmental Health and Natural Resources. Under the regulations, disturbances of less than 1 acre can require installation of a temporary rock dam, seeding and mulching, drainage and stabilization, and monitoring. Even on a small scale, these procedures can cost a great deal; when the activities are large bridge or highway projects, the costs can be enormous.

Underground Storage Tanks

EPA presently regulates approximately 2 million underground storage tanks (USTs) at 750,000 facilities across the United States; another 3 million tanks, most containing home heating oil, are exempt from federal regulations. Of these 5 million USTs, an estimated 80 percent are made of bare, unprotected steel, which is susceptible to corrosion and subsequent leakage. EPA has identified 175,000 confirmed tank releases that are potential threats to public health and the environment. This number is expected to rise to almost 400,000 over the next few years.

State UST regulations, many of which are derived from federal regulations, have significantly increased operating

costs. For instance, all new tanks and piping must have leak and corrosion protection and spill/overflow prevention systems, which can push the cost of a new tank to the \$40,000 to \$60,000 range. Existing tanks, meanwhile, had to have leak detection systems as of December 1993 and must have corrosion protection and spill/overflow prevention systems by December 1998 or, in some states, earlier. Cost information gathered from around the country indicates that upgrading a single tank can run from \$25,000 to \$45,000.

In many states, funds intended for tank cleanups are running short, forcing agencies to expand their funding bases to include revenue sources such as gasoline fees and taxes. For example, Florida was forced to enact new taxes to raise an additional \$160 million annually when the state found that its original \$50 million cleanup would not cover the cost of treating USTs. California, with more than 10 percent of its 200,000 tanks reported as leaking, created a similar cleanup fund that was to raise \$180 million by the end of 1992. The increased costs of complying with regulations have clearly proven expensive to state maintenance departments, businesses, and taxpayers.

Strict UST regulations and subsequent costs have forced many small businesses with storage tanks to close in recent years. The Petroleum Marketers Association of America, with more than 11,000 members, reports that more than one-third of its members have closed stations in the past several years mostly because of expenses arising from environmental compliance. The average marketer owns 8 to 10 stations and in 1991 spent nearly \$96,000 for tank upgrades. For larger operations such as state DOTs, expenses are certain to be higher.

In addition to regulations pertaining directly to tank maintenance, regulations in 40 CFR Part 280 Subpart H require that owners/operators demonstrate financial responsibility by taking corrective actions and compensating third parties for injuries and damages caused by accidental releases. Facilities not involved in petroleum production (such as DOTs) but having a monthly throughput of 10,000 gal or more are required to carry coverage of \$1 million per occurrence; lesser amounts are applicable for smaller throughputs.

Storm Water Runoff

The major difficulty in discussing the impacts of storm water runoff regulations is their relative newness: storm water runoff regulations have only been in effect since October 1, 1992. For this reason, no one knows exactly how these regulations will affect operations at state DOTs. On the basis of past experience, however, many expect that they will result in significant increases in operating costs.

EPA estimates that approximately 100,000 facilities, including state DOTs, are covered by the regulatory definition of "storm water discharges associated with industrial activity." This estimate may be low, however; one environmental representative from Alabama has conservatively estimated that there may be 10,000 permit applications in that state alone. The impact of the new regulations appears to be wide-ranging.

Organizations applying for industrial permit coverage for storm water discharges can apply for either individual or general permits. General permits cover several facilities engaged in similar operations, whereas individual permits are tailored to specific facilities.

Applying for an individual permit can be complex; a sizeable amount of material, including site maps, quantitative testing data, and other detailed documents must be submitted. Along with the application fee, the total cost of an individual permit application is approximately \$10,000. In Alabama, with an estimated 10,000 applications expected, the total cost may soar to \$100 million.

In contrast, the initial cost of a general permit is considerably less than for an individual one, though it still may run several thousand dollars. The requirements to maintain a general permit include implementation of a Spill Prevention, Control, and Countermeasures Plan, which can cost \$3,000 to \$4,000 and must be updated and recertified by a professional engineer every 3 years; Best Management Practices (BMP), which may require purchasing new equipment at a cost of several thousand dollars; and monitoring and reporting of storm water discharges and annual certification that all discharges meet permit standards, which can add up to between \$300 and \$400 per month in testing costs. Obviously, the costs of maintaining a general permit can also be quite high.

