

# Role of Technology Transfer Centers in Developing Safety Programs for Low-Volume Roads

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In spite of the concern for improving safety on the nation's streets and highways, there continue to be unmet safety needs. The increase in tort liability claims has highlighted the need to develop programs and procedures to reduce accidents and minimize the exposure of governmental agencies. Local agencies are responsible for over 60 percent of the roadway mileage in the United States. In excess of 98 percent of this mileage can be classified as low-volume roads as volumes are below 2,000 vehicles per day. These agencies must establish ongoing safety programs by integrating safety considerations in all aspects of development and operation of low-volume roads. The resources of the technology transfer (T<sup>2</sup>) center programs in the various states can assist local governments in developing comprehensive safety programs. Various safety-related activities of the T<sup>2</sup> centers, including workshops, newsletters, videotape lending libraries, computer software development, and other related programs, are described. Twelve guidelines are included for developing a systematic safety program. These guidelines can be used by local agencies to achieve highway safety objectives.

Providing a safe driving environment on low-volume roads requires that safety issues be made a part of all decisions that affect the design, construction, operation, and maintenance of roadway facilities. The increase in tort liability claims has highlighted the need to develop programs and procedures to reduce accidents and minimize the exposure of local jurisdictions to large financial losses through court action. The resources of the technology transfer (T<sup>2</sup>) programs in the various states can assist local agencies in establishing an ongoing safety program by using a systematic approach to integrate safety considerations in all stages of development and continued operation of low-volume roads. These T<sup>2</sup> programs offer many individual courses and activities that address safety needs and demonstrate how resources can be integrated into an agency's comprehensive safety program and can contribute to achieving safety objectives. Safety has always been one of the principal objectives of highway programs. In spite of this concern, there are unmet safety needs and safety deficiencies must be addressed. In many instances, important considerations of roadway consistency or driver expectation have been violated. Additional problems have resulted because safety issues have been ignored in completing construction or maintenance projects. In other instances, the safety implications of locating traffic control devices have not been reviewed adequately.

The key to eliminating these problems is establishing a safety philosophy that is applied to all aspects of an agency's activities.

Local agencies need to advocate safety at all levels by implementing proven programs and by making a conscious effort in all phases of low-volume road activities. Improving the safety of the driving environment and reducing the costs associated with accidents are continuing concerns. Selling safety is then the primary task of the local road manager. Unlike counterparts in highway departments and state departments of transportation, where functional divisions exist, the local road manager has the direct safety responsibility for all roadway tasks. Safety must become an attitude of all low-volume road users and local road agencies.

In the United States, almost 69 percent of the total rural roadway mileage is the responsibility of local agencies (see Table 1) (1,2). Over 98 percent of this mileage carries less than 2,000 vehicles per day. Almost 60 percent of the riding surface in rural areas consists of unpaved roads. The fatal accident rate on local, non-federal-aid rural roads in 1987 was 4.30 fatalities per 100 million vehicle-miles, twice the rate of 2.15 fatalities per 100 million vehicle-miles for the entire U.S. highway system (3).

Compounding the problem at many local agencies is the lack of trained professional engineers. In Wyoming, for example, 40 percent of the counties do not have a county engineer (4). These county agencies must rely on part-time consultants to produce site-specific engineering designs. This approach limits the county's ability to deal with safety improvements in a systematic manner. Most local agencies, however, are primarily concerned with maintenance and operational issues. An improved ability to recognize safety deficiencies is needed.

## T<sup>2</sup> PROGRAMS

In 1982, the federal government recognized the unique needs of the local road and street system in the provisions of the Surface Transportation Assistance Act. The Rural Technical Assistance Program (RTAP) was created and funded at a level of \$5 million per year. There were three objectives:

1. To enhance or establish programs for transferring technology to local agencies;
2. To improve communication on technical transportation issues between federal, state, and local agencies and universities; and

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TABLE 1 LOCAL ROAD AND STREET SYSTEM (1,2)

Nonfederal-Aid Mileage		
<u>System</u>	<u>Mileage</u>	<u>Percent of Total U.S. System</u>
Rural	2,473,000	64%
Urban	548,000	14%
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Local Jurisdiction Mileage	2,673,000	69%
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Local Road System Volume		
<u>(ADT)</u>	<u>Mileage (000)</u>	<u>Cumulative Percentage</u>
<50	1,129	41%
>50 to <200	831	73%
>200 to <500	343	86%
>500 to <2000	343	98%
>2000	41	100%
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Surface Type		
<u>Type</u>	<u>Mileage(000)</u>	<u>Percentage</u>
Paved	1,558	58%
Unpaved	1,114	42%
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3. To encourage implementation of the latest transportation technologies.

