# New York State Department of Transportation Safety Appurtenance Program
## Alternative Application of Road Safety Audits

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The state of New York owns and maintains an enormous inventory of roadside appurtenances, including guide rail, signs, delineators, and drainage structures. Those roadside features exist for the convenience and safety of the motoring public. Historically, maintenance of roadside appurtenances has depended to a large degree on inclusion in the department's pavement resurfacing programs, particularly the previous resurfacing and preservation and ongoing resurfacing, restoration, and rehabilitation programs. Those resurfacing programs have been largely supplanted by the department's highly successful preventive maintenance paving (PMP) program. In fact, the share of miles of pavement being resurfaced each year under the PMP program has been increasing steadily since 1990 (from 44 to 72 percent of total miles resurfaced). Since the goal of the PMP program is limited largely to maintaining pavements, roadside appurtenances were not receiving the attention they required. The New York State Department of Transportation safety appurtenance program (an FHWA road safety audit pilot program) ensures that roadside appurtenances receive the attention they need under the PMP program in order to protect a sizable roadside investment and to ensure the safety of road users. The Offices of Engineering and Operations jointly proposed the plan that would involve maintaining existing safety features and adding appropriate, easily implementable, and low-cost safety treatments at PMP project locations either during construction or, more likely, after construction as part of a distinct but "linked" effort. Work not included in the PMP project could be undertaken by maintenance forces or under requirements type contracts (separate signing or guide rail contracts). The guiding principles behind the plan are that it not interfere with accomplishment of the primary goal of the PMP resurfacing program (pavement maintenance), that it not result in a reduction in the number of lane miles treated with PMP resurfacing, and that it not significantly delay or otherwise complicate the processing of PMP resurfacing projects. A regional road safety audit team (composed of staff from design, traffic, and maintenance areas) now reviews proposed PMP project locations for existing accident problems, based on an identified accident history or potential accident problems such as obvious, hazardous roadway features that can be readily identified during a field review, and recommends cost-effective improvements to address existing and potential accident problems. The design of the program, how it gained executive management approval, and some early program accomplishments are discussed. The initiative has proven successful not only because of its clearly defined benefits for two agency goals (highway maintenance and safety) but also because of the systematic process by which it was introduced to agency managers with sometimes conflicting needs and agendas.

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The New York State Department of Transportation (NYSDOT) safety appurtenance program (SAFETAP) evolved in the early 1990s in response to a pavement maintenance initiative designed to ensure the maintenance of pavements at reduced cost. Called the

preventive maintenance paving (PMP) program, this initiative called for a simple 3.8-cm (1.5-in.) overlay of pavements rated "fair" in order to avoid more extensive and expensive future treatments. The program proved effective in cost-effectively maintaining the state's pavements. However, whereas a process was designed to ensure that accidents did not increase as a result of the higher speeds associated with new roadway surfaces, opportunities to improve highway safety along the treated sections of roadway were not included in the program.

This decision—not to use this dedicated pavement maintenance program to address opportunities to improve highway safety—assumed added significance as more miles paved each year moved from the department's "standards-based" resurfacing, restoration, and rehabilitation (3R) program to the PMP resurfacing program. Historically, maintenance of roadside appurtenances (signs, guide rail, delineators, drainage structures) has depended to a large degree on the inclusion of those improvements in the department's pavement resurfacing programs, particularly the previous resurfacing and preservation and ongoing 3R programs. Between 1990 and 1997 the share of miles resurfaced under the PMP resurfacing program increased from 45 percent of total to 70 percent of total. This posed a serious problem not only from a highway safety perspective but also from a highway maintenance perspective. This finding was particularly significant in light of earlier findings of an evaluation study conducted by NYSDOT in the mid-1980s, which showed that simple resurfacing without roadside improvements contributed to an increased number of accidents during the 3 years after construction. On the other hand, accident rates tended to decline when roadside improvements were incorporated in the simple resurfacing projects. NYSDOT's evaluation results were confirmed in a more sophisticated statistical study of the same projects undertaken by Hauer et al. (*1*). Sponsors of SAFETAP viewed it as both an added opportunity to ensure against increased accidents in the short term after resurfacing as well as an opportunity to provide for long-term (permanent) reductions in the number of accidents.

## Response of SAFETAP Sponsors

In response to these identified needs, the Offices of Engineering and Operations jointly proposed a plan that would incorporate safety considerations into the PMP program in a way that would not undermine the achievement of the program's primary pavement maintenance goals. This SAFETAP involved maintaining existing safety features and adding appropriate, easily implementable, and low-cost safety treatments at PMP project locations during construction, or after construction as part of a linked effort. Essential elements include the following:

- Examination of existing accident data as well as a site inspection to identify deficient roadside features and potential accident problems at each project site to determine specific safety related needs;
- Inspection by a team of experts (auditors) reflecting various functional areas within the agency (including traffic, maintenance, and design) with the appropriate expertise to assess existing and potential accident problems;
- Recommendations by the audit team of cost-effective solutions for those identified accident problems to agency leaders with responsibility for implementing proposed cost-effective accident countermeasures; and
- Reports each year to the Traffic Engineering and Highway Safety Division describing the disposition of recommendations and implemented actions.