Lead Paint

The environmental regulation that has had the greatest impact on maintenance organizations and their use of lead-based paints over the past few years is the Resource Conservation and Recovery Act (RCRA). The newness of regulations pertaining to lead-based paints has resulted in some confusion and other problems in the maintenance and painting industries. For example, bids for painting contracts involving the removal of lead paint from bridges or other structures have varied by as much as a factor of 10. Bids from contractors who are knowledgeable of regulations usually run about three times higher than those for projects not involving removal of lead-based paints.

An excellent example of the effect increasing regulation is having on DOTs and the industry recently occurred in Alabama. A company that was unaware of the new regulations submitted a bid for a project involving lead paint removal that totaled \$132,500; a second company,

aware of the regulations, submitted a bid of \$397,325, approximately three times higher. This and other examples demonstrate the impact of increased environmental regulations on state DOTs.

Bridge painting is significantly affected by federal environmental regulations, and many examples support this claim. For example, Georgia DOT personnel have stated that capturing lead paint residue after it has been blasted from a structure has become so costly that they have been forced to reduce the number of bridges they maintain each year from 210 to 50. Similarly, in Idaho, containment and disposal costs have risen to as much as \$1 million per project. And recently in Connecticut, two-thirds of the cost of a bridge-painting and rehabilitation project, which cost more than \$10 million, went toward environmental protection. Ironically, many states have found that it is sometimes more economical to replace an entire bridge than to strip and repaint the existing structure. Obviously, federal environmental regulations are affecting maintenance operations in this area.

Because of high disposal costs and safety considerations, transportation agencies have chosen to use unleaded paint on all steel-structure bridges. The Missouri DOT recently attempted to use unleaded paint on some bridges, with unsatisfactory results. The lead-free paint cost three times more and lasted only half as long, and disposal costs for residue were twice as much as before. However, states now have no alternative but to use the lead-free paints. Clearly, federal regulations regarding lead-based paints are having an enormous financial impact on state DOT budgets. The total financial impact is estimated to be in the hundreds of millions of dollars nationwide.

Hazardous Materials and Wastes

Since 1976, the RCRA has served to protect public health and the environment from improper hazardous waste management practices by determining guidelines for shipping hazardous waste off site, storing it on site, and other practices. Dozens of products used by highway departments are considered to be hazardous, including products for cleaning, operating, and maintaining equipment and vehicles. Not surprisingly, regulation of these types of materials is becoming stricter. One major concern addressed in the regulations is proper storage of hazardous materials; improperly stored materials can pose a significant threat to the environment, particularly groundwater. Many states are having to meet regulatory compliance by constructing new storage facilities at significant costs. For example, the Florida DOT spent nearly \$1 million during fiscal year 1992 to build hazardous materials storage facilities. Similar expenditures are expected in many states.

Hazardous waste disposal also requires large expenditures; for example, Florida pays \$200 to \$400 to dispose of each 55-gal drum of waste. Even when a portion of waste has been properly disposed of, it remains the property of the company or state that generated it. Florida recently received an unwanted surprise when a site was discovered at which approximately 1,000 drums of hazardous waste had been improperly disposed of by another party more than a decade before. Cleanup and remediation of the site initially cost \$4 million, and the department continues to invest nearly \$1 million annually for ongoing cleanup.

Finally, there are also steep costs involved in transporting hazardous wastes; these costs can include insurance and waste materials testing. Each laboratory test can cost several hundred dollars, and several tests must be performed monthly. Transportation costs depend on the amount of waste shipped and the distance to the landfill; insurance coverage of \$1 million or more is often required. Some states have addressed this problem in part by attempting to recycle wastes such as used oil and solvents into useful products.

Waste Management

An effective waste management strategy ensures that DOT programs and policies remain in compliance with changing requirements.

Program analyses and interviews have uncovered several important aspects of a successful waste management program. They include a standardized reporting system, comprehensive employee training and contingency plans, shrewd purchasing, regular environmental compliance audits of current operations, and a great deal of commitment by top-level management to carrying out these objectives. This sort of program will ensure an economically smart and efficiently run waste management program. Nonetheless, application of these beneficial principles will not fully offset the consequences resulting from the rapid promulgation of regulatory laws.