Statewide efforts were begun in 1983 as part of RTAP with the establishment of T<sup>2</sup> Centers (5). There are now 46 T<sup>2</sup> Centers. These centers, each with its own identity, provide six common services;

1. Develop and maintain a statewide mailing list,
2. Publish a quarterly newsletter,
3. Supply technology materials,
4. Provide an information service,
5. Conduct or arrange at least 10 training workshops or seminars per year, and
6. Perform periodic evaluations of their operations (5).

A primary characteristic of the T<sup>2</sup> Center's activities is that it is consumer oriented, delivering programs directly to the users. Training through T<sup>2</sup> programs has enhanced local agency understanding and concern about traffic safety problems and their solutions. Early T<sup>2</sup> needs assessments indicated that many of these jurisdictions did not perceive traffic safety as a problem. RTAP has helped local agencies identify potentially hazardous locations, assess where nonstandard traffic control

devices or practices are being used, and provide suggestions for low-cost alternatives to improve overall safety of the local road system.

However, much more can be accomplished. For example, many local agencies do little, if any, analysis of traffic accidents (6). Given their resource limitations, accident analysis does not receive a high priority when compared with the other activities that must be addressed in day-to-day operations. Liability is a real concern, but a systematic approach to traffic safety is often lacking.

#### T<sup>2</sup> SAFETY ACTIVITIES

The contributions of the technology transfer programs in the area of safety include a wide spectrum of activities. Several examples of specific programs are highlighted in the following paragraphs. These examples point out a growing emphasis on the topic of safety and are representative of the programs offered by the T<sup>2</sup> centers from coast to coast. Although similar examples could be obtained from most T<sup>2</sup> centers, it is important to note that each center acts as an individual entity and that the focus of a particular center may not emphasize local road safety to the same degree as one in another state.

### Video Tape Lending Libraries

In Maine, as in most T<sup>2</sup> Centers, a comprehensive video tape library is maintained (7–10). These video tapes can be checked out for free, generally for a 2-week period, by local officials and used for in-house training. Among the safety titles in stock in Maine are “Night Time Traffic Control,” “Traffic Control for Short-Term Work Zones,” “Flagger Training,” “Local Bridge Program,” and “Railroad-Highway Grade Crossings.” Many local agencies schedule regular weekly training sessions throughout the winter and reserve tapes for each week during the season when they cannot work in the field.

### Newsletters

The T<sup>2</sup> quarterly newsletters are frequently used to present articles emphasizing the need for improving safety features or to identify the liability risks resulting from roadway system failures. Examples detailing the consequences of failing to post and maintain load limit signs on county bridges, improper signing and not placing guardrail at warranted locations are typical topics which appear in these newsletters (11–15).

Newsletter articles also feature local success stories. One example, demonstrating how public participation can improve road safety, appeared in the Montana newsletter. In Great Falls, Montana, a city with 400 miles of city streets, the city promised to fix all potholes within 72 hr of notification. The residents were asked to call PARTNER and the city crews devoted their time fixing instead of locating potholes (9). In Kentucky, the results of a 5-year accident study by counties was presented in the *Research Link* (16). This was the first effort by T<sup>2</sup> Centers to provide comparative in-state data to local jurisdictions.

Most newsletters also contain articles that are instructive in nature. In Tennessee, an article highlighted bridge safety and the use of state accident reports (17). In 1984, *Tech Transfer* in California reported traffic sign improvement produced the greatest safety benefit-cost ratio for local expenditures (18). In the *Vermont Local Road News*, an article focused on the need to examine locations with the highest accident potential—intersections, horizontal curves, and bridges. Techniques such as standardizing signing, select tree removal, and low-cost sight distance improvements were emphasized. The importance of performing roadway evaluations after accidents has also been stressed in many articles (8,13). Many northern states have emphasized the need for a snow and ice control policy (19). The common elements stressed in all articles of this type are the importance of notifying the public and establishing an accident record keeping system. Tennessee’s *Roadtalk* article, “Safety Pays Off in Dollars, Time and Lives,” discussed how Lawrenceburg, after 3 years into a safety program, had reduced damage claims by 50 percent. *Roadtalk* also featured articles that showed the benefits from providing safety clothing to maintenance employees in Washington County and another informing local jurisdictions of available funding sources (11). A specific program described was one of the grants from The Tennessee Department of Transportation for signing and traffic engineering (15).