The plan would effectively piggyback SAFETAP on NYSDOT's simple resurfacing PMP program. In doing so, it would carefully avoid interfering with accomplishments under the PMP program's pavement maintenance goals (including maximizing the numbers of miles resurfaced). Most recommended improvements would be accomplished before or after resurfacing. Only superelevation and shoulder improvements would be implemented during resurfacing. SAFETAP improvements would be undertaken by maintenance forces or with simple requirements contracts for signing, delineation, or guide rail. A fuller description of the program, as it was eventually approved, is contained in the department's engineering instruction 99-001, *1R Requirements—Federal-Aid Single Course Overlay Maintenance Paving Projects* (Appendix A).

## Implementation Strategy

The SAFETAP program initiative anticipated and attempted to accommodate many of the competing concerns and needs that necessarily coexist in any large transportation agency. It accommodated maintenance staffing shortages by allowing and encouraging the use of special purpose contracts to accomplish the roadway improvements generated by the program. It accommodated the fact that infrastructure maintenance is perceived by many as the primary function of transportation agencies by minimizing the impact of the initiative on PMP resurfacing. At the same time, sponsors of the initiative recognized the existence of limited funds and that funding for a new initiative would mean that, unless new funds were found, some preexisting activities or projects would be sacrificed. Because a source of new funding was not available, or foreseen, sponsors of the SAFETAP initiative knew they had a difficult row to hoe.

It was decided to present the proposal to interested functional areas in the department (maintenance, design, and planning), gain their endorsement, and then present

the proposal to executive management (main office commissioners and regional directors). This would allow sponsors of the program to address any additional concerns of the affected parties and to present a proposal to executive management that the agency could live with. FHWA provided additional, and very important, support for the process when it agreed to make simple resurfacing projects that were subjected to the SAFETAP program eligible for federal aid funding.

## Agency Response

Response to the SAFETAP proposal was mixed. Most agreed that it is important to maintain safety appurtenances (signs, guide rail, median barriers, delineators, drainage facilities). But there were substantial differences on the cost of the program and the extent of coverage as well as on how the program was to be accomplished. Also, there was concern that expenditures on the maintenance of roadside features (as well as superelevation and shoulder improvements) would be subtracted from funds available for the department's paving programs, particularly the PMP program. This was particularly important, because the performance of many program areas and individual managers in the department is evaluated based largely on bridge and pavement (infrastructure) conditions. The proposal, therefore, was often viewed as directly challenging many competing, legitimate agency agendas. Department managers who viewed themselves as most directly affected by the proposal represented the maintenance, design, and planning functional areas.

## Agency Approval

The SAFETAP concept was introduced to agency functional managers in spring 1996. After nearly 2 years of informational meetings and negotiated modifications, the proposal gained wide support in the department. The maintenance department eventually came to recognized that it (together with traffic) had most to gain from the program, because maintenance is, after all, the functional area responsible for roadside maintenance. This recognition overcame its concern about possible loss of PMP funds. The design department came to realize that applying judgment to addressing safety concerns on simple resurfacing projects is an adequate (and sometimes superior) substitute for applying set engineering standards (or for no consideration of safety at all). The planning department, which was primarily concerned about program funding issues, eventually accepted that the benefits of SAFETAP (to maintenance and safety goals) entitled it to a high-priority status in the agency.

Once general agreement was reached, sponsors of the proposal were able to gain executive management support for presenting the initiative to the departments' regional directors. NYSDOT's regional directors are the agency officials responsible for carrying out agency programs and goals. Fortunately, in large part because of the broad support for the proposal among functional managers in the main office, the regional directors accepted the initiative as an appropriate method for addressing both safety and infrastructure maintenance needs. Regional maintenance, in particular, viewed the program as an excellent process for identifying and addressing roadside maintenance needs. SAFETAP was formally accepted as a department program in September 1998.

## Program Accomplishments

SAFETAP was approved for implementation in September 1998. Consistent with the program guidelines (contained in the engineering instruction), the department's 11 regional offices were asked to review all locations scheduled for resurfacing during the 1999 construction season and to report on planned and implemented actions affecting those locations by March 31, 1999. Table 1 indicates the types and numbers of improvements undertaken in three of the five regions (Binghamton, Watertown, and Hornell). SAFETAP in those regions alone generated 216 improvements including brush removal, shoulder work, sign installation and replacement, guide rail work, and drainage improvements. Because the program allows and encourages completion of roadside work before resurfacing, about half of the improvements (107) were completed at the end of March before the pavement was resurfaced.