The increased number of federal environmental regulations has greatly affected state DOT operations. Millions of dollars are being spent to comply with these regulations. Often, one type of compliance must be neglected at the expense of another if regulations affecting that sector of compliance seem more important at the time. The consequence can be deferred maintenance whose effect is difficult to measure. Costs due to the increased number of federal environmental regulations are already significant and will increase in the future. The question is how much more they will increase; only time will provide the answer.

INTERNAL ACTIVITIES

Departments of transportation have responded to environmental, health, and safety laws and regulations using

such tactics as internal communications, staffing changes, research, and training. Even though DOTs have developed specific staffing procedures and methods for responding to new or existing regulations, apparently no formal response programs exist.

Several states have developed specific procedures for responding to regulatory laws. Some of those procedures are explained below.

The Michigan DOT (MDOT) has established an environmental task force, composed of top management and chaired by the chief deputy director, primarily to set policy and evaluate compliance regarding environmental issues. Under this task force is an environmental compliance team, made up of representatives from different divisions within the DOT. The team's main functions are (a) to identify and discuss MDOT environmental compliance issues dealing with possible air, ground, or surface and groundwater contaminations; (b) to develop and implement action plans to resolve environmental compliance issues; (c) to develop and evaluate environmental policy for environmental task force approval; and (d) to implement environmental task force policy.

Also within MDOT is an environmental unit in the Materials and Technology Division that provides technical assistance to other divisions of MDOT to investigate and resolve environmental issues as they relate to possible air, ground, or water contamination. The Planning Division has responsibility for storm water discharge and wetlands. Each of the department's nine districts has an environmental compliance manager. MDOT has a full-time maintenance environmental engineer in the Maintenance Division who concentrates entirely on maintenance activities, including training and inspections in the area of environmental concerns. This person also serves as a member of the environmental compliance team. The Maintenance Division of MDOT regularly holds formal classes on environmental issues for its workers and assists them in environmental audits.

Environmental audits are the responsibility of the Division of Transportation and Planning. Two-thirds of these audits are related to maintenance facilities and involve visiting different MDOT facilities and determining the violations, risks, and environmental situations that eventually could become violations. The auditor, whose role is to train and direct personnel to help achieve regulatory compliance, is well regarded by other divisions of MDOT. As one representative noted, the auditor serves more as a "coach" than as an "umpire." The Department of Natural Resources, which has environmental responsibility on a statewide basis, would be more of an "umpire" entity.

In MDOT, the manager of health and safety is assigned to the Division of Personnel. The State Department of Labor is responsible for safety statewide, whereas the State Department of Health is responsible for health statewide.

Oregon has experienced significant success in litter control. This success can be attributed to four aspects of the state program: (a) revenue acquired through the sale of special license plates; (b) instigation of an Adopt-a-Highway Program for trash pickup; (c) strong enforcement of antilitter laws; and (d) recycling and reuse of some waste materials. For example, old tires are shredded for mixing in asphalt material; also, the department is required by law to use grass clippings to make mulch and compost.

One of the California DOT's (CalTrans) most successful management programs is in herbicide use, which is not a serious problem because the CalTrans has in place an exceptional training and procedures program. A well-conceived, comprehensive, preparatory program that addresses all major issues has been enacted, and detailed explanations of CalTrans's needs and requirements have been quantified in reports such as the Environmental Impact Study, so that substantial documentation has been readily available for hearings on the subject and for advertisements to the public. According to DOT representatives, money spent in this area has been well invested, and the strategy of introducing BMP has worked well. Most environmental organizations in the state have also been pleased with it.

A member of DOT summarized the view of the department that a commitment is being made to regard environmental thinking as a way of life, from the top officials down through the entire organization.

In North Carolina, a recent fire at a chicken-processing plant has greatly increased awareness of worker safety on all fronts. The state is attempting to increase the number of state on-site safety inspectors, and the North Carolina DOT is increasing worker safety training.