### Teleconferences

Nationwide teleconferences have been held providing training on topics of “Tort Liability,” “Planning a Safety Program,” “Work Zone Traffic Control,” and “Commercial Driver’s Licensing.” These emanated from locations around the country and were available at satellite locations in all states.

### Computer Software Development and Distribution

Even at the local level, computers have become commonplace and are used to assist in the performance of administrative tasks. Many T<sup>2</sup> Centers have either developed computer programs or have obtained software for public distribution that could be used to assist in safety evaluations. New Hampshire and North Carolina have developed programs tailored to local agency activities (20). Road Surface Management Systems (RSMSs) are examples of the type of programs that have been produced. These RSMS systems are used to evaluate road surface conditions and aid in specifying network maintenance practices and costs.

### Workshops

Workshops are one of the primary means used by T<sup>2</sup> Centers to distribute information on safety practices. In a 1988 survey of 43 T<sup>2</sup> Centers (E. M. Wilson, unpublished), it was determined that the average number of workshops held during the previous year was 21 workshops per center with over 50,000 man-days of training provided nationwide.

The Wyoming T<sup>2</sup> Center has been active in promoting workshop activity. Since 1986, it has held 40 one-day workshops in 14 cities devoted specifically to traffic safety improvement topics. Topics have included the following: “Safety Features for Local Roads and Streets,” “Tort Liability,” “Traffic Engineering,” “Safety Studies,” “Safety Improvement Programs,” “Work Zone Traffic Control,” and “Details on Work Zone Traffic Control.” As a result of workshop training, several counties have begun safety programs and sign inventory systems (21).

The key feature of these T<sup>2</sup> workshops is that they provide low-cost training for local agency personnel at convenient locations. Before T<sup>2</sup> training activities, only a limited number of states had local programs and most workshop opportunities required airline travel, overnight stays, and significant registration fees. This limited participation and restricted attendance to only those whose agencies had sizable budgets.

Local agencies have been strong supporters of the workshop programs and have recognized the benefits of having their people attend the sessions. The following quote from Harry Bisco, a local official, which appeared in the September 1987 *Alabama Transportation Newsletter*, illustrates the perceptions of these workshop opportunities (9):

Every association or profession offers training courses that are taught by the leaders in their field, most of whom are volunteering their services in order to keep the cost down. Most fees are used for lodging, food and transportation, but even those costs have risen with inflation. Many municipalities feeling the financial crunch are reluctant to fund training; however,

the dividends returned to them in savings as a result of such training are many, many times the cost. Using the cost of training as an excuse not to send an employee to a school is doing a disservice to the community. I have never attended a conference where I have not saved my municipality several times the cost to attend. Last year, I was engaged as an Expert Witness in three lawsuits against three different municipalities. My job was to testify as to what were the standard procedures followed by a majority of municipalities when plowing snow. I was instructed to find how many courses on snow removal were offered in the last five years within 100 miles of the municipal employees being sued, and what the costs were of such courses. There were courses conducted by the Department of Community Affairs of that state each of the five years. One was 15 miles from the community being sued. Due to the fact that these employees did not follow accepted practice, and had not attended any courses at any time, they were found negligent. The judge admonished the employees, and said that it was no excuse that the community could not afford to send them. They were told that they should have paid their own way, as they have as much responsibility to know the latest techniques as their elected officials. In all three cases the question of punitive damages was brought up, and the responsibility was placed on the employee for not obtaining the necessary training to do the operation efficiently with the latest techniques. Training makes leaders out of men; and leaders are more likely to get promoted than followers. The great Henry Ford once said, the best investment a man can make is in himself! The value of training is PRICELESS!