This is now the second year of the program. As more data on program accomplishments are received, it is possible to ascertain certain patterns. Different types of improvements are emphasized in different regions. Audit teams in regions with strong maintenance forces tend to recommend improvements that are susceptible to implementation with maintenance forces. In regions with scarce or overstretched maintenance forces, audit teams tend to place more emphasis on improvements implementable under special purpose (guide rail or signing) contracts. Emphasis so far has been largely on the roadside needs of rural roads. In the future the more urban regions may extend their areas of concern to simple traffic management strategies, such as modifications to signal timing or phasing. These developments will be monitored with the intent of encouraging the regions to pursue a comprehensive and balanced approach to addressing safety appurtenance needs. However, a centrally important feature of SAFETAP is to allow those in the regions with responsibility for program implementation maximum flexibility in meeting their responsibilities. The program is therefore designed to balance the accomplishment of main office program goals with regional implementation goals.

**TABLE 1 SAFETAP Accomplishments for Regions 6, 7, and 8, State Fiscal Year 1998**

| Activity | Treatment Sites # of Sites | # Complete |
|---|---|---|
| Clear Brush Obstructing: | | |
| Warning Signs | 46 | 32 |
| Traffic Control Signs | 4 | 4 |
| Sight Distances | 37 | 28 |
| Shoulder Work | | |
| Back-Up Shoulders | 5 | 2 |
| Correct Shoulder Failure | 4 | 3 |
| Install Rumble Strips | 3 | 0 |
| Drainage Work | | |
| Place Fill (Repair Holes etc.) | 3 | 1 |
| Repair Drop Inlets | 4 | 1 |
| Improve Drainage | 0 | 0 |
| Improve Ditch | 1 | 0 |
| Improve Surface Drainage | 2 | 1 |
| Add or Replace Signs | | |
| Install Signs | 4 | 2 |
| Improve Signs | 9 | 0 |
| Adjust Signs | 8 | 5 |
| Replace Signs | 22 | 13 |
| Remove Signs | 2 | 1 |
| Install Chevrons | 5 | 1 |
| Install Speed Panels | 1 | 0 |
| Correct Speed Panels | 1 | 0 |
| Replace Delineators | 4 | 2 |
| Add Delineation | 7 | 0 |
| Replace Reference Markers | 2 | 0 |
| Guiderail Work | | |
| Install Guiderail | 5 | 1 |
| Repair Guiderail | 9 | 4 |
| Adjust Guiderail Height | 0 | 0 |
| Tighten Guiderail Cable | 5 | 4 |
| Replace Guiderail Posts | 3 | 1 |
| Replace Guiderail | 10 | 1 |
| Extend Guiderail | 4 | 0 |
| Remove RR Rail Posts | 1 | 0 |
| Further Review | 1 | 0 |
| *TOTAL ACTIONS* | 216 | 107 |

## SAFETAP Strengths

Following is a description of elements of the SAFETAP process that have contributed to its success:

- Team approach: SAFETAP relies on a team of auditors made up of representatives from the major functional areas of the department (traffic, design, and maintenance) with interest in highway safety and roadside feature maintenance issues. There are several advantages to this arrangement. First, the team approach benefits from the diverse knowledge and experience of the team members. Second, it encourages agency buy-in by involving diverse agency interests, representing SAFETAP broadly as a department-wide program instead of narrowly as a traffic or maintenance program. Third, the audit recommendations generated by the program have broad support from representatives from the major department functional interests. They are not simply offered by the functional area or areas with particular responsibilities (such as traffic with its concern for highway safety, or maintenance with its concern for maintaining roadside features). This arrangement greatly enhances prospects for receiving the support of agency decision makers for the implementation of recommended improvements, and it served to encourage maintenance buy-in for this overall approach to fulfilling their maintenance responsibilities.