The Virginia DOT budget is greatly affected by safety, health, and environmental training. The training is closely tied to worker right-to-know laws. Virginia's concern for its employees is reflected in a number of policies. For example, (a) at least one person in each work crew must be trained in CPR, (b) health tests must be run on employees exposed to certain chemicals, and (c) employees who use chemicals for vegetation control must be certified applicators. The Virginia DOT spent \$2.95 million on worker training during the 1990-1991 fiscal year.

The Indiana DOT is conducting an environmental assessment of its facilities and how environmental and worker safety laws and regulations apply to the agency. The research effort, *Development of a Strategy for Compliance with EPA and OSHA Regulations Applicable to INDOT Facilities*, is Joint Highway Research Project HPR-2040-(027). The research consultant is the School of Civil Engineering, Purdue University.

The Center for Hazardous Materials Research and Tri-line Associates of Pittsburgh, Pennsylvania, has completed a research effort for the Pennsylvania Department of Transportation entitled *Waste Management Strategies*.

INTERORGANIZATIONAL EFFORTS

A major hurdle transportation agencies face in responding to environmental, health, and safety laws and regulations is the development of rapport with various regulatory agencies. Several factors can affect these relationships: performance and regulatory cross-purposes, conflicting personalities, lack of communication, previous experience, financial considerations, and political opinions.

Several departments of transportation have made significant efforts to enhance coordination and cooperation with regulatory agencies. In Michigan, for example, the Department of Natural Resources (DNR) is responsible for developing and enforcing environmental regulations. One problem for MDOT has been that, at times, different geographic regions and divisions of the central office of DNR have inadvertently offered conflicting responses to regulatory questions. In environmental impact statements for project development, wetland mitigation, and so forth, this problem has been addressed by placing a DOT liaison in the Bureau of Transportation Planning. This employee handles all official communications between MDOT and DNR, attends DNR monthly briefings about new and existing regulations, and keeps MDOT informed of any pending regulations. The liaison serves as the single spokesperson for MDOT in the areas of project development, wetland mitigation, and so forth.

There is no liaison in the area of hazardous and polluting materials, although the agency is considering one. In this area, interagency cooperation has consisted of task groups with representatives from MDOT, DNR, and other state agencies identifying and resolving regulatory concerns on specific issues.

The Oregon DOT is looking into funding a position for an employee who would work on DOT business but be based within the Department of Environmental Quality. This individual would serve as a liaison and a project facilitator between the DOT and the regulatory agency. Agency personnel realize that funding this position would affect their budget, but they also understand that a liaison could help prevent delays in conducting DOT business, which could be far more costly in the long run.

According to CalTrans representatives, preparation is the key when introducing maintenance-related problems to governing agencies, legislative officials, or other departments. A key to their success in this respect has been the

development of relationships with personnel in such areas as the Fish and Wildlife Department.

CalTrans has attempted to identify best management practices for use when dealing with legislative and other decision-making bodies in state government. This is obtained by a task force that determines mutual goals and a framework for achieving these goals. As one DOT representative explained, if the department leaves an impression that it is working in good faith, the legislature is less likely to "come down on them," and the DOT is likely to have more flexibility in carrying out its activities.

Whenever possible, the department prepares well-documented, quantified information to build its case before state decision makers. This is one way the department has attempted to shift from being a reactive organization to a proactive one.

The DOT has joined with other state departments, such as Fish and Wildlife and Natural Resources, to participate in joint training sessions so that various mutual concerns can be heard and understood and interaction facilitated. These administrative and communication activities are just some of the ways departments are attempting to confront the problems of regulatory compliance from an organizational perspective.

CONCLUSION

Highway maintenance personnel in all regions of the country will face increasingly difficult times and situations in the future. The dual problems of constantly changing and proliferating regulatory laws and the costly modifications they dictate, coupled with the ever-tightening budgets confronting most departments, are seriously hampering departments' ability to perform standard maintenance activities without diminishing the quantity or quality of work. Millions of dollars are being spent on efforts to comply with regulations. One area of departmental responsibility must often be neglected to meet the more urgent regulatory demands of another area. The effect of this practice, known as "deferred maintenance," is yet to be fully determined. However, it is safe to assume that costs of regulatory compliance will only continue to mount in the future; the only questions are how high and how rapidly the costs will climb, and how the citizens of affected states will in turn be affected, either as taxpayers or as travelers.