### Other Training Materials

T<sup>2</sup> Centers have also developed other training materials and compiled reference documents for use by local agencies. These materials are characterized by being focused on the specific needs within a state. Inspector's Job Guides (22), providing practical information on key activities, highway maintenance tables, and adaptation of PASER (Pavement Surface Evaluation and Rating) (23) to gravel roads are examples of local T<sup>2</sup> activities that have national application. As the preceding paragraphs have indicated, T<sup>2</sup> Centers are a valuable resource for local agencies in the development of a systematic safety program. Table 2 presents a summary of the services provided

TABLE 2 1987 SERVICES PROVIDED BY T<sup>2</sup> CENTERS

Service	# Centers
Video Library	44
800 Phone-In-State	21
Van Program	11
Electronic Bulletin Board	7
Software Library	17
Retired Engineers' Roster	10
Free Publications	44
Loan Publications	28
Training Workshops	44

by the 44 T<sup>2</sup> Centers that were in existence in 1987. Comprehensive listings of the programs offered on a nationwide basis are available from the National Highway Institute and American Public Works Association's publication, "State and Local Highway Training and Technology Resources" (24).

### SYSTEMATIC SAFETY PROGRAM GUIDELINES

The examples cited provide ideas for local agencies to incorporate in a systematic safety program. The following guidelines for developing such programs on a local level have been formulated based on the experiences of the T<sup>2</sup> Centers. Elaboration has been made for items not previously discussed.

1. Develop a safety attitude: Consider safety from all points of view and for all tasks. This should begin with the basics—wearing a hard hat and safety vest (supervisors, too)—and should permeate all aspects of an agency's activities, beginning with planning and ending with review and evaluation of completed projects.

2. Plan for safety: This begins with the budgeting process and should include, at a minimum, funds for a roadway inventory—bridges, signing, surface condition, physical characteristics, and salaries to hire local engineering college students for summer data collection and monies budget for employee training.

3. Create a public-private partnership: Seek the input of private citizens and local industry in the identification of safety problem areas. Two key elements are a formalized citizens advisory committee and an active program to keep the communication lines open.

4. Use the resources of the state's technology transfer center: The preceding sections have described the types of resources available through the T<sup>2</sup> Centers.

5. Classify the roadway system: Work towards completion of an inventory based on classification. Use traffic volume and user/trip characteristics—start by using existing knowledge of high volume and low-volume routes. Identify routes with high truck use and routes that have a high potential for nonlocal traffic. Expand this effort when additional funds become available.

6. Involve maintenance personnel initially in development of safety programs: Stress the value of their input in the program, consider establishing an employee incentive program, and use their knowledge in identification of safety problems.

7. Develop a list of roadway safety deficiencies: The fear of identifying existing deficiencies (liability) should not be considered a problem. The program will develop a systematic attack to eliminate these problems.

8. Develop reasonable and desired safety improvement standards based on classification and need: Consider using approaches such as Kansas' *Handbook of Traffic Control Practices for Low-Volume Roads* as a reasonable (Level 1 safety improvement) for low-volume roads (25). Comply with the *Manual on Uniform Traffic Control Devices* (MUTCD). Develop a program to upgrade all facilities to MUTCD standards (26).

9. Document everything: Documentation should include the training in the safety improvement program, the priorities

established, the improvements as they are made, all maintenance activities and inspections, and evaluations.

10. Develop an inspection program: Systematically view the roadway systems and traffic control devices. Inspections must be made at night and with opposing roadway traffic to determine the effectiveness of traffic control devices.

11. Use traffic accidents/citizen complaints: View these data as identifying potential system deficiencies that may have been overlooked. Respond to citizen input quickly. Communicate back in a positive manner. At a minimum, use a pin or spot map of all accidents. Conduct site investigations for all serious accidents.

12. View the safety program correctly: Work towards completion; it will never develop if the first step is not taken. Begin with training. This 12-step program will lead local road agencies towards providing a safer transportation system. It is the foundation for integrating safety considerations systematically in all aspects of a jurisdiction's work.

## SUMMARY

Local agencies with responsibility for operations and maintenance of low-volume roads must develop comprehensive safety programs to reduce the risk of tort liability claims and to reduce accidents. The T<sup>2</sup> centers in the various states have ongoing programs that can assist these local governments in achieving their safety objectives. The T<sup>2</sup> Center programs are consumer oriented and are responsive to the particular needs at the local level. The products of the T<sup>2</sup> Centers are varied and include workshops, newsletters, lending libraries, and other related activities. They provide low-cost and convenient support to local agencies and provide the means by which safety objectives can be met.

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