- Audit scope: SAFETAP offers a balanced and straightforward flexible approach to addressing potential accident problems. It is not a standards-based program. It recognizes that, by themselves, standards are not sufficient to address project-related safety concerns. Nor does it confine itself to consideration of identified accident patterns. The central focus of SAFETAP is on applying audit team judgment and experience to resolving potential accident problems. It calls for a simple examination of accident histories and allows for the application of standards if, in the judgment of the audit team, the application of standards constitutes the appropriate, cost-effective solution to the accident problem (actual or potential). This balanced approach appealed to a variety of competing interests (and philosophies) in the agency and contributed significantly to program approval.
- Effect on agency resources: It was recognized at the beginning of the process that agency maintenance forces were substantially reduced over the preceding 10 to 15 years. Without outside assistance they would likely be overwhelmed with the prospect of considerable extra work. Therefore agency support was provided for special requirements type contracts to assist existing maintenance forces. This provided the safety valve they needed.
- Effect on other agency goals: Sponsors of the initiative stressed the aspects of the proposal that ensured that it not interfere with accomplishments under the department's pavement goal. More specifically, they emphasized that the guiding principles behind the plan were that it not interfere with the accomplishment of the goals of the PMP resurfacing program, that it not result in a reduction in the numbers of lane miles treated with PMP resurfacing, and that it not significantly delay or otherwise complicate the processing of PMP resurfacing projects. Based on these principles, resurfacing projects are not delayed, nor are miles of pavement treated each year reduced. Roadside safety improvements are, in most cases, undertaken before or after resurfacing. Exceptions to this general rule (superelevation or shoulder work) are accomplished during resurfacing without substantially modifying preexisting paving strategies. Were it not for this early, sustained emphasis on the accommodation of other competing agency agendas (in this case infrastructure goals) it is not likely that the SAFETAP initiative would have received the kind of broad-based agency support it needed to succeed.

## FHWA Road Safety Audit Initiative

In the midst of this lengthy effort to gain department approval of the SAFETAP initiative, FHWA began an initiative to encourage the use of road safety audits in this country. Road safety audits, as presented under the federal initiative, are intended to supplement existing agency highway safety activities by directing a team of auditors to apply their knowledge and experience (engineering judgment) toward improving potentially hazardous highway features through better project design. FHWA has begun the process of clarifying the meaning of road safety audits, because the contours of the process (as they are careful to emphasize) have yet to be precisely defined in this country. According to FHWA's evolving definition of road safety audit, a team of "auditors" would examine project sites for the purpose of identifying and treating potential hazards. It calls for applying engineering judgment (not standards) toward the development of solutions to identified hazards and requires that a formal report of audit findings and recommendations be prepared and forwarded to agency decision makers for consideration.

There are a number of areas in which SAFETAP and conventional (or prevailing) views of road safety audits tend to differ. Prevailing views of road safety audits tend to emphasize their application to large-scale capital projects and downplay consideration of existing accident patterns (focusing instead on accident potential) and the application of standards. Those views also stress the importance of independence, failing to account for the importance of familiarity with agency culture (and agency buy-in) in ensuring implementation of audit recommendations. Those differences are discussed in detail elsewhere (2). That there are differences should not be a surprise, because the road safety audit concept originated in other countries facing different situations, and the approach is just getting under way here. It is important to note above all else, however, that, as a general approach to identifying and addressing highway safety needs, the road safety audit process, whatever its final form, offers great promise for contributing to the continuation of the dramatic decline in accident rates of the previous 35 years into the new century.

SAFETAP is a unique application of the road safety audit concept to simple resurfacing projects, which often are undertaken without consideration of highway safety needs. The process could fill a gap in many of this country's agencies, which address safety concerns for major capital projects through the application of carefully defined project development processes on the one hand but view simple resurfacing as limited to pavement maintenance (without consideration of highway safety) on the other. That FHWA recognizes the importance of filling that gap is demonstrated by its endorsement of SAFETAP as one of its road safety pilots. As indicated previously, FHWA's endorsement of the program and authorization of federal aid funding for simple resurfacing projects subjected to the program contributed substantially toward gaining department approval and support of the initiative.

## Conclusion

PMP projects, together with resurfacing done under the capital (3R) paving program, address about 10 percent of the state's 25 750-km (16,000-mi) highway system each year. SAFETAP, by maintaining roadside assets, helps achieve maintenance goals by providing a systematic process for meeting the department's roadside maintenance responsibilities. By addressing roadside safety needs ensuring that highway safety considerations are included, SAFETAP also contributes toward achieving a major goal of NYSDOT's safety management system—the incorporation of transportation safety consideration in all agency activities. It contributes toward accomplishing two seemingly disparate agency goals: accident reductions and maintenance of roadside assets.

The success of the initiative is attributable not only to its clear benefits to highway safety and maintenance but also to the systematic process by which the concept was introduced to the department. Sponsors of the initiative recognized the importance of achieving consensus among affected agency program (functional) managers before they solicited support from regional implementation managers and, ultimately, executive management. That process required patience. It took more than 2 years of explanatory discussions and negotiations, as well as some compromise with diverse agency interests, before the program gained formal agency approval. The result has been institutionalization of a major department-wide program that, by systematically incorporating highway safety into hundreds of simple resurfacing projects, goes a long way toward continuing into the next century the sizable accident reductions that occurred in New York, and throughout the country, during the final decades of the 20th century.

## Appendix A

### New York State Department of Transportation Engineering Instruction: 1R Requirements: Federal-Aid Single Course Overlay Maintenance Paving Projects

This engineering instruction (EI) (see Figure A-1) does not supersede any older issuances.

#### *Effective Date*

This EI is effective immediately. To qualify for federal aid for single course overlays in state fiscal year 1999–2000, project site selection and review by the safety audit team, as described, should begin immediately. Selection of the appropriate safety work and completion of SAFETAP Report Form A, as described, should be completed by March 31, 1999. 1R paving projects and safety work identified after submission of the SAFETAP reporting forms on March 31 may be progressed within the same state fiscal year by submitting an amended SAFETAP Report Form A.

#### *Purpose*

The purpose of this EI is to identify the 1R requirements for federal aid single-course overlays and to transmit the following supporting information:

- Requirements and guidance for safety work;
- SAFETAP report form requirements;
- Sample SAFETAP Report Form A;
- Sample SAFETAP Report Form B;
- Safety screening, dated January 27, 1994; and

*New York State Department of Transportation*
**ENGINEERING INSTRUCTION**

**EI 99-001**

Title: **1R REQUIREMENTS — FEDERAL-AID SINGLE COURSE OVERLAY MAINTENANCE PAVING PROJECTS**

Distribution:
☐ Manufacturers (18)
☒ Main Office (30)
☐ Local Govt. (31)
☒ Regions/Agencies (32)
☐ Surveyors (33)
☐ Consultants (34)
☐ Contractors (39)
☐ _____( )

Approved:

Robert A. Dennison
Deputy Chief Engineer (Design) 1/20/99 Date

FIGURE A-1 NYSDOT engineering instruction letterhead for distribution of 1R requirements.

• Pavement preventive maintenance projects second working draft, dated February 12, 1993.

## 1.0 Background and Applicability

P. T. Well's and C. A. Thomas's September 8, 1998, memo issued the department's guidelines for SAFETAP. SAFETAP is an initiative designed to ensure that safety considerations are incorporated into the department's maintenance paving projects. SAFETAP requires a project review of maintenance paving sites by a team of qualified department staff for the purpose of deciding on safety work to be implemented before, at the time of, or soon after, construction.

FHWA has approved single course overlay PMP projects and vendor in-place paving (VPP) projects for federal aid, provided they meet the requirements of this EI. For simplicity, this EI is referred to as the 1R requirements. These requirements, in effect, take the place of SAFETAP guidelines in order to make PMP and VPP projects eligible for federal aid.

The SAFETAP guidelines remain in effect for 100 percent state-funded maintenance paving projects, including PMP and VPP projects. However, all PMP and VPP projects meeting the 1R requirements in this EI are eligible for 100 percent state as well as federal funding. This allows greater flexibility in the fund source.

## 1.1 Responsibility

• Responsibility for implementing this program is shared among the design, traffic, maintenance, planning, and other groups within each region, as determined by the regional director.

• Decisions about disposition of the safety audit team recommendations for work that is practical and necessary to address existing or potential safety problems, as discussed in Sections 2.1 and 2.3 of this EI, reside with the regional director. [Note that safety work needed to avoid degrading safety that will not be accomplished shall be treated as a nonstandard feature in accordance with the *Highway Design Manual* (HDM) (Section 2.8) and the TEA-21 matrix in the *Design Procedure Manual*.]

• The responsibility for programming and scheduling the implementation of safety work, as discussed in Section 2.4 of this EI, resides with the regional director.

• Program reporting, as defined in Section 2.5 of this EI, is the responsibility of the regional traffic group, unless the regional director decides to assign it to another regional group.

## 2.0 Requirements

The 1R requirements are based on SAFETAP guidelines and the attached pavement preventive maintenance projects second working draft and safety screening. As the SAFETAP guidelines apply only to 100 percent state-funded maintenance paving projects, this EI takes the place of the SAFETAP guidelines for federal aid single-course overlays. This EI also modifies or clarifies the attached documents by adding the following 12 requirements.

• The project must be competitively let and the work by state forces cannot be an integral part of the contract for the paving work (e.g., state forces doing the maintenance and protection of traffic work for VPP).

• VPP projects let by the Office of General Services must meet all federal aid contracting requirements. The regional maintenance group or the main office maintenance division should be contacted to determine the general requirements for VPP projects.

• Work done by state forces is not eligible for federal aid.

• Overlays are limited to a single course with a maximum thickness of 50 mm. Multiple course federal aid resurfacing projects shall be progressed as 3R projects in accordance with the *Design Procedure Manual* and HDM (Chapter 7).

• The existing pavement must have a pavement surface condition rating of 6 or greater. Exceptions must follow the pavement treatment selection in EI 92-015 "Project Level Pavement Selection Process" and be approved on a case-by-case basis by the regional director.

• Truing and leveling is to be used at spot locations to remove irregularities in the old pavement, fill and patch holes, correct variations in banked pavement, establish pavement crowns, and terminate the overlay as noted in the HDM (Section 3.3.1). Truing and leveling is not to be used over substantial lengths of the project to effectively increase the overall maximum overlay thickness or add a second pavement course. Wheel ruts are to be filled with a shim course or top course material. The intent is to fill ruts to improve surface drainage and allow adequate compaction of the overlay without adding a second hot-mix asphalt course.

• Milling of 50 mm or less may be performed for the traveled way or traveled way and full depth shoulders to maintain the existing surface elevation. Reasons for milling include maintaining vertical clearances, maintaining proper barrier heights, maintaining curb height for drainage, and replacing a poor top course on a sound pavement structure.

• The overlay must extend the full width of the paved roadway (travel lanes and paved shoulders) unless milling is performed as noted above and the paved shoulders, if any, are in satisfactory condition.

• The safety audit team must inspect each site as outlined in Sections 2.2 and 2.3 of this EI.

• The nonpavement work must be performed in accordance with Sections 2.1 and 2.4 of this EI.

- A report is prepared in accordance with Section 2.5 of this EI.
- The contract is not restricted to the 10 contract items as stated in Attachment 6 (not provided here).

## 2.1 Safety Treatment Criteria

Safety work that meets either of the following criteria is to be implemented under the 1R requirements:

- Safety treatments are necessary to avoid degrading safety, or
- Safety treatments are practical and necessary to address existing or potential safety problems.

The safety work is to be identified by completing a safety audit, as described below.

## 2.2 Site Selection

During the early summer months, the regional maintenance group together with the regional planning and program manager and the regional pavement manager decide on locations that are to be progressed under the 1R requirements in order to qualify for federal aid.

## 2.3 Safety Audit Team

Before or during site selection, the regional director should assign one or more experts from each of the regional traffic, design, and maintenance groups, and any other regional groups he or she determines to be appropriate, to become part of a safety audit team. The safety audit team should review the selected sites soon after project selection to ensure that adequate plans can be made for any superelevation work to be included in the project.

The team will perform a simple analysis of site-related computerized accident data, examine the sites selected, and make recommendations for safety work. Safety work that meets the criteria in Section 2.1 should be recommended by the safety audit team and should be decided/scoped at the time of the on-site inspection. Requirements and guidance for conducting a safety audit and preparing the subsequent safety work are included in Figure A-2.

## 2.4 Type and Timing of Safety Work

This section includes a list of typical safety work with the timing of when the work should be accomplished. Ideally, the safety work should be done before or immediately after the paving work in order to minimize the public's exposure to existing or potential safety problems. However, scheduling the work requires consideration of the following:

- The need to mitigate accident problems;
- The potential for future accidents;
- The extent, complexity, and staging of the work involved;
- The impacts of winter shutdowns; and
- Contractor or state force availability.

Therefore, while the following list of safety work contains general time frames, the most critical safety needs should be addressed earlier. Additionally, safety work, such as brush removal, clearing, and grubbing, may be completed before the paving operation, as appropriate.

Note that implementation of the safety work items identified by the safety audit team and approved by the regional director is to be programmed or scheduled and reported on SAFETAP Reporting Form A as required by Section 2.5 of this EI. The work may be accomplished as part of the paving contract, as part of separate contract(s), by state maintenance forces, or by others under a highway work permit.

To be done before the paving contract, as required:

- Replace missing regulatory or warning signs as noted by the safety audit team.

To be done during the paving contract, as required:

- Superelevation.
- Shoulders.
- Interim treatment for edge of pavement drop-offs shall be provided in accordance with Section 619-3.01 G.3 of NYSDOT "Standard Specifications" and shall continue until the edge drop-offs are corrected.

To be done during or as soon as possible after completion of the paving contract, as appropriate (the safety work normally should be completed within 2 months of the paving work, unless otherwise specified; as an exception, safety work needed to supplement paving work completed near the end of the construction season may be deferred to the first couple of months in the following construction season if its completion within 2 months is impractical; pavement markings, regulatory signs, warning signs, critical guide rail, and other work to mitigate an accident problem are not included in this exception):

- Pavement markings (refer to specifications and current EIs for timing);
- Rumble strips;
- Back-up shoulders to eliminate edge drop-offs;
- Additional/updated regulatory, advisory, and warning signs not addressed (generally within 2 months);
- Brush removal, clearing, and grubbing;
- Fixed objects: remove, modify, relocate, delineate, or protect by guide rail;
- Guide rail:
  - Reset guide rail that is or will be at the improper height,

| | | |
|---|---|---|
| Project Location & Limits | Route =<br>From =<br>To =<br>Municipalities = | |
| Safety Audit Team Members & Regional Program Areas | Design =<br>Traffic =<br>Maintenance = | |
| Date | | |

| _ | Element | Guidance | Comments |
|---|---|---|---|
| | Signing | • Signs should be installed as needed in accordance with the NYS MUTCD.<br>• Immediately notify the Resident Engineer of any missing regulatory or warning signs. | |
| | Superelevation | Consult Figure 231-1 of the NYS MUTCD. Identify any current conditions which meet the criteria in Section 2.1 (i.e., curves where it is determined that existing operating speeds are now causing, or may in the future cause, vehicles to travel off the roadway or cross the centerline.) Sharp horizontal curves may be ball banked to help determine the need for additional superelevation.<br><br>Existing superelevation should not be reduced unless excessive (>8%) and causing a safety problem.<br><br>Where the superelevation will not be improved to the minimum required for the speed limit, install advisory speed signs and consider additional treatments (e.g., chevrons, roadside clearing, etc.) | |
| | Shoulder Resurfacing | Consider paving unpaved, stabilized shoulders based on the need to reinforce the edge of the traveled way, accommodate bicyclists or treat safety considerations. | |
| | Rumble Strips | On rural, high speed facilities (55 mph & 65 mph) consider in accordance with HDM §3.2.5.4. | |
| | Pavement Markings | Pavement markings should be installed in accordance with the NYS MUTCD. The adequacy of existing passing zones should be evaluated. Current EI's and specifications must be followed. | |

FIGURE A-2 Requirements and guidance for safety work. (NYS MUTCD = New York State Manual on Uniform Traffic Control Devices, SSD = stopping sight distance, SDCD = Structures Design and Construction Division, DQAB = Design Quality Assurance Bureau). (*continued on next page*)

| | Element | Guidance | Comments |
|---|---|---|---|
| | Sight Distance | Trim vegetation to improve substandard intersection sight distance, and horizontal and vertical stopping sight distance.<br>• Intersection Sight Distance - HDM § 5.10.5.1 A<br>• Passing Sight Distance - HDM § 5.8.2.2<br>• Horizontal & Sag Vertical SSD - HDM Chapter 2 and HDM § 5.8.2.1 | |
| | Fixed Objects | Based on the criteria in Section 2.1 of this EI, remove, modify, relocate, delineate, or protect by guide rail any fixed objects that require remediation due to existing or potential safety implications (e.g., tree removal on the outside of a curve or installation of traversable driveway culvert end sections on the outside of a curve). The Safety Audit Team should determine the timing of the work based on the work involved, accident data and accident potential.<br><br>For guidance on identifying fixed objects, refer to HDM §10.3.1.2 B. | |
| | Guide Rail | The following should be used to evaluate the need for guide rail and other roadside work.<br>• HDM Section §10.2.2.1 - point of need<br>• HDM Table 10-7 - acceptable guide rail height<br>• HDM Section §10.3.1.2 B - guidance on determining severely deteriorated guide rail and non-functional guide rail<br>• HDM Section §10.2.2.3 and Table 10-3 - barrier deflection distance<br>• HDM Section §10.2.2 - design of new guide rail | |
| | Bridge Rail Transitions | The Regional Structures Group, Regional Design Group, SDCD and DQAB should be contacted, as necessary, to help identify substandard connections to bridge rail and for the recommended treatment. | |
| | Delineation | Delineation should be installed in accordance with the NYS MUTCD | |
| | Other | | |

FIGURE A-2 (*continued*) Requirements and guidance for safety work.

– Replace severely deteriorated and nonfunctional guide rail,

– Replace severely substandard guide rail and connections to bridge rail (e.g., concrete post/cable or railroad rail post/cable),

– Install guide rail if missing or not extending to the point of need if a serious hazard such as a cliff, deep body of water, or liquid fuel tank is exposed and there is a reasonable expectation that vehicles will reach the hazard,

– Restore guide rail deflection distance through clearing and grubbing; and

• Delineation.

To be done in a timely manner after the completion of paving (within 18 months of the paving work)

• Guide rail not addressed under the "as soon as possible" work,

• Replacement of missing or damaged reference markers,

• Fixed objects that cannot be practically addressed as soon as possible,

• Installation of guide signs/route markers if needed, and

• Any other features of concern that are judged to meet the criteria outlined in Section 2.1 of this EI.

## 2.5 SAFETAP Reporting Requirements

In accordance with the need to monitor the effectiveness of the 1R requirements, SAFETAP Reporting Forms A and B, as detailed below and presented in Figures A-3 and A-4, must be completed each year. The completed SAFETAP reporting forms are to be sent to the safety program management bureau by the end of the state fiscal year (March 31) for the scheduled and completed maintenance resurfacing projects. (Note that yearly submission of the SAFETAP forms should include the 100 percent state-funded projects, as required by the *Safety Appurtenance Program Guidelines*.)

1R paving projects or safety work identified after submission of the SAFETAP reporting forms on March 31 may be progressed within the same state fiscal year by submitting an amended SAFETAP Report Form A.

### *SAFETAP Reporting Form A (See Figure A-3)*

• A listing of all sites selected for maintenance paving. This includes the following:

– Preventive maintenance paving projects using the 1R requirements (federal aid),

– VPP using the 1R requirements (federal aid),

– VPP with 100 percent state funds,

**State Fiscal Year _____ Prior to Maintenance Paving Work**

**MAINTENANCE PAVING PROJECTS TO BE IMPLEMENTED IN NEXT SFY**

| 1R Site | | Fund Source | Team Recommendation | Regional Approval or Disapproval | Reason(s) if Rejected | Scheduled Completion Date |
|---|---|---|---|---|---|---|
| Beg. RM | End. RM | | | | | |
| 1. 24 0303 1101 | 1141 | Federal | | | | April, 1999 |
| 1122 | 1122 | | Superelevation | Disapprove | 1. Insufficient ROW<br>2. Curve sign and delineation should address the problem | N/A |
| 1121 | 1121 | | Curve Warning Sign | Approve | | May, 1999 |
| 1121 | 1123 | | Post Mounted Delineators | Approve | | May, 1999 |
| 1134 | 1134 | | Guide Rail Replacement | Approve | | June, 1999 |
| 2. 27 0304 2104 | 2139 | State | | | | July, 1999 |
| 2113 | 2115 | | Chevrons | Approve | | August, 1999 |
| 2122 | 2124 | | Guide Rail Removal | Approve | | September, 1999 |
| 2133 | 2133 | | Transition to Bridge Rail | Approve | | September, 1999 |
| 3. 24 0303 1155 | 1190 | Federal | No Recommendations | N/A | | October, 1999 |

FIGURE A-3 Sample SAFETAP Reporting Form A: recommendations (SFY = state fiscal year, RM = road maintenance, ROW = right-of-way, N/A = not applicable).

| 1R Site | | Fund Source | Resurfacing Complete | Improvements | Completion Date Month/Year |
|---|---|---|---|---|---|
| Beg. RM | End. RM | | | | |
| 1. 25 0303 1101 | 1161 | State | May, 1999 | | |
| 1137 | 1138 | | | Post Mounted Delineation | June, 1999 |
| 1148 | 1149 | | | Post Mounted Delineation | June, 1999 |
| 2. 25A 0302 1068 | 1087 | Federal | June, 1999 | | |
| 1077 | 1078 | | | Superelevation | June, 1999 |
| 3. 27 0304 1139 | 1146 | State | July, 1999 | | |
| 1141 | 1143 | | | Guide Rail Replacement | October, 1999 |
| 4. 101 0301 1004 | 1012 | Federal | May, 1999 | | |
| 1006 | 1008 | | | Chevrons | August, 1999 |
| 1010 | 1011 | | | Chevrons | August, 1999 |

**FIGURE A-4 Sample SAFETAP Reporting Form B: completed safety improvements (RM = road maintenance).**

– Resurfacing by state forces with 100 percent state funds, and

– Simplified maintenance contracts with 100 percent state funds using the pavement preventive maintenance projects second working draft.

This listing should include the beginning and ending reference marker for each site.

- The fund source (federal aid or 100 percent state funded).
- A brief description of the safety work recommended by the safety audit team for each site. Safety work needed to avoid degrading safety shall be explicitly identified as such.
- An accounting of the disposition of those recommendations. If any recommendations for safety work practical and necessary to address existing or potential safety problems are not approved for implementation, an explanation should be given for that decision. (Note: Safety work needed to avoid degrading safety shall be treated as a nonstandard feature in accordance with the HDM Section 2.8 and the TEA-21 matrix in the *Design Procedure Manual* if not addressed.)
- The scheduled timing of when the paving and related safety work will be (or was) accomplished.

### *SAFETAP Reporting Form B (See Figure A-4)*

- A listing of all sites paved—this listing should include the beginning and ending reference marker for each site;
- The fund source used for the paving work;
- The year and month when the paving was done and the year and month when the safety recommendations were implemented; and
- The improvements made and the date when they were completed or scheduled to be completed, in accordance with Section 2.4 of this EI.

## 2.6 Records Retention

As a minimum, the project files relating to the safety audit and the safety work performed should be retained by the region until the next time the project limits are resurfaced or pending litigation is resolved.

### *Contacts*

Design-related questions about this EI should be directed to your regional quality control engineer. Further questions may be directed to the main office safety program management bureau or your regional liaison engineer in the design quality assurance bureau.

## REFERENCES

1. Hauer, E., D. Terry, and M. S. Griffith. Effect of Resurfacing on Safety of Two-Lane Rural Roads in New York State. In *Transportation Research Record 1467*, TRB, National Research Council, Washington, D.C., 1994, pp. 30–37.
2. Bray, J. S. Safety Appurtenance Program, NYSDOT's Road Safety Audit Pilot. Presented at 69th Annual Meeting of the Institute of Transportation Engineers, Las Vegas, Nev., Aug. 1999.